2201
Concrete Base

2201.1 DESCRIPTION

This work shall consist of constructing a base course of Portland cement concrete, with or without reinforcement, on a prepared subgrade.

2201.2 MATERIALS

A Concrete 2461

Mix designations shall be as given below for the method of placement to be used.

Manual Placement ..... Mix No. 3B42
Standard Machine Placement ..... Mix No. 3B32
Vibratory Machine Placement ..... Mix No. 3B22

In the event Class C aggregate is used meeting the requirements for CA-15 as given in 3137, the cement content required will not exceed the values given in 2461.3C.

B Reinforcement Bars 3301
C Dowel Bars 3302
D Steel Fabric 3303
E Blank
F Preformed Joint Filler 3702
G Emulsified Asphalt 3151
H Curing Paper 3752
I Blank
J Plastic Sheeting 3756
K Membrane Curing Compound 3754

2201.3 CONSTRUCTION REQUIREMENTS

Construction requirements shall be the same as those specified in 2301.3, Concrete Pavement, except as modified by the following:

A Joint Construction

When emulsified asphalt is used for curing and the joints are sawed, the sawing operations shall be completed within 24 hours after concrete placement.

When a widening strip is constructed adjacent to an existing pavement, a transverse joint shall be constructed opposite each old joint and, where the old joints are more than 9 m (**30 feet**) apart, additional joints shall be constructed approximately half-way between the old joints.

B Surface Finishing

When a concrete base is constructed to widen an existing concrete pavement and the Plans show the top of the base at the same elevation as the existing pavement surface, the surface of the base shall conform to the pavement surface.

After the surface has been screeded, no additional surface finishing will be required except for a final brooming to roughen the surface and such other finishing as may be necessary to produce a surface conforming to the requirements specified hereinafter.

C Integrant Curb

Concrete for integrant curb shall be Mix No. 3A22, 3A32, or 3A42, depending on the slump requirements for the equipment used.

D Concrete Curing

The concrete base shall be cured by the use of curing paper or plastic sheeting as provided for in 2301.3M, or by the use of emulsified asphalt applied by means of power spraying equipment at a total rate that will provide a moisture-proof film over the entire surface of the base.

Within 2 hours after application of asphalt emulsion, a coating of whitewash made of hydrated lime and water shall be applied. The proportions used in the whitewash and the rate of application shall be such that a uniform color, not darker than uncoated concrete after curing, will be produced on the surface of the base. After September l5th, the use of the whitewash application may be discontinued with the consent of the Engineer.

E Workmanship and Quality

The workmanship and quality requirements of 2301.3P shall apply to concrete base construction except that: (1) the surface smoothness requirements set forth hereinafter shall apply in lieu of 2301.3P; (2) the permissible deviations in average thickness of the base shall be 6 mm (**¼ inch**); and (3) the riding quality requirements of 2301.3P shall not apply.

After completion of the curing period, the Department will test the surface of the base for slope and grade uniformity. Except for any irregularities induced by grade requirements when the base is constructed adjacent to an existing concrete pavement or gutter, the surface of the base shall not vary more than from a 3 m (**10 foot**) straightedge.

Areas that are found to vary from the 3 m (**10 feet**) straightedge by more than 10 mm (**3/8 inch**) will not be excluded from the pay quantities, but in lieu of being removed and replaced acceptably, a deduction will be made from the moneys due the Contractor equal to the product of the defective area and: (1) \$1.25/ m^2 (**$1.00 per square yard**) for those areas where the maximum deviation is more than 10 mm (**3/8 inch**), but not more than 15 mm (**5/8 inch**), and (2) \$2.50/m^2 (**$2.00 per square yard**) for those areas where the maximum deviation exceeds 15 mm (**5/8 inch**).

2201.4 METHOD OF MEASUREMENT

The methods of measurement will be the same as specified in 2301.4 with the substitution of the term "base" for "pavement."

2201.5 BASIS OF PAYMENT BASIS OF PAYMENT

The basis of payment will be the same as specified in 2301.5 except for substituting the term "base" for "pavement" and using the following schedule.

Item No.	Item	Unit
2201.501	Concrete Base	square meter **(square yard)**
2201.502	Concrete Base, Standard Width	square meter **(square yard)**
2201.503	Concrete Base, Irregular Width	square meter **(square yard)**
2201.511	Structural Concrete	cubic meter **(cubic yard)**
2201.521	Base Reinforcement, Type___	square meter **(square yard)**
2201.529	Reinforcement Bars	kilogram **(pound)**
2201.531	Expansion Joints, Design___	meter **(linear foot)**
2201.536	Dowel Bar	each
2201.541	Integrant Curb, Design___	meter **(linear foot)**

2211
Aggregate Base

2211.1 DESCRIPTION

This work shall consist of constructing one or more courses of Contractor certified aggregate base on a prepared subgrade. The aggregate base shall be produced and placed under the Contractor's quality control program in accordance with Section 5-692.705 of the Mn/DOT Grading and Base Manual.

2211.2 MATERIALS

A Aggregate 3138

The class of aggregate to be used in each course will be shown in the contract. Gradation acceptance for Classes 1, 2, 3, 4, 5, 6 and 7 aggregates will be by the random sampling method in accordance with 2211.3F.

2211.3 CONSTRUCTION REQUIREMENTS

A General

Aggregate removed from below water shall be stockpiled and allowed to drain for at least 24 hours before being delivered on the road when its water content is such that, in the Engineer's opinion, it will cause saturation of the subgrade soils.

The base shall be constructed in layers not more than 75 mm (**3 inches**) in compacted thickness, except that each layer compacted with approved types of special compacting equipment may be increased

to a maximum of 150 mm (**6 inches**). Class 7 materials shall be constructed in layers not more than 75 mm (**3 inches**) in compacted thickness unless approved by the Engineer. Vibratory rollers will be allowed for use on a performance basis in accordance with 1805.

Where successive courses are to be constructed with different classes of aggregate, the Engineer may allow the Contractor to construct any course in accordance with the material requirements for the next above course. However, the Engineer will make payment for the combined work on the basis that each course was constructed according to the Plans.

B Placing and Mixing

When the base is constructed in a single layer, aggregate shall not be deposited on the roadbed more than 3 km (**2 miles**) in advance of the completed portion of the base. When the base is constructed in more than one layer, the aggregate for one layer shall not be deposited more than 5 km (**3 miles**) in advance of the completed portion of the succeeding layer, except that a single class of aggregate may be placed and compacted for the entire length of the Project before another class of aggregate is placed thereon. At the time of depositing the aggregate on the road, the roadbed shall be so dry and compact that no rutting or displacement will occur. Aggregate shall be placed on public road approaches and private entrances in the quantities designated by the Engineer.

If so required by the Contract, calcium chloride shall be furnished and mixed with the aggregate in accordance with 2131. Water may be added to the aggregate during mixing operations in the quantity necessary to produce proper compaction.

Aggregate windrows shall be moved, as directed by the Engineer, to permit satisfactory maintenance and drying of the subgrade. Any material that becomes contaminated after placement shall be removed and replaced, or corrected and retested.

When any surfacing is included in the same Contract as the aggregate base, the Contractor shall conduct operations in such a manner that, before suspending operations for the winter, all base aggregate deposited on the roadbed shall be covered with the initial surface course or otherwise protected in a manner approved by the Engineer. A bituminous penetration prime coat is not considered to be a surface course.

C Spreading and Compacting

At the time of spreading the base material for compaction, the aggregate shall be so uniformly mixed that it will meet specified gradation requirements, based on the results of gradation tests run on aggregate samples obtained after mixing and prior to compaction.

The material for each layer shall be spread and compacted with adequate moisture content, to the required cross section and density before placing aggregate thereon for a succeeding layer. The surface of each layer shall be maintained, with uniform texture and firmly keyed particles, until the next layer required by the Contract is placed thereon or until the completed base is accepted if no other construction is required thereon.

Compaction shall be obtained by the:
(1) Specified Density Method,
(2) Quality Compaction Method, or
(3) Penetration Index Method
whichever method is prescribed for the particular course. Compaction by the Specified Density Method will be required on all base courses except those that are otherwise designated in the contract for compaction by either the quality compaction or penetration index method. If Class 7 is specified or substituted for another class of aggregate, then densification shall only be obtained by the Quality Compaction Method or the Penetration Index Method.

C1 Specified Density Method

The full thickness of each layer shall be compacted to not less than 100 percent of maximum density. For test purposes, a layer will be considered to be 75 mm (**3 inches**) in compacted thickness. At the time of compaction, the moisture content of the base material shall be not less than 65 percent of optimum moisture.

The Engineer will make tests to determine the actual field density of the compacted base. The field density, optimum moisture, and maximum density will be determined in the field by methods described in the Mn/DOT Grading and Base Manual.

C2 Quality Compaction Method

Each layer shall be compacted until there is no further evidence of consolidation using a steel-wheeled roller or pneumatic-tired roller meeting 2123 unless the use of vibratory or other special compaction equipment is approved by the Engineer.

Water shall be applied to the base material during the mixing and spreading operations so that at the time of compaction the moisture content is not less than 5 percent of the dry weight.

The Engineer may elect to perform density tests as shown in the Mn/DOT Grading and Base Manual, as needed to assist inspection. The actual density obtained by testing the aggregate base must meet or exceed the requirements shown in 2211.3C1 Specified Density in order to be acceptable.

C3 Penetration Index Method

The full thickness of each layer of Class 5, 6 or 7 shall be compacted to achieve a penetration index value less than or equal to

10 mm (**0.4 inch**) per blow, as determined by a Mn/DOT standard dynamic cone penetrometer (DCP) device. For test purposes, a layer will be considered to be 75 mm (**3 inch**) in compacted thickness but a testing layer can be increased in thickness to a maximum of 150 mm (**6 inch**) if compacted in one lift by a vibratory roller. Two DCP tests shall be conducted at selected sites within each 800 m^3 (**1000 cubic yard**) (CV) of constructed base course. If either of the tests fails to meet the specified requirements, the material represented by the test shall require corrective action and be retested for penetration index compliance.

All aggregates prescribed to be tested under the Penetration Index Method 2211.3C3 must be tested and approved within 24 hours of placement and final compaction.

Water shall be applied to the base material during the mixing and spreading operations so that at the time of compaction the moisture content is not less than 5 percent of the dry weight.

D Workmanship and Quality

The Contractor shall construct each base course in conformity with the cross-sectional dimensions shown in the Plans and the staked grades. When the final layer of base has been completed, and at the time any additional construction is to be placed thereon, the finished surface of the base shall not vary more than 15 mm (**0.05 foot**) from the elevation prescribed for that point as determined from the staked grades and the typical sections shown in the Plans. When the base is placed adjacent to a pavement, the elevation of the finished surface of the base shall be referenced to the edge of the pavement.

When fine grading operations are required on the finished base prior to constructing pavement thereon, the surface elevation tolerance shall be met at the time of completing the fine grading. Any excess material deposited on the shoulders as a result of those operations, that is contaminated to the extent that it does not meet the Specification requirements for use in the aggregate shouldering, will be deducted from the pay quantities.

E Aggregate in Stockpiles

When the Proposal contains an item for stockpile aggregate, the Contractor shall, in addition to the aggregate required for the base construction, produce, deliver, and stockpile aggregate of the class specified at the designated sites as directed by the Engineer.

F Random Sampling Gradation Acceptance Method

The following provisions shall apply to the use of Class 1, 2, 3, 4, 5, 6 and 7 aggregates:

F1 Gradation Control

The Contractor and/or aggregate producer shall be responsible for maintaining a gradation control program in accordance with the random

sampling acceptance method described in Section 5-692.705 of the Mn/DOT Grading and Base Manual. The Contractor will be permitted to proceed with and complete the base construction on the basis of the Contractor's Certification (on Form 24346 furnished by the Engineer) that the material supplied and used conforms to the appropriate specification requirements. The Contractor shall assume full responsibility for the production and placement of uniform and acceptable materials. All payments for aggregate base materials shall be withheld until the Project Engineer receives and accepts the Contractor's Certification and quality control testing results.

F2 Acceptance Testing

Aggregate gradation compliance will be determined in accordance with following table:

TABLE 2211-A
ACCEPTANCE TESTING SCHEDULE[a]

Quantity [k] Metric tons [b] **Tons** [b]	No. Lots [c]	No. Samples[d][e] or No. Sublots/Lot[f]	Payment Acceptance Schedule
less than 500	N/A	use Form 2415 or 2403 (small qty.)	Table 2211-C
≥500 but less then 4,000	N/A	1/1000 metric tons[g] **(tons)** [g]	Table 2211-C
≥4,000 but less than 10,000	1 [h][i]	4[j]	Table 2211-B

(a) In accordance with 1503, Conformity with Plans and Specifications, it is the intent of these specifications that materials and workmanship shall be uniform in character and shall conform to the prescribed target value or to the middle portion of the tolerance range. The purpose of the tolerance range is to accommodate occasional minor variations from the median zone. The production and processing of the materials and the performance of the work shall be so controlled that the material or workmanship will not be of borderline quality.

(b) Or equivalent in cubic meters loose volume or cubic meters compacted volume:
1 metric ton = 0.6 m^3 **(1 ton = 0.7 cubic yard**) (LV) or
1 metric ton = 0.46 m^3 **(1 ton = 0.55 cubic yard**) (CV).

(c) The use of any one kind or class of material from more than one source is prohibited without permission of the engineer according to 1601. If the contractor changes sources (with Mn/DOT's approval), a new lot consisting of four sublots will be established provided that

the quantity equals or exceeds 4000 metric tons (**tons**). When a material source is changed prior to completing a lot, the remainder of the 4 samples will be taken from the previously placed materials, provided that the quantity equals or exceeds 4000 metric tons (**tons**). However, if the quantity placed is less that 4000 metric tons (**tons**), acceptance testing will be used on one test per thousand metric tons (**tons**).

(d) Samples for gradation testing will be taken randomly by the Engineer prior to compaction, in accordance with the random sampling method described in the Grading and Base Manual. All gradation tests will be reported to the nearest one-tenth of one percent for the specified sieves.

(e) Classes 1, 2 and 7, Shoulder Surfacing Aggregate, may be sampled from the stockpile for testing and acceptance, in accordance with 3138.3.

(f) Each lot will be divided into four sublots which are approximately equal in quantity.

(g) Each individual sample will be analyzed separately for payment.

(h) Each lot shall consist of a maximum of approximately 10000 metric tons (**ton**s) of material, although lesser sized lots may occur due to construction constraints.

(i) Each lot will be analyzed separately for payment.

(j) One gradation sample will be taken from each sublot and tested. Payment will be based on the average results from the four sublot samples (to the nearest one-tenth of one percent) for each specified sieve.

(k) Quantities shown are the same for both metric and English units.

The Engineer will have each sample tested in the field by a Mn/DOT Certified Tester or submit them to the laboratory approved by the Project Engineer for testing. A delay of at least 3 working days is anticipated before laboratory test results are available but a maximum of 8 working hours delay is anticipated for field gradations.

The individual test results or sublot averages, which are based on Table 2211-A, Acceptance Testing Schedule, shall be compared with tolerances shown in Tables 2211-B or 2211-C, Aggregate Base Payment Schedules. Acceptance for non-complying material shall be made in accordance with the respective tables. To qualify for full payment the Contractor may correct, at no cost to the Department, any lot of non-compliance material where acceptance is based on the lot criteria (greater than 4,000 metric tons **(tons)**) and/or the quantity of material represented by a failing test where acceptance is based on the individual sample criteria.

A 5.0% price reduction will be assessed to both individual or averaged test lots for each test result that fails to meet specified

gradations for sieve sizes not listed in Tables 2211-B and 2211-C by more than 2.0%. These price reductions are cumulative and shall be analyzed both separately and averaged by lot when applicable.

When corrective action is required for acceptance of the work, in accordance with Tables 2211-B and 2211-C, the Contractor shall perform the corrective work at no cost to the Department. The Contractor shall remove the unacceptable material and replace it with acceptable material, or correct the unacceptable material on the road. In lieu of replacement or correction, the Engineer may allow (in the best interest of the Department) the Contractor to accept a price reduction instead of corrective action.

Upon completion of any corrective work required for full payment, whether it is by blending, mixing, adding and/or replacing material, the corrected material will be sampled and tested for acceptance. The entire lot shall be retested, in accordance with Table 2211-A, when the acceptance is based on the lot criteria; otherwise, retesting will be based on one sample per thousand metric tons (**tons**).

TABLE 2211-B
AGGREGATE BASE PAYMENT SCHEDULE
(4 Sublots/4 Samples)

% Passing Outside Specified Limits*		
4.75 mm (**#4**), 2.00 mm (**#10**), And 425 µm (**# 40**) Sieves	75 µm (**#200**) Sieve	Acceptance Schedule (Price Reduction)
1	0.1	5.0%
----------	0.2	6%
----------	0.3	9%
----------	0.4	11%
----------	0.5	14%
2	0.6	15%
>2	>0.6	Corrective Action

*Based on average of 4 tests
Price reductions for more than one failing sieve size shall be cumulative. The compensation due to the Contractor for the quantity of material represented by the failing test results shall be reduced by the sum of the respective percentages.
The Contractor does not have the option of taking a price reduction in lieu of complying with the Specifications.

TABLE 2211-C
AGGREGATE BASE PAYMENT SCHEDULE
(Individual Test)

% Passing Outside Specified Limits*		
4.75 mm (**#4**), 2.00 mm (**#10**), and 425 µm (**# 40**) Sieves	75 µm (**#200**) Sieve	Acceptance Schedule (Price Reduction)
1	0.1-0.5	Substantial compliance
----------	0.6	1%
----------	0.7	2%
----------	0.8	3%
----------	0.9-1.0	4%
----------	1.1	5%
----------	1.2	6%
----------	1.3	7%
----------	1.4	8%
----------	1.5	9%
2	1.6-1.7	10%
----------	1.8	11%
----------	1.9	12%
----------	2.0	13%
----------	2.1	14%
3	2.2-2.5	15%
>3	>2.5	Corrective Action

*Based on individual sample test results.
Price reductions for more than one failing sieve size shall be cumulative. The compensation due to the Contractor for the quantity of material represented by the failing test results shall be reduced by the sum of the respective percentages; however, the reduction will not exceed 50 percent.
The Contractor does not have the option of taking a price reduction in lieu of complying with the Specifications.

TABLE 2211-D
BITUMEN CONTENT ACCEPTANCE SCHEDULE

Bitumen Content (Composite Mixture)	Acceptance Schedule (Price Reduction)
3.1%	Substantial Compliance
3.2%	7%
3.3%	10%
3.4%	14%
3.5%	18%
3.6%	21%
3.7%	25%
3.8%	28%
3.9%	32%
4.0%	35%
4.1%	39%
4.2%	43%
4.3%	46%
4.4% to 4.5%	50%
>4.5%	Corrective Action

2211.4 METHOD OF MEASUREMENT

The Engineer will measure aggregate base according to 1901 and as specified in the Contract, by mass or volume. No deductions will be made for the mass or volume of water and admixtures.

A Aggregate Base

Aggregate base of each class will be measured as indicated by:

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

Where variables or placement conditions make it impractical to determine the volume of placed material, the base material will be measured by mass or by loose volume (LV). The mass so measured will be converted to equivalent compacted volume on the basis of 2160 kg/m^3 (**135 pounds per cubic foot**) of compacted base. Vehicular measure will be converted to compacted volume by methods determined by the Engineer.

B Stockpile Aggregate

Aggregate of each class placed in stockpiles will be measured as indicated by:

(1) Mass,
(2) Loose volume (LV), or

(3) Stockpiling volume (SV)

2211.5 BASIS OF PAYMENT

Payment for the accepted quantities of aggregate base of each class at the Contract prices per unit of measure will be compensation in full for all costs of furnishing the materials and constructing the base as specified, except that separate payment will be made for any admixtures that may be specified.

No direct compensation will be made for water used in conjunction with the mixing, placing, and compacting operations.

Payment for the accepted quantities of stockpile aggregate of each class at the Contract prices per unit of measure will be compensation in full for all costs of furnishing and delivering the material as specified.

Payment will be made under items selected from the following schedule:

Item No.	Item	Unit
2211.501	Aggregate Base, Class _____	metric ton **(ton)**
2211.502	Aggregate Base (LV), Class _____	cubic meter **(cubic yard)**
2211.503	Aggregate Base (CV), Class _____	cubic meter **(cubic yard)**
2211.505	Stockpile Aggregate, Class _____	metric ton **(ton)**
2211.506	Stockpile Aggregate (LV), Class _____	cubic meter **(cubic yard)**
2211.507	Stockpile Aggregate (SV), Class ____	cubic meter **(cubic yard)**

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

2221
Aggregate Shouldering

2221.1 DESCRIPTION

This work shall consist of constructing one or more courses of Contractor certified aggregate on shoulders adjacent to concrete or bituminous pavements. The aggregate shall be produced and placed under the Contractor's quality control program in accordance with Section 5-692.705 of the Mn/DOT Grading and Base Manual.

2221.2 MATERIALS

A Aggregate 3138

The class of aggregate to be used in each course will be shown in the contract.

Gradation acceptance for Classes 1, 2, 3, 4, 5, 6, and 7 will be by the random sampling method in accordance with 2211.3F. The Engineer may elect to sample Classes 1, 2 and 7 shoulder surfacing aggregate from the stockpile. The stockpile sampling and testing will be

performed by Mn/DOT project personnel at the rate of one field gradation test per 1000 metric ton **(ton)**. Acceptance will be in accordance with the provisions of 3138.3.

2221.3 CONSTRUCTION REQUIREMENTS

Construction requirements for the aggregate shouldering shall be the same as those specified in 2211.3 for aggregate base, except that surfacing aggregate may not be substituted for lower courses.

A Subgrade Preparation

The existing shoulders, or that part of the subgrade on which the shouldering is to be placed, shall be shaped and compacted to the required grades and cross sections as given for the bottom of the shouldering, provided, however, that removal of excess material will not be required if it meets the Specification requirements for the shouldering aggregate. Contaminated material shall be removed and disposed of as directed.

The Contractor may place excess aggregate from the roadbed base construction operations on the shoulder when:

(1) The Engineer accepts the aggregate for use in shouldering.
(2) The Contractor shapes and compacts the shoulder to a uniform grade and cross-section, permitting placement of the remaining shoulder aggregate at a relatively constant spread, so far as this can be accomplished without loading and hauling materials.

When placing aggregate shouldering on an existing shoulder, the preparation of the existing shoulder shall be as directed by the Engineer. Removal of vegetation and the shaping and compacting of the shoulder subgrade shall be incidental work for which no direct compensation will be made. Removal of excess materials from the existing shoulders will be paid for as Extra Work in the absence of specific Contract items therefore, but only to the extent that the Engineer orders the excess material to be loaded and hauled away from the immediate shoulder area.

B Placing and Mixing

The aggregate shall not be deposited or mixed on the adjoining concrete pavement or bituminous wearing course surface. Any material spilled on the pavement surface shall be removed by sweeping.

At the time of depositing the aggregate on the shoulders, the subgrade shall be so dry and compact that no rutting or displacement will occur.

In conjunction with the placement of shoulder aggregate, additional material shall be placed on private entrances and road approaches as the Engineer directs.

The Contractor may place and compact the shoulder aggregate the same day that the bituminous base or surfacing is placed, if the bituminous is not damaged by this operation.

C Spreading and Compacting

When Class 1, 2, or 7 aggregates are used for shouldering, compaction shall be obtained by the Quality Compaction Method.

D Construction Under Traffic

The Contractor shall protect the traffic from drop-off conditions when traffic is carried during construction.

Drop-off conditions will be covered by the most current Mn/DOT Field Manual.

The final construction of the shoulder shall be in accordance with the typical section shown in the Plan.

2221.4 METHOD OF MEASUREMENT

Aggregate shouldering of each class specified will be measured by the same methods as prescribed in 2211.4.

2221.5 BASIS OF PAYMENT

Payment for the accepted quantities of aggregate shouldering of each class at the Contract prices per unit of measure will be compensation in full for all costs of furnishing the materials and constructing the shouldering as specified, except that separate payment will be made for any admixtures that may be specified.

No direct compensation will be made for water used in conjunction with the mixing, placing, and compacting operations.

Except as otherwise provided for in the Contract, all costs incurred in preparing and maintaining the shoulder subgrade shall be compensated for as a part of work required in 2112 or 1514.

Payment will be as follows:

Item No.	Item	Unit
2221.501	Aggregate Shouldering, Class ____	metric ton **(ton)**
2221.502	Aggregate Shouldering (LV), Class ____	cubic meter **(cubic yard)**
2221.503	Aggregate Shouldering (CV), Class ____	cubic meter **(cubic yard)**
2221.505	Stockpile Aggregate, Class ____	metric ton **(ton)**
2221.506	Stockpile Aggregate (LV), Class ____	cubic meter **(cubic yard)**
2221.507	Stockpile Aggregate (SV), Class ____	cubic meter **(cubic yard)**

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

2231
Bituminous Surface Reconditioning

2231.1 DESCRIPTION

This work shall consist of reconditioning the existing bituminous surface prior to construction of bituminous overlay or surfacing courses. It shall include the reconditioning of old pavements and all types of base courses other than an untreated aggregate base.

This work does not include the removal and replacement of pavement structure items to full depth, which may be necessary to remove unstable foundation material or facilitate other subsurface construction.

2231.2 MATERIALS

A Bituminous Patching Mixture

Bituminous patching mixture shall be the same material as will be used in the initial bituminous surfacing course that is to be constructed on the reconditioned base.

B Mixture for Joints and Cracks

Mixture for joints and cracks shall consist of a prepared mix containing fine aggregate and bituminous material conforming to the following:

Aggregate Gradation	**Percent by Mass**
Passing 12.5-mm (**½ inch**) sieve	100
Passing 2.00-mm (**# 8**) sieve	45 – 80
Passing 75-µm (**# 200**) sieve	2.0 – 7.0

Maximum spall content in the total aggregate sample shall not exceed 5.0 percent.

Bituminous Material	**Percent by Mass**
Asphalt Cement	6.5-7.0

The Engineer will designate the kind and grade of bituminous material to be used. The bituminous material used shall meet 3151.

Mixing operations shall be conducted as approved by the Engineer.

C Joint and Crack Filler (As specified in the Plans or Special Provisions)

2231.3 CONSTRUCTION REQUIREMENTS

A General

Where so indicated in the Plans or ordered by the Engineer, the existing base or pavement shall be removed and replaced in accordance with other provisions of the Contract.

B Surface Repair

Surface repairs shall be made as directed by the Engineer, so as to produce a satisfactory base on which to construct the pavement provided for in the Contract. All loose, unstable, or deteriorated portions of the existing base or pavement shall be removed to the extent that a stable surface will be achieved upon completion of the patching operations. All waste or surplus material shall be disposed of to the satisfaction of the Engineer.

All holes and depressions shall be filled with bituminous patching mixture in layers of a thickness approved by the Engineer. Compaction shall be obtained with mechanical tampers in areas not accessible to conventional rolling equipment. Specified density requirements will not apply.

C Joint Repair

Existing joints and cracks in concrete pavement that are more than 6 mm (**1/4 inch**) shall be cleaned and refilled as specified herein, if and to the extent that the required material is provided for as a Contract item.

Joints and cracks more than 6 mm (**1/4 inch**) but not more than 20 mm (**3/4 inch**) in width shall be cleaned of old filler material and foreign matter to a depth of at least 20 mm (**3/4 inch**), after which they are to be filled with joint and crack filler material.

Joints and cracks more than 20 mm (**3/4 inch**) in width shall be cleaned of old filler material and foreign matter to a depth of at least 25 mm (**1 inch**), after which they are to be refilled with mixture for joints and cracks. The material shall be thoroughly tamped into place.

2231.4 METHOD OF MEASUREMENT

The accepted quantities of bituminous patching mixture, mixture for joints and cracks, and joint and crack filler, as furnished and placed, will each be measured separately by the mass or by the LV of material, as indicated in the Proposal.

2231.5 BASIS OF PAYMENT

Payment for the accepted quantities of bituminous patching mixture, mixture for joints and cracks, and joint and crack filler, at the appropriate Contract price per unit of material furnished and placed, will be compensation in full for all costs of removal and disposal of the existing deteriorated materials, and for all costs of furnishing and placing the patching or filler materials as specified.

Removal of a concrete base or pavement to full depth and width between existing joints, or by sawing, shall be accomplished as Extra Work in the absence of an item covering its removal under the provisions of 2104.

Payment for base reconditioning will be made on the basis of the following schedule:

Item No.	Item	Unit
2231.501	Bituminous Patching Mixture	metric ton **(ton)**
2231.502	Bituminous Patching Mixture	cubic meter **(cubic yard)**
2231.505	Mixture for Joints and Cracks	kilogram **(pound)**
2231.507	Joint and Crack Filler	kilogram **(pound)**

2232
Mill Pavement Surface

2232.1 DESCRIPTION

This work shall consist of improving the profile, cross slope, and surface texture of an existing pavement surface by machine (cold) milling preparatory to placement of another course thereon.

2232.2 BLANK

2232.3 CONSTRUCTION REQUIREMENTS

A Equipment

Pavement milling shall be accomplished with a power operated, self-propelled cold milling machine capable of removing concrete and bituminous surface material as necessary to produce the required profile, cross slope, and surface texture uniformly across the pavement surface. The machine shall also be equipped with means to control dust and other particulate matter created by the cutting action.

The machine shall be equipped to accurately and automatically establish profile grades along each edge of the machine, within plus or minus 3 mm (**1/8 inch**), by referencing from the existing pavement by means of a ski or matching shoe, or from an independent grade control. The machine shall be controlled by an automatic system for controlling grade, elevation, and cross slope at a given rate.

B Operations

The pavement surface shall be milled to the depth, width, grade, and cross slope as shown in the Plans or as otherwise directed by the Engineer. Machine speeds shall be varied to produce the desired surface texture grid pattern. Milling shall be performed without excessive tearing or gouging of the underlying material.

The pavement milling operations shall be referenced from an independent grade control in those areas where the Engineer considers such control is essential. The control shall be established and maintained by the Contractor in a manner and in such position as the Engineer approves.

Milling operations shall be conducted so that the entire pavement width is milled to a flush surface at the end of each work period, whenever the pavement is open to traffic. In case of uncompleted operations resulting in a vertical or near vertical longitudinal cutting

face, it shall be the Contractor's responsibility to minimize the hazardous effects to traffic by resloping the longitudinal face to provide a suitable taper, by constructing a temporary bituminous taper, or by otherwise providing the necessary protective measures, as approved by the Engineer. Transverse cutting faces shall be tapered at the end of each working period where traffic is permitted. To further provide for traffic, the Contractor shall also construct temporary bituminous tapers at intersecting streets, around utility appurtenances, and at all appropriate entrances during the milling operations, as ordered by the Engineer.

The Contractor shall construct the temporary milled tapers and furnish, place, and remove temporary bituminous tapers as incidental work for which no direct compensation will be made.

In areas inaccessible to the milling machine, the work shall be accomplished by other equipment or methods acceptable to the Engineer.

The surfacing removed in conjunction with the milling operations may be recycled for use on the Project in accordance with the applicable Specifications, or disposed of outside of the Right of Way as specified in 2104.3.

After the milling operations are completed to the planned depth, the milled area shall be cleaned by sweeping or vacuuming with equipment approved by the Engineer. Such cleaning shall be performed to the satisfaction of the Engineer.

Debris resulting from milling and cleaning operations shall be disposed of outside of the Right of Way as specified in 2104.3, except as otherwise authorized by the Engineer.

Milling at previously patched areas shall be performed to the required depth below the pavement surface existing prior to the previous patch being placed, and not from the surface of the patch.

The Contractor shall take care to avoid disturbing or damaging any existing drainage or utility structures on the Project. Any damage resulting from the Contractor's operations shall be repaired by the Contractor at no expense to the Department.

2232.4 METHOD OF MEASUREMENT

Pavement milling will be measured by the area of each type of surface removed. Measurements will be of those areas milled as specified, based on actual finished dimensions of the work.

2232.5 BASIS OF PAYMENT

Payment for pavement milling at the appropriate Contract price per unit of measure will be compensation in full for all costs of performing the work as specified, including, but not limited to, traffic safety, cleanup, and disposal operations.

Payment for pavement milling will be made on the basis of the following schedule:

Item No.	**Item**	**Unit**
2232.501	Mill Bituminous Surface (___mm (**inches**))	..... square meter **(square yard)**
2232.502	Mill Concrete Pavement Surface (___mm (**inches**))	..... square meter **(square yard)**