To:		*New York State Department of Transportation* **ENGINEERING INSTRUCTION**	**EI 05-043**
Title: **PRECAST CONCRETE PAVEMENT SLAB SYSTEMS - DESIGN GUIDANCE**			
Distribution: ☒ Manufacturers (18) ☒ Local Govt. (31) ☒ Agencies (32) ❑ Surveyors (33) ☒ Consultants(34) ☒ Contractors (39) ❑ _____( )		Approved: /s/ Robert L. Sack Robert L. Sack, Deputy Chief Engineer, Technical Services	21DEC05 Date

ADMINISTRATIVE INFORMATION:

- This Engineering Instruction (EI) is effective upon signature.
- No EIs or Engineering Bulletins are hereby superseded.
- The design guidelines will reside in a future version of the Comprehensive Pavement Design Manual (CPDM).

PURPOSE: The purpose of this EI is to issue design guidance for projects using precast concrete pavement slabs.

TECHNICAL INFORMATION:

- A corresponding Special Specification 502.15PF--18, Precast Concrete Pavement Slabs, and a Standard Specification 704-15, Precast Concrete Pavement Slab Systems, are being issued concurrently by EIs 05-042 and 05-041, respectively.
- Design Guidance:
    1. Project Selection. Consider using precast slabs as an alternative to high-early-strength (HES) concretes that develop compressive strengths of 21 MPa in 12 hours or less. They should be strongly considered as an option to calcium chloride accelerated concrete, which typically achieves 14 MPa in 4 hours. These concretes are typically required for overnight-only lane closures that are necessary to maintain peak traffic flows through contracts. Alternate bid provisions may be incorporated into the contract documents if the use of these concretes is anticipated. It is acceptable to use both precast slabs and HES concrete in the same project, depending on traffic needs.

       Precast slabs offer advantages when compared to HES concrete:
       - Very high load carrying capacity.
       - Excellent durability.
       - Virtual elimination of early-age cracking.
       - High assurance that lanes will be opened to traffic on time.

       Precast slabs have disadvantages when compared to HES concrete:
       - Higher costs.
       - Material used to encase load transfer devices are not yet of the same high quality as the slabs themselves.
       - Increased likelihood of misalignment between slabs or adjacent pavement.
       - Slab systems used or proposed to date can not be placed directly on permeable base.
       - Slab systems may require a fine, gradable, and potentially pumpable bedding layer which may encourage faulting if the load transfer systems fail.

2. New Construction. Typically, select a 225 mm slab thickness when constructing a pavement from free edge to free edge (or curb line to curb line). Specify the following:
    - 502.15PF--18, Precast Concrete Pavement Slabs.
    - 502.92, Sealing Transverse Joints – Silicone Joint Sealant.
    - 502.93, Sealing Longitudinal Joints – Silicone Joint Sealant.

    A Highway Joint Sealant meeting ASTM D 6690, Type IV, may be specified in lieu of 502.92 and 502.93 as more experience is gained regarding joint configurations obtained from actual installations. Consult the Materials Bureau for recommended joint sealants.

3. Add-on Lanes or Ramps. When adding a lane of precast slabs adjacent to an existing portland cement concrete (PCC) pavement, match the precast slab thickness to the existing pavement nominal thickness. Tie the add-on lane to the existing pavement. Specify the following items:
    - 502.15PF--18, Precast Concrete Pavement Slabs.
    - 502.3301--18, Drill and Anchor Longitudinal Joint Ties, or 502.6001--18, Retrofit Bars in PCC Pavement, to tie the new lane to the existing pavement. Assume a 600 mm spacing to estimate quantities.
    - A joint sealing item as discussed above in New Construction.

4. Concrete Pavement Restoration (CPR) and Repairs Prior to Hot Mix Asphalt (HMA) Overlays. For projects that require making several isolated, full-depth repairs with precast slabs, select a few (two or three) typical slab sizes to facilitate production and estimate quantities. For example, if the majority of full-depth repairs can be addressed using 2.0 m x 3.67 m precast slabs and 3.0 m x 3.67 m precast slabs, identify those sizes in a plan note and estimate quantities accordingly. Larger repairs can combine those slab sizes as required.

    Consult the Materials Bureau for the appropriate use of required additional items. It is likely that the following items will need to be used along with precast slab construction in these projects:
    - 304.0001--18, Fine Grading of Existing Subbase.
    - 502.1001--18, PCC Pavement Repair and Markout.
    - 502.3101--18, Full-Depth PCC Liftout.
    - 502.3201--18, Drill and Anchor Dowels for Full-Depth PCC Pavement Repairs, or 502.7001--18, Retrofit Dowels in PCC Pavement.
    - 502.3301--18, Drill and Anchor Longitudinal Joint Ties for Full-Depth PCC Pavement Repairs, or 502.6001--18, Retrofit Bars in PCC Pavement.
    - 502.9001--18, Clean and Fill Joints and Cracks in PCC Pavement, ASTM D 6690, Type IV, for projects remaining concrete surfaced.
    - 633.13, Cleaning, Sealing, and/or Filling Joints, for projects receiving an HMA overlay.

5. Smoothness Requirement. Select a smoothness requirement and corresponding pay item for precast slabs using the same criteria for pavements constructed in accordance with Section 502, PCC Pavement. Refer to EI 02-003, PCC Pavement, or the CPDM.

6. Friction Requirement. Select a friction requirement and corresponding pay item for precast slabs using the same criteria for pavements constructed in accordance with Section 502, PCC Pavement. Refer to EI 04-020, Design Guidance for PCC Pavements and Architectural Pavements, or the CPDM.

- It is anticipated that precast slab construction will be significantly more expensive than constructing pavements in accordance with Section 502, PCC Pavements, particularly as quantities increase. Costs should converge with HES concrete as quantities decrease. To date, Regions have justified the added expense with the assumption that peak traffic flows will not be interrupted, thereby recouping

construction costs with user delay costs. No formal life-cycle cost analysis has been done to verify the assumption. This EI is not a justification for absorbing increased costs or using precast slabs. Instead, it has been developed to accommodate Regional policy while providing some formal quality control.

IMPLEMENTATION: The Design Guidance given above should be used in conjunction with EI 05-041, Precast Concrete Pavement Slab Systems – Standard Specification, and EI 05-042, Precast Concrete Pavement Slab Systems – Special Specification, which are effective with projects submitted for the letting of September 7, 2006.

TRANSMITTED MATERIALS: None.

BACKGROUND: Ideally, lane closure time frames would be sufficient to use standard concrete mixes or slightly accelerated concrete mixes. However, continued pressure for very short-term lane closures precipitated the need for very high-early-strength concretes. Innovators in the precast industry developed precast concrete pavement slabs as an alternative to very high-early-strength concretes. While long-term precast slab performance is not known, placements to date in New York State have been largely successful and the continued use of precast slab appears warranted.

CONTACT: Address questions concerning this issuance to the Field Engineering II Section of the Materials Bureau. Current contacts are Michael Brinkman (mbrinkman@dot.state.ny.us) at (518) 457-4584 or William Cuerdon (wcuerdon@dot.state.ny.us) at (518) 485-5278.