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CHAPTER EIGHT: MISCELLANEOUS PAVEMENT DETAILS AND REQUIREMENTS

In this chapter the following items are discussed:

- 1) Ear construction which prevents the tips of concrete tapers from breaking up
 - 2) Pavement smoothness and thickness tolerances and how they effect payment to the Contractor
 - 3) Protection of pavement
 - 4) Opening to traffic
 - 5) Removal and replacement of deficient pavement
 - 6) Methods of measurement for final payment
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EAR CONSTRUCTION

Ear construction (Standard Drawings **E605-ERCN-01** and **E605-ERCN-01**) is required wherever concrete pavement tapers to a point. This procedure may occur on ramps, recovery lanes, driveways, aprons, and other places. If the concrete was allowed to taper to a point, the concrete would shear off under the weight of traffic. The minimum width at the point with proper ear construction is 1 ft. Reinforcing steel is placed in the ear for additional strength and is paid for by the pound.

A concrete ear is separated from the ramp or apron by an expansion joint made of 1 in. preformed joint filler. A longitudinal construction joint ties the concrete ear to the adjacent pavement with tie bars. This causes the concrete ear to move with the adjacent pavement and independent of the ramp or apron.

PAVEMENT SMOOTHNESS

As soon as the concrete has cured enough to permit testing, the profile of the pavement is required to be checked for smoothness. INDOT may require that the pavement be tested within 24 h following the placement of the concrete. This requirement is continued until the paving operation is consistently providing pavement meeting the smoothness requirements without corrective action. All remaining pavement is to be checked for smoothness before opening to traffic or before work is suspended for the winter.

Smoothness is checked by one of three methods:

- 1) A profilograph (Figure 8-1), or an approved equivalent, is used on all mainline QC/QA full-width pavements over 250 ft or longer and having a design speed of greater than 45 mph, unless otherwise specified.



Figure 8-1. Profilograph

- 2) A 16 ft straightedge is used within 50 ft of a bridge end, within 50 ft of an existing pavement which is being joined, on full-width pavement under 250 ft long, ramps, and on full-width pavement having a design speed of 45 mph or less.

- 3) A 10 ft straightedge is used on transverse slopes, approaches, crossovers, and other miscellaneous areas.

Profile smoothness is checked 3 ft from, and parallel to, the outside edge of each lane up to 12 ft wide. Lanes wider than 12 feet are checked 3 ft from both edges. Any curing compound removed during straightedging should be replaced immediately.

When correction is needed, a groove type cutter is used to grind the pavement to the proper smoothness while maintaining the required skid resistance.

The required surface tolerances for non-QC/QA pavements are:

- 1) 16 ft straightedge – 1/4 in. or less
- 2) 10 ft straightedge – 1/8 in. or less

The required surface tolerances for QC/QA pavements are:

- 1) Profilograph (over 45 mph) – 1.2 in./0.1 mile profile index or less
- 2) 16 ft straightedge – 1/4 in. or less
- 3) 10 ft straightedge – 1/8 in. or less

In addition to the requirements for the profile index for the profilograph, any area having a high point deviation in excess of 0.3 in. is required to be removed. Verifying profilograph measurements are taken only in the 0.1 mile lengths where grinding has been conducted to reduce the profile index.

PROTECTION OF PAVEMENT

Until final acceptance of the new pavement, the Contractor is responsible for protecting the pavement against damage caused by any type of traffic, equipment, etc. This protection may require barricades, watchmen, lights, crossovers, or a number of other measures. All damage to pavement prior to final acceptance is required to be repaired or the pavement is replaced.

OPENING PAVEMENT TO TRAFFIC

CONSTRUCTION VEHICLES

Construction vehicles or equipment, having a gross weight exceeding 3t, is not permitted on the new pavement for 10 days after the pavement is placed or until the test beams indicated a modulus of rupture of at least 550 psi. Joint cutting saws are permitted on the new pavement.

The PE/PS should be notified immediately if a situation arises which may cause damage to the pavement.

NON-CONSTRUCTION VEHICLES

Pavement may be opened to traffic after 14 days or when test beams indicate a modulus of rupture of at least 550 psi. One set of beams are required to be made per one mile stretch of two lane pavement, with a minimum of one set per day.

If fly ash is used as an additive, or if type IP or IP-A cement is used, only the strength requirement applies to when the pavement may be opened to traffic. The 14-day rule for opening to traffic does not apply. For this reason at least two sets of beams are required to be made when fly ash is used.

The concrete pavement may also be opened to traffic based on results obtained from the Maturity Method (**ITM 402**). The Maturity Method is used to determine the in-place flexural strength of the concrete. The hydration of cement and gain in strength of concrete are dependent on both the curing time and temperature. Thus, the strength of concrete may be expressed as a function of time and temperature. This information is used to determine the strength of concrete without conducting destructive tests. In general the method is a three step process consisting of:

- 1) Laboratory procedure (**ITM 402 (7.0)**)
- 2) Field procedure (**ITM 402 (8.0)**)
- 3) Validation procedure (**ITM 402 (9.0)**)

PAVEMENT THICKNESS

Concrete pavement is required to be constructed to the exact thickness specified. Before final acceptance, the thickness as constructed, is determined from the measurement of cores drilled from the pavement.

CORING

Pavement thickness locations are determined by obtaining cores after corrective grinding (Figure 8-2). The Contractor obtains these cores at the locations determined by the Engineer. Cores are taken for the full depth of the pavement thickness and are required to be 4 in. in diameter. The coring operation is witnessed by the Engineer who identifies, marks, and takes immediate custody of the cores. Cores are not taken within 2 ft

of the edge of pavement, over dowels, or within 5 ft of a transverse construction joint.

For non-QC/QA concrete, each pay item is defined as a section and each section is divided into subsections of 1200 yd². At least one core is obtained at a random location determined in accordance with **ITM 802** in each subsection. Sections equal to or greater than 1200 yd² are required to have a minimum of four cores. Sections less than 1200 yd² are not required to be cored.



Figure 8-2. Concrete Coring

CORE MEASUREMENTS

Cores are measured in a laboratory in a device that takes a precise measurement of length at 10 locations on the core. The average of these measurements is considered the length of the core.

DEFICIENT PAVEMENT THICKNESS

If a core measurement reveals that the pavement is more than 0.5 in. deficient in thickness, additional cores are obtained at 20 ft intervals on each side of the original core. These additional cores are obtained on a line which passes through the original core and parallel to the centerline of the pavement. The drilling continues in both directions at 20 ft intervals until two successive cores indicate a thickness deficiency of 0.5 in. or less, or where cores may no longer be obtained in the new PCCP.

If a core indicates a thickness deficiency of more than 1.0 in. and two cores drilled adjacent at 20 foot intervals indicate a thickness deficiency of not more than 1.0 inch, additional cores are obtained at 5 ft intervals on each side of the initial core. The drilling continues in both directions at 20 ft intervals until two successive cores indicate a thickness deficiency of 0.5 in. or less, or where cores may no longer be drilled in the new PCCP.

When a single core indicates a thickness deficiency of more than 1.0 in., or if two or more adjacent cores indicate a thickness deficiency of more than 0.5 in., the investigation is expanded to include adjoining PCCP. Additional cores are taken from the adjoining traffic lanes or shoulders at the same station at which the first core or cores indicated the deficiency, whether the lane was paved at the same time or not.

The thickness of the PCCP for each section is the average lengths of all cores from the section; however, no cores are included from areas for which no payment is made. Where PCCP has been removed and replaced, the initial core lengths are discarded and the core lengths of the replaced PCCP are substituted. Any core measurement exceeding the specified PCCP thickness by more than 0.5 in. is recorded as the specified PCCP thickness plus 0.5 in. Measurements are made to the nearest 0.1 in.

PCCP ADJUSTED PAYMENT

If the average PCCP thickness for non-QC/QA concrete is equal to or greater than the specified thickness, no adjustments are made. If an average PCCP thickness is less than the specified thickness by up to 0.5 in., payment for that section is adjusted in accordance with the following.

$$Q_T = Q \times U \times (1 - M^2 / S^2)$$

where:

- Q_T = Quality assurance assessment for thickness
- Q = The placed quantity of the PCCP section
- M = The average PCCP thickness of the section
- S = The specified PCCP thickness of the section
- U = Unit bid price

PCCP NON-PAYMENT

Where two adjacent cores indicate a thickness deficiency of more than 0.5 in., no payment is made unless the PCCP is removed and replaced. Payment for PCCP with non-adjacent cores indicating a thickness deficiency of more than 0.5 in. is required to be in accordance with Section **502.21(e)**.

The limits of non-payment are extended from the deficient core to the transverse joint location nearest the first additional core indicating a thickness deficiency of less than 0.5 in.

PCCP REMOVAL

Where two adjacent cores indicate a thickness deficiency of more than 1.0 in., the PCCP is removed and replaced. Non-adjacent cores indicating a thickness deficiency of more than 1.0 in. do not require removal and replacement.

The limits of removal and replacement extend from the deficient core to the transverse joint location nearest the first additional core indicating a thickness deficiency of less than 0.5 in.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Concrete pavement is measured and paid for in square yards. The width is taken from the typical cross section on the plans and the length is measured along the center line of each lane or ramp. Bridges or similar structures which place gaps in the pavement are not measured. Payment for PCCP includes all materials not otherwise indicated in the contract as a pay item.

The weight of the reinforcing steel (except mesh, tie-bars, and dowel bars) is the theoretical weight of the steel in pounds. Retrofitted tie bars are paid separately for each bar.

Contraction, expansion, and terminal joints are measured and paid for by the linear foot. The cost of dowels, dowel bar assemblies, backer rod, joint sealants, and all necessary incidentals are included in the cost of the D-1 contraction joints. Anchor bolts, including expansion sleeves, are measured and paid for by the number of units installed.

The cost of the sleeper slab, reinforcing steel, bond breaker, and HMA mixtures are included in the cost of the terminal joint.