

1. DESCRIPTION:

- 1.01 The work shall consist of furnishing and installing reinforced pre-cast highway pavement slabs (Super-Slab®) as shown on the plans and in accordance with this specification. The work shall include sawcutting and removal of existing composite pavement, fine grading (supergrading), placement of slabs, installing dowel grout in inverted dovetail slots, and installing bedding grout under the slabs all in accordance with this specification.
- 1.02 The Contract shall take pavement cores in traffic lanes as ordered by the Engineer prior to the design of the pre-cast highway pavement slabs in order to verify existing pavement conditions.

2. MATERIALS :

- 2.01 The pre-cast concrete pavement slabs shall be in accordance with Section 704-03 with the following exceptions:
 - a. Coarse aggregate shall be sandstone, granite, chert, basaltic traprock, ore tailings, slag, or other similar non-carbonate materials. Non carbonate particles are defined as those having a minimum acid insoluble residue content of 80%.
 - b. The minimum compressive strength shall be 27.5 MPa at 28 days.
- 2.02 Working drawings shall be prepared as required in Section 704-03 and shall specifically include the following:
 - a. Slab layout drawing that shows the location of slabs appropriately mark numbered
 - b. Reinforcing size and position
 - c. Detailed piece drawings showing the locations and sizes of dowels, tie bars, inverted dovetail slots and all three dimensional geometry related to widths, lengths and warps of each slab
 - d. Production note sheet showing the source of materials, testing methods, weights of each slab, tolerances and all details relating to yard storage, shipping and handling
 - e. Texture of the top surface of the slabs
- 2.03 5% of the Portland Cement, by weight, in the precast slab shall be replaced with microsilica pozzolan.
- 2.03 All reinforcement shall be galvanized in accordance with ASTM A515M-96 GRADE 400.
- 2.04 The Contractor is advised that the Super-Slab® System is proprietary to The Fort Miller Co., Inc. of Schuylerville, NY (518) 695-5000.
- 2.05 The bedding material shall be crusher run limestone (stone dust) meeting the following gradation: All materials furnished shall be well graded and free from unsuitable materials. All processing shall be completed at the source.

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2. MATERIALS : (cont'd)

2.05 (cont'd)

A. Gradation

<u>Sieve Size Designation</u>	<u>Percent Passing by Weight</u>
1/2" max.	100
No. 4	80-100
No. 10	55-75
No. 40	10-40
No. 200	0-20

2.06 Load Transfer Devices, shall be supplied from the Approved List for Transverse Joint Supports. Each load transfer device shall consist of one epoxy coated dowel. The dowel element shall meet the requirements for dowel bars detailed in Section 705-15, Transverse Joint Supports. The "Basis of Acceptance" portions of Section 705-15 shall not apply. Certifications from the supplier shall be submitted indicating the dowel elements meet the "Tests" requirements of Section 705-15 and from the rolling mill as to the type and grade of steel used.

2.07 Grouting material for the transverse dowels and longitudinal tie bar slots shall be Dayton Superior's HD-50, HD-50 EPS, or Pre-Blend's Pre-cast Slab Dowel Grout. The final mix must be capable of being pumped into the slots and attain a minimum compressive strength of 17 MPa and meet the Pull-out Strength requirements of Section 701-05 of the NYS Standard Specifications before the slabs are opened to traffic. The prepackaged material shall be mixed and used in strict accordance with the manufacturer's instruction for use in Super-Slab®.

Fourteen (14) days prior to installation of the pre-cast pavement, mix a minimum of one trial batch of the dowel grout in strict accordance with the manufacturer's recommendations under the same time and temperature conditions expected during actual installation. The trial batch shall be a demonstration to the Engineer that required compressive strength and Pull-out Strength requirements of Section 701-05 of the NYS Standard Specifications can be achieved. The recipe used during the trial will become the recipe used during actual installation.

2.08 Grout material for bedding shall be a mixture of cement, water, Master Builder's Flowcable admixture and accelerator as required to attain a flow rate of 30 seconds in a standard ASTM C939 flow cone. Bedding grout material shall be designed, mixed and used in strict accordance with the instructions provided by the manufacturer of the Flowcable admixture and must be capable of attaining a compressive strength of 2 MPa before the slabs are opened to traffic. A mix design and pump equipment to be used shall be submitted to the Engineer for approval. Test cylinders may be required for proof of compressive strength.

Fourteen (14) days prior to installation of the pre-cast pavement, mix a minimum of one (1) trial batch of the bedding grout in strict accordance with the recommendations of the manufacturer of the bedding grout admixture under the same time and temperature conditions expected during actual installation. The trial batch shall be a demonstration to the Engineer that required flowability and compressive strength can be achieved. The recipe used during the trial will become the recipe used during actual installation.

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2.09 The foam gasket material shall be open cell two (2) pound polyester meeting the requirements of ASTM D3574 capable of being fully compressed under the weight of the slab.

2. MATERIALS : (cont'd)

2.10 Bond Breaker used to coat load transfer dowels shall be oil or paraffin based material

2.11 Mechanical Connectors used for splicing tie bars shall appear on the Approved List for Mechanical Connectors for Reinforcing Bar Splices, 709-10

3. CONSTRUCTION DETAILS :

3.01 Fabrication:

- A. Fabrication of the panels shall be in accordance with Section 704.03 of the General Specifications with the only exception being under Curing. Specifically, Membrane Curing Compounds shall not be allowed. Layout and shop drawings shall be required.
- B. The concrete pavement shall be cast in panels of the length and width shown on the plans.
- C. The bottom surface shall be smooth; the top surface shall be finished in accordance with the details shown on the Contract Plans or as approved by the Engineer.
- D. Load transfer dowels shall be cast in the slab at transverse joint ends as shown on the Contract Plans and as shown on Standard Sheet M502-15. Cast the dowels square to the transverse end and parallel to the top surface of the slab within ± 3 mm of the locations shown on the drawings.
- E. Tie bars shall be cast in the longitudinal edge of the slab as shown on the Plans and Standard Sheets M502-13. Cast one half of the tie bar in the slab such that the other end can be screwed into it in the field. Cast the tie bars square to the longitudinal edge and parallel to the top surface of the slab within ± 3 mm of the locations shown on the plans.
- F. Inverted dovetailed slots for the transverse dowels and longitudinal tie bars shall be cast in the panels to accommodate dowels and tie bars as shown on the plans square to the edge of the slab to within ± 3 mm.
- G. The lifting devices shall be designed to lift the panels from the topside. Each lifting device in the panel shall be recessed a minimum of 25mm below the surface.
- H. The portion of the dowels cast into the pre-cast slab shall be coated with bond breaker.
- I. Each slab shall have a 25mm thick by 25mm wide foam gasket attached to the underside edge of the slab to prevent grout leakage and to create discrete grout chambers between corresponding ports. The purpose of this is to provide for positive placement of grout in each chamber while minimizing upward pressure on the slab during placement. The location of all gaskets shall be clearly shown on the slab shop drawings.
- J. The slabs shall be cast to the following tolerances:

Length	± 4 mm
Width	± 4 mm

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Thickness	± 3mm
Difference in diagonals	not to exceed 4mm
Edge Squareness	2mm in 250mm (in relation to top and bottom surfaces)

3. CONSTRUCTION DETAILS: (cont'd)

3.02 **PRE-PLACEMENT MEETING**: A pre-placement meeting shall be held 10 to 14 calendar days before the planned start of slab installation with the Engineer, inspection personnel, project superintendent, project foreman, project surveyor, grout installers, the technical representative of the Super-Slab® System, pre-cast panel fabricator, and any other subcontractor who will be involved in the pre-cast pavement construction work.

The Contractor shall provide a facility for the meeting as agreed upon by the Engineer and the Contractor. The Engineer shall conduct the meeting. The technical representative of the Super-Slab® System shall provide training on the installation and inspection techniques and requirements of the Super-Slab® System.

3.03 **INSTALLATION PLAN**: A detailed installation plan shall be prepared by the Contractor and presented to the Engineer, or his assigned representative and the Technical Representative of the Super-Slab® System at least 10 days prior to the planned start of slab installation. The plan shall indicate, as a minimum, following information as required to meet the requirements of this Specification:

- a) Size and location of the placement crane
- b) Rigging to be used for lifting the slabs
- c) Routes to be used by the delivery trucks
- d) Plans for maintenance and protection of traffic
- e) Proposed method and equipment used for fine grading
- f) Materials proposed for dowel and bedding grout
- g) Grout mix designs to be used for each grout
- h) Equipment to be used for mixing and installing the grouts

3.04 **INSTALLATION PROCESS**. The installation of the panels shall include a.) surveying and/or engineering as required to establish finish grade and location of slabs, b.) subbase preparation, c.) placement, fine grading, compaction and final fine grading of a truing and leveling (T&L) course of bedding material, d.) placement of the precast slabs, e.) installing dowel and tie bar grout and f.) placement of bedding grout under the slab.

A. **Surveying and Engineering**. Before any slabs are fabricated and before existing pavement is removed, the Contractor shall determine the theoretical surface elevations and dimensional sizes of the new slabs. The new slabs shall be fabricated and be placed in accordance with the surface elevations shown or calculated from profile grade information shown on the contract drawings. If this information is not available, elevations of the existing abutting pavement to remain shall be taken and analyzed as required to establish the surface elevations of the new slabs. The Contractor shall use these elevations for fabrication of the new slabs and for the fine grading operation. The fine graded subgrade surface is the grade control for the new slabs.

B. **Subbase Preparation**. The existing subbase shall not be disturbed except to remove (if necessary) existing material to a required surface 6mm to 12mm below the theoretical bottom of the new concrete slab. The fine grade of the existing subbase shall meet the requirements of Section 304-3.

3. CONSTRUCTION DETAILS: (cont'd)**3.04 INSTALLATION PROCESS: (cont'd)**

- C. **Placement and Fine Grading Of T&L Bedding Material.** All fine grading of the bedding material shall be accomplished using a laser or otherwise mechanically-controlled screeding device. The screeding device shall be capable of grading fully compacted bedding material and of being adjusted to the required cross slope and to the required profile of each pavement slab. Other grading devices and methods may be used provided the Contractor demonstrates they are capable of grading fully compacted bedding material to the required tolerance. Hand grading under string lines shall not be permitted.

It is the intent to provide a pavement slab bed that serves as the grade control for the slabs placed upon it such that slabs need not be adjusted for grade after they have been placed. The surface shall be graded and checked to insure it does not vary from the theoretical plane more than $3\text{mm}\pm$ over a length of each slab. The operator of the screeding device shall be experienced in the use of the device.

The bedding material shall be placed in one layer over the subbase and fine graded in two passes. In the first pass it shall be graded with the screeding device set to a plane 6 mm (or as required) above the theoretical bottom of slab. The bedding material shall be dampened with water and compacted with two (2) passes of a vibratory roller. The compacted plane of the "first pass" shall be at least 3mm above the theoretical bottom of the slab.

During the second and final pass the screeding device shall be set to the theoretical plane of the bottom of the slab and shall then provide the final fine graded surface for the slab. This final grading pass is intended to remove any grade changes created by the compaction operation. The final fine graded surface shall **not** be rolled or compacted after the final grading pass. The final surface shall be dampened just prior to the placement of the slab. This dampening is needed to facilitate the grouting operation.

Prior to placing the slabs the subgrade surface shall be examined by the Contractor and the Engineer using a straight-edge and depth gage approved by the Engineer. The straight-edge shall not be less than 3m long and the depth gage not less than 2m long with the depth set equal to the thickness of the slab. The straight edge and the depth gage shall be provided by the Contractor, and maintained in good, usable condition, at the placement site at all times. Surface variations greater than the $3\text{mm}\pm$ in the bedding material shall be corrected prior to placement of the slab.

- C. **Pavement Slab Placement.** Prior to placement of any slabs the Project Surveyor shall mark out the leading ends and leading edges of all slabs to ensure proper placement and fit. The marks shall account for proper joint widths as indicated in the Contract Plans.

Dowel bars and the vertical edge of the slab from which they are protruding shall be coated with bond breaker prior to setting any slabs to break the bond between the

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concrete slab and the dowel grout. The longitudinal edge of previously set slab shall also be coated with bond breaker.

3. CONSTRUCTION DETAILS: (cont'd)

3.04 INSTALLATION PROCESS: (cont'd)

C. Pavement Slab Placement. (cont'd)

The slab shall be set in a manner such that all corners of the slab contacts the fine graded surface uniformly at the same time to avoid disturbing the finished fine graded surface unnecessarily and to avoid damaging the edges of the concrete slab. Tie off ropes and guide bars inserted in grout port holes shall be used to align the slabs to the marks during the placement process. The use of pry bars or wedges in joints for alignment purposes commonly result in spalling and shall not be allowed.

The finished vertical differential across any joint is to be 6mm or less. After the slab has been placed check the vertical differential before setting the next slab. If the differential exceeds 6mm remove the slab and re-grade the subgrade until the differential is 6 mm or less before setting the next slab. Any edge differentials greater than 6mm will require diamond grinding.

For pavements receiving hot mix asphalt (HMS) overlays, install slabs such that the vertical differential across any joint is 12mm or less. Joint width shall be between 0mm – 10mm.

If dowels are exposed at the end of a setting period they shall be protected with an approved method as directed by the Engineer. The method shall protect the bars against bending and against damage to the epoxy coating. It shall also provide protection to the final fine graded surface under the bars.

D. Placing New Slabs Next to Existing Pavement. If new slabs are placed adjacent to existing concrete, longitudinal tie and dowel bars shall be epoxy anchored into holes drilled into the existing concrete at locations that coincide with the slots in the new slabs or as shown in the plans. If required, transitions from the pre-cast slabs to existing pavement shall be paved with asphalt.

E. Placement of dowel and tie bar grout. Prior to installing dowel grout install foam grout dams at the open end of the joint to be grouted to prevent grout from escaping. Mix grout in strict accordance with the manufacturer's directions and as demonstrated in the trial batching procedure. The grout must be shown to meet the Pull-out Strength requirements of Section 701-05 of the NYS Standard Specifications before the slabs may be opened to traffic.

Start installing grout by inserting the grout nozzle into the back port of the lowest slot on the joint. Pump grout into the first port until it comes out of the adjacent port and the grout flows along the transverse joint to the next port. Proceed to the back port of the next slot and repeat the same procedure. Continue to monitor the grout level in previously grouted ports and add as required to keep the grout level even with the top of

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the slab. The Contractor shall provide a backup pump for availability in case of main pump failure.

Finish off the top of the grout port with the same finish as the rest of the slab surface. Do not allow traffic on the slab until the grout has reached a minimum strength of 17 MPa and the grout was shown in the trial batching procedure to meet the Pull-out Strength requirements of Section 701-05 of the NYS Standard Specifications.

3. CONSTRUCTION DETAILS: (cont'd)

3.04 INSTALLATION PROCESS: (cont'd)

- F. **Placement of Bedding Grout.** Mix bedding grout in strict accordance with the instructions provided by the manufacturer of the Flow Cable admixture and as demonstrated in the trial batching procedure.

Bedding grout installation shall commence at the downhill chamber at the lowest port. The bedding grout shall be pumped or poured into the grout port on the end of the slab until it exudes from the corresponding port at the other end of the slab insuring full bedding of the slab in that chamber. All remaining ports shall be filled in the same manner. The Contractor shall monitor the grout level in previously filled ports and add grout as required to keep it level with the top of the slab. Care shall be taken to minimize spillage and necessary clean up of the slab surface. Again, the Contractor shall provide a backup pump for availability in case of main pump failure.

After the bedding grout has taken an initial set and before it hardens completely, remove the bedding grout from the top 50mm of each bedding grout port and replace it with freeze-thaw durable dowel grout. The grout shall reach a minimum strength of 2 MPa before the slab(s) is opened to traffic.

- a. **Opening slabs to traffic.** It is highly desirable that the precast slabs meet the following minimum requirements before being opened to traffic:
- Dowel grout has been installed and has reached a strength of 17 MPa
 - Bedding grout has been installed and has reached a strength of 2 MPa

If slabs must be open to traffic before dowel and bedding grouts can be installed, a minimum of two incompressible shims must be installed in each transverse joint to prevent ungrouted slabs from hitting and spalling under traffic conditions. If ungrouted slabs settle or develop edge differentials under traffic conditions that are greater than 6 mm, they shall be removed, the subgrade re-graded and the slabs re-set prior to grouting. If the settled slab can not be removed because it is in the middle of a run of new slabs, the surface of the pavement shall be diamond ground until the edge differential is less than the allowable 6 mm.

- G. **Sealing of Transverse and Longitudinal Joints.** If panels are to be put in service before the permanent joint seals are installed, the unsealed joints are to be sealed with a silicone caulking material at the top of the slab.

All longitudinal and transverse joints shall be sealed in accordance with the joint sealing specification.

4. METHOD OF MEASUREMENT:

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4.01 The work shall be measured by the pay unit indicated in the Basis of Payment for the installation of precast concrete highway pavement slabs that are actually furnished and placed in accordance with the plans, specifications, shop drawings and as approved by the Engineer.

5. BASIS OF PAYMENT:

5.01 The unit price bid for the item of work listed below shall include the cost of all engineering, design, fabrication, quality control, labor, materials and equipment necessary to complete the work. This item shall also include all material certification(s), testing of material(s), final inspection of all slab units, all concrete, dowel and bedding grout, reinforcing steel, transportation and storage costs, erection equipment and bedding materials. Partial payment shall be made in accordance with Section 109-04 of the New York State Standard Specifications.

5.02 Payment shall be made under:

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>PAY UNIT</u>
25502.004750M	PRE-CAST CONCRETE HIGHWAY PAVEMENT SLAB (WITHOUT SENSORS)	Cubic Meter