METHODS OF SAMPLING AND TESTING
MT 103-07
METHOD FOR MEASURING THE THICKNESS OF IN-PLACE CONCRETE
BY USE OF CONCRETE THICKNESS GAUGE
(Montana Method)

1 Scope:

1.1 This method covers the procedure for measuring the thickness of concrete pavements. Thickness is determined by using a concrete thickness gauge to measure the time required for an echo to bounce off the backside of the concrete member being tested. The thickness is a product of the velocity of sound in the material and one half the transit time (round trip) through the material.

2 Referenced Documents:

2.1 Materials Manual:
MT 106 Measuring Length of Drilled Concrete Cores
MT 606 Selecting Sampling Locations by Random Sampling Technique

3 Apparatus:

3.1 Standard Surveying Equipment – EDM, mirrors, level, rod, etc.
3.2 Concrete Thickness Gauge
3.3 Core Drill – for obtaining cylindrical core specimens
3.4 Measuring Tape

4 Vertical Control:

4.1 When possible, it is recommended that at least one vertical control point be established for each day's placement of concrete, using survey methods prior to placement. After the concrete has hardened sufficiently, re-measure the same control point to determine the depth of the finished concrete. Use this point as a calibration point for the concrete thickness gauge. (Pre-established reference points and grade control points may also be used to determine concrete thickness).

5 Gauge Calibration Methods:

5.1 Gauge Calibration:

Place the concrete thickness gauge on the concrete, at the pre-established vertical control point, and calibrate according to the manufacturers instructions. The gauge will now establish the velocity for the particular concrete being tested.

5.2 Direct Input Method:

Following the manufacturer's instructions, a direct input method may be used to calibrate the concrete thickness gauge. For the purpose of this method, a core will be taken to determine the actual thickness of the placed concrete. The concrete thickness gauge will then be calibrated using the core thickness.

6 Procedure:

6.1 Calibrate the gauge according to one of the procedures described above. The gauge must be calibrated on the concrete to be tested or the correct velocity entered into the gauge. The calibration should be done on a smooth, clean surface to obtain the best data possible. (See Note 1) This data will be used for all subsequent tests and all tests must be completed on the
same day as the gauge calibration.

6.2 Randomly select test locations (see Note 1) according to MT 416, Random Sampling Technique or as directed by the Engineering Project manager.

6.3 At the test location, take four measurements by rotating the gauge around a center point and at 90 degrees from the previous reading and average the results. (See Note 1)

Note 1: Make certain that the test head of the concrete thickness gauge is in good contact with the concrete surface, should be done on a smooth clean surface to obtain the best data possible.

7 Calculation:

7.1 Record gauge readings to the hundredth of a foot or (mm) on lab form

7.2 Record the average of the four (4) readings from each test location to a hundredth of a foot or (mm).

7.3 Determine and record the concrete thickness variation by subtracting the average of the four readings from the design thickness and record to the nearest hundredth of a foot (mm).

8 Report:

8.1 Project Number
Project Name
Name of tester
Title
Address
Date Measurements made
Test Location/Station
Test results
Montana Department of Transportation  
Materials Division  

REPORT ON DEPTH OF PCCP CONCRETE

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<th>Lab No.</th>
<th>Project No.</th>
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### Depth measurement at four points

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<th>Sta. Cal or Tested</th>
<th>Avg. Depth</th>
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Remarks:

- Design thickness of PCCP: ________ (in / mm)
- Avg. variation from design: ________ (in / mm)

**Distr.**  
1-Materials Bureau  
1-Constr Bureau  
1-Pavement Analysis Sec.  
1-EPM,  
1-Dist/Area Lab