READ THIS FIRST

The Engineer shall verify that the latest version of the Federal Aviation Administration Advisory Circular AC 150/5370-10, “Standards for Specifying Construction Of Airports” and that the latest version of the Federal Aviation Administration, Northwest Mountain Region Revision to AC 150/5370-10, “Standards for Specifying Construction Of Airports” are incorporated into this specification.

This Project Spec Document may need additional modifications to suit your project. It is recommended that you proofread each section, paying attention to any “Notes” boxes such as this one--you should remove these “Notes” sections as you go. Also, do a search for all bracket characters “ [ ] “ as they are used to show you areas containing options or project specific details (you can use Microsoft Word’s Find feature {Ctrl-F} to jump to an open bracket “ [ “ character quickly). Again, these bracket characters should be removed.

It is important that every paragraph be numbered to allow for easy referencing. If you use the document’s built in styles and formatting your outline should be fine (turn on the formatting toolbar by going to View > Toolbars > Formatting). Most paragraphs will use the style “Numbered Material” and can be promoted (Shift) or demoted (Shift-Tab).

You should not have to manually enter extra spaces, carriage returns or outline characters such as A, B, C, or 1.01, 1.02; the formatting will do this for you. The entire document is 11 pt. Arial. If you paste items in, you may need to reapply the “Numbered Material” format.

1. GENERAL
   1. SUMMARY OF WORK
      1. The location and extent of “Crushed Aggregate Base Course (FAA)” Work is indicated in the Contract Documents. The crushed aggregate base course shall be provided upon the prepared subgrade or underlying course in accordance with the provisions of FAA Item P-209, Crushed Aggregate Base Course, attached hereto.
   2. GOVERNING CODES, STANDARDS, AND REFERENCES
      1. TBD
   3. SUBMITTALS
      1. Submit materials data in accordance with Section 01 33 00 - Submittals. Furnish manufacturers’ technical literature, standard details, product specifications, and installation instructions for all products.
      2. Submittals shall include the following:
2. NOT USED
3. NOT USED
4. NOT USED

End of Section

Revision History:

05/01/2014 Conversion to 2004 CSI Numbering System

10/15/2014 Added Sole Source and Salient Characteristics Note to Part 2 and revisions

# ITEM P-209 CRUSHED AGGREGATE BASE COURSE

## DESCRIPTION

209-1.1 This item consists of a base course composed of crushed aggregates constructed on a prepared course in accordance with these specifications and in conformity to the dimensions and typical cross sections shown on the plans.

## MATERIALS

A. If only one product is acceptable (single or sole source product), obtain an approved Competition Waiver and submit to the CPO Construction, Contract Administrator. The language shall read as: “Manufacturer Name, Product # XXXXX, No Equal.” Refer to CPO-6 Competition Waiver Policy for more information.

B. If a Competition Waiver is not approved or more than one product is acceptable, this section must list a minimum of 2 products plus the language “Or Approved Equal,” along with salient characteristics. Refer to CPO Construction’s Salient Characteristics Guidelines for more information.

209-2.1 AGGREGATE. Aggregates shall consist of clean, sound, durable particles of crushed stone, crushed gravel, or crushed slag and shall be free from coatings of clay, silt, vegetable matter, and other objectionable materials and shall contain no clay balls. Fine aggregate passing the No. 4 (4.75 mm) sieve shall consist of fines from the operation of crushing the coarse aggregate. If necessary, fine aggregate may be added to produce the correct gradation. The fine aggregate shall be produced by crushing stone, gravel, or slag that meet the requirements for wear and soundness specified for coarse aggregate.

The crushed slag shall be an air-cooled, blast furnace slag and shall have a unit weight of not less than 70 pounds per cubic foot (1.12 Mg/cubic meter) when tested in accordance with ASTM C 29.

The coarse aggregate portion, defined as the material retained on the No. 4 (4.75 mm) sieve and larger, shall contain no more than 15 percent, by weight, of flat or elongated pieces as defined in ASTM D 693 and shall have at least 90 percent by weight of particles with at least two fractured faces and 100 percent with at least one fractured face. The area of each face shall be equal to at least 75 percent of the smallest midsectional area of the piece. When two fractured faces are contiguous, the angle between the planes of fractures shall be at least 30 to count as two fractured faces.

The percentage of wear shall not be greater than 45 percent when tested in accordance with ASTM C 131. The sodium sulfate soundness loss shall not exceed 12 percent, after 5 cycles, when tested in accordance with ASTM C 88.

The fraction passing the No. 40 (0.42 mm) sieve shall have a liquid limit no greater than 25 and a plasticity index of not more than 4 when tested in accordance with ASTM D 4318. The fine aggregate shall have a minimum sand equivalent value of 35 when tested in accordance with ASTM D 2419.

a. Sampling and Testing. Aggregates for preliminary testing shall be furnished by the Contractor prior to the start of production. All tests for initial aggregate submittals necessary to determine compliance with the specification requirements will be made by the Engineer at no expense to the Contractor.

Samples of aggregates shall be furnished by the Contractor at the start of production and at intervals during production. The sampling points and intervals will be designated by the Engineer. The samples will be the basis of approval of specific lots of aggregates from the standpoint of the quality requirements of this section.

In lieu of testing, the Engineer may accept certified state test results indicating that the aggregate meets specification requirements. Certified test results shall be less than 6 months old.

Samples of aggregates to check gradation shall be taken by the Engineer at least two per lot. The lot will be consistent with acceptable sampling for density. The samples shall be taken from the in-place, compacted material. Sampling shall be in accordance with ASTM D 75, and testing shall be in accordance with ASTM C 136 and ASTM C 117.

b. Gradation Requirements. The gradation (job mix) of the final mixture shall fall within the design range indicated in Table 11, when tested in accordance with ASTM C 117 and ASTM C 136. The final gradation shall be continuously well graded from coarse to fine and shall not vary from the low limit on one sieve to the high limit on an adjacent sieve or vice versa. Where environmental conditions (temperature and availability of free moisture) indicate potential damage due to frost action, the maximum percent of material by weight of particles smaller than 0.02 mm shall be 3 percent when tested in accordance with ASTM D 422.

When a lower percentage of material passing the No. 200 sieve is needed to control the percentage of particles smaller than 0.02 mm, a maximum limit of 5 percent is recommended. Engineer has the option to specify a finer (locally available) gradation as a leveling course. The material must have the same quality requirements as the P-209, including equivalent fractured faces, LA wear, well graded, and non-frost susceptible, etc.

### Table 1 Requirements For Gradation Of Aggregate

|  |  |  |
| --- | --- | --- |
| **Sieve Size** | **Design Range**  **Percentage by Weight** | **Job Mix Tolerances**  **Percent** |
| 2 in (50.0 mm) | 100 | 0 |
| 1-1/2 (37.0 mm) | 95-100 | +/- 5 |
| 1 in (25.0 mm) | 70-95 | +/- 8 |
| 3/4 in (19.0 mm) | 55-85 | +/- 8 |
| No. 4 (4.75 mm) | 30-60 | +/- 8 |
| No. 30 (0.60 mm) | 12-30 | +/- 5 |
| No. 200 (0.075 mm) | 0-8 | +/- 3 |

The job mix tolerances in Table 1 shall be applied to the job mix gradation to establish a job control grading band. The full tolerance still will apply if application of the tolerances results in a job control grading band outside the design range.

The fraction of the final mixture that passes the No. 200 (0.075 mm) sieve shall not exceed 60 percent of the fraction passing the No. 30 (0.60 mm) sieve.

## CONSTRUCTION METHODS

209-3.1 PREPARING UNDERLYING COURSE. The underlying course shall be checked and accepted by the Engineer before placing and spreading operations are started. Any ruts or soft yielding places caused by improper drainage conditions, hauling, or any other cause shall be corrected at the Contractor’s expense before the base course is placed thereon. Material shall not be placed on frozen subgrade.

209-3.2 MIXING. The aggregate shall be uniformly blended during crushing operations or mixed in a plant. The plant shall blend and mix the materials to meet the specifications and to secure the proper moisture content for compaction.

209-3.3 PLACING. The crushed aggregate base material shall be placed on the moistened subgrade in layers of uniform thickness with a mechanical spreader. The mechanical spreader shall be capable of distributing the aggregate without segregation.

The maximum depth of a compacted layer shall be 6 in (150 mm). If the total depth of the compacted material is more than 6 in (150 mm), it shall be constructed in two or more layers. In multi-layer construction, the base course shall be placed in approximately equal-depth layers.

The previously constructed layer should be cleaned of loose and foreign material prior to placing the next layer. The surface of the compacted material shall be kept moist until covered with the next layer.

209-3.4 COMPACTION. Immediately upon completion of the spreading operations, the crushed aggregate shall be thoroughly compacted. The number, type, and weight of rollers shall be sufficient to compact the material to the required density.

The moisture content of the material during placing operations shall not be below, nor more than 2 percentage points above, the optimum moisture content as determined by ASTM [ ].

209-3.5 ACCEPTANCE SAMPLING AND TESTING FOR DENSITY. Aggregate base course shall be accepted for density on a lot basis. A lot will consist of one day’s production where it is not expected to exceed 2400 sq yd (2000 sq m). A lot will consist of one-half day’s production where a day’s production is expected to consist of between 2400 and 4800 sq yd (2000 and 4000 sq m). All testing shall be done by a laboratory hired by the contractor. Testing results shall be furnished daily to the Engineer for acceptance determination.

Each lot shall be divided into two equal sublots. One test shall be made for each sublot. Sampling locations will be determined by the Engineer on a random basis in accordance with statistical procedures contained in ASTM D 3665.

Each lot will be accepted for density when the field density is at least 100 percent of the maximum density of laboratory specimens prepared from samples of the base course material delivered to the job site. The specimens shall be compacted and tested in accordance with ASTM [ ]. The in-place field density shall be determined in accordance with ASTM D 1556 or D 2167. If the specified density is not attained, the entire lot shall be reworked and/or recompacted and two additional random tests made. This procedure shall be followed until the specified density is reached.

The Engineer shall specify ASTM D 698 for areas designated for aircraft with gross weights of 60,000 pounds (27 200 kg) or less and ASTM D 1557 for areas designated for aircraft with gross weights greater than 60,000 pounds (27 200 kg).

In lieu of the core method of field density determination, acceptance testing may be accomplished using a nuclear gauge in accordance with ASTM D 6938 . The gauge should be field calibrated in accordance with Section 120 and ASTM standards. Calibration tests shall be conducted on the first lot of material placed that meets the density requirements.

When using the nuclear method ASTM D 6938 shall be used to determine the moisture content of the material. The calibration curve furnished with the nuclear gauges shall be checked in accordance with ASTM standards. The calibration checks shall be made at the beginning of a job and at regular intervals.

If a nuclear gage is used for density determination, two random tests shall be made and averaged to represent each sublot.

209-3.6 FINISHING. The surface of the aggregate base course shall be finished by blading or with automated equipment especially designed for this purpose.

In no case will the addition of thin layers of material be added to the top layer of base course to meet grade. If the elevation of the top layer is 1/2 in (12 mm) or more below grade, the top layer of base shall be scarified to a depth of at least 3 in (75 mm), new material added, and the layer shall be blended and recompacted to bring it to grade. If the finished surface is above plan grade, it shall be cut back to grade and rerolled. The grade shall be measured on a 25 foot grid and be within +0 /-1/2 inch. Testing results shall be furnished daily to the Engineer for acceptance determination.

209-3.7 SURFACE TOLERANCES. The finished surface shall not vary more than 3/8 in (9 mm) when tested with a 16 ft (4.8 m) straightedge applied parallel with or at right angles to the centerline. Any deviation in excess of this amount shall be corrected by the Contractor at the Contractor’s expense.

209-3.8 THICKNESS CONTROL.

Note: This paragraph can be rewritten to permit the thickness acceptance determined by survey before and after placement. The survey intervals should be selected based on the size of the project and specified.

The completed thickness of the base course shall be within 1/2 in (12 mm) of the design thickness. Four determinations of thickness shall be made for each lot of material placed. The lot size shall be consistent with that specified in paragraph 3.5. Each lot shall be divided into four equal sublots. One test shall be made for each sublot. Sampling locations will be determined by the Engineer on a random basis in accordance with procedures contained in ASTM D 3665. Where the thickness is deficient by more than 1/2 in (12 mm), the Contractor shall correct such areas at no additional cost by excavating to the required depth and replacing with new material. Additional test holes may be required to identify the limits of deficient areas.

209-3.9 MAINTENANCE. The base course shall be maintained in a condition that will meet all specification requirements until the work is accepted. Equipment used in the construction of an adjoining section may be routed over completed portions of the base course, provided no damage results and provided that the equipment is routed over the full width of the base course to avoid rutting or uneven compaction.

The Contractor shall remove all survey and grade hubs from the base courses prior to placing any bituminous surface course.

## METHOD OF MEASUREMENT

209-4.1 The quantity of crushed aggregate base course to be paid for will be determined by measurement of the number of [square yards (square meters)] [cubic yards (cubic meters)] of material actually constructed and accepted by the Engineer as complying with the plans and specifications. [On individual depth measurements, thicknesses more than 1/2 in (12 mm) in excess of the design thickness shall be considered as the specified thickness, plus 1/2 in (12 mm) in computing the number of cubic yards (cubic meters) for payment.]

## BASIS OF PAYMENT

209-5.1 Payment shall be made at the contract unit price per [square yard (square meter)] [cubic yard (cubic meter)] for crushed aggregate base course. This price shall be full compensation for furnishing all materials, for preparing and placing these materials, and for all labor, equipment tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-209-5.1 Crushed Aggregate Base Course-per [square yard (square meter] [cubic yard (cubic meter)]

## TESTING REQUIREMENTS

|  |  |
| --- | --- |
| ASTM C 29 | Unit Weight of Aggregate |
| ASTM C 88 | Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate |
| ASTM C 117 | Materials Finer than 75 μm (No. 200) Sieve in Mineral Aggregates by Washing |
| ASTM C 131 | Resistance to Degradation of Small-Size Coarse Aggregate by abrasion and impact in the Los Angeles Machine |
| ASTM C 136 | Sieve Analysis of Fine and Coarse Aggregates |
| ASTM D 75 | Sampling Aggregate |
| ASTM D 422 | Particle Size Analysis of Soils |
| ASTM D 693 | Crushed Aggregate for Macadam Pavements |
| ASTM D 698 | Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 5.5-lb (2.49-kg) Rammer and 12 in (305 mm) Drop |
| ASTM D 1556 | Density of Soil in Place by the Sand-Cone Method |
| ASTM D 1557 | Test for Laboratory Compaction Characteristics of Soil Using Modified Effort |
| ASTM D 2167 | Density and Unit Weight of Soil in Place by the Rubber Balloon Method |
| ASTM D 2419 | Sand Equivalent Value of Soils and Fine Aggregate |
| ASTM D 6938 | In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods |
| ASTM D 3665 | Random Sampling of Construction Materials |
| ASTM D 4318 | Liquid Limit, Plastic Limit, and Plasticity Index of Soils |

End of Item P-209

## REFERENCES

1. ASTM compacted and tested
2. ASTM optimum moisture content
3. ASTM C 29 unit weight
4. ASTM C 29 Unit Weight of Aggregate
5. ASTM C 88 sodium sulfate soundness loss
6. ASTM C 88 Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
7. ASTM C 117 testing
8. ASTM C 117 gradation requirements
9. ASTM C 117 Materials Finer than 75um (No. 200) Sieve in Mineral Aggregates by Washing
10. ASTM C 131 percentage of wear
11. ASTM C 131 Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and impact in the Los Angeles Machine
12. ASTM C 136 testing
13. ASTM C 136 gradation requirements
14. ASTM C 136 Sieve Analysis of Fine and Coarse Aggregate
15. ASTM D 75 sampling
16. ASTM D 75 Sampling Aggregate
17. ASTM D 693 flat or elongated pieces
18. ASTM D 693 Crushed Aggregate for Macadam Pavements
19. ASTM D 698 aircraft gross weights of 60,000 pounds or less
20. ASTM D 698 Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 5.5 lb (2.49 kg) Rammer and 12 in (305 mm) Drop
21. ASTM D 1556 in-place field density
22. ASTM D 1556 Density of Soil in Place by the Sand-Cone Method
23. ASTM D 1557 aircraft with gross weights greater than 60,000 pounds
24. ASTM D 1557 Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb (4.5 kg) Rammer and 18 in (457 mm) Drop
25. ASTM D 2167 in-place field density
26. ASTM D 2167 Density and Unit Weight of Soil in Place by the Rubber Balloon Method
27. . ASTM D 2419 sand equivalent
28. ASTM D 2419 Sand Equivalent Value of Soils and Fine Aggregate
29. ASTM D 2922 nuclear gage
30. ASTM D 2922 gage field calibration
31. ASTM D 2922 wet unit weight
32. ASTM D 2922 Density of Soil and Soil-Aggregate in Place by Nuclear Methods
33. ASTM D 3017 moisture content of the material
34. ASTM D 3017 calibration curve checked
35. ASTM D 3017 Water Content of Soil and Rock in Place by Nuclear Methods
36. ASTM D 3665 sampling locations random basis
37. ASTM D 3665 Random Sampling of Construction Materials
38. ASTM D 4318 liquid limit and plasticity index
39. ASTM D 4318 Liquid Limit, Plastic Limit and Plasticity Index of Soils
40. FAA Item P-209 Crushed Aggregate Base Course

End of Item