

DIVISION 300 -- BASE COURSES

SECTION 304 -- AGGREGATE BASE COURSE

SECTION 306 -- RECLAIMED STABILIZED BASE

SECTION 304 -- AGGREGATE BASE COURSE

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Description

- 1.1** This work shall consist of furnishing and placing base courses on a previously prepared subgrade or course as shown on the plans or as ordered.
- 1.2** This work shall also include raising the grade of the edge of the roadway shoulders with crushed aggregate as shown on the plans or as ordered to match the grade of the pavement course placed on the shoulders or to provide a base for shoulder pavement.

Materials

2.1 General.

2.1.1 The materials shall consist of hard, durable particles or fragments of stone or gravel. Materials that break up when alternately frozen and thawed or wetted and dried shall not be used for aggregate base course materials. Fine particles shall consist of natural or processed sand. The materials shall be free of harmful amounts of organic material. Unless otherwise specified, the percent wear of base course material shall not exceed 50 percent as determined by AASHTO T 96, Grading A.

2.1.2 Crushed stone shall be processed material obtained from a source that has been stripped of all overburden. The processed material shall consist of clean, durable fragments of ledge rock of uniform quality and reasonably free of thin or elongated pieces.

2.1.3 Materials for glass cullet shall either be separated/recyclables received from a recycling facility permitted (pursuant to RSA 149-M:10) by the Waste Management Division of the Department of Environmental Services and/or materials certified for Direct Re-Use in accordance with Env-Sw 1500.

2.1.3.1 Glass cullet shall meet the requirements of AASHTO M318.

2.2 Gradation. The required gradation of base course material shall conform to [Table 304-1](#).

2.3 Sand. The maximum size of any stone or fragment shall not exceed three-fourths of the compacted depth of the layer being placed but in no case larger than 6”.

2.4 Gravel. The maximum size of stone particles shall not exceed three-fourths of the compacted thickness of the layer being placed but in no case larger than 6”.

2.5 Crushed gravel. At least 50 percent of the material retained on the 1” sieve shall have a fractured face.

2.6 Crushed gravel for shoulder leveling. This material shall consist either of a crushed aggregate, or a blend of crushed aggregate and reclaimed asphalt or concrete materials. Reclaimed Asphalt Pavement (RAP) and/or Reclaimed Concrete Aggregate

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(RCA) may be blended up to 75% by volume with the crushed aggregate. The crushed aggregate shall meet the gradation requirements of Item 304.32 in [Table 304-1](#) prior to blending with reclaimed materials. The reclaimed materials shall meet the requirements of 2.6.1 or 2.6.2 as applicable prior to blending with crushed aggregate.

2.6.1 RAP for this purpose shall be processed by either crushing or screening such that 100% of the material passes the 1" sieve. Screening will only be allowed if the source of the RAP is pavement millings from cold planning bituminous surfaces.

2.6.2 RCA shall meet the requirements of AASHTO M 319, except for its gradation requirements. 100% of the material shall pass the 1" sieve.

2.7 Crushed aggregate for shoulders. This material shall meet the gradation requirements of [Table 304-1](#).

2.8 Gravel for drives. The material shall meet the requirements of gravel as shown in [Table 304-1](#).

2.9 Crushed gravel for drives. The material shall meet the gradation requirements of either crushed gravel or crushed stone (fine) as shown in [Table 304-1](#).

2.10 Crushed stone base course (fine gradation). Acceptable sand may be blended as necessary to obtain the proper gradation for the fine aggregate portion.

Table 304-1 - Base Course Materials Required Gradation

Item No.	304.1	304.2	304.3	304.32	304.33	304.4	304.5	304.6
Item	Sand	Gravel	Crushed Gravel	Crushed Gravel for Shoulder Leveling	Crushed Aggregate for Shoulders	Crushed Stone (Fine)	Crushed Stone (Coarse)	Crushed Stone (Very Coarse)
Sieve Size	Percent Passing By Weight							
6"	100	100	---	---	---	---	---	100
5"	---	---	---	---	---	---	---	---
4"	---	---	---	---	---	---	---	---
3 1/2"	---	---	---	---	---	---	100	---
3"	---	---	100	---	---	---	85 – 100	60-90
2 1/2"	---	---	---	---	---	---	---	---
2"	---	---	95 – 100	---	---	100	---	---
1 1/2"	---	---	---	100	100	85 – 100	60 – 90	45-75
1"	---	---	55 – 85	90-100	90 – 100	---	---	---
3/4"	---	---	---	---	---	45 – 75	40 – 70	35-65
1/2"	---	---	---	65-90	---	---	---	---
#4	70 – 100	25 – 70	27 – 52	30-55	30 – 65	10 – 45	15 – 40	15-40
# 200 (In Sand Portion)*	0 – 12	0 – 12	0 – 12	---	---	---	---	---
# 200 (In Total Sample)	---	---	---	0-10	0 – 10	0 – 5	0 – 5	0-5

* Fraction passing the # 4 sieve

2.11 Crushed stone base course (coarse gradation). Acceptable sand may be blended as necessary to obtain the proper gradation for the fine aggregate portion.

2.11.1 The substitution of crushed stone meeting the requirements of crushed stone base course (fine gradation) for all or part of this item will be permitted.

Construction Requirements

3.1 General.

3.1.1 Upon approval, base course materials found within the project limits may be used under the specific item in accordance with [104.04](#).

3.1.2 Gravel or approved substitution for gravel may be substituted for any sand course. Crushed gravel may be substituted for gravel. Substitutions must be made across the entire section and will not be allowed for short or discontinuous segments.

3.1.3 Crushed stone (fine gradation) may be substituted for crushed gravel provided there is a minimum of 1 ft. of free draining material (sand, gravel, crushed stone coarse, or crushed stone very coarse) below the crushed stone. The substitution must be made across the entire section at a constant depth and will not be allowed for short or discontinuous segments.

3.1.4 Permission may be granted to use the following recycled materials in lieu of crushed gravel or crushed stone (fine gradation) provided the following requirements are met:

- (a) Free draining material exists below the replacement material as described in 3.1.3.
- (b) Substituted materials must come from a homogenous stockpile that meets the gradation requirements of the material being replaced.
- (c) Transitions between replacement material and crushed gravel or crushed stone (fine gradation) shall be made using a 50 ft. taper.
- (d) The material shall be placed directly under the proposed pavement.

3.1.4.1 Reclaimed asphalt pavement, blended with granular material, shall be tested in accordance with NHDOT test method S1.

3.1.4.2 Reclaimed concrete aggregate shall also meet the requirements of AASHTO M 319, except for the gradation requirements. The material shall contain no more than 5 percent reclaimed asphalt pavement.

3.1.5 Crushed stone (coarse or very coarse) may be substituted for gravel provided that all crushed gravel above the crushed stone is replaced with a combination of crushed stone coarse and fine with the top layer consisting of a minimum of 6" of crushed stone fine. The substitution must be made across the entire section and will not be allowed for short or discontinuous segments.

3.1.6 Crushed aggregate base course materials shall be produced and placed in their final location with as little segregation as possible.

3.1.7 Excess reclaimed stabilized base material substantially meeting the requirements of 2.7 may be substituted for the crushed aggregate for shoulders in 2.6. Reclaimed stabilized base material shall be mixed with loam as specified in 2.6.

3.1.7.1 Reclaimed stabilized base material shall not be substituted for crushed aggregate for shoulders in areas contiguous to residences and other existing landscaped areas where the growth of grass is desired.

3.2 Aggregate Crushing Plant.

3.2.1 The equipment for producing crushed gravel shall be of adequate size and with sufficient adjustments to produce the required materials without unnecessary waste. The plant shall be capable of removing excess fines.

3.2.2 The equipment for producing crushed stone shall consist of sufficient units with sufficient adjustments to produce the required material. The plant shall be capable of removing undesirable material and excess fines. In order to meet the required gradation, the Contractor may produce acceptable material in one operation or combine coarse and fine piles through a proportioning hopper to create a combined stockpile.

3.2.3 Glass Cullet Crushing Plant. The glass cullet crushing plant shall be capable of producing a product meeting the gradation requirements of AASHTO M 318.

3.2.3.1 Glass cullet shall be thoroughly mixed with other base course materials to produce a homogeneous blend prior to being placed on the roadway. In-place field blending of glass cullet with other base course materials will not be permitted, unless otherwise permitted.

3.3 Stockpile Construction.

3.3.1 All crushed aggregate base course materials shall be stockpiled. The Contractor shall give the Engineer advance notification of when the manufacturing and stockpiling are to begin.

3.3.2 A stockpile of acceptable material, as described in 3.5, equal to at least 20 percent of the bid quantity or 5,000 cy, whichever is less, shall be constructed before the hauling and placing phase of the work begins. The stockpile shall be maintained until approximately 80 percent of the quantity has been placed.

3.3.3 Stockpiles shall be constructed in layers that minimize segregation. The desired optimum thickness of layers is 6 ft. and in no instance shall the layer be more than 10 ft. Each layer shall be completed before the next layer is started. Construction of stockpiles by direct use of a fixed conveyor belt system or by dumping over a bank will not be permitted.

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3.4 Placing.

3.4.1 The subgrade or preceding course shall be shaped to the specified crown and grade and maintained in a smooth condition free of holes and ruts. If the hauling equipment causes ruts in the subgrade or previously placed base course, the equipment shall be operated only on the course being placed, behind the spreading equipment.

3.4.2 Care shall be taken to avoid segregation during placement. Base course material shall be dumped on the course being placed and spread at once onto the previously placed layer. If spreading equipment is not available, dumping will not be permitted. Any segregation that occurs shall be remedied or the materials removed and replaced at no additional cost to the Department.

3.4.3 The Contractor's method of operation shall be such that oversized stones will not be delivered to the project.

3.4.4 When the base course is to be surface-treated and no pavement is to be placed upon it, stones having any dimension greater than 3" shall be removed from the upper 4" of the top layer.

3.4.5 Prior to fine grading, hard spots in the surface of the top layer shall be eliminated by scarifying the top 4" .

3.4.6 Crushed gravel for shoulder leveling shall be spread uniformly along the area adjoining the edge of the pavement. The material shall be spread along both sides and under guardrail where there is no curb.

3.4.6.1 Reclaimed stabilized base material utilized in shoulders greater than 1-1/2", in any direction, shall not be exposed after placement.

3.4.7 To prevent segregation of crushed aggregate during spreading and to assist in obtaining the required density of the mixture, water may be added to the crushed aggregate prior to performing the grading operations. The course shall be maintained in the moist condition during grading operations.

3.4.8 Crushed aggregate shall be hauled from an approved stockpile. Material obtained directly from a conveyor shall not be placed on the roadway without first stockpiling.

3.4.9 The base course material shall be spread in the amount necessary for proper consolidation and shall be shaped true to grade and cross-section by means of power graders or other approved equipment.

3.4.10 Surface voids in crushed stone base course (fine gradation) shall be eliminated by the addition of filler material to just fill the voids. Any surplus filler material shall be removed. The finished surface shall be uniform, true to grade, and free from segregation. The Contractor shall furnish and place filler material to correct any visible segregation prior to paving. The filler material shall be spread, scarified, if required, into the course, and recompact to the required density. Filler material shall meet the gradation requirements of sand. The final gradation of crushed stone base course (fine gradation) shall meet the requirements of Table 304-1.

3.5 Testing For Gradation.

3.5.1 Sampling procedure shall conform to AASHTO T 2. Testing procedures shall be in accordance with AASHTO T 27.

3.5.1.1 When reclaimed asphalt pavement is blended with granular material to be used in lieu of crushed gravel or crushed stone base course (fine gradation) the method used to determine the amount of coarse material shall be determined according to NHDOT S-1.

3.5.2 The amount of material finer than the No. 200 sieve shall be determined according to AASHTO T 11, which specifies dry sieving after washing.

3.5.2.1 When reclaimed asphalt pavement is blended with granular material to be used in lieu of crushed gravel or crushed stone base course (fine gradation) the method used to determine the amount of material finer than the No. 200 sieve shall be determined according to NHDOT S-1.

3.5.3 For a preliminary determination of compliance with the specification for gradation, samples of sand and gravel may be taken from the pit, and samples of crushed gravel and crushed aggregate may be taken from the stockpile or from the final phase of the crushing operation. Materials not meeting the gradation requirements shall not be placed on the roadway

3.5.4 Samples for acceptance testing of the material in place will be taken from each lift. Sampling for acceptance testing will not be done until the material has been graded and compacted.

3.5.5. Previously tested and accepted material contaminated by earthen, organic, or other foreign matter or degraded by hauling equipment to such an extent that the material no longer meets the gradation requirements shall be removed and replaced or otherwise made acceptable at the Contractor's expense.

3.6 Compaction.

3.6.1 Unless shown on the plans or ordered otherwise, the compacted depth of sand courses shall not exceed 12". The compacted depth of any layer of gravel, crushed gravel, or crushed stone placed shall not exceed 8".

3.6.2 Compaction of base course material shall be done with a method and adequate water to meet the requirements of 3.7. Rolling and shaping shall continue until the required density is attained.

3.6.3 Rolling and shaping patterns shall begin on the lower side and progress to the higher side of the course while lapping the roller passes parallel to the centerline. Rolling and shaping shall continue until each layer conforms to the required grade and cross-section and the surface is smooth and uniform.

3.6.4 Water shall be uniformly applied over the base course materials during compaction in the amount necessary for proper consolidation.

3.6.5 When vibratory equipment is being operated, the amplitude of vibrations, the compaction process shall be adjusted as necessary to avoid causing damage or vibration complaints to adjacent buildings and property.

3.6.6 Except at inaccessible locations, such as near guardrail, material used for shoulder leveling shall be set with a pneumatic-tired roller.

3.7 Density Testing.

3.7.1 The density of sand courses shall be determined by AASHTO T 191 (Sand-Cone Method), AASHTO T 204 (Dry-Cylinder Method), or AASHTO T 310 (Nuclear Methods). The density shall not be less than 95 percent of the maximum density determined in accordance with AASHTO T 99 (Standard Proctor Test) or a control strip per 3.8.

3.7.2 The density of gravel and crushed gravel courses shall be determined by AASHTO T 191 (Sand-Cone Method) or AASHTO T 310 (Nuclear Methods). The density of crushed stone base courses shall be determined by AASHTO T 310 (Nuclear Methods). The density shall not be less than 95 percent of the maximum density as determined by AASHTO T 99 (Standard Proctor Test) or a control strip per 3.8.

3.8 Control Strip Procedure.

3.8.1 At the beginning of the compaction operation a control strip of at least 100 linear ft. in length and spanning the width of the section being placed shall be constructed. The density requirement shall be determined by compacting the control strip at a suitable moisture content until no further increase in density can be measured. The remainder of the course shall be compacted to a density not less than 95 percent of the maximum control strip density, as measured by the nuclear density testing equipment. A new control strip will be required when there is a significant change in the gradation of the material being placed or a change in compaction equipment. Compaction of the control strip shall be done with approved vibratory rollers or compactors capable of producing a dynamic force of at least 27,000 lb.

3.8.2 Crushed gravel for roundabout truck apron curb shall be compacted to a density not less than 98 percent of the maximum control strip density, as measured by the nuclear density testing equipment.

3.9 Winter Construction.

3.9.1 Base course materials shall not be placed on or above frozen material if the depth from the top of the contemplated course to the bottom of the frozen material exceeds 2-1/2 ft.

3.9.2 If the density requirements are not attained for any layer before the material freezes, no further material shall be placed on that layer.

3.10 Maintenance of Traffic. Glass cullet base course blends shall be capped with standard specification base course materials before the traveling public is allowed to drive over the material.

Method of Measurement

4.1 Roadbed base course materials of sand, gravel, crushed gravel, crushed aggregate for shoulders, crushed stone (fine gradation), and crushed stone (coarse gradation) will not be measured, but shall be the cubic yard final pay quantity in accordance with 109.11 of compacted material required within the lines shown on the plans.

4.2 Applicable provisions as stated in 106.02 shall apply to base course materials.

4.3 Crushed gravel for shoulder leveling will be measured by the ton in accordance with 109.01.

4.3.1 Reclaimed stabilized base material used for crushed gravel for shoulder leveling shall be measured by the cubic yard using average lengths, widths and depths of the area to be filled or as provided in 4.3 as determined by the Engineer.

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4.4 Gravel and crushed gravel for drives will be measured by the cubic yard of compacted materials placed within the limits shown on the plans.

Basis of Payment

5.1 Roadbed base course materials of sand, gravel, crushed gravel, crushed stone (fine gradation), and crushed stone (coarse gradation) are final pay quantities and will be paid for at the Contract unit price per cubic yard in accordance with 109.11.

5.1.1 Reclaimed stabilized base authorized for use in lieu of crushed gravel or crushed stone (fine gradation) will be paid for as provided in 5.1.

5.2 Filler material used to eliminate voids in crushed stone base course (fine gradation) will be subsidiary.

5.3 The accepted quantity of gravel, crushed aggregate for shoulders or crushed gravel for drives will be paid for at the Contract unit price per cubic yard complete in place. The accepted quantity of crushed gravel for shoulder leveling will be paid for at the Contract unit price per ton delivered and used on the project.

Pay items and units:

304.1	Sand (F)	Cubic Yard
304.2	Gravel (F)	Cubic Yard
304.25	Gravel for Drives	Cubic Yard
304.3	Crushed Gravel (F)	Cubic Yard
304.32	Crushed Gravel for Shoulder Leveling	Ton
304.33	Crushed Aggregate for Shoulders	Cubic Yard
304.35	Crushed Gravel for Drives	Cubic Yard
304.4	Crushed Stone (Fine Gradation) (F)	Cubic Yard
304.5	Crushed Stone (Coarse Gradation) (F)	Cubic Yard
304.6	Crushed Stone (Very Coarse)	Cubic Yard