Section 430—Portland Cement Concrete Pavement

430.1 General Description
General Provisions 101 through 150.

430.1.01 Definition
General Provisions 101 through 150.

430.1.02 Related References
A. Standard Specifications
   Section 430—Portland Cement Concrete Pavement
   Section 500—Concrete Structures
   Section 511—Reinforcement Steel

B. Referenced Documents
   AASHTO-22
   Form 319
   Form 640
   GDT 4
   GDT 26
   GDT 27
   GDT 32
   GDT 35
   GDT 63
   GDT 73
   GSP 2
   QPL 3

430.1.03 Submittals
A. Design Study
   The Contractor must have a mix tested by a qualified testing laboratory. Submit the mix data and resulting strengths to the Office of Materials and Research at least 35 days before paving operations start. The Office of Materials and Research may at their discretion require the Contractor to submit a sufficient quantity of materials for a design study. The Contractor must submit the materials before any deliveries have been made to the batching site. Approval of each proposed combination of materials shall be based on the use of approved materials. Arrangements for submission of samples must be discussed with the Contractor at the earliest possible date to prevent unnecessary delays.

430.2 Materials
A. Portland Cement
   1. Approved Source
      Testing Management Personnel will take acceptance samples at a frequency of 1 per 2,000 tons (2000 Mg) per source. The cement must be from a Department of Transportation approved source as designated on QPL 3 prepared
Section 430—Portland Cement Concrete Pavement

by the Office of Materials and Research. The Engineer will check the delivery ticket on bags to verify that cement is from an approved source. If the Engineer suspects non-uniform or non-specification materials, the Engineer may submit samples to the Office of Materials and Research for tests. The Engineer may choose not to use the materials until it has been determined whether the materials meet the specification requirements for the type specified.

2. Unapproved Source

If the cement is from an unapproved source, the Engineer must notify the Concrete Branch of the Office of Materials and Research before using the cement.

3. Report

Information on Form 319 shall include the cement type, the producer, and the location of the mill.

B. Fly-Ash and Slag

1. Testing Management personnel will take acceptance samples shall be taken at a frequency of 1 per 2,000 tons (2000 Mg). The fly ash or slag shall be from a Department of Transportation approved source as designated on QPL 30 prepared by the Office of Materials and Research.

The Engineer will check the delivery tickets on bags to verify that the fly ash or slag is from an approved source. If the Engineer, for any reason, suspects nonuniform or nonspecifications materials, he or she may submit samples to the Office of Materials and Research for tests. The Engineer may choose not to use the materials until it has been determined whether the materials meet the specification requirements for the type specified.

2. Unapproved Source

If the fly ash or slag is from an unapproved source, the Engineer must notify the Concrete Branch of the Office of Materials and Research before use of the material.

C. Aggregate

1. Project-Mixed Concrete

a. Testing Management personnel must perform Stockpile Control Testing. Each day aggregate is delivered to the Project, one gradation test will be conducted for each 1,500 tons (1500 Mg) of each size aggregate, except when aggregates are delivered from an approved source. This aggregate shall be sampled at a frequency of 1 per 2,000 tons (2000 Mg) for either coarse or fine aggregate.

Coarse Aggregate will be sampled according to the procedures outlined in GSP 2. Gradation tests will be conducted according to applicable methods in GDT 2. Tests will also be conducted according to GDT 2, “Method of Test for Material Finer than the No. 200 (75 µm) Sieve in Aggregate,” when the amount of material passing the least specified screen or the presence of fine material coating the aggregate pieces indicate the presence of excessive minus No. 200 (75 µm) material.

Report the results on Form 640.

Fine aggregate will be sampled according to the procedures outlined in GSP 2. Gradation tests will also be conducted according to applicable methods in GDT 2 and GDT 63. When the amount of material passing the least sieve indicates the presence of excessive minus No. 200 (75 µm) material, report the test results on Form 640.

b. Batch Control Testing: During paving operations, 1 control sample per 4,000 tons (4000 Mg) for each size aggregate from each source used shall be tested by Testing Management according to the applicable method specified in C.1.a above. The sampling frequency may be changed if stockpile conditions indicate the need for revision.

2. Ready-Mix Concrete

Acceptance sampling and testing are not required for aggregate used in concrete secured from approved ready-mixed concrete plants. Aggregates used in concrete from these sources are tested under provisions outlined in Section 500 of the Sampling, Testing, and Inspection information.
D. Water

Testing Management personnel will submit a 1 qt (1 L) sample of water from each proposed source to the Office of Materials and Research before its use in concrete.

If the water proposed for use is from a source which is suitable for drinking and ordinary household purposes, it may be used without further testing and Form 319 shall serve as the acceptance document.

E. Admixtures

The Office of Materials and Research maintains QPL 13 and QPL 14 for admixtures. Products that appear on this list may be used without sampling or pre-testing provided the Engineer determines the product is uncontaminated or undamaged or provided the product is identified as the material on the governing list. No report is necessary but documentations should be made in the Project Diary or as required by the Construction Manual.

F. Curing Agents

1. Liquid Membrane Type

The Office of Materials and Research maintains a QPL 16 for liquid membrane curing agents. Products that appear on the QPL may be used without sampling or pre-testing provided the Engineer determines the product is uncontaminated or undamaged and provided the product is identified as the material on the governing list. No report is necessary but documentation should be made in the Project Diary or as required by the Construction Manual.

If a curing agent is received that is not on the QPL, a 1 qt (1 L) control sample representing each 500 gal (2000 L) from each source shall be submitted to the Office of Materials and Research for testing before use.

2. Papers, Mats, Fabric Blanket Type

Normally, papers, mats and fabric blanket will be pre-tested and no further testing is necessary. However, if the Engineer suspects non-uniform or non-specification material, he or she may submit samples to the Office of Materials and Research for testing before use of the material is allowed. No report is necessary but documentation should be made in the Project Diary or as required by the Construction Manual.

If the papers, mats, fabric blankets are not pre-tested, a 1 yd² (1 m²) control sample of each type from each shipment shall be submitted to the Office of Materials and Research by the Engineer.

G. Joint Fillers

See Section 461 of the Sampling, Testing, and Inspection information.

H. Dowel Bars and Tie Bars

If dowel bars and tie bars are not pre-tested, a control sample consisting of two bars shall be taken from each shipment and submitted to the Office of Materials and Research by the Engineer.

If the dowel bars and tie bars are pre-tested, no further sampling will be required.

The Office of Materials and Research will distribute test reports based on the pre-inspection and test. The Engineer will not report the dowel bars and tie bars. If, however, the Engineer has not received a test report within 10 calendar days from the receipt of the dowel bars and tie bars, the Office of Materials and Research must be contacted immediately.

I. Steel Reinforcement

Reinforcing Steel shall be according to Section 511 of the Sampling, Testing, and Inspection information.

430.2.01 Delivery, Storage, and Handling

General Provisions 101 through 150.
430.3 Construction Requirements

430.3.01 Personnel
General Provisions 101 through 150.

430.3.02 Equipment
General Provisions 101 through 150.

430.3.03 Preparation
General Provisions 101 through 150.

430.3.04 Fabrication
General Provisions 101 through 150.

430.3.05 Construction
General Provisions 101 through 150.

430.3.06 Quality Acceptance

A. Acceptance of Fresh Concrete

Acceptance of individual loads or batches of fresh concrete may be based on the results of slump and air content tests conducted by the Engineer. Daily slump and air content tests must be performed by the Engineer to ensure that all variations of concrete consistency are within the Specification limits. The slump test must be conducted according to GDT 27 and air content tested according to the apparent alternate of GDT 26 or GDT 32. Samples taken for control of the slump and air content of the concrete will be taken from concrete delivered to the roadway. The samples shall be taken before the concrete is subjected to vibration and shall be of sufficient size to conduct the necessary tests.

B. Design Proportions Control

The Office of Materials and Research will establish or approve the concrete design proportions before the placement of concrete. The continued acceptability of the proportions will be determined by the results of compressive tests conducted on specimens manufactured from concrete delivered to the project. Any changes in the design proportions must be approved by the Office of Materials and Research.

C. Opening the Slab to Traffic

Opening the slab to traffic is to be based on compressive tests. The Contractor shall fabricate a minimum of 2 cylinders to represent each 5,333 yd² (4400 m²) or fraction thereof for each day’s production. These cylinders will be tested by the Engineer to determine when each section may be put into service. These specimens shall be obtained, molded, and cured according to the applicable provision of GDT 35.

D. Acceptance of Concrete Strength

Use a lot acceptance sampling plan to determine the acceptability of paving concrete with regard to strength. The lot boundaries will be predetermined and will consist of approximately 5,333 yd² (4400 m²) of pavement. Ramps, acceleration and deceleration lanes, and connecting wedges may be set up as separate lots provided the total quantity of paving is 7,500 yd² (6300 m²) or less.

Three production units (samples) will be randomly selected from each lot and a sufficient quantity of fresh concrete will be taken to perform the following tests:

1. Slump, GDT 27
2. Percent of entrained air, GDT 26 or GDT 32 as applicable to aggregate types
3. Compressive strength
A minimum of two sets of cylinders shall be cast for each production unit. One set shall be placed immediately in a water tank at (95 °F, ± 5 °) 35 °C, ± 3 °. They shall be removed at 23-1/2 hours ± 1/2 hour, and tested at 24 hours ± 15 minutes. The other sets will be according to GDT 35. A set consists of two 6 x 12 in (150 x 300 mm) cylinders. At the completion of the specified curing, each concrete cylinder will be tested according to AASHTO T 22. The test result will be the average strength of the two cylinders.

The measurements of air and slump specified above will be in addition to the tests required for adequate control of air content and consistency. Additional tests of air and slump will be made throughout placement to assure that uniform concrete is being produced.

E. Selection of Sample Location

The following method of selecting sample locations provides for sampling concrete at pre-selected station numbers at the roadway. The Office of Materials and Research may approve other selection procedures provided unbiased sampling is ensured. The adopted procedure must be maintained uniformly for the duration of the project unless the Office of Materials and Research authorizes changes.

1. Sampling Plan for Concrete at the Roadway
   a. Introduction: Concrete will be sampled on the roadway at pre-selected station numbers according to this procedure.
   b. Establishment of Lot Boundaries: Before selecting the station numbers for concrete to be sampled, the lot boundaries shall be established.
      If a pre-selected station number is outside the established lot boundaries, another station number will be chosen at random to ensure that all samples are taken within the lot boundaries.
      NOTE: Never change lot boundaries arbitrarily once such boundaries are established.
   c. Selecting of Station Number to be Sampled: A minimum of three production units within each lot will be selected as follows:
      1) Calculate the length of the lot in feet (meters) using the specified lot size of 7000 yd² (5850 m²) and the width of the shoulder.
         Example: 10-ft shoulder:
         Length of lot = 7000 x 9 ÷ 10 = 6300 ft
         Example: 3-m shoulder:
         Length of lot = 5850 ÷ 3 = 1950 m
      2) Using an unbiased technique, select one of the blocks in the Table of Random Numbers in GDT 73; then select a row. The first 3 successive numbers in the randomly selected row are used to calculate specific station numbers for sampling. For example, block 10, column 2, is chosen.
         Multiply 3 digits in the chosen row by the length of lot. Round off numbers to the nearest whole number.
         English:
         .993 x 6300 = 6256
         .919 x 6300 = 5790
         .501 x 6300 = 3156
         Metric:
         .993 x 1950 = 1936
         .919 x 1950 = 1792
         .501 x 1950 = 977
      3) Determine the station numbers for sampling by adding the random calculated lengths to the beginning station number of the production run for the lot. For example, beginning station number is 0+00 (0+000).
English:
0+00 + 6256 = 62+56
0+00 + 5790 = 57+90
0+00 + 3156 = 31+56

Metric:
0+000 + 1936 = 1+936
0+000 + 1792 = 1+792
0+000 + 977 = 0+977

Thus station numbers 62+56, 57+90, and 31+56 (1+936, 1+792, and 0+977) are selected to represent the 3 production units.

4) Procedure for Sampling a Pre-selected Station Number:
   a. When concrete for a pre-selected station number is delivered to the roadway, a sample will be taken at this point for acceptance testing.
   b. Tests will be conducted on the sample as required in Section D above.

F. Thickness

Thickness shall be determined at an interval of at least 1 per 1,000 ft (300 m) per 2 lanes or as per governing specifications.

G. Reporting of Results

Lots will be numbered in sequence. A tabulation of results will be maintained which shows at least the following for each lot:

- Lot number and description of lot
- Date sampled
- Station number where sample was taken
- Tabulation of individual test locations and corresponding values for air, slump, and strength
- Calculated lot average strength as specified in Section 430 of the Specifications

430.3.07 Contractor Warranty and Acceptance

General Provisions 101 through 150.

430.4 Measurement

General Provisions 101 through 150.

430.4.01 Limits

General Provisions 101 through 150.

430.5 Payment

General Provisions 101 through 150.

430.5.01 Adjustments

General Provisions 101 through 150.