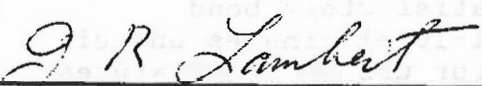


TO: SUPERSEDED BY EI 93-016 EFFECTIVE 11/18/93	ENGINEERING INSTRUCTION NEW YORK STATE DEPARTMENT OF TRANSPORTATION	
	SUBJECT: RAPID SETTING CONCRETE PAVEMENT REPAIRS Subject Code: 7.27-3-502	
Distribution:	30 Main Office 32 Regions 34 Special	Code: <u> EI 91-32 </u> Date: <u> Dec. 23, 1991 </u> Supersedes: EI 87-18
APPROVED:  <u>J. R. LAMBERT, Deputy Chief Engr., Fac. Design Div.</u>		

Attached and listed below are revised special specifications for Rapid Setting Concrete Repair Materials that replace similar items issued under EI 87-18.

NEW REVISED SPECIFICATIONS

Item 18502.0705 - Surface Preparation for Rapid Setting Concrete Pavement Repairs

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

Also attached is a proposal insert shelf note that modifies the Basis of Acceptance of 701-09 Rapid Setting Concrete Repair Material (Normal Weather) of the Standard Specifications of January 2, 1990..

DOCUMENTS RESCINDED OR SUPERSEDED

EI 87-18 - Rapid Setting Concrete Pavement Repairs

Item 18502.0701 - Surface Preparation for Rapid Setting Concrete Pavement Repairs

Item 18502.0702 - Furnish and Placement of Rapid Setting Concrete Pavement Repairs

701-10 - Rapid Setting Concrete Repair Material (Cold Weather)

EFFECTIVE DATE AND STATUS

This Engineering Instruction becomes effective with the letting of June 18, 1992. The revised special specifications are considered to be a Statewide Standard and are allowed for general use in the Estimate Handling System. The specifications and shelf note will be inserted into proposals at PS&E by the Design Quality Assurance Bureau.

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GENERAL INFO

The specification revisions include deletion of all references to Materials Specification 701-10 RAPID SETTING CONCRETE REPAIR MATERIAL (Cold Weather). Materials specification 701-10 has been withdrawn due to manufacturers' inability to provide satisfactory bond strengths at 35 F. Elimination of 701-10 eliminates one of the two materials previously allowed for use at temperatures down to 35 F. Work performed at 35-49 F will now use only 721-20 RAPID SETTING POLYMER CONCRETE.

This Engineering Instruction also deletes the requirements for Economic Justification as stated in superseded EI 87-18 and provides more generalized recommendations to the designer in regard to economic comparison of viable alternatives.

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. The 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, currently distributed to the Regions in draft form and to be published in the near future, contains a methodology for Present Worth Life Cycle Cost Analysis that should be used when comparing pavement treatment alternatives. NCHRP Synthesis 122 Life-Cycle Cost Analysis of Pavements is an excellent reference for anyone wishing to learn about or brush up on life cycle concepts and methods.
3. The Designer should be confident of the quantities estimated for repair because these items are expensive and overruns may drastically affect contract costs.

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4. It is estimated the cost of surface preparation (Item 18502.0705) will range from \$20.00 to \$35.00/sf depending on project quantities and conditions.
5. The cost of Rapid Setting Concrete Repair Material (701-09) in place (Item 18502.0706) is estimated to range from \$100 to \$150/cu. ft. depending on project conditions and quantities. This is based on utilizing a 60% extension rate with aggregate. \$100-\$150/cu. ft. translates into a bid price of approximately \$1.20-1.80 per lb. of premixed bagged material.
6. The cost of Rapid Setting Polymer Concrete (721-20) in place (Item 18502.0706) is believed to be more expensive than the 701-09 material; however a contractor may find it more economical for small repairs that are widely spaced due to simplified mixing requirements (can be mixed in suppliers' plastic bags).
7. The following chart depicting material yield should be of assistance to designers when estimating quantities.

PATCHING MATERIAL YIELD WITH AGGREGATE EXTENSION

MATERIAL

701-09	50 lbs. + 60% aggregate ext. = 0.60 cu. ft.
	50 lbs. + 75% aggregate ext. = 0.67 cu. ft.
721-20	50 lbs. + 75% aggregate ext. = 0.65 cu. ft.
	50 lbs. + 85% aggregate ext. = 0.68 cu. ft.
	50 lbs. +100% aggregate ext. = 0.72 cu. ft.

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

RAPID SETTING CONCRETE REPAIR MATERIAL

Make the following changes to the Standard Specifications of January 2, 1990.

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Under 701-09 RAPID SETTING CONCRETE REPAIR MATERIAL (Normal Weather), delete the Basis of Acceptance in its entirety and replace with the following:

BASIS OF ACCEPTANCE: Application for material approval shall be submitted to the Materials Bureau, by the manufacturer. The application shall be accompanied by a 50 pound sample of the product. Upon approval, the name, and manufacturer, of the product will be placed on the Department's approved list. Products so listed will be accepted at the work site on the basis of the brand name labeled on the container. The manufacturer is required to print the date of manufacture on the container in the following format 'month, year'. Inclusion of the day of manufacture in the date is optional. The expiration date of acceptance for this material shall be one calendar year from the date of manufacture or as stated in the Approved List, whichever is less. If in the opinion of the Engineer the material is determined to be unsuitable for Department work, the material will be rejected.

- ITEM 18502.0705 SURFACE PREPARATION FOR RAPID SETTING CONCRETE PAVEMENT REPAIRS
- ITEM 18502.0706 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 existing patching material and 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:

<u>Depth of Application</u>	<u>Gradation</u>
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 component of the patching material shall be used:

<u>Patch Material Type</u>	<u>Type CA1 or CA2 Crushed Aggregate</u>	<u>Type CA1 or CA2 Uncrushed Aggregate</u>
701-09	60-65%	75-80%
721-20	75-80%(Type CA1) 100-105%(Type CA2)	85-90%(Type CA1) 100-105%(Type CA2)

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 be completely dry at the time of mixing.

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Rapid Setting Polymer Concrete is flammable. Safety precautions should be taken to prevent fire and explosion. Protective equipment should be worn to prevent skin contact.

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 will be sounded with a 16 oz. hammer and the perimeter of the area to be patched will be designated by the Engineer. 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 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.

2. Milling Machine. 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.

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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 any 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 approved screening 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 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:

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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 be completely dry. 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.

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 Specifications 555-3.04 B "Vibrating" to minimize the possibility of voids in the patch. The patching material shall be hand screeded and finished to meet the adjacent elevation, cross slopes, and texture. Once placed, no curing procedure is required for any type of patching material; however it shall be allowed to air dry 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.

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Furnish and Placement of Rapid Setting Concrete Pavement Repairs.
 The quantity to be measured shall be the number of pounds of dry premixed 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.

Furnish and Placement of Rapid Setting Concrete Pavement Repairs. The unit price bid per pound of dry premixed 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
18502.0705	Surface Preparation for Rapid Setting Concrete Pavement Repairs	Square Foot
18502.0706	Furnish and Placement of Rapid Setting Concrete Pavement Repairs	Pound