

**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, that exist within the construction area and that are not specifically designated to remain.

**2101.2 BLANK****2101.3 CONSTRUCTION REQUIREMENTS**

The Engineer will establish the Right of Way lines and construction limits within which the clearing and grubbing operations are to be confined. The Engineer will designate those trees, brush, and other vegetation that are to be preserved and those that are to be removed. The Contractor shall remove and dispose of the trees, brush, stumps, and roots from the limits designated for clearing and grubbing.

The Contractor shall salvage topsoil to the extent feasible in accordance with 2105.

The Contractor shall protect the items designated to remain in accordance with 1712 and 2572, place temporary fence, and conduct all clearing and grubbing operations in a manner that will not damage or jeopardize the surrounding plant life and property.

The Contractor shall prune low hanging, unsound, or unsightly branches from the trees and brush designated to remain. Pruning shall be performed in accordance with 2571.3.

**A Clearing and Grubbing Operations**

The Contractor shall 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, for clearing operations, and for grubbing operations. The Contractor shall perform clearing and grubbing as required on the Project to construct the proposed improvements as planned, including the clearing and grubbing of designated areas outside those construction limits, either as indicated in the Plans or as designated by the Engineer in consideration of the following:

- (1) Within the Right of Way, the Engineer will designate and require the removal of trees, brush, stumps, and aesthetically undesirable items that can be viewed from the traveled way.
- (2) Within 5 m (**15 feet**) of the construction limits outside of structures, the Engineer will designate and require the removal of trees, stumps, roots, brush, and branches as necessary to protect and maintain the completed improvements.

**B Clearing Operations**

The Contractor shall cut off, remove, and dispose of trees and brush in the areas designated as a clearing operation. When grubbing is not

### 2101.3

required, the point of cut off shall be within 150 mm (**6 inches**) of the ground.

#### **C Grubbing Operations**

The Contractor shall remove and dispose of the brush, stumps, roots, and other remains in the designated areas as a grubbing operation. Stumps shall be removed completely unless permitted to remain. If stumps are permitted to remain, they shall be cut off not more than 150 mm (**6 inches**) above ground, and flush with or below ground surface if so directed.

The Contractor shall fill all depressions resulting from the grubbing operations with suitable material and compact the material to the satisfaction of the Engineer, except in those areas to be excavated as part of the Contract work.

#### **D Disposal Limitations**

The Contractor shall dispose of trees, brush, stumps, roots, and other debris or byproducts by chipping, marketing, burning, or burying. The Contractor:

- (1) May chip the wood through a chipping machine and use or dispose of the chips to the satisfaction of the Engineer.
- (2) Shall use unchipped marketable trees or make them available to wood-using industries and individuals.
- (3) Shall comply with the disposal requirements for pine, elm, and oak wilt infected red oak trees.
- (4) Shall conduct burning according to 2104.3, Minnesota Rules Chapter 7009 and any applicable local ordinances. At no time shall waste tires, rubber or plastics or similar materials be used to ignite these wastes.
- (5) Shall conduct burying operations according to 2104.3, Minnesota Rules Chapter 7035 and any applicable local ordinances. The Contractor must first receive approval from the Engineer to bury vegetation material.

#### **D1 Marketable Trees**

The Contractor shall make marketable trees, which are designated for removal, available to wood-using industries or individuals. Marketable trees are all trees, except elm and oak wilt infected red oak trees, that have a diameter of 150 mm (**6 inches**) or more measured at a point 600 mm (**24 inches**) above the ground surface. The Contractor:

- (a) Shall not burn or waste marketable trees without having written proof from three potential wood-using industries or individuals that the wood is not wanted. This requirement only applies when the volume of marketable trees on the Project exceeds 75 m<sup>3</sup> (**100 cubic yards**).
- (b) Shall not dispose of marketable material remaining after harvesting by wood-using industries or individuals, without having written

**2101.3**

proof of first offered them to the public for use as firewood in accordance with the intent of Minnesota Statute 116F.30.

(c) Is not required to make non-marketable trees available to wood-using industries or individuals.

(d) Is not required to cut trees in lengths of less than 2.5 m (**6 feet**).

D2 Elm and Oak Wilt Infected Red Oak Trees

D2a Elm Trees

The Contractor shall dispose of all elm trees, brush, stumps, roots, and debris, together with the bark and byproducts with adhering bark of elm tree origin according to Minnesota Rules 1505.0230, 1505.0240, and 1505.0250 and local ordinances.

D2b Oak Wilt Infected Red Oak Trees

The Contractor shall dispose of all stumps, roots and debris from all oak wilt infected oak trees of the red oak and white oak families consistent with Minnesota Rules 1505.0320 and 1505.0340 and local ordinances.

D2c Disposal Deadlines and Locations

The Contractor shall dispose of elm and oak wilt infected red oak trees:

- (1) Within 20 calendar days of notification or of clearing and grubbing, whichever comes first, when the cutting operations are performed between April 1 and September 15.
- (2) By April 1 when cutting operations are performed between September 15 and March 31.
- (3) Within the Right of Way by burning, burying, or chipping, when allowed.
- (4) Off the Right of Way provided the trees, with intact bark, are processed within the time limitations.

D3 Pine

The Contractor shall dispose of all non-marketable pine trees, brush, stumps, roots, and debris by chipping, debarking, burning, burying, or covering with an air tight tarp within 20 calendar days of being cleared during the growing season.

D4 Blank

D5 Burning..... 2104.3

D6 Burying..... 2104.3

The Contractor must obtain the Engineer's approval before burying vegetation material.

**E Temporary Fencing..... 2572**

## 2101.4

### 2101.4 METHOD OF MEASUREMENT

The Department will measure clearing and grubbing by area, lump sum, or individual unit basis as indicated in the Contract. Diameter will be determined by dividing the measured circumference by 3.14.

#### **A Qualifying Trees and Stumps**

The Engineer will only measure trees for payment that have a diameter of more than 100 mm (**4 inches**) at a point 600 mm (**24 inches**) above the ground surface.

The Engineer will only measure stumps for payment that have a diameter of more than 100 mm (**4 inches**) at:

- (a) A point 600 mm (**2 feet**) above the ground surface when the tree was cleared under the same Contract, or
- (b) The point of cutoff when the tree was not cleared under the same Contract.

No measurement will be made for the removal and disposal of brush nor of stumps having a diameter of 100 mm (**4 inches**) or less at the point of cutoff.

#### **B Area Basis**

When the hectare is the unit, quantities will be determined by measuring (to the nearest 0.02 ha (**0.05 acre**)) all areas cleared and all areas grubbed, within the limits shown in the Plans or staked by the Engineer. All measurements will be made horizontally to points 3 m (**10 feet**) outside the trunks of qualifying trees or stumps on the perimeter of the area being measured. Separate areas smaller than 0.02 ha (**0.05 acre**) will be considered to be 0.02 ha (**0.05 acre**).

Whenever isolated trees or stumps are to be removed outside the areas designated to be cleared or grubbed by the hectare, and no unit price is provided in the Contract for clearing and grubbing individual trees or stumps, payment will be made on the following basis:

- (1) Each isolated qualifying tree measuring less than 1 m (**40 inches**) in diameter at a point 600 mm (**2 feet**) above the ground surface, and each isolated qualifying stump measuring less than 1 m at the point of cutoff, will be considered as being 0.02 ha (**0.05 acre**).
- (2) Each isolated tree or stump measuring 1 m (**40 inches**) or more in diameter, at the points described above, will be considered as being 0.04 ha (**0.1 acre**).

#### **C Individual Unit Basis**

When the tree is the unit, quantities will be determined by counting the number of qualifying trees cleared and the number of qualifying stumps grubbed.

#### **D Lump Sum Basis**

No measurement will be made of an individual area, tree, or stump when clearing and grubbing is a lump sum item.

**2102.1**

**2101.5 BASIS OF PAYMENT**

Payment for the accepted quantities of clearing and grubbing at the Contract prices per unit of measure will be full compensation for all removal and disposal costs, including the costs of securing outside disposal sites as needed and of carrying out the specified treatment in disposing of elmwood, oak wilt infected red oaks, pine, and marketable trees.

Payment of the lump sum item for clearing and grubbing, regardless of the size of the trees and stumps, will be compensation in full for all costs of clearing and grubbing required.

The Contractor shall remove and dispose of brush and stumps having a diameter of 100 mm (**4 inches**) or less at the point of cutoff as an incidental item to the Contract.

The Contractor will not receive compensation for pruning except as allowed in 2572.5.

When the Proposal does not contain a pay item for clearing and grubbing, the Contractor will receive compensation as Extra Work for clearing and grubbing of qualifying trees and stumps, as described in 2101.4, required for construction of the Project. The Department will not make payment for clearing and grubbing non-qualifying trees and stumps.

Payment will be as follows:

<b>Item No.</b>	<b>Item</b>	<b>Unit</b>
2101.501	Clearing .....	hectare ( <b>acre</b> )
2101.502	Clearing .....	tree
2101.506	Grubbing.....	hectare ( <b>acre</b> )
2101.507	Grubbing.....	tree
2101.511	Clearing and Grubbing .....	lump sum

**2102**

**Pavement Marking Removal**

**2102.1 DESCRIPTION**

This work shall consist of the removal of pavement markings that conflict with revised traffic patterns. The markings will usually be in the form of 100 mm (**4 inches**) wide widths, in solid line or skip line lengths, but may include other patterns or widths and the type will be as (one) of the following:

- A) Pavement Marking Removal: this work shall consist of the removal of non-durable pavement markings such as paint type markings.

### 2102.1

- B) Pavement Marking Removal - Temporary: this work shall consist of the removal of Temporary Reflectorized Pavement Marking Tape or Removable Preformed Plastic Pavement Markings.
- C) Pavement Marking Removal - Permanent: this work shall consist of the removal of durable pavement markings.

### 2102.2 BLANK

### 2102.3 REMOVAL REQUIREMENTS

Before effecting a change in traffic pattern, the Contractor shall remove all conflicting pavement markings approved by the Engineer, using methods and equipment that will not significantly damage the pavement structure or surface texture. Should the removal operations result in significant damage, as determined by the Engineer, the Contractor shall repair the damaged areas as the Engineer directs at no expense to the Department.

Whatever methods of removal are employed, the Contractor shall control or restrict operations to avoid exposing traffic to hazardous or detrimental conditions. Any expended materials or agents used in the removal process shall not be allowed to accumulate on the pavement surface but shall be promptly removed by suction or other approved methods as the work progresses.

Linear paint markings shall be removed so as not to leave a distinguishing pattern of removal. Where unsatisfactory results are achieved, the Contractor shall obliterate any deceptive lines remaining by applying a color-matched paint or asphalt sealer that will blend with the surface texture satisfactorily.

### 2102.4 METHOD OF MEASUREMENT

Pavement marking removal will be measured by either area or length of the original markings as acceptably removed. Unless otherwise provided, markings of all types will be included for payment under a single Contract item.

Removal areas will be computed on the basis of nominal widths and actual lengths as originally applied and still evidenced at the time of removal. Other irregular shaped markings will be measured as enclosed within rectangular boundaries of least dimension as determined by the Engineer.

Removal length will be computed by the actual length of each pavement marking removed and will not include the gap between the broken lines.

### 2102.5 BASIS OF PAYMENT

Payment for pavement marking removal at the Contract price per unit of measure will be compensation in full for all costs of obliterating the markings as specified and for all costs of restoring the original pavement texture as needed.

**2103.3**

Payment for this work will be made on the basis of the following schedule:

<b>Item No.</b>	<b>Item</b>	<b>Unit</b>
2102.501	Pavement Marking Removal ...	square meter ( <b>square foot</b> )
2102.501	Pavement Marking Removal – Temporary	..... square meter ( <b>square foot</b> )
2102.501	Pavement Marking Removal – Permanent	..... square meter ( <b>square foot</b> )
2102.502	Pavement Marking Removal .....	meter ( <b>linear foot</b> )
2102.502	Pavement Marking Removal – Temporary	..... meter ( <b>linear foot</b> )
2102.502	Pavement Marking Removal – Permanent	..... meter ( <b>linear foot</b> )

**2103**

**Building Removal**

**2103.1 DESCRIPTION**

This work consists of removing from the Right of Way those buildings that have been vacated and are not considered to have salvage value as buildings.

This work includes sewer and water service disconnections.

This work does not include the removal of sidewalks, driveways, or miscellaneous structures unless so indicated in the Contract.

**2103.2 BLANK**

**2103.3 REMOVAL REQUIREMENTS**

**A General**

The Contractor shall do all work in accordance with the applicable laws and ordinances.

The Contract will list the buildings to be removed, show the approximate location of each building by the street address or by reference to a survey station, and give a general description of the building. Building removal shall also include the listed miscellaneous removals from the locations indicated in the Contract.

In doing building removal work, the Contractor may remove any buildings (including all fixtures except those owned by public or private utilities) by demolition before removal from the Right of Way or remove any buildings from the Right of Way without demolition.

If the Contractor elects to move any building to another location, the Contractor shall obtain all necessary permits including those required by the Department.

**2103.3**

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**

The Contractor shall entirely remove all buildings and structures, including steps, basement walls, floor slabs, and footings from the Right of Way. Where the building rests on a concrete surface slab, the Contractor shall remove the entire slab and related footings.

**C Utilities..... 1507**

**C1 Disconnection of Sewer and Water Services**

The Contractor shall locate, expose, cut off, and plug all sewer and water service connections at the sewer and water mains. The Contractor shall, at no additional compensation, plug all sewers leading from the building using watertight plugs.

The Contractor shall abandon wells in accordance with 2104.

**C2 Other Utilities**

The utility owners are responsible for disconnecting telephone, electric power, and other wire services, and gas service pipes outside the buildings, and removing fixtures belonging to such utility companies; however, the Contractor's attention is directed to 1507.

**D Disposal of Materials and Debris**

All materials removed, other than utility owned fixtures, and all debris resulting from the removal operations, shall become the property of the Contractor and the Contractor shall dispose of them in accordance with 2104.3C.

**E Filling Basements**

If the building was removed under a separate Contract, the Contractor shall fill all basements and other excavations made, as specified in the Contract. The Contractor shall fill the excavation to the level of the existing ground surface using sand, gravel, clay, loam, or other inorganic soil. The Contractor shall furnish the fill material from sources outside the Right of Way, subject to 1405. The Engineer will not require mechanical compaction of the fill material.

If the building removal is included in the same Contract as the grading, the Contractor shall remove the foundations according to 2103.3B and fill basements according to 2105.3G.

**2103.4 METHOD OF MEASUREMENT**

**A Building Removal**

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

**2104.3**

**B Basement Fill**

When the Contractor is required to furnish the material for filling basements, and only then, the Engineer will measure basement fill as the volume of the air space within the basements, below the ground surface.

**C Disconnection of Sewer and Water Services**

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

**2103.5 BASIS OF PAYMENT**

The Department will pay for the building removal item at the Contract lump sum as compensation for all costs of the work described above, except filling basements when the Contractor is required to furnish the fill material and for sewer and water disconnections.

The Department will pay for disconnect of sewer and water services at the main at the Contract unit price for each disconnection. This payment will be compensation in full for all costs involved, including restoration of street and property surfaces.

The Department will pay for building removal by the following schedule:

<b>Item No.</b>	<b>Item</b>	<b>Unit</b>
2103.501	Building Removal.....	lump sum
2103.505	Disconnect Sewer Service .....	each
2103.507	Disconnect Water Service .....	each
2103.511	Basement Fill.....	cubic meter ( <b>cubic yard</b> )

**2104**

**Removing Pavement and Miscellaneous Structures**

**2104.1 DESCRIPTION**

This work shall consist of the removal, in part or wholly, and satisfactory disposal of pavement, sewers, culverts, guardrails, abandoned structures, and other obstructions existing on the Right of Way, but not including bridges, covered under 2442, and buildings. The work shall include salvaging designated materials and backfilling the resulting trenches, holes, and depressions.

**2104.2 BLANK**

**2104.3 CONSTRUCTION REQUIREMENTS**

**A General**

Those structures and facilities that are to remain in place will be indicated in the Contract or designated by the Engineer.

The Engineer may determine that the existence of a structure or an obstruction does not interfere with, endanger, or detract from the new construction in any way, and therefore, may remain in place.

The Contractor shall remove and dispose of all structures and obstructions specifically included for payment in the Contract, except

### 2104.3

those that are specified to be removed by others or that are permitted to remain by the Engineer.

In an excavation area, excavation includes removal of all obstructions unless the obstruction is specifically identified for removal in the Contract as a separate pay item. If obstructions are encountered in the excavation operations that require removal, and that require equipment and handling substantially different from that employed in the excavation operation, the Engineer may pay for the removal as Extra Work.

#### **B Removal Operations**

All removal operations that may endanger new construction shall be completed prior to construction of the affected work. All materials that have been designated for salvage shall be removed in a manner that will not result in unwarranted damage. The salvaged material shall be dismantled into section or assembly units as required to facilitate removing in undamaged condition and permit convenient handling. Pipe materials shall be completely emptied of infiltrated material prior to being stockpiled.

##### **B1 Remaining Portion of Structure**

Where a portion of an existing structure is to be retained for use, that portion shall not be damaged during the removal operations. Where a portion of a reinforced concrete structure is to be removed and the structure extended, existing reinforcement bars shall be left in place for a distance of not less than 40 diameters from the face of the cut, to provide bond between the old and new concrete. Where a concrete box culvert is to be extended, the old structure shall be removed to the extent shown in the Plans.

##### **B2 Pavements and Sidewalks**

In removing pavements, sidewalks, and similar structures, where the cut will be exposed in the finished work, the structure shall be sawed along the removal line(s) with a concrete saw, unless the removal is made to an existing joint. The use of wedges driven into the saw cut to break off the portion to be removed will not be permitted. Elsewhere, the structure shall be cut and chipped to true lines and vertical faces.

The Contractor shall saw the existing concrete or bituminous pavement at the location(s) shown in the Plans and as staked by the Engineer for the purpose of establishing a neat line from which to extend the new work.

##### **B2a Sawing Concrete Pavement**

The Contractor shall saw concrete pavement along the removal line(s) to the depth indicated in the Plans, the pertinent Specification, or, in the absence thereof, to a depth 30 percent of the thickness of the concrete prior to breaking off the pavement.

## 2104.3

### B2b Sawing Bituminous Pavement

When sawing is specified, the Contractor shall saw bituminous pavement along the removal line(s) to a minimum depth of 75 mm (**3 inches**) prior to breaking off the pavement. When sawing is not specified, the Contractor may use other methods of removal that will produce a neat line acceptable to the Engineer.

### B3 Integrant Curb

The Contractor shall remove integrant curb by controlled blasting, utilizing detonating cord of sufficient core load and so placed that the explosive force will effectively remove the curb to within 15 mm (**0.5 inches**) of the designated break line conforming to the normal pavement surface. Any projections extending more than 15 mm (**0.5 inches**) above the designated break line after blasting shall be removed by chipping with pneumatic hammers or by other approved methods. Overbreakage shall be held to a practical minimum by careful control of the blasting force. If any unacceptable overbreakage occurs, repairs shall be made as directed by the Engineer, using suitable patching mixture properly placed to restore the surface acceptably. Unless otherwise approved, the patching material shall be a suitable Portland cement concrete or mortar mix. All loose material shall be removed from the areas to be patched and an approved bonding agent shall be applied to the depression surfaces prior to placing the patching mixture.

After each blasting operation, the Contractor shall clean the traveled portions of the roadway of all debris before allowing resumption of traffic. All shoulder depressions resulting from the Contractor's operations shall be backfilled to the Engineer's satisfaction, prior to suspension of each day's operations.

All concrete removal debris shall be disposed of outside the Right of Way in accordance with this Specification.

### B4 Blank

### B5 Concrete and Masonry Structures

Within municipalities the Contractor shall entirely remove concrete and masonry structures located within the roadbed. Elsewhere, concrete and masonry structures located within the roadbed shall, unless they are specified to be removed entirely, be removed to an elevation at least 1200 mm (**4 feet**) below the surface of the subgrade. Concrete and masonry structures located outside the roadbed shall be removed to an elevation not less than 600 mm (**2 feet**) below the final ground surface.

The Contractor shall remove septic tanks, cisterns, and cesspools to the extent required above and in accordance with Minnesota Department of Health regulations.

The Contractor shall rebuild and reconnect live sewers when related manholes, catch basins, and drop inlets are removed. The Contractor

### 2104.3

shall provide a by-pass and maintain the service during the operations, to the satisfaction of the Engineer.

The upgrade ends of all drainage or sewer pipes leading from abandoned basements, manholes, or similar structures shall be plugged with concrete or masonry.

Before filling abandoned basements, manholes, cesspools, septic tanks, cisterns, and similar structures that are not completely removed, the Contractor shall make holes in the bottom to prevent the entrapment of water.

#### B6 Timber Structures and Underground Tanks

The Contractor shall completely remove all timber structures and all underground tanks in accordance with applicable regulations.

#### B6a Underground Petroleum Tank

Contractors removing underground petroleum tanks and all related liquids and sludge residues must have MPCA certification.

The Contractor shall:

- (1) Give written notification to the Engineer at least 15 days prior to removal of the underground tank,
- (2) Obtain any required permits,
- (3) Have a MPCA Certified Supervisor on site during tank removal,
- (4) Drain all connecting pipes,
- (5) Close all connections except vents,
- (6) Remove all fluids, sludge residue, and explosive vapors from the tank,
- (7) Dispose of tanks in accordance with applicable Motor Carrier Safety and Hazardous Materials Transport requirements. During transport, all tanks shall be secured so that no material leaks from the tank onto the vehicle or onto the road, and
- (8) Give written certification to the Engineer within 30 days after removal of the tank that the tank, liquids, and residue have received proper disposal.

#### B7 Wells and Holes

All wells, well shafts, elevator shafts, environmental bore holes, and the like that are to be abandoned shall be filled and sealed by a Contractor licensed by the Minnesota Department of Health in accordance with the "Water Well Construction Code," Chapter 4725. Until permanently abandoned in accordance with the Code, wells, shafts, etc., shall be sealed or otherwise protected as necessary during the work to prevent any surface drainage from entering the opening. After abandonment and sealing has been completed, wells, shafts, etc., shall be removed to the elevations specified on the Plans or as designated by the Engineer. A copy of the completed Well Sealing Certificate shall be filed with the Department's Central Office Property Management Supervisor

## 2104.3

### B8 Miscellaneous Items

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

When removing guardrail and fences that are to be salvaged, the Contractor shall neatly coil the wire and cable, pull posts from the ground, and remove nails and staples from posts and boards.

### C Disposal of Materials and Debris

The Contractor shall provide the Engineer with information and documentation substantiating proper disposal arrangements and operations. The Contractor's attention is directed to burying regulations, including Minnesota Rules 7035.2825. If waste materials or debris have been or are being disposed of improperly, the Engineer may order the Contractor to take corrective action. The Engineer may withhold payments until compliance is ensured.

The Contractor shall dispose of trees, brush, stumps, roots, and related vegetation according to 2101.3 and these requirements.

### C1 Disposal of Salvageable Materials

The Contractor shall stockpile materials designated for salvage by the Department on the Right of Way at locations approved by the Engineer upon being removed, dismantled, and cleaned as required.

The Contractor shall dispose of materials not designated for salvage by the Department and all debris resulting from the removal and demolition operations as provided for in these requirements and in specific regulations imposed by laws, ordinances, orders, and decrees.

Materials of marketable value that are removed in accordance with these provisions, but that are not to be possessed by the Department, shall become the property of the Contractor and shall be removed from the Right of Way.

### C2 Disposal Within Right of Way

The Contractor may dispose of noncombustible materials and debris other than metallic substances in the roadway embankments in accordance with 2105 for rock placement or by burying them under a minimum covering of 600 mm (**2 feet**) of earth material at locations approved by the Engineer.

The Contractor may burn combustible materials and debris within the Right of Way, provided the required burning permits are obtained. The Contractor shall conduct burning operations under the constant care of a competent caretaker and in accordance with all applicable regulations.

The Contractor may bury metallic materials and combustible materials or remains within the Right of Way at locations approved by the Engineer outside the roadbed, but not within the limits of a

### 2104.3

municipality. Before burying, the bulk must be reduced to a practicable minimum prior to being covered with earth.

#### C3 Disposal Outside Right of Way

The Contractor shall dispose of all materials and debris outside the Right of Way when so designated in the Contract. The Contractor shall also dispose of all materials and debris, resulting from removal or demolition operations, which have no specific disposal provisions, at locations outside the Right of Way. The Contractor shall dispose of the materials and debris in a manner that will not create a public nuisance nor result in unsightly conditions within view of a public road, recreational area, residential district, or other place of public concern.

The Contractor shall arrange for and secure suitable disposal sites for materials and debris to be removed from the Project for disposal outside the Right of Way. The Contractor shall assume full responsibility for acceptable disposition of the material as well as for damages resulting from the disposal operations.

The Engineer will not give final acceptance of the work:

- (a) Unless disposal is made at a publicly controlled dumping site or some other established facility where the Engineer is satisfied that the material will be properly disposed of by and at no additional expense to the Department.
- (b) Until the disposal areas are in acceptable condition with respect to the Contractor's obligations.

#### **D Backfilling Depressions**

If the remains of partially removed structures prevent natural filtration of water, the Contractor shall make perforations in the structure bottoms prior to placing the backfill to prevent entrapment of water.

All depressions and air spaces within partially removed structures shall be backfilled with suitable material in accordance with 2105.

### 2104.4 METHOD OF MEASUREMENT

No measurement will be made of any removals that are not required nor of any removals that are specifically designated as being covered by other Contract items.

Removal and salvage items will be measured separately by type of structure as identified in the item name. Measurements will be separated by size and kind of material only to the extent stated in the item Name.

#### **A Area**

Pavements, sidewalks, surfacing, and other uniform thickness items will be measured by area, without specifying thickness.

Pavement removal will be classified by kind of paving material whenever the material is comprised entirely of Portland cement concrete (remove concrete pavement) or entirely of bituminous-aggregate

## 2104.5

mixtures (remove bituminous pavement). Otherwise, when the pavement is comprised of a combination of different paving materials such as a concrete base or pavement overlaid with bituminous surfacing, removal of the entire structure will be accomplished under the unclassified item of "remove pavement." Regardless of classification, pavement removal shall include the removal of any integrant curb removed in conjunction therewith.

Removal of pavement in connection with the excavation of trenches for installation of drainage structures or utility items will be measured separately from other pavement removals, under the item of remove trench pavement, which shall include the removal of all paving courses including unclassified materials.

Removal of surfacing will be limited to the stripping of a wearing course overlaid on a concrete base preparatory to placement of a new wearing course thereon. This item will be classified by kind of material, such as: remove bituminous surfacing, remove brick surfacing, etc. Removal shall include any granular cushion course existing on top of the concrete base, if so required.

### **B Length**

Length measurements will be made along the longitudinal centerline of the structure, parallel to the base or foundation upon which the structure is placed, and from end to end of the structure as removed. Pipe measurements will be made from center to center of junction fittings, catch basins, or manholes, and will include the length of any aprons required to be removed in conjunction therewith.

Sawing of concrete and bituminous pavements will be measured by length along the saw cut line(s) as staked by the Engineer when these pay items appear in the Proposal.

### **C Volume**

In the case of concrete or masonry structures, volume will be determined from measurements taken on the in place structure as it is being uncovered and removed except where the structure dimensions or volumes are otherwise established.

### **D Number (Complete Unit)**

All items designated for payment on a per each basis will be measured separately by the number of individual units removed, salvaged, or abandoned, including all appurtenances.

## **2104.5 BASIS OF PAYMENT**

Payment for the accepted quantities of remove, salvage, or abandon items at the Contract price per unit of measure will be compensation in full for all costs of removing the material or specified portions thereof, for disposing of the materials removed and the salvaging of parts thereof as may be specified, for the backfilling of depressions and other restoration work required, and for well abandonment procedures and the

**2104.5**

performance of all other work of a special nature that may be specified or imposed by laws, ordinances, and regulations.

Payment for sawing will only be made for acceptable sawing of concrete and bituminous pavements when these pay items appear in the Proposal. All other sawing will be considered as incidental work to the Contract item.

Unless the Proposal includes an item for fence removal, the removal of abandoned fences shall be done at no expense to the Department, without any direct compensation being made therefor.

No direct compensation will be made for removing bituminous curbing, bituminous pavements less than 150 mm (**6 inches**) in thickness, and other minor encumbrances encountered within the limits of the roadway excavation that are not to be salvaged and that can be excavated and disposed of in the embankment or elsewhere without separate handling or the use of special equipment.

No direct compensation will be made for removing open metal flumes, metal curbs and gutters, and other similar metal items unless such materials are required to be salvaged.

In the case of salvage items, only those item units that are removed in acceptable condition will be measured for payment under the salvage items. Where removal is necessary, unacceptable units that are either damaged or deteriorated will be measured for payment under appropriate removal items or as Extra Work items in absence thereof. Otherwise, materials having insufficient salvage value shall be left in place where possible, without incurring removal expense.

If any materials designated for salvage are damaged due to negligence by the Contractor, 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.

Removing the ends of old box culverts preparatory to extending the structure will be paid for by the cubic meter (**cubic yard**) of removal or by each unit.

Backfilling depressions resulting from the removal of structures will be considered to be embankment construction, and no extra compensation will be made.

Payment for removing miscellaneous structures will be made on the basis of the following schedule:

<b>Item No.</b>	<b>Item</b>	<b>Unit</b>
2104.501	Remove (1).....	meter ( <b>linear foot</b> )
2104.503	Remove (1).....	square meter ( <b>square foot</b> )
2104.505	Remove (1).....	( <b>square yard</b> )

**2105.2**

2104.507	Remove (1).....	cubic meter ( <b>cubic yard</b> )
2104.509	Remove (1).....	each
2104.511	Sawing Concrete Pavement.....	meter ( <b>linear foot</b> )
2104.513	Sawing Bituminous Pavement.....	meter ( <b>linear foot</b> )
2104.521	Salvage (1).....	meter ( <b>linear foot</b> )
2104.523	Salvage (1).....	each
2104.525	Abandon (1).....	each

NOTE: (1) 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 shall consist of constructing roadway excavations and embankments within the Right of Way and easements, including any grading that may be specified on roadside areas.

**2105.2 MATERIALS**

**A Excavation Material**

Classification of excavated materials on each section of the Project will be made by the Engineer as the work progresses. The excavations will be classified for payment in accordance with the following provisions:

**A1 Common Excavation**

Common excavation shall consist of all excavation materials not classified herein as rock excavation, muck excavation, common channel excavation, or rock channel excavation, and shall include the excavations classified as subgrade excavation when a separate item therefor is not included in the Proposal.

**A2 Rock Excavation**

Rock excavation shall consist of all materials that cannot, in the Engineer's opinion, be excavated without drilling and blasting or without the use of rippers, together with all boulders and other detached rock each having a volume of 1 m (**1 cubic yard**) or more, but exclusive of those quantities that are to be paid for separately under the item of rock channel excavation.

**A3 Muck Excavation**

Muck excavation shall consist of all saturated and unsaturated mixtures of soil and organic matter not suitable for foundation material regardless of moisture content, that is removed from below the natural ground level of marshes, swamps, and bogs over which embankments are to be constructed, where the excavation is required:

## 2105.2

- (a) To provide a stable foundation for embankments, or
- (b) To accelerate the subsidence of unstable material under embankment load.

### A4 Subgrade Excavation

Subgrade excavation shall consist of all excavations made below the top of the final graded surface of the road and between the shoulder slopes that are not made for the purpose of obtaining topsoil and where the excavation materials are not classified for payment as rock excavation or muck excavation.

### A5 Common Channel Excavation

Common channel excavation shall consist of the excavation of channel changes outside the limits of the normal roadway excavation and embankment, together with the excavation of waterways leading to and from culverts but outside the roadway section, and includes the excavation of all materials encountered except for that which is to be classified for payment as rock channel excavation.

### A6 Rock Channel Excavation

Rock channel excavation shall consist of the same material as previously described for rock excavation, but includes only the material that is excavated in areas outside the normal roadway grading section as defined for common channel excavation.

### A7 Unclassified Excavation

Unclassified excavation does not include excavation that would be classified as muck excavation, common channel excavation, or rock channel excavation, but includes all other excavations, regardless of character or classification of material, that are not included for payment under separate items.

## **B Borrow Material**

Borrow material is material required for embankment construction or other specified purposes that is not available or is not to be obtained from the roadway excavations defined in 2105.2A. Unless otherwise provided in the Contract, borrow material shall be furnished by the Contractor from sources selected by the Contractor outside the Right of Way, subject to 1405 and 1602.

Borrow material will be classified in accordance with the material requirements given below. All borrow material furnished from sources selected by the Contractor must be approved by the Engineer prior to being delivered to the Project. The Contractor shall give the Engineer sufficient notice to permit any testing of the material that may be required for approval.

When measurement of borrow material is to be made at the source by cross-section methods, the Contractor shall allow sufficient time, and arrange the operations, so as to leave the excavated areas in a condition

**2105.2**

that will permit the taking of original and final cross-sections as necessary for accurate determination of quantities.

Borrow material shall be furnished and placed only to the extent that the required materials are not obtainable from the excavations within the Right of Way.

If the Contractor places more borrow material than is required or ordered by the Engineer, and thereby causes materials excavated from within the Right of Way to be wasted, the quantity wasted will be deducted from the borrow material measurements.

If materials are encountered within the planned roadway excavation limits which are excess materials and which meet all specified requirements for a Plan designated borrow item, the Contractor may, at his/her option, utilize those materials in that portion of the roadway where said borrow item was designated. This does not apply to topsoil items.

If the Contractor elects to use such excess material as a borrow item, payment will be made at the respective Contract unit prices for both the excavation of the material and the item for which the excavated material is used. If the particular borrow item is not established in the Plan as a (P) Plan Quantity measurement, the Contractor shall perform its operations in cooperation with and as directed by the Engineer to provide for measurement of the material by the Department.

Whether the Contractor chooses to provide borrow from outside the excavation limits or as outlined above, any resultant excess material shall be disposed of outside the Right of Way at no additional cost to the State.

B1 Granular Borrow ..... 3149

Material meeting the requirements for select granular borrow shall be furnished if so specified.

B2 Common Borrow

Common borrow shall consist of materials approved by the Engineer for use in the embankment construction or other specified purposes as the Engineer considers suitable.

B3 Topsoil Borrow ..... 3877

Material meeting the requirements for select topsoil borrow shall be furnished if so specified.

**C Salvage Material**

Salvage material shall consist of material available on the Project, such as native topsoil or aggregates in existing pavement and base courses, which is to be reserved for a specific use, either in the work under Contract or in future construction. Salvage of these materials will be required only when the Proposal contains separate and specific items therefor.

**2105.2**

The material to be salvaged shall be stockpiled for future use or utilized in the new construction as indicated in the Plans. All salvage material used in the new construction shall be placed in accordance with the Specification requirements for the class of work in which it is used. Salvage operations shall be in accordance with the following provisions.

**C1 Salvaged Aggregate**

Salvage aggregate shall include all existing sand, gravel, or crushed rock materials that can be salvaged and utilized without pulverization.

**C2 Salvaged Topsoil**

Salvaged topsoil for general use as a growth medium shall be obtained from the soil horizons normally designated as "A" or "B", or shall be obtained from alluvial deposits.

As part of the salvaging operations, all debris and any stones exceeding 75 mm (**3 inches**) in greatest dimension shall be removed prior to stockpiling.

**D Stabilizing Aggregate ..... 3149**

**2105.3 CONSTRUCTION REQUIREMENTS**

**A General**

The Contractor shall complete all clearing and grubbing operations in an area according to 2101 prior to excavation and embankment operations. During winter construction, the Contractor shall remove all ice and snow from an area just prior to excavation or embankment construction operations.

The Contractor shall not begin excavation operations on any area until the necessary cross-sections have been taken and the necessary construction stakes and grades have been established to the satisfaction of the Engineer. No excavating shall be performed beyond the elevations, slopes, and limits established, without approval of the Engineer.

The Contractor shall schedule and conduct erosion control operations according to 1717.2.

The Contractor shall maintain all excavations and embankments in a well drained condition at all times. The Contractor shall install planned drainage facilities concurrently with the embankment construction, temporarily crown grades to minimize infiltration, and install temporary drainage facilities as directed by the Engineer. No material shall be stockpiled in a manner that will restrict surface drainage.

If the Contractor interrupts existing surface drainage, sewers, or subsurface drainage, the Contractor shall, at no expense to the Department, provide and maintain temporary drainage facilities as approved by the Engineer until permanent facilities are completed and operative.

**B Preparation of Embankment Foundation**

Before placing embankment on an existing slope steeper than 1 vertical to 4 horizontal, the Contractor shall either:

- (a) Flatten the existing slope to the extent that it will not be steeper than 1 vertical to 4 horizontal; or
- (b) Construct steps in the slope, with the back surface being as nearly vertical as practicable and with the horizontal cuts being made as close together as the slope permits, but with no step being less than 300 mm (**12 inches**) in width. All work required by these provisions is incidental work for which no direct compensation will be made.

Before placing any embankment 1 m (**3 feet**) or less in height, all soil that the Engineer considers unsuitable for use in the upper 1 m (**3 feet**) of the roadbed shall be removed from the area between the shoulder lines and disposed of as hereinafter provided.

Where embankment is to be constructed over swamp or marsh areas or at other locations where the foundation material is unstable, the foundation shall be excavated to remove unstable material as indicated in the Plans or as directed by the Engineer. Where non-granular soils are to be used for excavation backfill and embankments, the foundation area shall be free of standing water. No direct compensation will be made for removing such water from the excavation.

Wherever practicable, the foundations for all embankments shall be compacted between the shoulder lines by a tamping roller. Four passes shall be made on each strip the width of the roller. Other rollers may be used with permission of the Engineer. No direct compensation will be made for compacting the embankment foundations.

Before placing embankment over an old road, the Contractor shall remove any surfacing that is specified to be salvaged and excavate the old road core to an elevation 300 mm (**12 inches**) below subgrade, unless a greater depth is required by the Plans.

Before backfilling depressions within the roadway caused by the removal of foundations, basements, and other structures, the Contractor shall enlarge the depressions as directed.

**C Excavating Operations**

All excavations shall be made in conformity with the lines, grades, and slopes staked by the Engineer and as the Engineer may otherwise direct, based on the typical section and elevation controls shown in the Contract. Any excavating performed beyond the limits described by the stakes that was not authorized or ordered by the Engineer will be considered to be unauthorized work.

Excavations below final grade, for the purpose of removing unstable foundation materials or removing materials that are considered unsuitable for use in the upper portion of the roadbed, shall be

### 2105.3

conducted with the understanding that the excavation limits staked will be subject to change as the actual subsurface conditions are disclosed. Where granular backfill is used, seepage trenches shall be excavated for drainage as directed by the Engineer.

Excavations in rock shall be made to secure uniformity of grade and cross-section. All rock outcroppings shall be removed from within the slope lines staked and above the elevations shown in the Plans. All loosened material shall be removed from the backslopes. Roadbed excavating shall be conducted to provide drainage to the shoulder slopes and not to leave depressions that cannot be drained. Unless otherwise specified, presplitting will be required for all rock backslopes steeper than 1:1 in hard rock types such as igneous, metamorphic, and carbonates.

Blasting operations shall be controlled to produce a shattering effect on the rock that will not throw the material out of the excavation areas. The "coyote" method of blasting will not be permitted. Any rock blasted away from the excavation and embankment areas shall be recovered as directed. If seismic methods are used to monitor blasting, a record shall be furnished to the Engineer.

#### **D Disposition of Excavated Material**

Excavated materials shall be utilized, to the fullest extent practicable and so far as the material is suitable, for construction of the embankments or as otherwise indicated in the Plans. Each layer of the roadbed shall be constructed of uniform material. When excavation operations disclose the presence of different types of soil, the Contractor shall select the different materials and place them in the embankments or elsewhere as directed. In general, when granular materials are uncovered, they shall be placed in the uppermost portion of the embankment. Granular material shall not be removed from the Project without the written approval of the Engineer.

When the soils are so varied that selection and placement of uniform soils is not practical, the Contractor shall use disks, plows, graders or other equipment to blend and mix suitable soils to produce a uniform soil texture, moisture content, and density; except that, all soils that contain 20 percent or more particles passing the 75  $\mu\text{m}$  (#200) sieve shall be blended, mixed, and dried with a disk meeting 2123 within the entire upper 2 meters (6 feet) of embankment. A disk is also to be used below the upper 2 meters (6 feet) of the embankment fill area if, in the opinion of the Engineer, the contractor is not producing a uniform soil texture. No capping of granular materials with nongranular materials will be permitted at or within 300 mm (12 inches) of the subgrade surface. In the event that the Engineer orders the Contractor to select materials to an extent greater than could be normally expected with the

### 2105.3

loading method employed by the Contractor, any additional costs incurred by the Contractor will be compensated for as Extra Work.

The Engineer will designate those soils that are considered unsuitable or unstable with respect to the requirements of the Plans and the provisions hereof.

The Contractor shall remove the topsoil, store it in locations selected by the Contractor, and use it for topsoil covering at locations and to the minimum depths shown in the Plans. The Plans will indicate the quantity of topsoil considered necessary. If, at the time the Plans are prepared, it is known that there will not be sufficient topsoil available in the areas indicated above, the Proposal will contain a bid item for topsoil borrow, in which case the Contractor shall furnish the topsoil in excess of the quantity available within the Right of Way.

Peat, muskeg, and other unstable materials that are not to be used in the roadbed embankments shall be deposited in the areas indicated in the Plans or elsewhere as approved by the Engineer. All other material, including bituminous and concrete waste, that is considered unsuitable for use in the upper portion of the roadbed shall be placed in embankments at least 1 m (**3 feet**) below the top of the subgrade or outside of a 1:1 slope down and outward from the shoulder lines on fills under 10 m (**30 feet**) in height or outside of a 1 vertical to 1.5 horizontal slope down and outward from shoulder lines on fills over 10 m (**30 feet**) in height, or used to flatten the embankment slopes, or disposed of elsewhere as approved by the Engineer.

If no other disposition is specified, the excavated materials in channels outside of the roadway construction limits shall be used to fill abandoned portions of the channels and any remaining material shall be deposited in spoil banks or elsewhere as approved by the Engineer. Spoil banks shall be properly shaped and shall be provided with sufficient openings to permit natural drainage from adjoining property. Any topsoil excavated shall be used to cover the other fill material.

Snow, ice and frozen lumps exceeding 150 mm (**6 inches**) in greatest dimension will not be permitted in the roadbed embankments. Sod and frozen lumps less than 150 mm (**6 inches**) in greatest dimension may be placed only in that portion of the embankment which is outside of a 1:1 slope down and outward from the shoulder lines, but not over or adjacent to structures.

No stone, broken concrete or bituminous fragments exceeding 75 mm (**3 inches**) in greatest dimension will be permitted in the upper 150 mm (**6 inches**) of the roadbed embankment nor within 500 mm (**20 inches**) of a structure. No stones exceeding 150 mm (**6 inches**) in greatest dimension will be permitted in the upper 300 mm (**12 inches**) of the roadbed embankment. Stones or broken concrete exceeding 150 mm (**6 inches**) in greatest dimension, and other solid materials shall

### 2105.3

not be placed in embankment areas where piling is to be installed. Concrete and bituminous pavement or other such slabs of solid materials shall be processed or pulverized to the extent that the maximum size particles shall not exceed 150 mm (**6 inches**) in greatest dimension when used in the upper 1 m (**3 feet**) of embankment or backfill.

All combustible debris materials (stumps, roots, logs, brush, etc.), together with all noncombustible materials other than soils (oversized rock, broken concrete, metals, etc.) that cannot be placed satisfactorily in the embankments, shall be disposed of in accordance with 2104.3C.

All surplus excavated soils and rock that are not wasted, stockpiled, or otherwise disposed of as specifically allowed or required by the Contract shall become the property of the Contractor and shall be disposed of by the Contractor outside of the Project limits in accordance with a satisfactory Disposal Plan. This disposal plan shall constitute the Contractor's proposal for acceptable disposition of surplus materials outside of the Project limits in compliance with applicable environmental regulations, permit requirements, and any requirements or limitations imposed by the Contract. A satisfactory Disposal Plan shall be submitted to the Engineer prior to starting the disposal operations.

In the absence of Contract provisions requiring off-project disposal, such disposition of material will only be ordered as Extra Work, in which case an acceptable disposal plan will be required as a basis for agreement.

Whenever disposal sites are indicated in the Contract, whether on or off the Project, they are to be considered as being possible sites with the Contractor having the option of choosing other sites after award of the Contract under the disposal plan provisions, except in cases where mandatory disposition is intended.

#### **E Placing Embankments**

Roadbed embankments shall not be constructed during periods when the embankment material freezes while being placed and compacted, nor shall any embankment material be placed on soil that is frozen to a depth greater than 100 mm (**4 inches**). Where the foundation soil is frozen to a depth exceeding 100 mm (**4 inches**), at a time when weather conditions are such that embankment construction could be continued without the material freezing as it is being placed and compacted, the Contractor may be permitted to excavate the frozen foundation soil and proceed with the embankment construction for so long as the weather will permit, but only if and to the extent approved by the Engineer, and with the understanding that the additional costs involved shall be borne by the Contractor. The frozen soil shall be

### 2105.3

wasted and replaced with other suitable soil as may be necessary to construct the embankments as specified.

Excavations below subgrade, together with any seepage trenches excavated to provide drainage, shall be backfilled in accordance with the requirements for embankment construction and with the material specified in the Contract, or with suitable materials obtained from the excavations if no other material is specified.

Before backfilling roadbed subcuts that are 750 mm (**30 inches**) or less in depth, the upper 150 mm (**6 inches**) of soil below the bottom of the excavation shall be compacted to 95 percent of maximum density.

Embankment material shall be deposited and spread in relatively uniform layers approximately parallel to the profile grade, and extending over the full width of the embankment. Earth moving equipment shall be routed evenly over the entire width of the roadway being constructed. Embankment widening construction shall proceed from the toe of the proposed slope inward toward the existing fill slope. Layers in the upper 1 m (**3 feet**) of the roadbed shall not be more than 200 mm (**8 inches**) in thickness (loose measurement) and those below the upper 1 m (**3 feet**) shall be not more than 300 mm (**12 inches**) in thickness (loose measurement), except under the following conditions:

- (1) Where the foundation for the embankment (or backfill) is under water or is so unstable that it will not support the hauling equipment without appreciable displacement of the underlying soils, the embankment thereon may be constructed as one layer up to the lowest elevation at which the hauling equipment can operate over it without causing intrusion of the underlying soils into the upper 200 mm (**8 inches**) of the embankment so placed, but in no case shall the top of that layer be less than 1 m (**3 feet**) below the subgrade. The top of that layer shall be compacted to the satisfaction of the Engineer before any additional material is placed thereon.
- (2) When the embankment material is of a granular nature, not more than 20 percent of which will pass a 75  $\mu\text{m}$  (**#200**) sieve, the thickness of the layers in the upper 1 m (**3 feet**) of the roadbed may be increased to not more than 300 mm (**12 inches**) provided compaction is obtained by an approved compactor.
- (3) When the embankment material consists predominantly of stone, broken concrete, or rock fragments of such sizes that the material cannot be compacted, that material may be placed in the embankment up to an elevation 1200 mm (**4 feet**) below the top of the subgrade, in layers not to exceed 600 mm (**24 inches**) in thickness, and with the exception that larger stones may be placed outside of the shoulder lines but not within the median area of a roadway.

### 2105.3

- (4) Except as otherwise permitted in (2) above, embankment materials placed adjacent to structures within the roadbed shall be placed in layers not more than 200 mm (**8 inches**) in loose thickness, for a distance of at least 15 m (**50 feet**) on each side of pipes 1200 mm (**4 feet**) or less in diameter and 30 m (**100 feet**) on each side of other structures, and for the full height from the embankment foundation to the top elevation of the structure.
- (5) Except as may be necessary to obtain satisfactory compaction, layer construction will not be required in constructing such items as ditch blocks and entrances where the use of conventional equipment is impractical, nor in constructing such items as channel fills, spoil banks, and berms that do not provide foundation support for structural items.
- (6) Granular Materials (3149.2B) which are excavated below the water surface or table shall not be placed on embankment soils if the water content of the excavated material, in the Engineer's opinion, is causing saturation of the previously placed embankment soils and resulting in the loss of stability and density of these soils.

Each layer consisting predominantly of rock or broken concrete shall be leveled prior to placing the next layer thereon, using suitable equipment operated in a manner that will provide even distribution of the larger rock or broken concrete and fill the voids with finer material to form a compact mass.

If sufficient suitable material has not been made available to construct the embankments as specified, additional suitable material shall be obtained from sources designated by the Engineer. If additional material is obtained from sources outside the Right of Way, the furnishing of that material will be paid for as Extra Work.

If, at any time prior to or during construction, the Engineer determines that it is necessary to resort to a surcharge, the Contractor shall construct the embankment as directed by the Engineer. The surcharge shall continue until the Engineer considers that satisfactory subsidence has been obtained. If, at any time during the construction, the Engineer considers it necessary, the Contractor shall excavate relief trenches as directed by the Engineer adjacent to the toes of the embankment, and backfill them as required.

The Department reserves the right to install settlement plates within the approach embankments at any bridge site as well as in other embankment areas, together with measurement control points outside the embankments, all in such locations and numbers as the Engineer deems necessary to determine the stability of the embankments. The Contractor's operations shall not disturb such installations. Any settlement plates damaged or destroyed by the Contractor's operations shall be replaced at no expense to the Department. No compensation in

### 2105.3

addition to Contract prices will be made to the Contractor for any inconvenience or expense incurred as a result of these settlement plate installations.

At a time designated by the Engineer, the Contractor shall complete the embankment by adding more material or removing any excess. After satisfactory settlement of the embankment has been obtained and the slopes have been roughly finished, the excavated material temporarily deposited outside the embankment slopes shall be disposed of as shown in the Plans or as approved by the Engineer.

If embankment surcharge is ordered to achieve subsidence, in the absence of Contract provisions requiring the same, any equipment movement required thereby that would not otherwise be necessary will be compensated for as Extra Work. Unless otherwise specified, removal of excess materials deposited by order of the Engineer will be paid for as Extra Work to the extent the removal is ordered by the Engineer.

Before any embankment is placed behind abutments that support steel superstructures, the Contractor shall place temporary hardwood wedges, as directed by the Engineer, between the superstructure and abutment parapets. These wedges shall be removed when, in the opinion of the Engineer, satisfactory settlement of the embankment has been secured.

When the design of a structure is such that the strength of the substructure is dependent upon the restraining effect of the superstructure, the abutting embankment shall not be constructed until the superstructure has been completed to the extent necessary to provide the required restraint.

#### **F Compacting Embankments**

The rate of depositing material on the embankment shall not exceed the capacity of the leveling and compaction equipment. Compaction of this material should not be delayed after being placed.

Rollers shall be used to compact the embankment materials in totality (area, layers, etc.). The type of roller(s) used for compaction shall be sufficient to meet the density requirements, as specified. The minimum size, gross weight, and applied pressure exerted by the roller(s) shall be in accordance with the equipment requirements specified under 2123.

The use of equipment to haul material (trucks, carryalls, scrapers, etc.) shall not be considered in lieu of the specified compaction equipment. Construction traffic from such hauling equipment shall be distributed uniformly over the entire embankment to the maximum extent possible.

### 2105.3

All roadbed embankment material shall be compacted as required herein for the Specified Density Method, except as otherwise provided for specific materials or portions of embankments.

Materials placed outside of a 1 vertical to 1.5 horizontal slope down and outward from the grading shoulder PI (point of intersection) on fills over 10 m (**30 feet**) in height, or outside of a 1:1 slope down and outward from the grading shoulder PI on fills of 10 m (**30 feet**) or less in height, will not be subject to the specified density requirements but shall be compacted to the satisfaction of the Engineer.

Mechanical compaction will not be required on those portions of the embankment that are constructed with material consisting predominantly of stone or rock fragments, nor in conjunction with placement of topsoil covering or roadside grading involving the filling of channels and depressions where acceptable consolidation is obtained with the grading equipment.

Density control shall not apply to waste materials (peat, muskeg, etc.) nor to any other non-rock material utilized for incidental drainage or landscape filling outside the roadbed embankment. However, such materials shall be consolidated to the satisfaction of the Engineer.

The Engineer shall have full authority to suspend hauling operations and the placement of additional embankment materials at any time, until the preceding layer has been blended and compacted, and its surface has been properly leveled.

#### F1 Specified Density Method

Where this method is specified, the Engineer will sample and test the soils that are to be used, to determine the maximum density and Optimum Moisture, and will make density and moisture tests on the compacted embankment, using methods described in the Mn/DOT Grading and Base Manual.

The upper 1 m (**3 feet**) of the embankment, together with those portions of the embankment that are below the upper 1 m (**3 feet**) but that are adjacent to structures and are subject to the same maximum layer thickness as the upper 1 m (**3 feet**), shall be compacted to a density of not less than 100 percent of maximum density. Those portions of the embankment that are below the upper 1 m (**3 feet**) and that are not adjacent to structures shall be compacted to a density of not less than 95 percent of maximum density.

At the time of compaction, the moisture content of the embankment material shall be not less than 65 percent nor more than 115 percent of Optimum Moisture where 95 percent of maximum density is required and shall be not less than 65 percent nor more than 102 percent of Optimum Moisture where 100 percent of maximum density is required.

## 2105.3

### F2 Quality Compaction (Visual Inspection) Method

When this method is specified, the equipment used in constructing the embankment shall meet 2123 and each layer of embankment material shall be compacted until there is no evidence of further consolidation. Embankment construction shall not continue when, in the opinion of the Engineer, the existing soil moisture content does not allow proper compaction.

The Engineer may elect to perform moisture and density tests as shown in the Mn/DOT Grading and Base Manual, as needed to assist Visual Inspection. The actual density or moisture obtained by testing the road embankment must meet or exceed the requirements shown in 2105.3F1 Specified Density of the Standard Specifications in order to be acceptable.

Compaction shall be obtained with a tamping roller or an approved type of vibratory compactor, except as otherwise provided for specific materials and portions of the embankments.

In plastic soils, pneumatic-tired, steel-wheeled, or grid rollers may be used for compacting embankment layers 75 mm (**3 inches**) or less in loose thickness or for compacting the upper 75 mm (**3 inches**) of thicker layers where a tamping roller will not produce an increase in density. In nonplastic soils, pneumatic-tired, steel-wheeled, or grid rollers may be used for compacting layers of 200 mm (**8 inches**) or less in loose thickness.

Compaction shall be obtained with special compacting equipment or by hand tamping methods where the use of conventional rollers is not feasible.

### **G Finishing Operations**

All excavation, embankment and roadside areas involved in or disturbed by the construction shall be finished in reasonably close conformity with the established lines and grades, including any tolerances specified. The subgrade shall be finished and maintained as required by the applicable provisions of 2112.3. When compaction was obtained by the quality compaction method, the final shaping of the roadbed shall be done when, in the opinion of the Engineer, the moisture content of the upper portion of the roadbed is suitable for that work. If necessary, in conjunction with the final shaping, the Contractor shall, at no expense to the Department, scarify the roadbed to a depth of 150 mm (**6 inches**) and recompact it.

In conjunction with the final subgrade finishing operations, the upper portion of a granular subgrade shall be stabilized by incorporation of stabilizing aggregate if necessary to achieve satisfactory surface stability as determined by the Engineer. The aggregate shall be spread to the depth and width shown in the Plans or as needed and shall be mixed (if required) with the subgrade to the extent that stability is best

### 2105.3

achieved. After incorporation of the aggregate, the subgrade shall be recompacted and shaped to produce a stable surface meeting the specified surface tolerances. When the material needing stabilization was furnished by the Contractor as a borrow material item, the furnishing and placing of stabilizing aggregate shall be at no expense to the Department. Otherwise, this work will be compensated for under the item "stabilizing aggregate", or as Extra Work in the absence of a Contract item therefor.

Earthwork finishing and topsoil covering operations shall be conducted concurrently with the grading operations so as to permit prosecution and completion of erosion control items at the earliest practicable time. Topsoil covering operations shall be carried out as soon as possible after the subsoil has been finished to grade on any significant area. At the time the topsoil covering is placed, the subsoil shall be in a loose, friable condition for a uniform depth of at least 75 mm (**3 inches**), and there shall be no erosion rills or washouts in the subsoil surface exceeding 75 mm (**3 inches**) in depth. To achieve this condition scarification of the subsoil will be required as directed by the Engineer, wherever the subsoil has been compacted by equipment operation or has become dried out and crusted, and where necessary to obliterate erosion rills.

Subsoiling shall be required to reduce soil compaction in all areas where turf establishment is shown on the Plan. Subsoiling shall be performed by the prime or excavating contractor and shall occur after topsoil placement.

The contractor shall schedule a 15 meter (**50 foot**), two directional test and demonstrate competence to the Engineer prior to continuing operations. The Engineer shall identify the test area. Subsoiled areas shall be loosened to less than 1400 kPa (**200 psi**) to a depth of 500 mm (**20 inches**) of the in-place and top soil. When directed by the Engineer, the Contractor shall verify that the subsoiling work conforms to the specified depth. To test for conformance, the Contractor shall use a cone penetrometer that meets standard ASAE Soil Testing Specifications of a 20 mm (**13/16 inch**) insertion rate per second.

After obtaining approval by the Engineer that the equipment and methods are sufficient to perform the work, the Contractor may proceed and complete the subsoiling operation. Work done without the Engineer's approval will be considered as unauthorized work.

Subsoiling shall form a two-directional (90°) grid. Channels shall be created by a commercially available, multi-shanked, parallelogram implement attached to track-type equipment. The equipment shall be capable of exerting a penetration force necessary for the site. No disc cultivators, chisel plows, or spring-loaded equipment will be allowed. The grid channels shall be spaced a minimum of 300 mm

## 2105.4

(**12 inches**) to a maximum of 910 mm (**36 inches**) apart, depending on equipment, site conditions, and the Plan. The channel depth shall be a minimum of 500 mm (**20 inches**) or as specified in the Plan. If soils are saturated, the Contractor shall delay operations until the soil dries to field capacity or less.

Only one pass shall be performed on erodible slopes greater than 1 vertical to 3 horizontal. Work shall be at right angles to the direction of surface drainage, whenever practical. Exceptions to subsoiling include areas within the dripline of any existing trees, over utility installations within 750 mm (**30 inches**) of the surface, where trenching/drainage lines are installed, where compaction is by design (abutments, footings, or inslopes), and inaccessible slopes, as approved by the Engineer. In cases where exceptions occur, the Contractor shall observe a minimum setback, as directed by the Engineer.

Those portions of an old road that are abandoned, which are outside the grading areas as staked, shall be graded and finished to an acceptable contour that blends with the adjoining terrain. On all areas where an old roadbed or temporary haul road have been located, and are to receive turf, the existing soils and granular material shall be removed and replaced and/or subsoiled to provide not less than 500 mm (**20 inches**) of loose, friable soil below the finished surface. All structural material including granular, shall be removed. Any temporary haul removal costs will be incidental to the Project. Removed material may be disposed of off the Project site or recycled on the Project if approved by the Engineer.

All depressions resulting from structure removals, debris burying, grubbing operations, and other causes, shall be backfilled with suitable material to the designated contour and so as to conform with any pertinent requirements. All debris and any stones exceeding 75 mm (**3 inches**) in diameter on the soil surface at the time of performing the final blading operations shall be removed from the Project site. They shall be disposed of in accordance with 2104.3C (Disposal of Materials and Debris). If pre-existing to the Project, debris and stone removal will be paid for as Extra Work.

All work involved in the finishing operations, as specified herein and as otherwise required by the Contract, shall be compensated for as part of the payment for Contract items covering excavation, removals, or the furnishing of material.

### **2105.4 METHOD OF MEASUREMENT**

The Department will determine quantities for excavation and embankment according to 1901 as modified by these provisions.

#### **A Excavation Material**

The Department will determine the quantities by excavated volume (EV) of the excavation material in its original position. Volumes will be

#### 2105.4

computed by the average end area method determined from original and final cross-sections.

In excavations classified as rock, the measurement will include a volume allowance for overbreakage if the plane of the bottom of the excavation falls within a layer or stratum of rock. Unless other limits are shown on the typical grading sections, measurements will include a 150 mm (**6 inches**) overbreak allowance outside the grading section as staked, with the exception that 500 mm (**20 inches**) (measured horizontally) will be allowed outside of backslopes in hard rock types where pre-splitting is not required. No overbreak allowance will be made for pre-split backslopes.

The Engineer will determine the actual limits between different material classifications by field measurements during construction as true elevations are disclosed. If any changes are made in the Plan grading sections or grades that affect the excavation limits as indicated in the Contract, measurements will be taken as necessary to establish the actual limits of excavation. Where topsoil covering is required, measurements will be taken on the finished surface after placement of the topsoil, and a quantity allowance will be made equal to the thickness of topsoil placed. In excavations made below finished grade, the limits of excavation measurement will be as defined by the grades and slope lines staked, unless actual field measurements are taken.

The Contractor may dispute the Engineer's determination of excavation quantities after completing the excavations within a specific balance (as planned) when the Contractor has a reasonable cause for dispute. The Contractor must submit a written dispute within 7 days after completing the excavations within a balance except for final finishing. The Contractor shall have waived the right to dispute the pay quantity determinations in that balance if these conditions are not met. However, at any time prior to completion of all roadway excavations on the Project, the Engineer will honor any request for investigation of quantity irregularities that may be submitted in writing by the Contractor, and if findings so warrant, quantity adjustments will be made on the basis of any measurements taken at the Engineer's discretion.

The limits for determination of quantities will be defined by the cross-sections. The limits for quantity determinations will not extend beyond the authorized grading sections as staked, except for the allowances specified. Quantity deductions will be determined by actual or fixed dimensions to exclude materials encompassed by the excavation measurements that are to be removed or salvaged under other Contract items. Excavation quantities, will be recomputed or otherwise adjusted on the basis of actual limits as measured or

## 2105.5

otherwise fixed, and payment for excavation items will be made as altered thereby.

### **B Borrow Material**

The Engineer will measure borrow material by volume according to 1901 and as specified in the Contract as one of the following:

- (1) Excavated volume (EV),
- (2) Loose volume (LV),
- (3) Compacted volume (CV), or
- (4) Stockpile volume (SV).

Only those materials accepted for use on the Project will be measured for payment under the borrow material items.

### **C Salvage Material**

The Engineer will measure salvage material by loose volume unless a different basis of measure is indicated in the item name, in which case the designation symbols will be the same as given for borrow materials in 2105.4B. The Engineer will select either:

- (1) Loose volume (LV), or
- (2) Stockpile volume (SV).

Salvaging, processing, stockpiling (if necessary), and placing operations will all be considered a single operation (one complete unit of measure), unless the item name is expanded to include the words "in Stockpiles" or "from Stockpiles." Also see 1901.

The operations of salvaging material from the existing roadway, processing the material as specified, and placing the processed material in stockpiles will be one operation constituting a complete unit of measure. The operations of removing material from stockpiles and placing it in the work as specified will be one operation constituting a complete unit of measure.

### **D Stabilizing Aggregate**

The Engineer will measure stabilizing aggregate according to 1901 by mass or loose volume (LV) as furnished and incorporated into the subgrade.

### **E Subsoiling**

The Engineer will measure subsoiling according to 1901 by area field measurement.

## **2105.5 BASIS OF PAYMENT**

If it should be ordered by the Engineer, but not otherwise required by the Contract, that excavated material or salvage material be stockpiled and later loaded and hauled to a different location, rehandling the material will be paid for at the same Contract prices as that paid for the initial excavation or salvage work.

Payment for salvage material under items of salvaged aggregate or salvaged topsoil at the Contract prices per unit of measure will be compensation in full for all costs of excavating, processing, loading,

## 2105.5

hauling, and placing the material in the new construction as specified. Salvage material "in Stockpiles" will cover all costs incurred in production of the stockpiled material, and salvage material "from Stockpiles" will cover all costs of placing stockpiled material in the new construction as specified.

Payment for the accepted quantities of borrow material or stabilizing aggregate at the Contract prices per unit of measure will be compensation in full for furnishing and placing the material as specified, including final finishing operations.

No separate compensation will be made for any incidental pit stripping, waste excavation, clearing and grubbing, topsoil replacement, pit shaping, seeding, or other expenses incurred in supplying borrow material from Contractor selected sources, whether indicated as a possible source or not. However, when the Contractor is required to obtain borrow material from a source specifically stipulated in the Contract, any required incidental pit excavation (stripping, waste, etc.) will be compensated for separately, or as Extra Work in the absence of such payment provisions.

Payment for the accepted quantities of roadway excavation items at the Contract prices per unit of measure of excavation, subject to the price adjustment and Extra Work compensation specified herein, will be compensation in full for all costs of scalping and preparing the excavation and embankment construction areas; of excavating, loading, hauling and placing, or disposing of the materials as specified; of compacting the embankments and finishing the construction areas as specified; and of all other operations incidental to the work. No direct compensation will be made for water used in conjunction with the mixing, placing, and compacting operations.

Extra Work compensation will be provided for the removal and disposal of any debris encountered in the excavations to the extent that its existence was not known to the Contractor at the time of bidding, and then only when its satisfactory removal and disposition requires separate handling or the use of special equipment.

Compensation for roadway excavation items will include any increased haul costs not qualifying for Extra Work compensation or bid price adjustment in consideration of 1402.

When the Proposal contains an item for common excavation but does not provide an item for common channel excavation, any excavation ordered and performed that would otherwise be classified as common channel excavation will be paid for separately at the Contract price for common excavation plus \$1.30 additional per cubic meter (**\$1.00 per cubic yard**).

If the Proposal fails to include a bid item for rock excavation or rock channel excavation, and material is uncovered that is so classified,

## 2105.5

excavation of the rock will be paid for separately at the Contract price for common excavation or common channel excavation, plus an additional \$16.00 per cubic meter (**\$12.00 per cubic yard**). If no bid item is provided for common channel excavation, excavation of materials classified as rock channel excavation will be paid for at the Contract price for common excavation plus an additional \$18.00 per cubic meter (**\$13.50 per cubic yard**). Such stipulated prices for rock excavation will apply up to a maximum of 200 m<sup>3</sup> (**260 cubic yards**) of excavation per item or to such quantity as may be performed by mutual consent prior to execution of an Extra Work agreement.

When payment for muck excavation on the basis of equipment rental is specified, all operations of excavating and disposing of the materials so classified will be paid for at the Contract prices for the equipment used, in accordance with 2123. In the absence of Contract prices covering removal of material classified as muck excavation, payment will be made for its removal as Extra Work.

If any muck excavation in addition to that indicated in the Plans is required by the Engineer, when payment is made on the basis of excavation volumes, the increased quantity will not be considered as a basis of claim for increased compensation, except as provided by the following:

- (a) That portion of the additional excavation that is removed from below a plane parallel to and 5 m (**15 feet**) below the natural ground surface will be measured in 2 m (**5 foot**) depth zone increments and paid for separately at adjusted unit prices. The adjusted unit price will be equal to the Contract bid price for muck excavation plus \$0.20 per cubic meter (**\$0.15 per cubic yard**) for the additional excavation within the 5-7 m (**15-20 foot**) depth zone and an additional \$0.05 per cubic meter (**\$0.05 per cubic yard**) for each additional 2 m (**5 foot**) increment of depth beyond 7 m (**20 feet**).
- (b) If any portion of the additional excavated material should be required to be placed in a disposal area other than shown or described for the planned excavation, any additional costs incurred will be compensated for as Extra Work.

The adjusted unit prices specified above for muck excavation will be compensation in full for all additional costs incurred in excavating to depths greater than planned, in finishing the additional disposal quantities and areas, and in rehandling any materials deposited within the extended excavation limits. Payment at the Contract price will include full compensation for all pumping and dewatering specifically required, for all rehandling and hauling of the excavated material that is necessary for its disposal as planned, and for all finishing of the planned disposal areas.

## 2105.5

Partial payments will be subject to withholding of a portion of the Contract amount to cover the reasonable value of any uncompleted operations that are designated as a part of the complete unit. The amounts so withheld will be based upon the estimated surface area exposed to probable erosion without the required surface finishing and turf establishment operations being completed.

All areas within the grading construction limits, exclusive of roadbed areas, on which the natural vegetation has been rendered ineffective by the grading or grubbing operations, will be considered as being exposed to probable erosion until such time that the final surface finishing and turf establishment operations have been completed.

The amounts to be withheld on each partial estimate will be the product of \$7413.00 per hectare (**\$3000.00 per acre**), unless otherwise stated in the Contract, and the estimated number of unfinished hectares (**acres**) exposed to probable erosion at the time the estimate is prepared. This withholding will apply to the entire Project or to any area, as determined by the Engineer.

For application and release purposes, the Project may be divided into separate control areas based on earthwork balance points, drainage area boundaries, or roadway segments as indicated in the Contract or as otherwise deemed appropriate by the Engineer.

Upon completion of the rough grading operations and placement of topsoil in each control area, the amount withheld for that area will be reduced by 50 percent. Once mulch has been placed, the amount will be reduced by an additional 30 percent. Full release of the amount withheld will be made when the seeding has been accepted.

Whenever the possibility for erosion damage or water pollution exists, release of withheld amounts will not be made for a control area until adequate temporary or permanent erosion control measures have been provided.

Topsoil borrow will be accepted for payment in accordance with the provisions of Table 2105-1.

**TABLE 2105-1  
TOPSOIL BORROW ACCEPTANCE SCHEDULE**

REQUIREMENT	FULL PAYMENT RANGE	PRICE REDUCTION RANGE		CORRECTIVE ACTION REQUIRED WHEN
		5 %	15 %	
Percent passing the 2.00 mm (#10) Sieve	85% or Greater	80.0 - 84.9	75.0 - 79.9	Less than 75.0%
Clay Content	5% or Greater 30% or Less	3.0 - 4.9 30.1 -35.0	2.0 - 2.9 35.1 -40.0	Less than 2.0% More than 40.0%
Silt Content	10% or Greater 70% or Less	7.0 - 9.9 70.1 -75.0	4.0 - 6.9 75.1 -78.0	Less than 4.0% More than 78.0%
Sand and Gravel Content	10% or Greater 70% or Less	7.0 - 9.9 70.1 -75.0	4.0 - 6.9 75.1 -78.0	Less than 4.0% More than 78.0%
Organic	3% or Greater 20% or Less	2.0 - 2.9 20.1 -22.0	1.5 - 1.9 22.1 -25.0	Less than 1.5% More than 25.0%
pH	6.1 or Greater 7.8 or Less	(A) 7.9 - 8.0	(A) 8.1 - 8.2	Less than 6.1 More than 8.2

NOTE: The price reductions for multiple failure are cumulative.

(A) May be corrected by the addition of agricultural lime at a rate determined by the Engineer.

Payment for excavation and embankment construction will be made on the basis of the following schedule:

Item No.	Item	Unit
2105.501	Common Excavation .....	cubic meter ( <b>cubic yard</b> )
2105.503	Rock Excavation.....	cubic meter ( <b>cubic yard</b> )
2105.505	Muck Excavation.....	cubic meter ( <b>cubic yard</b> )
2105.507	Subgrade Excavation .....	cubic meter ( <b>cubic yard</b> )
2105.511	Common Channel Excavation ....	cubic meter ( <b>cubic yard</b> )
2105.513	Rock Channel Excavation.....	cubic meter ( <b>cubic yard</b> )
2105.515	Unclassified Excavation .....	cubic meter ( <b>cubic yard</b> )
2105.521	Granular Borrow (1) .....	cubic meter ( <b>cubic yard</b> )
2105.522	Select Granular Borrow (1) .....	cubic meter ( <b>cubic yard</b> )
2105.523	Common Borrow (1) .....	cubic meter ( <b>cubic yard</b> )
2105.525	Topsoil Borrow (1) .....	cubic meter ( <b>cubic yard</b> )
2105.526	Select Topsoil Borrow (1) .....	cubic meter ( <b>cubic yard</b> )
2105.533	Salvage Aggregate (1) .....	cubic meter ( <b>cubic yard</b> )
2105.535	Salvaged Topsoil (1).....	cubic meter ( <b>cubic yard</b> )
2105.541	Stabilizing Aggregate .....	cubic meter ( <b>cubic yard</b> )

## 2105.5

2105.543 Stabilizing Aggregate ..... metric ton (**ton**)

2105.550 Subsoiling ..... hectare (**acre**)

NOTE: (1) Specify basis of measure: EV, LV, SV, or CV. See 2105.4 and 1901.

See 2105.4C and insert the words "in Stockpile" or "from Stockpile" if appropriate.

## 2111

### Test Rolling

#### 2111.1 DESCRIPTION

This work shall consist of testing the bearing capacity of the roadbed by rolling with heavy rollers.

Test rolling will be required only when and where specifically provided in the Contract.

#### 2111.2 EQUIPMENT

The roller shall be pneumatic-tired, towed by suitable tractive equipment and shall conform to the following requirements:

- (a) The roller shall have 2 wheels spaced not less than 1.8 m (**6 feet**) apart (center to center transversely).
- (b) The tire size shall be either 18 x 24 or 18 x 25. Each tire shall be inflated to a pressure of 650 kPa (**95 psi**).
- (c) The gross mass of the roller shall be not less than 13.5 metric tons (**14.9 tons**) and not more than 13.7 metric tons (**15.1 tons**) on each wheel.

#### 2111.3 CONSTRUCTION REQUIREMENTS

Test rolling shall be performed on the roadbed as required at a time when the grading grade is completed within 100 mm (**4 inches**) of the grade staked by the Engineer, and shall cover the full top width of the proposed pavement structure as defined by the bottom width of the typical subcut sections shown in the Plans, unless other specific dimensions are given. Test rolling shall not be performed until the Engineer and Contractor mutually agree that the subgrade has been properly prepared and is acceptable for test rolling.

The test rolling shall be performed by making one pass over each strip covered by the width of a tire. Unrolled areas between tire paths shall not be wider than 300 mm (**12 inches**). The roller shall be operated at a speed of not less than 4 km/h (**2.5 mph**) nor more than 8 km/h (**5 mph**) and in a pattern approved by the Engineer.

The Contractor shall take precautions to protect culverts and other structures during the test rolling. Where a culvert or other structure has, or will have, insufficient protective cover to withstand test rolling, the test rolling may be performed prior to installing the structure or performed on the surface of any additional cover that may be provided.

## 2111.5

as protection for in place structures. Any structures damaged by the test rolling shall be replaced at no expense to the Department

On those portions of a Project where the Plans require treatment of the upper portion of a granular subgrade by the addition of aggregate or binder soil, the test rolling may be performed either before or after the treatment work is performed.

The roadbed will be considered to be unstable if, under the operation of the roller, the surface shows yielding or rutting (at the time the roller passes over the grade) of more than 50 mm (**2 inches**) measured from the top of the constructed grade to the bottom of the rut, except that an additional 25 mm (**1 inch**) will be allowed when a granular subgrade is to be treated after test rolling. The Contractor will be required to furnish a device that will mark the surface of the roadbed where rutting or yielding occurs as approved by the Engineer.

Where test failure occurs on a roadbed not constructed by the Contractor under the same Contract, the unstable sections shall be repaired by the Contractor, as directed by the Engineer, at the Department's expense.

If, on a roadbed constructed by the Contractor under the same Contract, test rolling shows any sections of the roadbed to be unstable, the Contractor shall, at no expense to the Department, scarify the roadbed and aerate or add moisture to the material as necessary, and recompact the material to the extent that it will be stable when retested by rolling. However, where test failure occurs on an isolated section of roadbed less than 50 m (**2 road stations**) in length, retesting of that section by rolling will not be required if the Engineer is satisfied that the corrective measures taken have eliminated the cause of failure and have produced acceptable stability as evidenced by density tests or visual inspection.

### 2111.4 METHOD OF MEASUREMENT

If the roadbed tested was constructed under a previous Contract, and only then, test rolling (together with any retesting required by the Engineer after unstable sections have been repaired) will be measured by length where such work is performed. The work on each separate roadbed, in the case of divided highways, will be measured separately. If the Engineer orders testing on any portion of the roadbed to an extent less than the full width specified, the measurement will be in proportion to the width tested.

### 2111.5 BASIS OF PAYMENT

If the roadbed tested was constructed by the Contractor under the same Contract, the Contractor shall perform test rolling (including all repairs to unstable sections and retesting) as incidental work with no direct compensation.

**2111.5**

If the roadbed tested was constructed under a previous Contract, and only then, all repairs to unstable sections ordered by the Engineer will be paid for as Extra Work and the test rolling will be paid for on the basis of the following schedule:

<b>Item No.</b>	<b>Item</b>	<b>Unit</b>
2111.501	Test Rolling .....	meter ( <b>road station</b> )

**2112**

**Subgrade Preparation**

**2112.1 DESCRIPTION**

This work shall consist of shaping and compacting the subgrade prior to placing a base or surface course thereon.

**2112.2 BLANK**

**2112.3 CONSTRUCTION REQUIREMENTS**

This work shall be performed after any unstable sections of the subgrade have been repaired and after any existing base or surface courses required to be removed have been removed.

The Contractor shall compact and shape the subgrade for its full width as may be necessary to produce, at the time the base or surface course is placed, the required density and stability in the top 150 mm (**6 inches**) of the subgrade and the required grade and cross-section. The Contractor shall scarify, dry the material, or apply water as may be necessary to obtain the required density and stability. Unless otherwise provided in the Contract, the density shall be 100 percent of maximum density as defined by the Specified Density Method.

The required stability shall be such that when any material for base or surface courses is deposited on the subgrade, no rutting or displacement of the roadbed will occur.

The required grade and cross-section shall consist of a smooth subgrade surface conforming to the prescribed elevations for the particular subgrade being prepared prior to constructing an additional course thereon. The prescribed elevation for any point on the subgrade surface where measurement is made shall be as determined from the grades staked by the Engineer and the typical sections shown in the Plans, within the following tolerances:

## 2112.5

- (a) When the subgrade is being prepared for placement of an aggregate wearing course or is being finished for acceptance of the grading construction, the elevation of the finished surface shall not vary by more than 30 mm (**0.1 foot**) from the prescribed elevation at any point where measurement is made.
- (b) When the subgrade is being prepared for placement of an aggregate base course, the elevation of the finished surface at the time the next layer is placed, shall not vary by more than 15 mm (**0.05 foot**) above or 30 mm (**0.1 foot**) below the prescribed elevation at any point where measurement is made.
- (c) When the subgrade is being prepared for placement of a surface course, the elevation of the finished surface at the time the next layer is placed, shall not vary by more than 15 mm (**0.05 foot**) from the prescribed elevation at any point where measurement is made.

In conjunction with the operations of subgrade preparation, the Contractor shall produce, load, and haul aggregate (of the same type as that used in the subgrade or in the course to be constructed) where and in such quantities as the Engineer directs, and incorporate such material into the subgrade. This work will be paid for at the appropriate Contract prices for the material in place or, in the absence of such prices, as Extra Work.

### 2112.4 METHOD OF MEASUREMENT

Subgrade preparation will be measured by length, along the centerline of the roadbed. The work on each separate roadbed, in the case of divided highways will be measured separately. Locations where grading or subgrade excavation (as described in 2105) is required will not be included in the measurements. On ramps and loops, the length will be measured between the ends of the exit and entrance noses, along the centerline of the ramp or loop roadbed.

### 2112.5 BASIS OF PAYMENT

If the roadbed or other course being prepared was constructed under the same Contract, the Contractor shall perform subgrade preparation as incidental work with no direct compensation. Payment for subgrade preparation, as a separate item, will be made only when the roadbed or other course being prepared was constructed under a previous contract.

Payment for subgrade preparation at the Contract price per unit of measure will be compensation in full for all costs of preparing the subgrade as specified, except that any expenses incurred in correcting unstable conditions below the top 150 mm (**6 inches**) will be compensated for separately as Extra Work, or at the Contract prices for the equipment used if so provided for in the Contract.

**2112.5**

Payment for subgrade preparation will be made on the basis of the following schedule:

<b>Item No.</b>	<b>Item</b>	<b>Unit</b>
2112.501	Subgrade Preparation.....	meter ( <b>road station</b> )

**2118**

**Aggregate Surfacing**

**2118.1 DESCRIPTION**

This work shall consist of constructing an aggregate wearing course on a prepared Subgrade.

**2118.2 MATERIALS**

**A Aggregate ..... 3138**

The class of aggregate to be used will be as shown in the Contract.

**2118.3 CONSTRUCTION REQUIREMENTS**

The specified quantity of aggregate shall be deposited on the road and spread to the required cross-section only when the roadbed is so dry and compact that no rutting or displacement will occur, and only on sections of such length as will meet the Engineer's approval. Aggregate shall be deposited and spread on public road approaches and private entrances in the quantities directed by the Engineer.

Aggregate windrows shall be moved as necessary to permit drying and reshaping of the subgrade. The aggregate shall be mixed prior to spreading, as necessary to produce uniformity in the gradation of the material.

No compaction will be required of the aggregate surfacing unless the quantity of aggregate placed results in a surface thickness in excess of 50 mm (**2 inches**), in which case the aggregate surfacing shall be compacted in accordance with 2211.3, quality compaction method.

**2118.4 METHOD OF MEASUREMENT**

Aggregate surfacing will be measured, as indicated in the Proposal, by mass (**weight**) or by volume (vehicular measure) of aggregate deposited on the road.

**2118.5 BASIS OF PAYMENT**

Payment for the accepted quantity of aggregate surfacing at the Contract price per unit of measure will be compensation in full for all costs of furnishing and placing the aggregate surfacing as specified.

Payment for the aggregate surfacing will be made on the basis of the following schedule:

<b>Item No.</b>	<b>Item</b>	<b>Unit</b>
2118.501	Aggregate Surfacing, Class __ .....	metric ton ( <b>ton</b> )
2118.502	Aggregate Surfacing, Class __ ...	cubic meter ( <b>cubic yard</b> )

**2123**  
**Equipment Rental**

**2123.1 DESCRIPTION**

This work shall consist of furnishing laborers and of furnishing and operating equipment, in cases where the Contract provides that the work is to be performed as directed by the Engineer and at the Department's expense.

**2123.2 GENERAL REQUIREMENTS**

All equipment shall be in a mechanical condition such that it will operate in a manner satisfactory to the Engineer.

All equipment that operates on bituminous or concrete surfaces shall be equipped with rubber tires or smooth street plates.

Tractive equipment used to draw any other equipment shall be of a type that will not damage the work being performed and that has sufficient power to effectively operate the drawn equipment.

**2123.3 SPECIFIC REQUIREMENTS**

Equipment rented under this Specification shall meet the following specific requirements regarding type, size, capacity, power, or dimensions.

**A Motor Grader**

The motor grader shall be of the self-propelled type with pneumatic-tired wheels and power-operated controls and shall have a mass of not less than 8600 kg (**19,000 pounds**). It shall have a moldboard at least 3.6 m (**12 feet**) long with a suitable cutting edge and shall be equipped with a suitable scarifier.

**B Dozer**

The dozer may be of either the angle-dozer or bull-dozer type attached to a crawler-type tractor having at least 56 kw (**75 horsepower**) at the draw-bar and power operated controls. The dozer blade shall be not less than 2.3 m (**90 inches**) wide. Angle-dozers shall be adjustable to an angle of 90 degrees with the direction of travel of the tractor. The dozer and tractor will be considered as a single unit.

**C Scraper**

The scraper may be the carryall type mounted on pneumatic-tired wheels or the rotary type drawn by a tractor of suitable size. It shall have not less than the volumetric capacity indicated in the Proposal, which shall be construed to be the manufacturer's rated heaped capacity.

**D Dragline**

The dragline shall be of the full-revolving type, equipped with a bucket of at least the size specified in the Proposal, but in no case larger than that for which the machine is designed.

The 0.75 m<sup>3</sup> (**1 cubic yard**) dragline shall have at least a 13.7 m (**45 foot**) boom and a working radius of at least 10.6 m (**35 feet**).

### 2123.3

The 1.9 m<sup>3</sup> (**2.5 cubic yard**) dragline shall have at least a 24.3 m (**80 foot**) boom and a working radius of at least 18.2 m (**60 feet**).

Any other size of dragline shall have the boom length and working radius specified in the Contract.

For swamp work, one set of mats shall be furnished for each dragline. Each mat shall have a length of not less than twice the distance between the outside edges of the crawler treads. The combined width of all the mats shall equal at least twice the bearing length of the crawler treads.

#### **E Power Shovel**

The power shovel shall be of the full-revolving crawler-type with a bucket of the size recommended by the manufacturer. The size of the shovel will be indicated in the Proposal by the capacity of the bucket.

#### **F Tractor**

The tractor shall be of the crawler type and shall have the specified power at the draw-bar as indicated in the Proposal. The power shall be measured in kilowatts (**horsepower**).

#### **G Pneumatic-Tired Roller**

The pneumatic-tired roller shall have a compacting width of 1.5 m (**5 foot**) or more and shall be so constructed that the gross mass can be varied, as directed by the Engineer, within the range of 1700-4400 kg/meter (**100-250 pounds/inch**) of rolling width. The arrangement of the tires shall be such that compaction will be obtained over the full compacting width with each pass of the roller.

The roller may be self propelled or provided with suitable tractive equipment, unless the Proposal specifies a certain type. If more than one roller is propelled by a single tractive unit, the combination will be counted as a single roller unit.

#### **H Tamping Roller**

For the purposes of this Specification, a tamping roller consists of two sections, each having a drum at least 1.2 m (**48 inches**) in diameter, a gross mass and number of pads as approved by the Engineer, and drawn by suitable tractive equipment.

#### **I Blank**

#### **J Steel-Wheeled Roller**

The steel-wheeled roller shall be self propelled and have a minimum total mass of 7.3 metric tons (**8 tons**), or as otherwise specified in the Contract. When vibratory rollers are used, they shall produce 45 kN per meter (**250 pounds/inch**) of width. The roller shall be capable of reversing without backlash and shall be equipped with spray attachments for moistening all rolls on both the front and back.

Unless otherwise specified in the Proposal, steel-wheeled rollers may be either the tandem type or the three wheeled type.

## 2123.5

### **K Truck**

The truck shall have a minimum manufacturer's rated capacity of at least 1.3 metric tons (**1.5 tons**) and shall have a volumetric capacity of not less than 3.8 m<sup>3</sup> (**5 cubic yards**). It shall be equipped with a power-operated hoist and a metal dump box of the end dump type. The rear axle of the truck shall be equipped with dual wheels and tires not less than 200 mm (**8 inches**) in width (manufacturer's designated size).

### **L Rotary Tiller**

The rotary tiller shall be at least 1370 mm (**54 inches**) wide and adjustable for any depth up to 225 mm (**9 inches**), and shall be drawn by suitable tractive equipment.

### **M Front End Loader**

The front end loader shall consist of a crawler type or rubber-tired tractor, equipped with a power-operated loader having a bucket with at least the struck capacity specified in the Proposal. It shall be capable of excavating to a depth of at least 250 mm (**10 inches**) below the bottom of the treads (or tires) and loading the excavated material on the trucks used for hauling.

## **2123.4 METHOD OF MEASUREMENT**

### **A Equipment Hours**

Rental of each unit of equipment will be measured by the number of hours of actual working time and necessary traveling time within the Project limits.

### **B Common Laborer Hire**

Common laborer hire will be measured by the hours of actual working time and necessary traveling time within the Project limits.

## **2123.5 BASIS OF PAYMENT**

Payment for the use of any equipment at the Contract price per hour will be compensation in full for the use and operation of such equipment, including the operator or operators and any tractive equipment and other accessories required in connection with such use, subject only to these provisions for additional compensation in cases where the Contractor is obligated to pay overtime wages for work performed by order of the Engineer on Sundays, holidays, or during overtime periods.

Payment for laborers at the Contract price per hour will include compensation for the use of any hand tools used by such laborers, subject only to these provisions for additional compensation in cases where the Contractor is obligated to pay overtime wages for work performed by order of the Engineer on Sundays, holidays, or during overtime periods.

No compensation in addition to the Contract price per hour for equipment rental or common laborer hire will be made because of any overtime or work performed on Sundays or holidays except when such

**2123.5**

work is ordered by the Engineer to be performed during those times. If the Engineer orders the use of equipment or common laborers during overtime periods or on Sundays or holidays, compensation will be made in addition to the Contract price per hour for equipment rental or common laborer hire only for the increased wages for which the Contractor is obligated under the terms of wage agreements. Such additional compensation will be made 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 employed in operating the equipment or performing the labor, as determined from the Contractor's payroll.

Payment as provided above will include such supervision by the Contractor as may be necessary to accomplish the work in the manner directed by the Engineer, except that, if the Engineer considers that a full time foreman is necessary and so orders, payment for furnishing such a foreman will be as Extra Work on a Force Account basis.

Payment for equipment rental and common laborer hire will be made on the basis of the following schedule:

<b>Item No. Item</b>	<b>Unit</b>
2123.501 Common Laborers .....	hour
2123.503 Motor Grader .....	hour
2123.506 __ m <sup>3</sup> ( <b>cubic yard</b> ) Dragline .....	hour
2123.507 __ m <sup>3</sup> ( <b>cubic yard</b> ) Shovel .....	hour
2123.508 __ m <sup>3</sup> ( <b>cubic yard</b> ) Scraper .....	hour
2123.509 Dozer .....	hour
2123.510 __ m <sup>3</sup> ( <b>cubic yard</b> ) Truck.....	hour
2123.511 __ kW ( <b>hp</b> ) Tractor.....	hour
2123.512 Rotary Tiller .....	hour
2123.514 __ m <sup>3</sup> ( <b>cubic yard</b> ) 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 __ metric ton ( <b>ton</b> ) Steel-Wheeled Roller.....	hour

**2130****Application of Water****2130.1 DESCRIPTION**

This work shall consist of furnishing and applying water for dust control within the Project limits as directed by the Engineer or stipulated in the Contract.

**2130.2 MATERIALS**

The water shall be furnished by the Contractor and it shall be reasonably clean.

**2130.3 CONSTRUCTION REQUIREMENTS****A Equipment**

Water supply tanks shall be equipped with distributing bars or other apparatus that will ensure uniform application of the water. Application of water on the road shall be with a self-propelled distributor of the pressure type, mounted on pneumatic-tired wheels. Pump capacity shall be sufficient to permit application of the whole load uniformly at any rate up to 940 L (**250 gallons**) per minute.

**B Application**

The water supply and equipment used shall be sufficient to apply the quantity required within the time interval necessary to secure optimum results and avoid unwarranted loss of water through evaporation, absorption, or drainage. The water shall be applied at such times and in such quantities as the Engineer approves.

**2130.4 METHOD OF MEASUREMENT**

Water applied for dust control within the Project limits, by direct order of the Engineer or when application is specified at the Department's expense, will be measured for payment by volume.

Deductions may be made for any water wasted through failure of the Contractor to coordinate the application of water with other operations as may be directed.

**2130.5 BASIS OF PAYMENT**

Payment for the accepted quantities of water at the Contract price per unit of measure will be compensation in full for all costs of furnishing, transporting, and applying the water as directed.

These provisions apply to water used for dust control within the Project limits as directed by the Engineer. These provisions do not apply to any sprinkling or other uses for water required in conjunction with the construction of concrete pavements; to any water used in the production or curing of concrete; to any water used to maintain plant life; to any water used in conjunction with compacting soil and aggregate; or to any water used for dust control on any Contractor selected haul roads, detours, or work sites outside of the Project limits; all costs of which will be incidental to the Contract items involved.

**2130.5**

Water applied by order or approval of the Engineer for dust control will be paid for at a unit price of \$3.00 per cubic meter (**\$11.00 per 1000 gallons**) in the absence of the Contract bid item 2130.501.

Payment for the application of water will be made on the basis of the following schedule:

<b>Item No.</b>	<b>Item</b>	<b>Unit</b>
2130.501	Water .....	cubic meter ( <b>1000 M Gal</b> )

**2131**

**Application of Calcium Chloride**

**2131.1 DESCRIPTION**

This work shall consist of furnishing and applying calcium chloride, either as a surface treatment or as an admixture, in conjunction with grading or the construction of an aggregate base or surface course, or as a surface application on the road.

**2131.2 MATERIALS**

**A Calcium Chloride, type as specified or permitted ..... 3911**

**B Water**

Water used for preparing solutions shall be reasonably clean and free of suspended matter.

**2131.3 CONSTRUCTION REQUIREMENTS**

**A Surface Application**

Calcium chloride in dry form shall be applied on the road with a spreader capable of distributing the material uniformly at the rate directed. Calcium chloride solutions shall be applied on the road with a distributor meeting the requirements of 2321.3C1.

Unless otherwise specified, application rates shall be as directed by the Engineer.

**B Admixture Application**

When used as an admixture, the calcium chloride may be mixed with the aggregate at the aggregate producing plant, applied on the road as a surface application and there mixed with the aggregate, or applied on the road in solution with the mixing water.

If the calcium chloride is added at the aggregate producing plant, it shall be introduced into the aggregate at a uniform rate and in the required proportions, by a separate conveyor or metering device approved by the Engineer.

**2131.4 METHOD OF MEASUREMENT**

In the case of bulk shipments of dry calcium chloride, the material of each type as delivered and used will be measured by the net railroad or truck mass. In the case of bag or drum shipments, the mass of the material as delivered and used will be computed from the bag or drum mass.

2131.5

Calcium chloride solutions will be measured by volume as adjusted to 15°C (60° F). Tank volumes will be corrected for temperature by using the correction factors for asphalt emulsion as shown in the Mn/DOT Bituminous Manual. Conversion of shipping mass to volume will be on the basis of 1390 kg/m<sup>3</sup> (11.6 pound/gallon) in the case of solutions of 38 percent concentration.

For application, measurement, and payment purposes, the percentage of anhydrous chloride in the various types of material as delivered will be assumed to be as follows:

<u>Material</u>	<u>Anhydrous Chloride Percentage by Mass</u>
Calcium Chloride, Type 1 .....	77%
Calcium Chloride, Type 2 .....	94%
Calcium Chloride Solution .....	38%

If the material as delivered does not conform to the above specified percentages, the application rates and pay quantities will be adjusted by the Engineer so as to make payment for equivalent quantities based on conversion factors established by the Department in accordance with the assumed percentages for each type.

In the event of unseasonably cold weather, which might cause crystallization in the 38 percent calcium chloride solution, a solution containing 35 percent anhydrous chloride may be furnished with the Engineer's approval, in which case conversion of shipping mass to volume will be on the basis of 1360 kg/m<sup>3</sup> (11.35 pounds/ gallon). For payment, the net volume of 35 percent solution will be converted to equivalent volume of 38 percent solution by multiplying by 0.921.

**2131.5 BASIS OF PAYMENT**

Payment for calcium chloride at the Contract price per unit of measure will be compensation in full for furnishing and applying the material as specified.

Application of water in conjunction with the use of dry calcium chloride will be paid for in accordance with 2130, as a separate item, only to the extent that water is used by order of the Engineer.

Payment for application of calcium chloride will be made on the basis of the following schedule:

<b>Item No.</b>	<b>Item</b>	<b>Unit</b>
2131.501	Calcium Chloride, Type __ .....	metric ton ( <b>ton</b> )
2131.502	Calcium Chloride Solution .....	cubic meter ( <b>gallons</b> )