1. September 3, 2020
2. REVISION OF SECTION 601
3. CONCRETE DECK (PATCHING) AND EXPANSION JOINT CONCRETE

**NOTICE**

This is a standard special provision that revises or modifies CDOT’s *Standard Specifications for Road and Bridge Construction.* It has gone through a formal review and approval process and has been issued by CDOT’s Project Development Branch with formal instructions for its use on CDOT construction projects. It is to be used as written without change. Do not use modified versions of this special provision on CDOT construction projects, and do not use this special provision on CDOT projects in a manner other than that specified in the instructions unless such use is first approved by CDOT’s Standards and Specifications Unit. The instructions for use on CDOT construction projects appear below.

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

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

Use in projects having concrete patching material on existing bridge decks and expansion joint replacements.

Section 601 of the Standard Specifications is hereby revised for this project to include the following:

**DESCRIPTION**

**601.21** This work consists of furnishing and placing concrete patching material on existing bridge decks and expansion joint replacements in accordance with these specifications and in conformity with the lines, grades and dimensions as shown on the plans or established.

**MATERIALS**

**601.22** The concrete patching material may be pre-packaged Concrete patching material or Class DR concrete.

1. *Pre-Packaged Concrete Patching Material.* Concrete patching material shall be polymer modified hydraulic cement from the CDOT Approved Products List (Concrete/Repair/Patching/Class DR [Pre-Packaged] ). Concrete patching materials shall demonstrate 1/32-inch maximum mid panel and end crack widths, 0 percent delamination, and 0 percent spalling as tested by NTPEP in a one-year field evaluation. The Contractor shall refer to rapid-set concrete patch materials at [www.ntpep.org](http://www.ntpep.org).

The Contractor shall obtain and provide to the Engineer documentation from the Concrete patching material supplier stating the expiration dates of the material components that will be used on the project.

Concrete patching material shall attain an average compressive strength of at least 2,500 psi prior to placing traffic and 4,500 psi at 28 days. Concrete patching material compressive strengths shall be tested according to ASTM C39 or ASTM C109. The compressive strengths shall be used to develop a strength versus time curve for the material. Three strength data points shall be determined to assess the necessary time to wait before traffic is allowed on the material. Maturity meter data will be submitted to allow the use of maturity meter to determine when the patching material has gained the required strength for opening to traffic.

Concrete patching material shall provide a minimum bond strength of 2,000 psi at 28 days, as tested by ASTM C882.

Concrete patching material shall have a relative durability factor greater than 90 and a mass loss not to exceed 2.0 percent as tested by ASTM C666.

Concrete patching material shall have a maximum expansion of 0.05 percent, at 28 days as tested by ASTM C157

ASTM C39, C109, C882 and C157 testing shall be from the same lot of concrete patching material being used on the project. A CTR, in accordance with subsection 106.13, shall be submitted to the Engineer for approval at least 2 weeks prior to placement.

Two bags of the concrete patching material, and two bags of the extending aggregate if used, from the same lot to be used on the project shall be submitted to an accredited Lab to verify compressive strength, and set time properties, by the Contractor before the concrete patching material is to be used on the project. Test results shall be submitted to the Engineer for acceptance. Verification of the strength properties will be achieved if the test results are either equal in strength or stronger than those advertised. Verification of the set time will be achieved if the set time is equal or less than the advertised value. Testing shall be included in the cost of the materials. Test results from other projects using the same lot may be submitted. If the project uses material from more than one lot, test results are required for each lot used.

1. *Class DR Concrete.*Class DR Concrete shall have an air content of 5 to 8 percent, a maximum water to cement ratio of 0.44, a minimum 6 hour compressive strength of 2,500 psi and a minimum 28 day compressive strength of 4,500 psi. The concrete mix shall consist of a minimum of 50 percent AASHTO M 43 Size No. 7 or Size No. 8 coarse aggregate by weight of total aggregate. Lab test results shall show that the unrestrained shrinkage is less than 0.050 percent when tested by CP-L 4103 and ASTM C1202 test results shall not exceed 2500 coulombs at 56 days of age . ASTM C150 Type III or ASTM C1157 Type HE cement may be used.

Materials, proportioning, batching and mixing requirements of subsections 601.03 through 601.07 shall apply to Class DR concrete. Concrete Class DR shall meet Sulfate Level 0 requirements.

The Contractor shall develop maturity relationships in accordance with CP 69. The Contractor shall provide a multi-channel maturity meter and all necessary wire and connectors. The Contractor shall be responsible for the placement and maintenance of the maturity meter and wire. Placement shall be as directed by the Engineer.

**CONSTRUCTION REQUIREMENTS**

**601.23**

1. *Pre-Packaged Concrete Patching Material.* Concrete patching material shall be placed in the repair areas before the expiration date of the material. Proportions of all mix components shall be measured by volume measurement (number of bags of standard weight and quantity of water or liquid component in gallons or quarts). If partial bags are used the bagged mix, extending aggregate, and water shall be weighed on a calibrated scale provided by the Contractor. The Contractor shall submit the Concrete patching material mix design for approval two weeks before any concrete patching material is placed. The Contractor shall also submit a method statement describing what type of equipment will be used to batch the patching material, including the type of mixer, the type of material, volume measures to be used, scales for partial bags, procedures to insure accurate proportioning of the patching material components, and tools to be used in placing and finishing the surface of the patch.

The Contractor shall produce a batch ticket for each mixed batch of concrete patching material with the following information shown on each ticket:

* 1. Project No.
	2. Bridge No.
	3. Structure Temperature
	4. Date and Time of batch
	5. Material Type, name, and manufacturer
	6. Material expiration date
	7. Weight or volume of bag mix concrete
	8. Weight or volume of extending aggregate
	9. Weight or volume of water or liquid component
	10. Location of placement (Lane and Station Limits)

The tickets shall be available on site for CDOT personnel to inspect.

Each day the Contractor shall provide to the Engineer tickets for each bridge in separate envelopes stating Project Number, Bridge Number, Date of Paving, Type of Material, Daily Total, and Cumulative Total.

Concrete patching material minimum and maximum thicknesses shall be per recommendation of the material manufacturer.

Concrete patching material site preparation, batching, extending with aggregate, mixing, placement, placement during cold temperatures, consolidation, and curing shall be in accordance with the manufacturer’s recommendations. A mix may be extended up to 90 percent of the manufacturer’s maximum extension.

The surface of concrete patching material shall have a similar texture as the adjacent driving surfaces.

The Contractor shall submit a report consisting of the mix proportions and compressive strength vs time curve information to the Engineer at least two weeks before the material is to be used on the project.

Field cast cylinders or cubes shall be taken by a qualified testing representative and test results shall be submitted to the Engineer within 24 hours, each day deck patching material is placed with compressive strength determined at 24 hours according to ASTM C 39 or ASTM C109.

Areas patched with Pre-Packaged Concrete Patching Material shall not be opened to traffic until concrete patching material has reached a compressive strength of 2,500 psi using the compressive strength versus time curve developed for the material.

Areas of the deck patched with Pre-Packaged Concrete Patching Material shall not receive a waterproof membrane until 4 hours after placement.

1. Class DR Concrete. Class DR Concrete shall be placed in accordance with Class D concrete with the following changes:

The area to be patched with Class DR Concrete shall be saturated surface dry before placement and shall be free of standing water at the time of placement.

Portions of decks patched with Concrete Class DR shall not be opened to traffic until the concrete’s compressive strength, determined by CP 69, has achieved at least 2500 psi.

Areas of the deck patched with Concrete Class DR shall not receive a waterproof membrane until the concrete patches have cured for a minimum of 5 days or have a moisture content of 5% or less as measured by a moisture meter approved by the Engineer.

Concrete Class DR shall be cured until a compressive strength of at least 2500 psi has been achieved. The curing compound shall conform to ASTM C309, Type 2 applied at a rate of 1 gallon per 100 square feet. The curing compound shall be applied as a fine spray within 10 minutes of discontinuing the finishing operation. Before and during application the curing compound shall be kept thoroughly mixed. Curing blankets with a minimum R-value of 0.5 shall be provided and shall be placed as soon as they can be placed without marring the surface. When the ambient temperature is below 50°F, the Contractor shall maintain the concrete temperature above 50°F during the curing period.

**METHOD OF MEASUREMENT**

**601.24** Concrete (Patching) will be measured and paid for as the actual quantity placed and accepted by the Engineer.

**BASIS OF PAYMENT**

**601.25** The accepted quantities will be paid for at the contract unit price per unit of measurement for each of the pay items listed below that appear in the bid schedule.

**Pay Item** **Pay Unit**

Concrete Class DR Cubic Yard

Payment for Concrete (Patching) will be full compensation for all the work, materials, tools, equipment, testing, and incidentals required to complete patching, excluding special installation of anodes when specified, when required.

Furnishing all appurtenances including the molding, curing and breaking of cylinders or cubes for generating the strength versus time curve and for determining the information cylinder or cube strength will not be measured and paid for separately, but shall be included in the work. Concrete patching material or Class DR Concrete will not be measured and paid for separately, but shall be included in the Concrete (Patching) bid item.