TO:

ENGINEERING INSTRUCTION

NEW YORK STATE DEPARTMENT OF TRANSPORTATION

SUPERSEDED
BY EB 01-017
EFFECTIVE 7/5/01

SUBJECT: RAPID SETTING CONCRETE PAVEMENT REPAIRS

Subject Code: 7.27-3-502

Distribution: 30 Main Office 32 Regions 34 Special

Code: EI 93-016

APPROVED: J R Lambert

J. R. Lambert, Deputy Chief Engineer
Facilities Design Division

Date: 1 JULY 1993

Supersedes:
EI 91-32

Attached and listed below are revised special specifications for Rapid Setting Concrete Repair Materials that replace similar items issued under EI 91-32.

NEW REVISED SPECIFICATIONS

Item 18502.0707 - Surface Preparation for Rapid Setting Concrete Pavement Repairs

• Item 18502.0708 - Furnish and Placement of Rapid Setting Concrete Pavement Repairs

The insert shelf note issued by EI 91-32 that modified the Basis of Acceptance of 701-09 Rapid Setting Concrete Repair Material (Normal Weather) of the Standard Specifications of January 2, 1990 has been incorporated into Addendum No. 1 adopted November 18, 1993.

DOCUMENTS RESCINDED OR SUPERSEDED

EI 91-32 - Rapid Setting Concrete Pavement Repairs

Item 18502.0705 - Surface Preparation for Rapid Setting Concrete Pavement Repairs

Item 18502.0706 - Furnish and Placement of Rapid Setting Concrete Pavement Repairs

EFFECTIVE DATE AND STATUS

This Engineering Instruction becomes effective with the letting of November 18, 1993. The revised special specifications are considered to be a Statewide Standard and are allowed for general use in the Estimate Handling System. The specifications will be inserted into proposals at PS&E by the Design Quality Assurance Bureau.

GENERAL INFO

The revisions to the specifications are intended to:

1. Help alleviate a minor problem with shrinkage cracking experienced on several recently completed contracts.

2. Simplify aggregate extension rates, bringing them closer in line with accepted field practice and maunufacturers'recommendations. This change will also help designers provide more accurate quantity estimates for the items.

3. Improve finishing and curing procedures to prolong service life.

Work performed at 35-49°F will require the Contractor to use only 721-20 RAPID SETTING POLYMER CONCRETE.

GUIDELINES AND APPLICATION

1. Use for partial depth repair of spalled or deteriorated areas of PCC pavements that are not receiving an overlay and where extended life and durability are required. Present estimates for the life of these materials is approximately 10 years. These items would not normally be used for short term solutions or pavements that cannot utilize the life extension benefits possible with these materials. Due to the high cost associated with these items, the designer should consider other alternates for large spall areas or where substantial volume of deteriorated concrete is to be removed and replaced.

2. Due to the high cost associated with repairing PCC pavements, a point is reached where other methods of repair (overlay) or pavement replacement become economically feasible. Life cycle analysis in the form of present worth costs is a sound and accepted method for comparing viable alternates on an economic basis. Pavement Rehabilitation Manual, VOLUME II, TREATMENT SELECTION, contains a method for Present Worth Life Cycle Cost Analysis that should be used when comparing pavement treatment alternatives.

3. Due to the relatively high cost of these items, designer estimated quantities for repair should be adequately developed in order to minimize contract overruns or under runs. The specifications require that patch areas should be of rectangular dimensions and approach square dimensions when feasible. Long narrow patch areas tend to develop shrinkage cracks. It is understood that long narrow patches are inevitable, particularly at joint areas. Minimum patch depth is 1" with 721-20 and 2" with 701-09.

4. The minimum aggregate extension rate for 701-09 Rapid Setting Concrete Repair Material (Normal Weather) is 60% by weight of the dry prepackaged material, which yields 0.60 cu. ft./ 50 lbs.of prepackaged material (83.3 lbs. of dry prepackaged 701-09 per cu. ft.). The minimum aggregate extension of 721-20 Rapid Setting Polymer Concrete is 75 % which yields 0.65 cu. ft./50 lbs. of dry prepackaged material (77 lbs.of dry prepackaged 721-20 per cu. ft.). Contractors will probably utilize the 701-09 material whenever ambient temperatures are 50° F or higher because material cost of 701-09 is less than that of 721-20 by approximately $0.20 to $0.25 per lb. Therefore it is recommeded that a yield of 0.60 cu. ft. per 50 lb. of prepackaged material be used to estimate quantities unless the designer anticipates a low temperature application (35° to 49° F). Bid price analysis should be utilized to develop current prices.

Questions regarding this instruction may be directed to Bruce Zeh at (518) 457-4090. Technical questions concerning the 18502.07XX specification should be directed to Mike Brinkman of the Materials Bureau at (518) 457-5956.

ITEM 18502.0707 SURFACE PREPARATION FOR RAPID SETTING CONCRETE PAVEMENT REPAIRS

ITEM 18502.0708 FURNISH AND PLACEMENT OF RAPID SETTING CONCRETE PAVEMENT REPAIRS

DESCRIPTION: This work shall consist of patching spalls, potholes, corner breaks or other surface distress in portland cement concrete pavements and joints. 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 concretes listed below where indicated on the plans or directed by the Engineer. The Contractor will have the option of using the types of repair material listed below.

MATERIALS: The materials used shall meet the requirements of the following subsections:

Coarse Aggregate (703-0204 Crushed Slag shall not be used)	703-02
Rapid Setting Concrete Repair Material (Normal Weather)	701-09
Rapid Setting Polymer Concrete	721-20
Water	712-01

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

Depth of Application	Gradation
Up to 4 inches	Type CA1 Table 501-2
4 inches and greater	Type CA2 Table 501-2

The following aggregate extension rates by weight of the dry prepackaged component of the patching material shall be used:

Patch Material Type	Type CA1 or CA2 Aggregate Extension	Estimated Yield With Aggregate Extension (cu. ft./50 lb. bag)
701-09	60-65%	0.60 - 0.62
721-20	75-80%	0.65 - 0.67

The amount of water (if required) added shall be no greater than required by the patching material manufacturer's instruction. The moisture content of the aggregate shall be determined by the Contractor. The Contractor shall adjust the patching material manufacturer's water content allowing for the aggregate moisture content. This adjustment shall be approved by the Engineer before mixing.

Aggregate used in Rapid Setting Polymer Concrete (721-20) shall contain no moisture at the time of mixing.

Manufacturers' Material Safety Data Sheets should be consulted before storing, handling or using Rapid Setting Polymer Concrete and its primers. The dry and liquid components of polymer concrete are highly flammable and extremely explosion sensitive. Protective equipment should be worn to prevent skin and eye contact. Suitable MESA/NIOSH approved respirators are required where exposure limits are exceeded.

ITEM 18502.0707 SURFACE PREPARATION FOR RAPID SETTING CONCRETE PAVEMENT REPAIRS

ITEM 18502.0708 FURNISH AND PLACEMENT OF RAPID SETTING CONCRETE PAVEMENT REPAIRS

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 2 to 3 pound hammer and the perimeter of the area to be patched will be designated by the Engineer. To minimize possible shrinkage cracking and to maximize the service life of the pavement 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 kind, and unsound concrete shall be removed from the repair area.

The Contractor has the option of using chipping hammers, a small milling machine, or high pressure water blast for concrete removal. When Rapid Setting Polymer Concrete is used, high pressure water blast is not permitted.

1. Chipping Hammers. The edges of the patch shall be chipped to produce a nearly vertical, intentionally rough sound edge. No undercutting shall be required or permitted. The floor of the patched area shall be chipped away to produce a minimum patch depth of an inch at all points within the patch if Rapid Setting Polymer Concrete is used. Patches that use 701-09 material shall be a minimum two inches deep.

   Chipping hammers that are used shall not damage the concrete that is to remain. Chipping hammers shall weigh not more than 45 pounds with the bit and muffler removed. 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 100 psi measured at the air compressor. An air pressure gauge in proper working condition shall be provided. Only sharp, 3 inch 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. The edges of the patch shall be blasted to produce a nearly vertical, intentionally rough sound edge. No undercutting shall be required or permitted. The minimum patch thickness shall be two inches in all areas of the repair. Water blasters shall have a minimum pressure of 10,000 psi when measured at the machine.

Sand blasting 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 resandblasted, followed by vacuum or air blasting before patching material placement.

Patches being filled with rapid setting polymer concrete shall be completely dry, and primed with a compatible primer recommended by the manufacturer before placing the polymer concrete.

Steel pavement mesh which is exposed in the area to be patched shall be removed and not replaced.

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 for placing the patching materials are as follows:

Ambient Temperature Range	Patching Material Type	
50 - 90° F	701-09	Rapid Setting Concrete Repair Material (Normal Weather)
35 - 90° F	721-20	Rapid Setting Polymer Concrete

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. Polymer concrete may be mixed in manufacturer supplied plastic bags or a mortar type mixer. 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 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. Aggregate used with polymer concrete shall contain no moisture. The materials shall be mixed following the manufacturer's directions.

Before placing the patching material at a pavement joint, forms shall be placed abutting the pavement edge and parallel to the joint. A straight edge shall be formed at the joint. Forms shall be flush with the vertical pavement edge. A joint space to be sealed under the appropriate item(s) shall also be provided. The forms shall be coated with a material that is compatible with the patching material but will not adhere to it. In no case shall the patching material bridge the joint opening and/or be sawed to create a joint reservoir.

ITEM 18502.0707 SURFACE PREPARATION FOR RAPID SETTING CONCRETE PAVEMENT REPAIRS

ITEM 18502.0708 FURNISH AND PLACEMENT OF RAPID SETTING CONCRETE PAVEMENT REPAIRS

The patching material, except polymer concrete, shall be placed in one lift, starting at one edge of the repair area and working to the opposite edge. Polymer concrete may be placed in lifts. All patches equal to or greater than two inches in depth shall be consolidated by internal vibration following Standard Specification 555-3.04 B. The patching material shall be hand screeded and finished to meet the adjacent elevation, cross slopes, and texture. Repairs formed with right angled edges (i.e. those at transverse, longitudinal and/or pavement shoulder joints) shall be edged with an edging tool that provides a 1/4 inch($\pm$ 1/8 inch) radius rounding of these corners. Once placed and finished, the patching material shall be cured in accordance with manufacturer's instructions. Patches shall be allowed to cure for at least one hour prior to allowing traffic to travel over the patched area.

METHOD OF MEASUREMENT:

Surface Preparation for Rapid Setting Concrete Pavement Repairs. The quantity to be measured will be the number of square feet of prepared area plane to the surface of the pavement.

Furnish and Placement of Rapid Setting Concrete Pavement Repairs. The quantity to be measured shall be the number of pounds of dry prepackaged component of the rapid setting repair material incorporated into the work.

BASIS OF PAYMENT:

Surface Preparation for Rapid Setting Concrete Pavement Repairs. The unit price bid per square foot shall include the cost of all labor and equipment necessary, including disposal of the removed material, to complete the surface preparation up to but not including sand blasting. Damage caused by the Contractor's operations shall be repaired at no additional cost to the State.

Furnish and Placement of Rapid Setting Concrete Pavement Repairs. The unit price bid per pound of dry prepackaged material shall include the cost of all labor, material and equipment necessary to complete the work including sandblasting, air blasting, vacuuming, primer and forms.

Payment will be made under:

Item No.	Item	Pay Unit
18502.0707	Surface Preparation for Rapid Setting Concrete Pavement Repairs	Square Foot
18502.0708	Furnish and Placement of Rapid Setting Concrete Pavement Repairs	Pound

6/29/93