



**DEVELOPMENTAL SPECIFICATIONS
FOR
PARTIAL DEPTH BRIDGE DECK PATCHING**

**Effective Date
January 21, 2015**

THE STANDARD SPECIFICATIONS, SERIES 2012, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE DEVELOPMENTAL SPECIFICATIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

12061.01 DESCRIPTION.

Partial depth bridge deck patching consists of removing deteriorated bridge deck concrete in areas designated by the contract documents. This includes furnishing and placing patching material to provide a new traffic surface. This work is in areas where the size, shape, and depth of patch depends on the extent of deck deterioration and will be determined during the removal operation.

12061.02 MATERIALS AND EQUIPMENT.

A. Materials.

1. When extended lane closures are allowed by the contract documents, a Class O or HPC-O mix in accordance with Material I.M. 529 may be utilized. ~~Curing times are shown in the following table. Do not use these mixes if average daily temperature drops below 40°F (5°C) for more than three consecutive days or stays below 50°F (10°C) for more than one half of any 24 hour period.~~

Table DS-12061.02-1: Curing Times

Ambient temperature	Curing period
Greater than 85°F (30°C)	24 hours
70 to 84°F (21 to 29°C)	36 hours
50 to 69°F (10 to 20°C)	48 hours

2. Use materials described below if extended lane closures are not allowed in the contract documents.
 - a. Use materials listed in Materials I.M. 491.20, Appendix B.
 - b. Follow manufacturer's recommendations for patching material except as modified by this specification. Furnish two copies of manufacturer's product information, mixing procedures, placement procedures and curing procedures to the Engineer at least 14 calendar days prior to Preconstruction Conference.
 - c. Calcium chloride shall not be added to patching mix.
 - d. Patching materials may be used with or without coarse aggregate in accordance with manufacturer's recommendations.
 - e. Aggregate for extending grout shall be pea gravel with a minimum durability of Class 2 meeting the following gradation:

Table DS-12061.02-21: Pea Gravel Gradation

Sieve Size	Percent Passing
0.5 inch (12.5 mm)	100
0.375 inch (9.5 mm)	85 - 100
No. 8 (2.36 mm)	0 - 10

- f. Manufacturer's recommendations shall be followed for adding aggregates to these mixes.

B. Equipment.

1. Remove existing deck surface material by wet or dry saws, jack hammers, or similar equipment. Hand equipment may be necessary to achieve a vertical edge and designated shape.
2. The following additional equipment will be required:
 - Sandblasting equipment for cleaning the prepared patch area before placing the patch.
 - Preparation of the patch area shall be completed using equipment no heavier than a 15 pound (7 kg) air chisel. With the approval of the Engineer, a 35 pound (16 kg) air chisel or jackhammer, may be used if its use does not result in significant damage to patch area and edges.
 - Compressed air for cleaning the prepared area shall be oil and moisture free.
 - An on-site mortar or paddle type concrete mixer shall be used for mixing patching material from Materials I.M. 491.20, Appendix B and also Class O and HPC-O mixes. When patch sizes, concrete volume, and deposition rate are appropriate, and the Contractor ensures adequate labor and equipment will be available, the Engineer may approve use of ready mixed Class O or HPC-O concrete.

12061.03 CONSTRUCTION.

Tabulations for partial depth bridge deck finish patches shown in the contract documents are for estimating purposes only. The Engineer will designate the location and limits of the patches. The shape and depth may be irregular, thus requiring the use of hand-operated equipment for some or all removal. Existing deck material shall be removed within the designated area to sound concrete as determined by the Engineer. Material removed and not designated for salvage shall become the property of the Contractor and removed in accordance with Article 1104.08 of the Standard Specifications.

Visually survey the bottom of the deck over open roadways or railroads prior to beginning removal operations. Care shall be taken to prevent material from falling onto traffic below. Lane closures below the bridge deck being patched may be required.

A. Preparation of Patch Area.

1. Area to be Patched.

The Engineer will determine areas to be patched by hand sounding. The patching area will normally include 2 to 3 inches (50 mm to 75 mm) of sound concrete around patch edges. Efforts will be made to mark the patching area to accommodate sawing patch edges by using a square, triangle, rectangle, or similar straight edged shape. The minimum depth of patch shall be 1 inch (25 mm).

2. Sawing.

- a. Determine the depth of existing reinforcing bars before sawing.
- b. Saw at a depth of 0.75 to 1 inch (20 to 25 mm) around the designated area. Care shall be taken to avoid cutting into reinforcing bars.
- c. Keep areas where concrete has been removed free of slurry produced from wet sawing.

3. Removal.

- a. Remove unsound concrete to a minimum depth of 1 inch (25 mm) and no deeper than 1 inch (25 mm) below the top mat of reinforcing steel. Avoid jack hammering on reinforcing steel to prevent damage to reinforcing bars. Care shall to be taken to avoid breaking through the bridge deck. Keep patch edges as straight and square as possible when removal depth exceeds the initial sawcut.
- b. Within 24 hours prior to placing patching material, thoroughly clean all reinforcing bars and newly exposed concrete by sand blasting or shot blasting. Where the bond between existing concrete and reinforcing steel has been broken, remove the concrete adjacent to the reinforcing bar to a depth that will permit new concrete to bond to the entire periphery of the exposed bar. A minimum of 0.75 inch (20 mm) clearance will be required around the bar. Exercise care to prevent cutting, stretching, or damaging reinforcing steel. Do not sand blast or shot blast epoxy coated reinforcing steel. Clean epoxy coated reinforcing steel with hand tools and compressed air to avoid damaging the epoxy coating. Repair damage to the epoxy coating by a method approved by the Engineer.
- c. After sand blasting, remove all loose material with compressed air.

4. Mixing of Patch Material.

- a. Mix material in accordance with manufacturer's recommendations and subject to approval of the Engineer. For Class O and HPC-O mixes, mix material in accordance with Materials I.M. 529. For Class O and HPC-O concrete mixed on-site, slump at time of placement shall be 3 inches (75 mm) with a variation not to exceed +/-1 inch (25 mm). For ready mixed Class O and HPC-O concrete, slump at time of placement shall be 3 inches (75 mm) with a variation not to exceed +/-1 inch (25 mm) and air content of fresh, unvibrated concrete at the time of placement, as determined by Materials I.M. 318, shall be 6.5%, with a maximum variation of plus 2.0% and minus 1.0%.
- b. Organize work so all personnel and equipment are in place before mixing.
- c. Mix according to patch material manufacturer's recommendations and subject to approval of the Engineer. Mix only the amount of material that can be placed in the time frame designated by manufacturer. For Class O and HPC-O mixes, mix material in accordance with Materials I.M. 529 and only the amount of material that can be placed in the working time frame for the mix.
- d. Add ingredients to mixer in order of manufacturer's recommendations for materials listed in Materials I.M. 491.20 Appendix B.
- e. Amount of mix water is important. Use a properly graduated measuring device to measure required amount of water. Never exceed maximum recommended water content.

5. Patching Material Placement.

- a. Place patching mix according to the patching material manufacturer's recommendations and subject to the approval of the Engineer. Place Class O and HPC-O mix according to Article 2426.03, C.
- b. When Class O or HPC-O concrete is used, ~~bonding grout is required. Bonding grout and placement shall be in accordance with Section 2426-~~ scrub a cement-sand-water grout of creamy consistency onto patch surface, including edges. Grout shall consist of two parts Type I or Type I/II Portland cement and one part sand mixed with water. Mix grout by mechanical means. Place patch material before grout dries. If grout dries before placement of patch material, clean patch area again by sandblasting and air blasting, then reapply grout.
- c. Thoroughly trowel patching material into patch edges to ensure a good bond and seal. Ensure that all saw cuts extending beyond the patch area are filled with patching material to prevent water from getting around or under the patch.
- ~~d. Protect and cure patches according to the manufacturer's recommendations. Cure Class O and HPC-O mix in accordance with Article 2426.03, D.~~
- e d.** Match profile of patches to the existing deck grade and cross slope. Texture the surface of patches to match the adjacent deck surface.

- f e. Prior to final acceptance, the patch shall be level with the adjacent pavement and have a smooth riding surface.

6. Curing and Opening.

- a. Cure patches according to manufacturer’s recommendations. In lieu of manufacturer’s strength data at anticipated curing temperatures, use the following curing times and protection.
 - 1) When ambient temperatures are between 50 and 60°F (10 to 16°C), precondition materials by storing them in a warm place at 70°F (21°C) or warmer, for at least 48 hours before use. Keep materials warm in vehicle cab or insulating box when transporting to job site. Heat substrate by using ground heaters until surface is a minimum of 70°F (21°C). Cover repair with an insulating blanket for a minimum of 4 hours after placement.
 - 2) From 61 to 74°F (16 to 23°C), cure a minimum of 3 hours.
 - 3) From 75 to 90°F (24 to 32°C), cure a minimum of 2 hours.
- b. Cure Class O and HPC-O mix in accordance with Article 2426.03, D and the following table.

Table DS-12061.03-1: Curing Times

Ambient temperature	Curing period
Greater than 85°F (30°C)	24 hours
70 to 84°F (21 to 29°C)	36 hours
50 to 69°F (10 to 20°C)	48 hours

B. Limitations of Operations.

1. When patching material, as listed in Materials I.M. 491.20, Appendix B is used, a manufacturer’s representative for the patch material being used shall be present at the Preconstruction Conference and at the job site on the first day of patch material placement. Contractor is responsible for notifying manufacturer’s representative of these dates and ensuring the representative will attend.
2. Maintain traffic during construction unless the road is closed. Conduct operations with minimum inconvenience to traffic. Lane closures shall be in accordance with the Traffic Control Plan. On two-lane roadways, limit work to one traffic lane at a time except for minor encroachment in the adjacent lane for sawing and patch preparation when traffic is maintained. For multiple lane roadways, the work area may include one lane in each direction.
3. When approved by the Engineer, patch areas may extend up to 2 feet (0.6 m) into an adjacent lane as allowed by the Traffic Control Plan.
4. Place patch material within 24 hours of sawing operations.
5. When patching material, as listed in Materials I.M. 491.20, Appendix B is being used and unforeseen conditions result in excavated areas being left open overnight, furnish a sufficient number of flaggers to warn motorists and direct traffic until patches are complete and the roadway is open to normal traffic. The cost of providing these flaggers shall be at no additional cost to the Contracting Authority.
6. Place concrete patching material only when the ambient air and pavement deck temperatures are in accordance with the manufacturer’s recommendations between 50 and 90°F (10 and 32°C). Place Class O and HPC-O mix only when ambient air temperatures are greater than 50°F (10°C) for more than one half day and concrete repair surface temperature is 40°F (5°C) or greater.

~~7. Open patched areas to traffic as soon as the manufacturer's recommended patch strength is achieved. For Class O and HPC-O mixes, curing times are stated in Table DS-12061.02-1.~~

C. Area Restoration.

Keep bridge deck surface and areas immediately adjacent to patch areas clean of slurry and excess patch materials.

12061.04 METHOD OF MEASUREMENT.

- A. The Engineer will calculate the area of each Partial Depth Bridge Deck Finish Patch in square feet (square meters) from surface measurements.
- B. The area of each patch less than 1 square foot (0.1 m^2) will be counted as 1 square foot (0.1 m^2) for payment purposes.

12061.05 BASIS OF PAYMENT.

- A. Payment for Partial Depth Bridge Deck Finish Patch will be at the contract unit price per square foot (square meter).
- B. Payment is full compensation for sawing, removal of bridge deck concrete, preparing patch area, furnishing and placing patch material, finishing, curing, and restoration of the area.