

## BASE COURSES

### SECTION 200 ROCK BASE

#### **200-1 Description.**

Construct a base composed of base rock. Perform work in accordance with an approved Quality Control Plan meeting the requirements of 6-8.

#### **200-2 Materials.**

Meet the requirements of either 911, 913, 913A or 915 for the particular type of base to be constructed. The Contractor may use more than one source of base rock on a single Contract provided that a single source is used throughout the entire width and depth of a section of base. Obtain approval from the Engineer before placing material from more than one source. Place material to ensure total thickness single source integrity at any station location of the base. Intermittent placement or “Blending” of sources is not permitted. Base rock may be referred to hereinafter as “rock”.

Do not use any of the existing base that is removed to construct the new base.

#### **200-3 Equipment.**

Use mechanical rock spreaders, equipped with a device that strikes off the rock uniformly to laying thickness, capable of producing even distribution. For crossovers, intersections and ramp areas; roadway widths of 20 feet [6 m] or less; the main roadway area when forms are used and any other areas where the use of a mechanical spreader is not practicable; the Contractor may spread the rock using bulldozers or blade graders.

#### **200-4 Transporting Rock.**

Transport the rock to its point of use, over rock previously placed, if practicable, and dump it on the end of the preceding spread. Hauling and dumping on the subgrade will be permitted only when, in the Engineer’s opinion, these operations will not be detrimental to the subgrade.

#### **200-5 Spreading Rock.**

**200-5.1 Method of Spreading:** Spread the rock uniformly. Remove all segregated areas of fine or coarse rock and replace them with properly graded rock.

**200-5.2 Number of Courses:** When the specified compacted thickness of the base is greater than 6 inches [150 mm], construct the base in multiple courses of equal thickness. Individual courses shall not be less than 3 inches [75 mm]. The thickness of the first course may be increased to bear the weight of the construction equipment without disturbing the subgrade.

If, through field tests, the Contractor can demonstrate that the compaction equipment can achieve density for the full depth of a thicker lift, and if approved by the Engineer, the base may be constructed in successive courses of not more than 8 inches [200 mm] compacted thickness.

The Engineer will base approval on results of a test section constructed using the Contractor’s specified compaction effort. Notify the Engineer prior to beginning construction of a test section. Construct a test section of the length of one LOT. Perform five QC density tests at random locations within the test section. At each test site, test the bottom 6 inches [150 mm] in addition to the entire course thickness. All QC tests and a Department Verification test must meet the density required by 200-7.2.1. Identify the test section with the compaction effort and thickness in the Logbook. Remove the materials above the bottom 6 inches [150 mm], at no expense to the Department. The minimum density required on the thicker lift will be the average of the five results obtained on the thick lift in the passing test section. Maintain the exposed surface as close to “undisturbed” as possible; no further compaction will be permitted during the test preparation. If unable to achieve the required density, remove and replace

or repair the test section to comply with the specifications at no additional expense to the Department. The Contractor may elect to place material in 6 inches [150 mm] compacted thickness at any time.

Once approved, a change in the source of base material will require the construction of a new test section. Do not change the compaction effort once the test section is approved. The Engineer will periodically verify the density of the bottom 6 inches [150 mm] during thick lift operations.

The Engineer may terminate the use of thick lift construction and instruct the Contractor to revert to the 6 inches [150 mm] maximum lift thickness if the Contractor fails to achieve satisfactory results or meet applicable specifications.

**200-5.3 Rock Base for Shoulder Pavement:** Unless otherwise permitted, complete all rock base shoulder construction at any particular location before placing the final course of pavement on the traveled roadway. When dumping material for the construction of a rock base on the shoulders, do not allow material capable of scarring or contaminating the pavement surface on the adjacent pavement. Immediately sweep off any rock material that is deposited on the surface course.

## **200-6 Compacting and Finishing Base.**

**200-6.1 General:** A LOT is defined as a single lift of finished base not to exceed 500 feet [150 m]. Shoulders compacted separately shall be considered separate LOTs. Isolated compaction operations will be considered as separate LOTs. For multiple phase construction, a LOT shall not extend beyond the limits of the phase.

**200-6.1.1 Single Course Base:** After spreading, scarify the entire surface, then shape the base to produce the required grade and cross-section after compaction.

**200-6.1.2 Multiple Course Base:** Clean the first course of foreign material, then blade and bring it to a surface cross-section approximately parallel to the finished base. Before spreading any material for the upper courses, allow the Engineer to make density tests for the lower courses to determine that the required compaction has been obtained. After spreading the material for the top course, finish and shape its surface to produce the required grade and cross-section, free of scabs and laminations, after compaction.

**200-6.2 Moisture Content:** When the material does not have the proper moisture content to ensure the required density, wet or dry it as required. When adding water, uniformly mix it in by disking to the full depth of the course that is being compacted. During wetting or drying operations, manipulate, as a unit, the entire width and depth of the course that is being compacted.

**200-6.3 Thickness Requirements:** Within the entire limits of the width and depth of the base, construct the base to specified width. The average depth in any LOT must meet the specified depth value. Meet the thickness requirements of 285-6.

### **200-6.4 Correction of Defects:**

**200-6.4.1 Contamination of Base Material:** If, at any time, the subgrade material becomes mixed with the base course material, dig out and remove the mixture, and reshape and compact the subgrade. Then replace the materials removed with clean base material, and shape and compact as specified above. Perform this work at no expense to the Department.

**200-6.4.2 Cracks and Checks:** If cracks or checks appear in the base, either before or after priming, which, in the opinion of the Engineer, would impair the structural efficiency of the base, remove the cracks or checks by rescarifying, reshaping, adding base material where necessary, and recompacting.

**200-6.5 Compaction of Widening Strips:** Where base construction consists of widening strips and the trench width is not sufficient to permit use of standard base compaction equipment, compact the base using vibratory compactors, trench rollers or other special equipment which will achieve the density requirements specified herein.

When multiple course base construction is required, compact each course prior to spreading material for the overlaying course.

## **200-7 Acceptance Program.**

**200-7.1 General Requirements:** Meet the requirements of 120-10.1, except use 200-7.2 instead of 120-10.2.

**200-7.2 Acceptance Criteria:**

**200-7.2.1 Density:** Within the entire limits of the width and depth of the base, obtain a minimum density in any LOT of 98% of maximum density as determined by AASHTO FM 1-T 180, Method D. Compact the base of any LOT of shoulder pavement to not less than 95% of the maximum density as determined by FM 1-T 180, Method D.

**200-7.2.2 Frequency:** Conduct QC sampling and testing at a minimum frequency listed in the table below. The Engineer will perform Verification sampling and tests at a minimum frequency listed in the table below.

Test Name	Quality Control	Verification
Maximum Density	One per eight consecutive LOTs	One per 16 consecutive LOTs
Density	One per LOT	One per four LOTs
Roadway Surface	Ten per LOT	Three per LOT
Shoulder/widening* Surface	Five per LOT	One per LOT
Roadway Thickness	Three per LOT	Three per four LOTs
Shoulder/widening* Thickness	Three per two consecutive LOTs	Three per eight consecutive LOTs

\* Note = for widening less than or equal to 4 ft [1.2 m]

**200-7.3 Additional Requirements:**

**200-7.3.1 Quality Control Testing:**

**200-7.3.1.1 Maximum Density Requirement:** Split each sample and retain for the Engineer's Verification or Resolution testing until the Engineer accepts the 16 LOTs represented by the samples.

**200-7.3.1.2 Depth and Surface Testing Requirements:** Determine test locations including Stations and Offsets, using the Random Number generator provided by the Department. Enter test results into the Department's database. Perform thickness check on the finished base or granular subbase component of a composite base. Provide traffic control, coring/boring equipment, and an operator for the coring/boring equipment. Traffic control is to be provided in accordance with the standard maintenance of traffic requirements of the Contract.

The thickness is considered deficient, if the measured depth is over 1/2 inch [13 mm] less than the specified thickness. Correct all deficient areas of the completed base by scarifying and adding additional base material. As an exception, if authorized by the Department, such areas may be left in place without correction and with no payment.

Check the finished surface of the base course with a template cut to the required crown and with a 15-foot [4.572 m] straightedge laid parallel to the centerline of the road. Correct all irregularities greater than 1/4 inch [6 mm] to the satisfaction of the Engineer by scarifying and removing or adding rock as required, and recompact the entire area as specified hereinbefore.

**200-7.3.1.3 Surface & Thickness Reduced Testing Frequency:** When no Resolution testing is required for 12 consecutive verified LOTs, or if required, the QC test data was upheld, reduce the QC surface and/or thickness checks to one half the minimum requirements as stated in 200-7.2.2 (eg. Reduce frequency from ten per LOT to ten per two LOTs) by identifying the substantiating tests and notifying the Engineer in writing prior to starting reduced frequency of testing. If the Verification test fails, and Quality Control test data is not upheld by Resolution testing the Quality Control testing will revert to the original frequency of 200-7.2.2. The results of the Independent Verification testing will not affect the frequency of the Quality Control testing.

**200-7.3.2 Department Verification Tests:**

**200-7.3.2.1 Maximum Density:** The Engineer will randomly select one of the two split samples and test in accordance with FM 1-T 180, Method D.

**200-7.3.2.2 Thickness and Surface Testing Requirements:** the department will verify the Base thickness at the frequency listed in 200-7.2.2. The Department will select test locations, including Stations, Offsets, and Lifts using a Random Number generator, based on a set LOTs under consideration. If the Verification test results are not deficient as defined in 200-7.3.1.2, the QC test data will be considered verified. If the Verification test results are deficient, the requirements of 200-7.4.3 will apply in affected LOTs. Provide traffic control, coring/boring equipment, and an operator for the coring/boring equipment. Traffic control is to be provided in accordance with the standard maintenance of traffic requirements of the Contract.

**200-7.4 Verification Comparison Criteria and Resolution Procedures:**

**200-7.4.1 Maximum Density:** The Engineer will verify the Quality Control results of the 16 consecutive LOTs if the Verification test result compares within 4.5 PCF [72 kg/m<sup>3</sup>] of the QC result for the corresponding LOTs. Otherwise, the Engineer will use the Verification results for material acceptance purposes for the eight corresponding LOTs. The Engineer will collect the remaining split sample corresponding to the remaining eight LOTs in question. The State Materials Office or an AASHTO accredited laboratory designated by the State Materials Office will perform Resolution testing. The material will be sampled and tested in accordance with FM 1-T 180, Method D.

The Engineer will compare the Resolution Test results with the Quality Control test results. If the Resolution Test result is within 4.5 PCF [72 kg/m<sup>3</sup>] of the corresponding Quality Control test result, the Engineer will use the Quality Control test results for material acceptance purposes for the remaining eight LOTs. If the Resolution test result is not within 4.5 PCF [72 kg/m<sup>3</sup>] of the corresponding Quality Control test, the Resolution test results will be used for material acceptance purposes for the remaining eight LOTs in question.

**200-7.4.2 Density:** When a Verification or Independent Verification density test does not meet 200-7.2.1 (Acceptance Criteria), retest the LOT at a site within a 5 feet (1.5 meter) radius of the Verification test location and observe the following:

1. If the Quality Control retest meets the Acceptance Criteria and compares favorably with the Verification or Independent Verification test, the Engineer will accept the four LOTs in question.
2. If the Quality Control retest does not meet the Acceptance Criteria and compares favorably with the Verification or Independent Verification test, rework and retest the material in that LOT. The Engineer will re-verify the four LOTs in question.
3. If the Quality Control retest and the Verification or Independent Verification test do not compare favorably, complete a new equipment-comparison analysis as defined in 120-10.1.1. Once acceptable comparison is achieved, retest the four LOTs. The Engineer will perform new verification testing. Acceptance testing will not begin on a new LOT until the Contractor has a gauge that meets the comparison requirements.

**200-7.4.3 Thickness and Surface Testing Requirements:** Perform a QC re-test within 5 feet [1.5 m] of the Verification test site in each affected LOT. If the QC re-test meets the requirements, the LOT will be accepted using QC test results. If the QC re-test confirms deficient thickness or surface irregularity, the Contractor will rework and re-test that LOT by scarifying and adding additional base material. The Department will re-verify the group of those LOTs. As an exception, if authorized by the Engineer, such areas may be left in place without correction and with no payment.

**200-8 Priming and Maintaining.**

**200-8.1 Priming:** Apply the prime coat only when the base meets the specified density requirements and when the moisture content in the top half of the base does not exceed 90% of the optimum moisture of the base material. At the time of priming, ensure that the base is firm, unyielding and in such condition that no undue distortion will occur.

**200-8.2 Maintaining:** Maintain the true crown and template, with no rutting or other distortion, while applying the surface course.

## **200-9 Calculations for Average Thickness of Base.**

For bases that are not mixed in place, the Engineer will determine the average thickness from the measurements specified in 200-10.1, calculated as follows:

(a) When the measured thickness is more than 1/2 inch [13 mm] greater than the design thickness shown on the typical cross-section in the plans, it will be considered as the design thickness plus 1/2 inch [13 mm].

(b) Average thickness will be calculated per typical cross-section for the entire job as a unit.

(c) Any areas of base left in place with no payment will not be included in the calculations.

(d) Where it is not possible through borings to distinguish the base materials from the underlying materials, the thickness of the base used in the measurement will be the design thickness.

## **200-10 Method of Measurement.**

**200-10.1 General:** The quantity to be paid for will be the plan quantity, adjusted as specified below.

**200-10.2 Authorized Normal Thickness Base:** The surface area of authorized normal thickness base to be adjusted will be the plan quantity as specified above, omitting any areas not allowed for payment under the provisions of 200-6.3 and omitting areas which are to be included for payment under 200-10.3. The adjustment shall be made by adding or deducting, as appropriate, the area of base represented by the difference between the calculated average thickness, determined as provided in 200-9, and the specified normal thickness, converted to equivalent square yards [square meters] of normal thickness base.

**200-10.3 Authorized Variable Thickness Base:** Where the base is constructed to a compacted thickness other than the normal thickness as shown on the typical section in the plans, as specified on the plans or ordered by the Engineer for providing additional depths at culverts or bridges, or for providing transitions to connecting pavements, the volume of such authorized variable thickness compacted base will be calculated from authorized lines and grades, or by other methods selected by the Engineer, converted to equivalent square yards [square meters] of normal thickness base for payment.

## **200-11 Basis of Payment.**

Price and payment will be full compensation for all the work specified in this Section, including correcting all defective surface and deficient thickness, removing cracks and checks as provided in 200-6.4.2, the prime coat application as directed in Article 300-8, and the additional rock required for crack elimination.

Payment shall be made under:

Item No. 285-7-	Optional Base - per square yard.
Item No. 2285-7-	Optional Base - per square meter.