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| REVIEW OF NEW SPECIFICATION OR SPECIFICATION CHANGE  | **Log No.: 601-1** |
| **Specification Section No.:** 601 | **Item:** Cold Weather Placement and Curing of Bridge Decks |
| **Originating Office:** Project Support | **By:** Eric Prieve |
| **Date Sent For Review:** February 22, 2019 | **Date Comments Due:** March 22, 2019 |
| Submit response to: Andrew Pihaly, Specifications Engineer, 3rd floor, CDOT HQ |
| **Vote****Y/N** | **Concurrent Reviews – Others Commenting** | The attached Draft Specification is submitted for your review and comments. If not returned by Date Comments Due, the draft specification will be considered to be approved unless the Standards and Specifications Unit of the Project Development Branch [(303) 757-9402] is advised otherwise.**REMARKS:** If these proposed changes are approved, our unit will issue these in a standard special provision. |
|  | **Spec Committee Members:** | **✓** |
|  | Co-Chairman: Neil Lacey | ✓ |
|  | Region 1: Telecia McCline | **✓** |
|  | Region 1: Jason Lucerna | **✓** |
|  | Region 2: Jennifer Billings | **✓** |
|  | Region 3: Jarrett Spegele | **✓** |
|  | Region 4: Chris Boespflug | **✓** |
|  | Region 5: David Valentinelli | **✓** |
|  | Project Development: Neil Lacey | **✓** |
|  | Standards and Specifications: Shawn Yu | **✓** |
|  | Area Engineers: Straub, Zamora, & Ryburn | **✓** |
|  | Bridge: Hoang Bui | **✓** |
|  | Contracts & Market Analysis: Markos Atamo | **✓** |
|  | Materials: Mike Stanford | **✓** |
|  | Materials: Craig Wieden | **✓** |
|  | Traffic Engineering: Manjari Bhat | **✓** | REVIEWER COMMENTS:( ) Approved ( ) Disapproved ( ) ModifiedIf disapproved or modified, give reason why and show any modifications on the attached draft copy: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_ Name/Signature Date |
|  | Maintenance: Tyler Weldon | **✓** |
|  | FHWA: Kelly Galardi | **✓** |
|  | Attorney General: Leo Milan | **✓** |
|  | **Others:** |  |
|  | Colorado Contractors Assoc.: Jim Moody | **✓** |
|  | **Technical Committees:** |  |
|  | Bridge |  |
|  | PDAC | **✓** |
|  | Drainage Advisory Committee (DAC) |  |
|  | Water Quality Advisory Committee (WQAC) |  |

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| **COLORADO DEPARTMENT OF TRANSPORTATION****SUBMITTAL OF NEW SPECIFICATION OR SPECIFICATION CHANGE** | Log No. (Assigned by Standards and Specifications Unit)601-1 |
| TO: Standards & Specifications Unit Project Development Branch | FROM:Eric Prieve and PDAC(Region, Branch or Technical Committee) |
| SPECIFICATION SECTION NO.601 | ITEMCold Weather Placement and Curing of Bridge Decks | PriorityRoutine x Fast  |
| Reason for this new or changed specification:Revises subsection 601.16(f) to clarify what is required for cold weather concrete deck placements and curing.Maturity meters will be required to monitor deck strength for determining when bridge deck curing can be removed in cold weather. **Approved at the December 12, 2018 PDAC meeting.** |
| New or Revised Specification:See attached. |
| NOTE: See Procedural Directive 513.1 for a description of appropriate specification development procedures. |

XXXXXX XX, 2019

# REVISION OF SECTION 601

COLD WEATHER PLACMENT AND CURING OF BRIDGE DECKS

**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:**

Projects with structural concrete.

Section 601 of the Standard Specifications is hereby revised for this project as follows:

Delete subsection 601.16(f) and replace with the following:

(f) When the ambient temperature is expected to fall below 40 °F during the curing period, the Contractor shall maintain the internal concrete temperature above 50 °F during the curing period and until the concrete has developed a compressive strength of 0.80f’c. The Contractor shall provide suitable measures such as straw, additional burlap, ground heaters, or other suitable blanketing materials, and/or housing and artificial heat to maintain the internal concrete temperature above 50 ºF. The mixed concrete shall meet the requirements of subsection 601.12(c).

Concrete shall not be placed on forms, girders, or deck panels that have a surface temperature less than 35 °F. Forms, girders, or deck panels where concrete is to be placed shall be free of snow, ice, and frost. Salt shall not be used to thaw ice, snow, or frost. Heating forms, girders, or deck panels prior to concrete placement may be required.

When the Contractor chooses to use an enclosure, the Contractor shall enclose the area underneath the deck and heat it so that the temperature of the enclosed air is as close as possible to the temperature of the enclosed air above the concrete. When artificial heating is used to maintain the concrete temperature, adequate ventilation shall be provided to limit exposure to carbon dioxide, and the enclosed air temperature shall not exceed 90 ºF. During the curing period, the Contractor shall monitor the air temperature within the enclosure at intervals acceptable to the Engineer. The Contractor shall monitor and maintain the structural integrity of the enclosure. Heating of the enclosure may be stopped after 72 hours if the air surrounding the concrete is greater than 40 °F or the concrete has achieved 0.80f’c. For every day that the internal temperature of the concrete is below 50 ºF during the curing period, an additional day of curing with a minimum internal concrete temperature of 50 ºF will be required unless the concrete has achieved 0.80f’c. After completion of the required curing period, the Contractor shall remove the enclosure in such a manner that the temperature of the concrete during the following 24 hours does not fall by more than 25 °F.

When the Contractor chooses not to use an enclosure, after the curing period and after the concrete has achieved 0.80f’c, the Contractor shall remove the protection in such a manner that the temperature of the concrete during the following 24 hours does not fall by more than 25 °F. For every day that the internal temperature of the concrete is below 50 ºF during the curing period, an additional day of curing with a minimum internal concrete temperature of 50 ºF will be required unless the concrete has achieved 0.80f’c.

Internal concrete temperature shall be determined by using thermocouples. Thermocouple wire, connectors, and hand held thermometer shall be supplied by the Contractor. The Contractor shall install the thermocouples at locations designated by the Engineer.

Concrete compressive strength shall be determined by maturity meters. The Contractor shall develop maturity relationships for each mix placed during the cold weather conditions in accordance with CP 69. The maturity relationship shall be submitted to the Engineer prior to cold weather concrete placement. The Contractor shall provide the maturity meters and all necessary wires and connectors. The Contractor shall be responsible for the placement, protection, and maintenance of the maturity meters and wires. Locations where the maturity meters are placed shall be protected in the same manner as the rest of the concrete.

Heat sources shall not be placed in such a manner as to endanger formwork or expose any area of concrete to drying due to excessive temperatures.

If the internal concrete temperature at any location in the bridge deck concrete falls below 32 °F during the first 24 hours of the curing period, the Engineer may direct the Contractor to core the areas in question at the locations indicated by the Engineer. The Engineer will take immediate possession of the cores. The Engineer will submit the cores to a petrographer for examination in accordance with ASTM C856. Concrete damaged by frost, as determined by the petrographer, shall be removed and replaced at the Contractor's expense. All costs associated with coring, transmittal of cores, and petrographic examination shall be borne by the Contractor regardless of the outcome of the petrographic examination.