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New York State Department of Transportation

ENGINEERING INSTRUCTION

EI 97-023

Title: **SUBSTRUCTURE APPLICATIONS FOR CLASS HP CONCRETE**

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Approved:

Paul J. Mack, Director
Technical Services Division

9/12/97
Date

EFFECTIVE DATE: This Engineering Instruction will be effective on all Department contracts beginning with the February 5, 1998 letting.

PURPOSE: To authorize the use of Class HP concrete for mass placements and substructures .

BACKGROUND: NYSDOT recently implemented a new class of concrete, Class HP, as the standard class of concrete for bridge decks. This instruction provides further information and applications for Class HP concrete.

Class HP concrete, developed in 1994 as a modification of Class H concrete, contains physical properties that provide significant benefits in placements other than bridge decks. Reduced permeability and less potential for cracking are two attributes conducive to longer lasting concrete. Class HP concrete obtains these attributes by using a lower water to total cementitious ratio of 0.40, with the addition of 20% Class F flyash and 6% microsilica. The lower water to total cementitious ratio reduces the potential of shrinkage cracking, and the lower amount of actual cement reduces the heat of hydration, which in turn reduces the potential for thermal cracking. The addition of flyash and microsilica, particles much finer than cement, creates a more dense concrete which reduces permeability considerably.

Benefits that justify substituting Class HP for Class A in mass placements and substructure applications include:

- Method of conveyance (pumpable)
- Handling and workability
- Extended service life

Additional benefits associated with the use of Class HP concrete in mass placements will also include the resistance to thermal cracking due to the low cement content and, due to the use of pozzolans in the concrete, a reduced risk of sulfate attack in environmentally aggressive locations.

GUIDELINES FOR SUBSTITUTIONS: This EI authorizes the use of Class HP concrete as a design option where the following conditions exist:

- All footing concrete
- All concrete placements exposed to seawater and its spray. This includes all tidal waters of New York State except those of the Hudson River and its tributaries north of the Newburgh-Beacon Bridge.

GUIDELINES FOR SUBSTITUTIONS:(continued)

- Abutments, columns, and pier caps that are subjected to chlorides or chloride over-spray from roadways.

Additionally, Class HP concrete is required for all sidewalks and safety walks associated with bridge deck construction and replacement.

IMPLEMENTATION: This EI establishes Class HP concrete as an optional substitute for Class A concrete in mass placements and substructures effective on all Department contracts beginning with the February 5, 1998 letting. Ongoing construction projects may be considered at the discretion of the Regional Construction Engineer.

SPECIFICATION SUBSTITUTIONS: Class HP concrete specifications may be substituted for Class A concrete according to the guidelines noted above.

ITEM 18555.96, CONCRETE FOR STRUCTURES, CLASS HP, may be substituted for the following specification items as appropriate:

ITEM 555.0104- FOOTING CONCRETE, CLASS A
(No Concrete Class Substitutions Permitted)
ITEM 555.0105, CONCRETE FOR STRUCTURES, CLASS A

ITEM 18555.96M, CONCRETE FOR STRUCTURES, CLASS HP, may be substituted for the following specification items as appropriate:

ITEM 555.0104M, FOOTING CONCRETE, CLASS A, (No Concrete Class Substitutions Permitted, Except Class H Where Footing is 1 M Thick or Less)
ITEM 555.0105M, CONCRETE FOR STRUCTURES, CLASS A

COST IMPACT: The cost of producing Class HP concrete will vary, depending on concrete plant capabilities and regional location. The ease of conveyance as well as the extended service life of Class HP concrete should offset any initial increased costs of production. Recent bid prices show that the placement costs of Class HP concrete are comparable to that of Class H. Considerations of method of conveyance, handling, workability, and extended service life should be made in conjunction with any life cycle cost determination. As more projects are designed with this option, further cost comparisons can be established based on bid price analysis. In addition, where the cost of Class HP concrete is expected to be less than Class A concrete, Class HP should be used.

CONTACT PERSON: Any questions regarding this Instruction should be directed to Field Engineering II, Materials Bureau at 518-457-4582.