**NOTICE**

This Standard Special Provision (SSP) revises or modifies CDOT’s Standard Specifications for Road and Bridge Construction. These are the official instructions for its use on CDOT construction projects, and the Construction Engineering Services Branch has reviewed, approved, and issued it. Use as written without change. Do not use modified versions of this SSP on CDOT construction projects. Do not use this special provision on CDOT projects in a manner other than specified in the instructions without approval by CDOT’s Standards and Specifications Unit. The instructions for use appear below.

Other agencies using the Standard Specifications for Road and Bridge Construction to administer construction projects may use this special provision appropriately and at their own risk.

**Instructions for use on CDOT construction projects:**

Use this standard special provision on most projects with concrete pavement.  On certain projects, the use of MPI should be excluded due to shallow metallic utility lines and multiple boxes, for example, in urban areas.

**Revise Sections 106 and 412 of the Standard Specifications as follows:**

**Add the following to Subsection 106.06(a)6.:**

D. The Contractor shall supply an MIT Scan T2 or MIT Scan T3 and the associated tests plates when pavement thick acceptance is based on magnetic pulse induction (MPI).

**Delete Subsection 106.06 (b) and replace with the following:**

*(b)Acceptance Testing.* Acceptance testing frequencies shall be per the Schedule (Owner Acceptance) in the Department’s Field Materials Manual. Except for flexural strength, acceptance tests will be conducted by and at the expense of the Department. Acceptance sampling and testing procedures will be per the Department’s Field Materials Manual with the following exceptions and inclusions:

A split sample from an acceptance test shall not be used for a process control test. The Engineer will designate the location where samples are to be taken. Samples shall be taken by the Contractor per CP 61. The Engineer will be present during the sampling and take possession of all acceptance samples. Samples transported in different containers will be combined and mixed before molding specimens. All materials are subject to inspection and testing at all times.

Pavement thickness acceptance will be determined by cores or magnetic pulse induction (MPI).

Acceptance tests for thickness using MPI shall be the Contractor’s process control tests. MPI testing shall be per AASHTO T359

When compressive strength testing is specified, the Engineer will distribute electronically to the concrete supplier all compressive-strength Owner Acceptance (OA) data for the concrete supplied to the project. The Engineer will distribute the OA compressive strength data within two business days of the 7-day and 28-day compressive strength testing. The data will include the compressive strength and batch ticket number at a minimum. The Contractor shall not have a valid dispute or claim as a result of any action or inaction by the Department related to the distribution of test results.

The compressive strength test for acceptance will be the average compressive strength of three test cylinders cast in plastic molds from a single sample of concrete and cured under standard laboratory conditions before testing. If the compressive strength of any one specimen differs from the average by more than 10 percent, that specimen will be deleted, and the average strength will be determined using the remaining two specimens. If the compressive strength of more than one specimen differs from the average by more than 10 percent, the average strength will be determined using all three specimens. Each set of three cylinders will be tested at 28 days after molding.

Acceptance tests for flexural strength shall be the Contractor’s process control tests. The flexural strength tests shall be the average flexural strength of four test beams. The test beams shall be prepared according to AASHTO T23. The flexural strength of each specimen shall be measured according to AASHTO T97 with the following additional requirements: If the flexural strength of only one specimen differs from the average by more than 10 percent, that specimen shall be deleted, and the average strength shall be determined using the remaining three specimens. If the flexural strength of more than one specimen differs from the average by more than 10 percent, the test value shall be the average of all four specimens. Each set of four beams shall be tested at 28 days after molding. If the nominal maximum aggregate size of the mix is 3/4 inches or less, then the Contractor shall prepare three additional test beams using the 4x4x14 inch molds. The 4x4x14 inch specimens will be tested 28 days. The results of the 4x4x14 inch specimens will be for information only and will not be used to determine the acceptability of the concrete. Results of the 4x4x14 inch specimens will be reported to the Engineer with the corresponding acceptance test results. These additional specimens are being used to evaluate the validity of using smaller test specimens for acceptance.

**Delete Subsection 412.21 and replace with the following:**

412.21 **Determining Pavement Thickness**. Pavement thickness will be determined by cores or magnetic pulse induction (MPI). The Contractor shall select the pavement thickness determinization method at the pre-paving conference.

1. Pavement thickness using cores. The Contractor shall perform the process control (PC) testing for pavement thickness. A process control testing plan shall be submitted and must be approved before the start of paving. This PC testing plan shall include determining the thickness of freshly finished concrete pavement at a minimum frequency of one measurement per 1,250 linear feet of each traffic lane. All shoulders 8 feet or greater in width shall be tested as a separate traffic lane. Shoulders less than 8 feet wide shall be included in the adjacent lane. Areas such as sections of mainline pavement that are less than 1,250 linear feet long, intersections, entrances, crossovers, ramps, etc., shall be grouped into units of 1,000 square feet or remaining fraction. A minimum of one random measurement shall be taken in each unit.

The Engineer may inspect the Contractor’s PC tests at any time during the paving operations. Approval and inspection of the Contractor’s PC plan and operations does not constitute acceptance of the pavement thickness and does not relieve the Contractor of the responsibility for providing the required hardened pavement cores for project acceptance testing. The Contractor shall provide daily written reports to the Engineer listing the daily results of the PC thickness measurements.

Project acceptance (PA) testing will be the responsibility of the Engineer. PA testing consists of determining pavement thickness by measuring the length of cores taken by the Contractor from the hardened pavement as outlined below. Acceptance of the pavement thickness and price adjustment for deficient thickness will be based on project acceptance tests.

The Engineer will designate the time and location of the coring and will be present during the coring operation. The Contractor shall obtain 4-inch or 6-inch nominal diameter cores from the hardened pavement that are suitable for measuring per AASHTO T-148. When the cores are removed from the pavement, the Engineer will take possession and determine their length per AASHTO T-148.

The lower tolerance limit (TL) for pavement thickness shall be Plan Thickness (PT) minus 0.4 inches. This TL shall be used in the formulas in Section 105 for Incentive and Disincentive Payments (I/DP), Quality Levels (QL) and Pay Factor (PF) determinations. Any pavement thickness test value that exceeds the PT by more than 1.0 inch shall be assigned a value of PT +1.0 inch for the purpose of calculating the QL, PF and I/DP.

Core locations shall be determined by a random procedure so that each area has a randomly selected coring location. One core will be taken at each location.

Where the new PCCP overlays an existing roadway, cores for measuring pavement thickness shall be determined by a stratified random procedure in the longitudinal direction and by the point of minimum required thickness in the lateral direction as shown in the plans. If existing field conditions show a condition where the point of minimum thickness in the lateral direction as shown in the plans is not appropriate, the Contractor shall identify the location and extent of the area to the Engineer at least 24 hours before paving. The Engineer may exclude this area from pavement thickness measurements for incentive and disincentive payments.

Pavement thickness tests will be evaluated per subsection 105.06. Additional cores will be taken at the direction of the Engineer as follows:

1. One additional core at the location of each PC or PA test that is less than PT minus 1.0 inch.
	1. If the length of the additional core is greater than PT minus 1.0 inch, no additional actions will be taken and the PA test core will be used to compute I/DP for the process that includes this material.
	2. If the length of the additional core is less than PT minus 1.0 inch, the area represented by this core shall become a separate process and this core will not be used to compute an I/DP. Exploratory cores shall be taken at intervals of 15 feet or less, parallel to the centerline in each direction from the affected location until two consecutive cores are found in each direction which are not less than PT minus 1.0 inch. Four additional randomly selected cores will be taken within the area represented by these cores. The four additional cores will be used to compute an I/DP per Section 105. Cores taken at locations not randomly determined, such as process control cores will not be used to compute I/DP.

. Pavement areas found to be less than PT minus 1.0 inch shall be removed and replaced at the Contractor’s expense.

When the removal and replacement have been completed, four additional randomly selected cores will be taken within the area represented by this core. The four additional cores will be used to compute an I/DP per subsection 105.06. Exploratory cores will not be used to compute I/DP.

The Contractor shall repair all core holes by filling them with an approved non-shrink high-strength grout.

1. Pavement thickness using MPI. The Contractor shall perform the process control (PC) testing for pavement thickness using MPI. A process control testing plan shall be submitted and must be approved before the start of paving. This PC testing plan shall include determining the thickness of hardened concrete pavement at a minimum frequency of one measurement per 1,250 linear feet of each traffic lane. All shoulders 8 feet or greater in width shall be tested as a separate traffic lane. Shoulders less than 8 feet wide shall be included in the adjacent lane. Areas such as sections of mainline pavement that are less than 1,250 linear feet long, intersections, entrances, crossovers, ramps, etc., shall be grouped into units of 1,000 square feet or remaining fraction thereof. A minimum of one random measurement shall be taken in each unit.

The Contractor’s PC test results using MPI for pavement thickness will be used for Project Acceptance (PA) and used to calculate I/DP. PC testing will be witnessed by the Engineer.

The MPI results will be considered acceptable when the range of the three individual scans is less than or equal to 0.10 inches. If the three scans are not within 0.10 inches, a second set of three scans shall be taken. The three new scans will be considered acceptable when the range of the three individual scans is less than or equal to 0.10 inches. If the second set of three scans are not within 0.10 inches, the MPI for this location will not be used. A MPI test will be the result of the average of a set of three acceptable scans at a location. The average of the set of three scans shall be rounded to the nearest 0.04 inches. If a MPI location is unable to obtain three acceptable scans, a core shall be taken and used for thickness determination and I/DP.

A test section shall be conducted to verify the calibration and correlation of the MPI pavement thickness determination at the start of PCCP operations. The test section correlation shall be established in the first 7,500 square yards of PCCP per a stratified random sampling schedule as established in CP 75. The test section correlation verification shall consist of conducting ten pavement thickness measurements by taking a core at the MPI test locations. The Contractor shall obtain 4-inch nominal diameter cores from the hardened pavement that are suitable for measuring per AASHTO T148. When the cores are removed from the pavement the Contractor shall determine their length and then the Engineer will take possession and determine their length per AASHTO T148. A verification must be run for each MPI device used on the project. The verification of any MPI device can be run at the initial verification locations. The comparison of the PC MPI measurements and hardened concrete cores shall be within 0.15 inches to be considered a valid correlation between the two test methods.

After successful completion of the thickness measurement correlation verification process, a minimum of one hardened concrete core will be taken for every 25 MPI thickness measurements for core thickness determination. When a change in thickness or process occurs, the first three MPI location shall be cored for thickness. At a minimum, one MPI test location will be cored for thickness for each pavement thickness process, or as directed by the Engineer. A core may be taken when the MPI result is in doubt. The correlation between core and MPI thickness measurements shall be verified to be within 0.15 inches at the same location. If the thickness difference between the methods exceeds 0.15 inches, the next five MPI locations will be cored. If the thickness difference between the two methods exceeds 0.15 inches on any location the contractor shall use the coring method for acceptance until the MPI is repaired or replaced and verified. Previous MPI locations shall be cored until three successive thickness differences between the two methods is equal to or less than 0.15 inches. If the MPI device is not able to be repaired or replaced within 10,000 sq yd of paving, the acceptance method will revert to coring acceptance from the last acceptable MPI measurement. A new process for pavement thickness will be started for the change in method of measurement.

The lower tolerance limit (TL) for pavement thickness shall be Plan Thickness (PT) minus 0.4 inches. This TL shall be used in the formulas in Section 105 for Incentive and Disincentive Payments (I/DP), Quality Levels (QL) and Pay Factor (PF) determinations. Any pavement thickness test value that exceeds the PT by more than 1.0 inch shall be assigned a value of PT +1.0 inch for the purpose of calculating the QL, PF and I/DP.

MPI test locations shall be determined by a random procedure so that each area has a randomly selected coring location. A MPI test plate will be installed before paving. The location of the MPI test plate shall be at least 4 feet from any dowel bar locations, tie bar location and utility box cover locations. The operator of the MPI device should use composite safety boots to not interfere with the device.

Where the new PCCP overlays an existing roadway, MPI test locations shall be determined by a stratified random procedure in the longitudinal direction and by the point of minimum required thickness in the lateral direction as shown in the plans. If existing field conditions show a condition where the point of minimum thickness in the lateral direction as shown in the plans is not appropriate, the Contractor shall identify the location and extent of the area to the Engineer at least 24 hours before paving. The Engineer may exclude this area from pavement thickness measurements for incentive and disincentive payments.

Pavement thickness tests will be evaluated per subsection 105.06. Additional cores will be taken at the direction of the Engineer at the contractor’s expense as follows:

One additional core at the location of each process control (PC) test that is less than PT minus 1.0 Inch.

* + - 1. If the length of the additional core is greater than PT minus 1.0 inch, no additional actions will be taken and the core test result will replace the MPI result to compute I/DP
			2. If the length of the additional core is less than PT minus 1.0 inch the area represented by this PC test shall become a separate process and will not be used to compute an I/DP. The thickness of the pavement in this area will be determined by taking cores. Cores shall be taken at intervals of 15 feet or less, parallel to the centerline in each direction from this location until two consecutive cores are found in each direction which are not less than PT minus 1.0 inch. The pavement found to be less than PT minus 1.0 inch shall be removed and replaced at the Contractor’s expense.

When the removal and replacement have been completed, four additional randomly selected cores will be taken within the area represented by this core. The four additional cores will be used to compute an I/DP per subsection 105.06.

The Contractor shall repair all core holes by filling them with an approved non-shrink high-strength grout.