ITEM 584.0709--11M - SURFACE PREPARATION FOR RAPID SETTING CONCRETE BRIDGE AND APPROACH SLAB

ITEM 584.07090111M - FURNISH AND PLACEMENT OF RAPID SETTING CONCRETE BRIDGE AND APPROACH SLAB REPAIRS

DESCRIPTION: This work shall consist of patching spalls, potholes, corner breaks or other surface distress in Portland cement concrete bridge and approach slabs. The patch area shall be prepared by removal of all existing patching material, broken, damaged or disintegrated concrete, and patched with one of the rapid setting concrete products listed below where indicated on the plans or directed by the Engineer. The depth of cavity, prior to patching, shall be a minimum of 50 mm.

MATERIAL: The materials used shall meet the following requirements:

Coarse Aggregate (703-0204 Crushed Slag shall not be used)	703-02
Rapid Setting Concrete Repair Material HD-50, Fastcrete or other materials on the Approved List with the same characteristics.	HD-50, as supplied by Dayton Superior Corp Oregon, IL
Products submitted as having the same characteristics to the above alternatives shall be subject to review and approved by the Director, Materials Bureau.	Fastcrete, as supplied by Silpro Masonry Systems, Inc Ayer, MA
Water	712-01
Insulating Blankets	711-07
Burlap	711-06

The aggregate shall be size as follows, based upon the depth of application of the mixture:

Depth of Application	Gradation
Up to 100 mm	Type CA1 Table 501-2
100 mm and greater	Type CA2 Table 501-2

The dry prepackaged component of the patching material shall be extended, by weight, with 60-65% Type CA1 or CA2 coarse aggregate.

Mixing water shall be added per the manufacturer's instructions. The Contractor shall determine the moisture content of the aggregate. The Contractor shall adjust the amount of mixing water to allow for the aggregate moisture content. The Engineer shall approve this adjustment before mixing.

CONSTRUCTION DETAILS: The areas to be repaired are indicated on the plans or will be

designated by the Engineer. Repairs shall conform to the details shown on the plans or be in accordance with the directions of the Engineer. The area around the spall or other distress shall be sounded with a 0.9 to 1.4 kg hammer to identify delaminations. The delaminated area plus 150 mm shall be designated by the Engineer for removal. To minimize possible shrinkage cracking and to maximize the service life of the bridge and approach slab repair, patch areas should approach rectangular dimensions and preferably square dimensions when feasible. Patches should refrain from tapers or dimensions that result in narrow, pointed shapes. All asphalt concrete, foreign materials of any kinds, and unsound concrete shall be removed from the repair area.

All wire mesh reinforcement encountered during concrete removal shall be cut out and disposed of by the Contractor. The Contractor will not be required to replace wire mesh reinforcement removed from a patch area.

If steel reinforcing bars are encountered during removal of deteriorated concrete, the terms and conditions of subsections 579-1.02 Exposure of Reinforcing Bars and 579-3.02 Reinforcing Bar Exposure shall apply. If reinforcement is encountered and exposed with the 25 mm clearance as called for in subsection 579-1.02B, only CA1 aggregate shall be used to extend the repair material regardless of the total patch depth.

The Contractor has the option of using chipping hammers, a milling machine approved by the Engineer, or high pressure water blast for concrete removal.

1. *Chipping Hammers.* The edges of the patch shall be sawcut 20 mm deep with the remainder of the patch depth chipped to a rough sound edge with an inward slope of approximately 45° as detailed on the Contract Plans. The floor of the patched area shall be chipped away to produce a minimum patch depth of 50 mm, however, at slabs with top reinforcing, the depth shall extend to an even plane a minimum of 25 mm below the bottom of the upper reinforcing bar mat at all points within the patch.

   Chipping hammers that are used shall not damage the concrete that is to remain. Chipping hammers shall weigh not more than 20 kg with the bit and muffler removed. The hammer shall deliver no more than 1600 blows per minute. The Contractor shall provide the Engineer with information from the hammer manufacturer that these requirements are not exceeded. The air pressure used to power the hammer shall not exceed 690 KPa measured at the air compressor. An air pressure gauge in proper working condition shall be provided. Only sharp, 75 mm minimum width chisel point bits shall be used. All bits determined by the Engineer to be dull shall be sharpened or replaced. If the Engineer determines that the Contractor's operations are resulting in damage to concrete that is to remain, the Contractor shall make immediate corrections. These corrections shall include the use of a lighter chipping hammer if so ordered by the Engineer. Damage caused by the Contractor's

operations shall be repaired to the satisfaction of the Engineer at no additional cost to the State.

2. *Milling Machines.* Milling machines that are used for concrete removal shall result in the same surface preparation as in *1. Chipping Hammers*. Their use shall be approved by the Engineer.

3. *High Pressure Water Blast*. Hydrodemolition equipment shall meet the requirements of subsection 579-3.04. The edges of the patch shall be sawcut and chip hammered to a slope of approximately 45° in accordance with Paragraph 1, Chipping Hammers. The floor of the patched area shall be water blasted away to produce a minimum patch depth of 50 mm, however, at slabs with top reinforcing, the depth shall extend to an even plane a minimum of 25 mm below the bottom of the upper reinforcing bar mat at all points within the patch.

Blast cleaning shall follow concrete removal to remove all remaining contaminants or loose chips of concrete.

Immediately prior to placing the patching material, the area to be patched shall be cleaned of all loose material by vacuum or air blasting. The air used for sand and air blasting shall be free of oil or any other foreign substances that would contaminate the cleaned surfaces. Air compressors shall be equipped with moisture traps. Air blasting shall have a pressure sufficient to remove all loose debris. The Contractor is required, at all times while sand, water or air blasting to provide protection by means of screening, approved by the Engineer, to prevent damage to, or interference with, traffic in adjacent lanes.

If patching material is not placed during the same working day as when the patch area is prepared, the area shall be reblasted clean, followed by vacuum or air blasting before patching material placement.

Only when using cement based grouts, prior to placing the patching material, the sides and bottom of the existing concrete , in contact with the patching material, shall be soaked with water. Remove all standing water within the patched area.

Patching material shall not be placed in wet weather. If, in the opinion of the Engineer, the patching material is damaged, it shall be removed and replaced.

Temperature Limitations. The rapid setting concrete material shall be placed when the ambient air temperature is within a range of 5° C to 32° C.

Handling, Placing, and Mixing. The materials shall be mixed in a mortar-type mixer or mixer of such capacity that one batch will completely fill the area(s) to be patched. The mixer(s) shall be inspected and approved by the Engineer prior to use. If water is required, it shall be the first

material added to the mixer. The moisture content of the aggregate used to extend the yield shall be determined and the amount of mixing water added shall be adjusted accordingly to compensate for the moisture content. The Contractor shall provide a device to accurately measure the amount of water and aggregate. The materials shall be mixed by adding the mixing water into the mixer and then adding the patch material into the mixer. Continue mixing until the material is free of lumps (approximately 3 to 5 minutes) or as per manufacturer's recommendations. Mix as close as possible to the area to be repaired. Do not allow material to build up on equipment and wash equipment periodically with water. Do not retemper the mixed material or use admixtures. Place immediately after mixing, working the material firmly into the sides and bottom, eliminating any air pockets and assuring maximum bond.

If patching material is to be placed at a joint or slab edge, the necessary forms or joint forming material as indicated on the plans or ordered by the Engineer shall be provided. Any forms or joint spacers shall be coated with a material that will not react with the patching material and will not adhere to it.

The patching material shall be placed in one lift, starting at one edge of the repair area and working to the opposite edge. All patches equal to or greater than 50 mm in depth shall be consolidated by internal vibration following Standard Specification Subsection 555-3.04E *"Vibration"* to minimize the possibility of voids in the patch.

Cold Weather Applications. When the ambient air temperature falls, or is expected to fall below 10° C but remains above 5° C during the concrete placement, the following cold weather provisions shall apply:

1 Heat the surrounding concrete until warm to the touch by a method approved by the Engineer;
2. Warm the patch material; and
3. Use approximately 32° C minimum mixing water such that concrete drop temperature range of 10-24° C is achieved.

Finishing. The patching material shall be hand screeded and finished to meet the adjacent elevation, cross slopes, and texture.

Curing. Patching material shall be cured in accordance with the following cure schedule:

Ambient Temperature *(during curing time)*	Cure Time
Above 18º C to 32º C	1 hour
10º C to 18º C	2 hours
5º C to 9.9º C	3 hours

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Patch material placed under cold weather provisions, when the ambient air temperature is between 5º C to 9.9º C, shall be protected from the cold by installing insulated blankets over the patch area. Patch material cured between 27º C to 32º C shall be covered with continuously wetted burlap during the cure time specified hereinbefore. After the curing is completed, traffic may travel over the patch area.

METHOD OF MEASUREMENT:

Surface Preparation for Rapid Setting Concrete Bridge and Approach Slab Repairs. The quantity to be measured will be the number of square meters of prepared area plane to the surface of the bridge and approach slab.

Furnish and Placement of Rapid Setting Concrete Bridge and Approach Slab Repairs. The quantity to be measured shall be the number of kilograms of dry prepackage component of the rapid setting repair material incorporated into the work.

BASIS OF PAYMENT:

Surface Preparation for Rapid Setting Concrete Bridge and Approach Slab Repairs. The unit price bid per square meter shall include the cost of all labor and equipment necessary, including disposal of the removed material, to complete the surface preparation up to and including blast cleaning. Damage caused by the Contractor's operations shall be repaired at no additional cost to the State.

Furnish and Replacement of Rapid Setting Concrete Bridge and Approach Slab Repairs. The unit price bid per kilogram of dry prepackaged material shall include the cost of all labor, material and equipment necessary to complete the work including, air blasting, vacuuming, forms, and cold weather concreting provisions.

Payment will be made under:

Item No.	Item	Pay Unit
584.0709- - 11M	Surface Preparation for Rapid Setting Concrete Bridge and Approach Slab Repairs	Square Meter
584.07090111M	Furnish and Placement of Rapid Setting Concrete Bridge and Approach Slab Repairs	Kilogram