ITEM 18502.0601 M - Thin Portland Cement Concrete (PCC) Overlay of Hot Mix Asphalt (HMA) Surfaced Pavement, Unprofilographed.
ITEM 18502.0602 M - Thin Portland Cement Concrete (PCC) Overlay of Hot Mix Asphalt (HMA) Surfaced Pavement, Unprofilographed, High Early Strength Mix.
ITEM 18502.0603 M - Thin Portland Cement Concrete (PCC) Overlay of Hot Mix Asphalt (HMA) Surfaced Pavement, Profilographed.
ITEM 18502.0604 M - Smoothness Quality Adjustment.
ITEM 18502.0605 M - Thin Portland Cement Concrete (PCC) Overlay of Hot Mix Asphalt (HMA) Surfaced Pavement, Profilographed, High Early Strength Mix.
ITEM 18502.0606 M - Smoothness Quality Adjustment, High Early Strength Mix.

DESCRIPTION: Construct a thin (50 - 150 mm), fiber-reinforced, PCC wearing surface atop a prepared HMA surfaced pavement.

MATERIALS:

Portland cement concrete	501
Non-chloride accelerator admixture	Approved List
Membrane curing compound	711-05

- Use only neutralized vinsol resin based air entraining agents.
- Water reducer, if used, must be Type A (Normal).
- Type III cement may be used in fresh water and low sulfate soil areas.
- Use 100 percent virgin polypropylene, fibrillated, multi-designed graded fibers, containing no reprocessed olefin material, specifically engineered and manufactured for use as secondary concrete reinforcement, such as FiberMesh, or approved equal as determined by the Director, Materials Bureau, to produce fiber-reinforced concrete.

Add 1.80 kilograms of fiber per cubic meter of concrete. Add fibers in whole bag increments during batching. Use batch-specific bags or batch the appropriate volume of concrete such that only whole commercially available bags are used. Mix the fiber into the concrete in accordance with the fiber manufacturer's recommendations.

Concrete. Use concrete furnished in accordance with Section 501, Portland Cement Concrete - General, except as modified herein. The Engineer will perform control test series in accordance with Department procedures, except the testing rate is one test set per 30 m^3 of concrete placed. For placements 75 mm thick or greater, use Class C, Class D, or Class F concrete. For placements less than 75 mm thick, use Class D concrete.

High Early Strength (HES) Concrete. The contract documents may require the use of a HES concrete. Develop the HES mix to satisfy the opening to traffic time requirements of the project. HES concrete may also be requested for use by the Contractor. Whether required or requested, submit the HES concrete mix design to the Engineer and the Director, Materials Bureau. Include admixture brands and dosages as well as mixing, transporting, placing, paving, curing, and anticipated strength gain details. Any HES concrete use is subject to the approval of the Engineer.

Produce and place a trial batch in accordance with the written directives of the Materials Bureau at an off-project location approved by the Engineer. Produce the trial batch using the same materials and processes as those to be used to produce the project concrete. Coordinate trial batch production to ensure the presence of the Engineer, Regional Materials Engineer, and the Materials Bureau.

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Provide an ACI Certified Concrete Field Testing Technician, Grade I, or higher, to (1) measure slump, air content, and unit weight and (2) cast cylinders for compressive strength and freeze-thaw resistance testing. Determine the compressive strength of the trial batch concrete at the desired time as discussed below in Project Strength Determination.

The Materials Bureau will render a decision on mix acceptability, curing requirements, and opening to traffic requirements. The decision will be made within 30 days of trial batch production. The mix must meet the requirements of Table 1, High Early Strength Concrete Mix Requirements.

TABLE 1
HIGH EARLY STRENGTH CONCRETE MIX REQUIREMENTS

Property	Minimum	Desired	Maximum
28 Day Compressive Strength	26.0 MPa	-	-
Opening Compressive Strength	17.0 MPa	-	-
Plastic Air Content	5.0 %	6.5 %	8.0 %
Hardened Air Content	5.0 %	6.5 %	8.0 %
Water - Cement Ratio	-	-	0.44
Slump*	25 mm	-	150 mm

* Minimum slump provided the mix consolidates and finishes properly. Maximum slump provided the mix is non-segregating.

Changes other than minor fluctuations in admixture dosage rates require a new mix design and trial batch. The Engineer may halt paving and order additional trial batches whenever the specified properties are not achieved.

Equipment. Bring all equipment needed to place, consolidate, finish, cure, texture, saw cut and test the PCC to the job site a minimum of 24 business hours before its use to allow thorough examination by the Engineer. A business hour is any hour, Monday through Friday, excluding New York State recognized holidays. Repair or replace any equipment found to be defective before or during its use to the Engineer's satisfaction. Discontinue any operation if unsatisfactory results are being obtained, as determined by the Engineer.

1. Pavers. Manual, vibrator equipped, power screeds appearing on the Department's Approved List may be used, as well as slip form or conventional fixed form paving equipment detailed in §502, Portland Cement Concrete Pavement.

2. Vibrators. Use internal vibrators capable of providing thoroughly consolidated, honeycomb-free concrete. Internal vibrators must operate within a frequency range of 6000 - 9000 vibrations per minute. Vibrators may be hand-held or attached to slip form or fixed form paving equipment.

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3. Curing Compound Applicators. Use atomizing mechanical sprayers capable of exerting consistent pressure without hand pumping. The applicators must be equipped with tank agitators to continuously mix the curing compound. Use nozzles with spray shields to prevent drift. Flush nozzles daily before use. Keep an adequate supply of spare nozzles on hand.

4. Saw Cutting Equipment. Use early entry diamond blade saws (such as a Soff Cut saw or approved equal as determined by the Director, Materials Bureau) with guides that are capable of making straight cuts as described below in “Joints”. Maintain an adequate supply of saws, new blades, and other parts at the site during saw cutting to ensure uninterrupted operation.

5. Profilograph. For projects with profilograph smoothness requirements, use an automated California-type profilograph meeting the written requirements of the Materials Bureau. The profilograph must be capable of producing and analyzing a profile trace in accordance with those instructions. The automation must be capable of reporting profile indices in mm/km using a 5 mm (0.2 in.) blanking band, in mm/km using a zero blanking band, and in the International Roughness Index (IRI). Provide the means to transport the profilograph as required by the Engineer.

6. Diamond Grinding. Use equipment having gang mounted diamond saw blades on a multi-blade arbor specifically designed for pavement bump cutting or production grinding. Production grinding equipment must be capable of producing a 900 mm (minimum) grinding pass width and must be equipped with a vacuum system capable of removing slurry from the pavement surface (such as the Target 3800 or Target 3804, or equal as approved by the Director, Materials Bureau).

Use of other equipment is subject to the approval of the Director, Materials Bureau.

CONSTRUCTION DETAILS: Apply the requirements of §502-3, Construction Requirements, except as modified herein. The Engineer will convene a pre-paving meeting seven to fourteen days before the planned start of paving with inspection personnel, the Contractor, and any PCC paving and saw cutting subcontractors to coordinate all aspects of paving and inspection, including equipment review, construction methods, and time and personnel requirements.

Existing HMA Surface Preparation. Cold mill the pavement surface to be overlaid to the line, grade, and cross section shown on the contract documents in accordance with §490, Cold Milling. Power wash the milled surface within 4 hours of milling such that no slurry or residue builds up on the milled surface. Sand blast clean any milled surface where residue does build up, as determined by the Engineer. Air blast the surface immediately before paving to remove all debris and standing water. Provide a clean and dry prepared surface immediately before paving. If construction traffic is allowed on the prepared surface, completely cover the surface

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such that it is not contaminated prior to paving. Use plastic sheeting of sufficient thickness to withstand traffic without tearing.

Remove additional HMA as required to accommodate form installation or to provide a thickened transverse edge adjacent to existing pavement to remain in place as depicted in Detail 1, Transition from PCC Overlay to Existing Pavement, or Detail 2, Thickened Edge Transverse Joints at Intersections.

Setting Forms. Clean and oil forms, if used, before use. Set forms to accommodate a full days paving before placing any concrete. Securely anchor the forms such that they do not move during placement and paving. Check the alignment and grade of the forms before paving. Remove and replace any damaged or unstable form to the Engineer's satisfaction.

Placing and Spreading Concrete. Place PCC between April 1 and October 15, provided the requirements of §502-3.01, Weather Limitations, are satisfied. Determine the temperature of the prepared surface. If the temperature exceeds 38_C, apply a fine water mist such that the surface temperature drops below 38_C, but no standing water remains. Remove standing water by air blasting.

Deposit concrete as near to final position as possible. Finish the concrete with a continuous forward movement of the equipment such that a smooth, homogeneous, well consolidated pavement results with a minimum of hand finishing. Thoroughly consolidate the entire placement. Use hand-held vibrators if vibrators are not attached to the paving equipment or in any placement thicker than 100 mm when a manual, vibrator equipped, power screed is used, including thickened edges. Stop vibrating if the forward movement of the paving equipment stops. If concrete has been deposited on the prepared surface for 30 minutes without finishing, remove it and construct an undowelled transverse construction joint at the end of the finished concrete.

Prior to placing PCC adjacent to a previous PCC placement, thoroughly sand blast the vertical surface of the previous placement to achieve a clean, uniformly roughened surface, free of dirt, curing compound, HMA, or other contaminants.

Texturing. Immediately after finishing and prior to curing, texture the PCC surface with a set of irregularly spaced steel spring tines perpendicular to the pavement center line. Use rectangular tines 3 mm wide, 0.7 mm thick, approximately 125 mm long with the following spacing:

16/25/22/16/32/19/25/25/25/25/19/22/25/22/10/25/25/25/25/32/38/22/25/22/25.

Produce tine texture 3 - 4 mm deep with minimal aggregate dislodging, as determined by the Engineer. Operate the tine head manually or mechanically. In either case, hold the tines as near an angle of 45_ with the PCC surface as possible to minimize mortar dragging. Keep the tines free of hardened concrete.

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Curing. Use white pigmented membrane curing compound. Thoroughly and uniformly coat all exposed PCC horizontal and vertical surfaces. Thoroughly mix the curing compound before each use and continuously agitate during use. Use a minimum application rate of 3.5 m^2/l. Apply the curing compound in two passes, one forward, one backward, with no longer than 15 minutes between passes. Immediately reapply curing compound to any damaged coating areas, including damage resulting from saw cutting joints. Do not apply curing compound in the rain. If rain damages the curing compound, reapply after the standing water leaves the pavement surface. Where directed by the Engineer, sand blast the PCC to remove residual curing compound or other contaminants prior to placing permanent pavement markings.

Joints. Saw cut joints as soon as the PCC has developed sufficient strength to be cut without raveling or chipping and before uncontrolled cracking occurs. Saw cut the PCC longitudinally and transversely into square slabs dimensioned in accordance with Table 2, Slab Dimensions. Make longitudinal saw cuts parallel to the pavement centerline and transverse saw cuts perpendicular to the longitudinal cuts. If a placement can not be evenly cut into whole squares, ensure that the rectangular (or irregular) slabs are at the outside project limits. In any case, make the longer slab dimension no more than 1.5 times the shorter dimension. Make saw cuts one-quarter of the placement thickness deep and 3 - 5 mm wide. Do not saw cut joints between adjacent placements.

TABLE 2
SLAB DIMENSIONS

PCC Thickness	Slab Dimension (Maximum)
50 mm	600 mm
75 mm	900 mm
100 - 150 mm	1.2 m

Form Removal. Remove forms, if used, after the concrete has developed sufficient strength to allow removal without damaging the concrete. Repair concrete damaged during form removal as directed by the Engineer. Remove forms before saw cutting joints or saw cut into the forms as needed to provide joints of the proper depth across the full-width of the placement. Apply curing compound to the exposed vertical faces resulting from form removal unless PCC will be immediately placed against the face.

Tack coat all faces of the void resulting from form removal and patch it immediately after the PCC has achieved a compressive strength of 17 MPa, as discussed below in Project Strength Determination. Use Asphalt Concrete - Truing and Leveling Course in a manner approved by the Engineer. Base course is not allowed in this location.

Surface Test (Non-Profilographed Projects). After the concrete has hardened sufficiently, test the entire longitudinal center of each travel lane with a 3 m (minimum) long straight edge laid longitudinally. Test in the presence of the Engineer. The Engineer will mark high and low

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deviations in the pavement surface exceeding 3 mm in 3 m. Diamond grind these areas such that the deviations do not exceed 3 mm in 3 m when retested with the straight edge.

Profilograph (Profilographed Projects). Provide traffic control and survey stationing for referencing measurements. The Engineer will divide the PCC surface into 160 m long reporting segments. The Engineer may group segments shorter than 160 m with previous or subsequent placements. The reporting segment width is the placement width. The minimum profilographed segment length is 100 m.

Develop a profile trace and determine an initial profile index (PI) for each travel lane of each reporting segment. Obtain the trace along the longitudinal center of the travel lane in accordance with the written requirements of the Materials Bureau. Provide the traces and initial PIs to the Engineer. Develop a referencing system that allows the Engineer to readily associate a trace and an initial PI to the actual corresponding reporting segment travel lane.

The Engineer will identify bumps exceeding 10 mm in 7.6 m on each profile trace. Locate and diamond grind these bumps, if any, to 10 mm or less in 7.6 m. If no grinding was required for a given reporting segment, the initial PI may be used as the final PI for determining the payable Quality Units of Smoothness Quality Adjustment per reporting segment as discussed in Basis of Payment.

Diamond grinding up to 10% of any reporting segment's surface area is allowed to increase the amount of Quality Units payable. This 10% includes areas ground to remove bumps exceeding 10 mm in 7.6 m. Whether diamond grinding was required through profile trace analysis, or optionally performed, re-profilograph the reporting segment and determine a final PI for each travel lane. Provide the Engineer the final profile traces and the final PI (determined by using both the 5 mm (0.2 in.) and zero blanking bands) and the corresponding IRI.

The Engineer will report the final PI and payable Quality Units, if any, for each segment as discussed in Basis of Payment. No Quality Units will be paid for a reporting segment if more than 10% of the segment's surface area was diamond ground to achieve the minimum acceptable PI. If more than 20% of a reporting segment's surface area was diamond ground to achieve the minimum acceptable PI, production grind the entire segment to achieve the minimum PI for the segment. Diamond grinding area is the maximum length of a ground area multiplied by the maximum width of the ground area.

Production Diamond Grinding (Profilographed Projects). Grind the pavement longitudinally, beginning and ending at lines normal to the pavement centerline. The finished surface must be at least 95% diamond ground. After grinding, the PCC pavement across a joint or crack must be in the same plane when measured with a 1.0 m (minimum) straightedge. Provide surface drainage by maintaining the proper cross slope on the finished surface and by blending adjacent passes. Re-grind the pavement if an acceptable surface is not being obtained, as determined by the Engineer.

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If required in the contract documents, continuously remove the slurry from the pavement using the vacuum system on the grinding equipment. Transfer the slurry into equipment capable of transporting it from the job site without spills. Dispose of the slurry in conformance with all applicable Federal, State, or local regulations. Do not allow the slurry into occupied travel lanes or drainage structures.

Opening to Traffic. Open Class C and F concrete to traffic in accordance with §502, PCC Pavement. Open Class D concrete in accordance with the Class C opening requirements. With the Engineer's approval, these time frames may be reduced to the time required for the concrete to achieve a compressive strength of 17 MPa. Determine concrete compressive strength as discussed below in Project Strength Determination.

Project Strength Determination. This section applies to HES concrete mixes and reduced opening to traffic time frames for Class C, D, or F concrete as discussed above in Opening to Traffic. Provide an ACI Certified Concrete Field Testing Technician, Grade I, or higher, to cast all cylinders. Unless otherwise noted in the contract documents, provide a testing facility either accredited by the AASHTO Accreditation Program (AAP) in the field of construction materials testing of PCC or approved by the Regional Materials Engineer to perform concrete compressive strength testing. Cast and test cylinders in the presence of the Engineer or the Regional Materials Engineer and to the Engineer's satisfaction. Provide acceptable proof of ACI Certification and AASHTO Accreditation to the Engineer before placing any concrete. The Engineer will complete the Concrete Cylinder Report as cylinders are cast and tested.

Cast a minimum of three cylinder pairs (six total) from each days placement in accordance with the written requirements of the Materials Bureau. Cast each pair from different delivery trucks. Develop an Engineer approved marking system that readily associates a cylinder to the corresponding placement location and time. Mark the cylinders and place them adjacent to the pavement under similar curing conditions. Determine the concrete compressive strength at the desired time in accordance with the written requirements of the Materials Bureau. The concrete may be opened to traffic if:

- the average compressive strength of the cylinder pairs exceed 17 MPa,
- the average compressive strength of each cylinder pair exceeds 14 MPa, and
- the appropriate time frame has elapsed for the entire area to be opened.

If these conditions are not met, retest three additional cylinder pairs at a later time, provided the appropriate number of additional cylinders were cast. If the above conditions are not met after retests, or, if the required number of additional cylinders were not cast, open the pavement to traffic five days after placement.

Project testing of 28 day compressive strength is not required. If subsequent trial batches are required, the Engineer may waive the 28 day compressive strength testing.

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METHOD OF MEASUREMENT: The Engineer will compute cubic meters from the payment lines shown on the plans and linear measurements made longitudinally and transversely on the finished pavement surface, except where revised payment lines are established by the Engineer prior to paving. No deductions will be made for catch basins, manholes, or other similar pavement obstructions.

BASIS OF PAYMENT: In the unit bid price, include the cost of all materials, equipment, and labor necessary to clean the milled surface and place, spread, consolidate, finish, texture, cure, saw cut, profilograph (if required), and diamond grind (if required) the PCC.

No additional payment will be made for Contractor requested HES concrete use. No payment will be made for the materials used in the HES concrete trial batch or the trial HES concrete placement itself. Payment for cold milling, saw cutting HMA pavement at the transition from PCC overlay to existing HMA, and tack coat and HMA placement associated with form removal will be made under separate items.

For profilographed projects, make the unit bid price of the Smoothness Quality Adjustment equal to the unit bid price of the PCC overlay.

On projects with profilograph smoothness requirements, the Engineer will determine the Quality Units of Smoothness Quality Adjustment, if any, payable for each reporting segment. Use the appropriate Smoothness Adjustment Factor (SAF) from Table 3, Smoothness Adjustment Factors, based on the final PI obtained for each reporting segment. Quality Units for a reporting segment is given by the following:

Quality Units (Per Segment) = (SAF - 1.00) x PCC Cubic Meters (Per Segment)

Up to 10% of the reporting segment surface area may be diamond ground to receive the smoothness adjustment. No smoothness adjustment will be paid if more than 10% of the surface is diamond ground.

TABLE 3
SMOOTHNESS ADJUSTMENT FACTORS

Final Profile Index (mm\km)	SAF
0 - 40	1.05
41 - 80	1.04
81 - 120	1.03
121 - 160	1.02
161 - 180	1.01
180 - 200	1.00
200 +	Grind

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Payment will be made under:

Item #	**Item**	**Pay Unit**
18502.0601M	Thin PCC Overlay of HMA Surfaced Pavement, Unprofilographed.	Cubic Meter
18502.0602 M	Thin PCC Overlay of HMA Surfaced Pavement, Unprofilographed, High Early Strength Mix.	Cubic Meter
18502.0603 M	Thin PCC Overlay of HMA Surfaced Pavement, Profilographed.	Cubic Meter
18502.0604 M	Smoothness Quality Adjustment.	Quality Unit
18502.0605 M	Thin PCC Overlay of HMA Surfaced Pavement, Profilographed, High Early Strength Mix.	Cubic Meter
18502.0606 M	Smoothness Quality Adjustment, High Early Strength Mix.	Quality Unit

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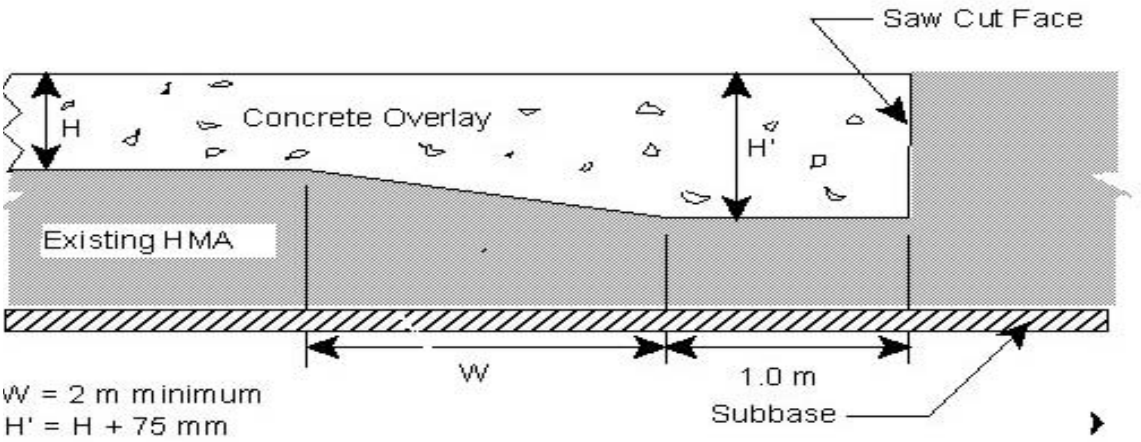
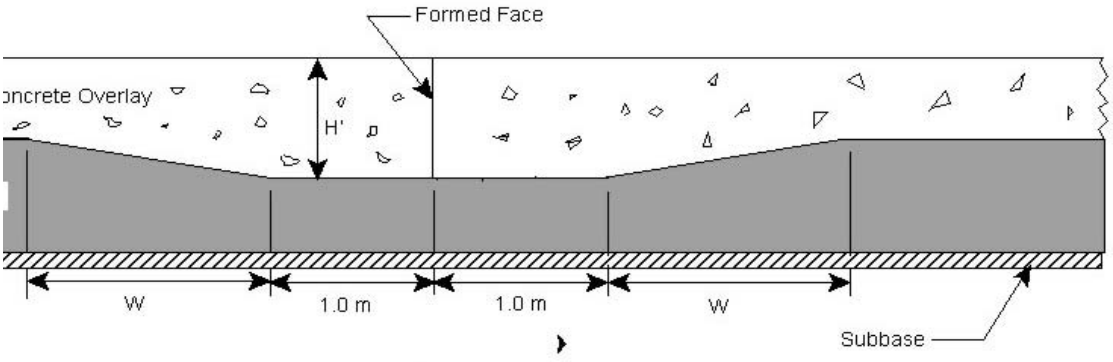


Detail 1

Transition from PCC Overlay to Existing Pavement



Detail 2

Thickened Edge Transverse Joints at Intersections