Florida Department of
TRANSPORTATION

State Materials Office Concrete Research Projects

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Effects of Chemical and Mineral Admixtures on Performance of Florida Structural Concrete

- Investigate effects of chemical and mineral (supplemental cementitious materials, SCMs) admixtures on the hydration and strength development of PCC.
- Evaluate compatibility of selected combinations of cement and admixtures.
- Examine relationships between composite heat of hydration and potential for thermal cracking
- Assess the effects of cement-admixture combinations on concrete strength and durability.

Evaluation of Alternative Pozzolanic Materials for Partial Replacement of Portland Cement in Concrete

- Investigate new sources of pozzolanic materials.
- Candidate materials include Class C fly ash, any highly siliceous ashes such as rice husk and sugar cane bagasse ash, and pulverized waste glass.
- Of particular interest are Class C fly ash and pulverized waste glass.
  - Class C fly ash is commercially available and is in common use in other parts of the country. Could be implemented quickly.
  - Pulverized waste glass is abundantly available - requires considerably more research and development. Implementation will depend on development of supply chain.

Long-Life Slab Replacement Concrete

- Identify factors or parameters contributing to cracking of concrete replacement slabs
- Specifications/procedures that will minimize occurrence of cracking.

Effects of Coarse Aggregate on the Physical Properties of Florida Concrete Mixes

- Investigate the effects of coarse aggregate sources on the strength, physical, thermal, and durability properties of concrete.
  - Enable designers to use accurate physical property data in the design of structural concrete members
  - Provide necessary data used for prediction of physical properties of any FDOT mix designs
  - Help ensure durability of FDOT concrete
  - Aid in the development of performance-based specifications

Accelerated Slab Replacement Using Temporary Precast Panels and Self-Consolidating Concrete (SCC)

- Develop a system to improve the efficiency of concrete slab replacement.
- Reusable temporary precast panels for temporary slab replacement.
- Benefits for concrete pavement rehabilitation projects:
  - Accelerated construction.
  - Reduced MOT, improved safety, cost savings.
  - Reduction in cracking of replacement slabs – longer cure times before opening to traffic.

Maximum Heat of Mass Concrete - Phase 2

- Build a database of rate of heat production for different cement blends used in Florida mass concrete.
- Evaluate typical segmental bridge pier segments used in Florida to determine if some need to be treated as mass concrete.
- Determine insulating properties of different soils under various moisture conditions to use in thermal analysis of footings placed on the soils.

Development of Standard Operating Procedure for Analysis of Ammonia Concentrations in Coal Fly Ash

- Develop means of testing fly ash for ammonia content.
  - Equipment economical and easy to operate.
  - Methods simple and easy.
- Provide method to fly ash distributors to determine the ammonia content of their fly ash.

Internally Cured Concrete for Pavement and Bridge Deck Applications

- Reduce cracking in structural applications such as pavements and bridge decks.
- Fine lightweight aggregate (LWA, expanded shale) used to partially replace normal fine aggregate.
- LWA acts as an internal water reservoir, providing water as needed for curing.
  - Faster and more complete curing due to the prevention of self-desiccation.
- Benefits include improved strengths, lower porosity, and reduced shrinkage and cracking.

Slab Replacement Maturity Guidelines

- Determine if maturity method can identify early-age strength of pavement slab replacement concrete for opening within a 4-6 hour window.
- Develop guidelines for use of maturity method to determine when opening strength attained instead of using cylinder strengths.
- Develop best construction practices for using maturity method.

Ground Tire Rubber (GTR) as a Component Material in Concrete Mixtures for Paving Concrete

- Determine optimum particle size or gradation of GTR for pavement concrete.
- Determine replacement % of GTR for fine and/or coarse aggregate.
- Identify optimum moisture content, storage conditions, order of addition and mixing, w/cm ranges, air contents.
- Establish effects on density, strength, elastic modulus, and thermal expansion.

US 301 Concrete Test Road

- 2.5 mile long test road
- Live traffic
- Construction to begin in 2016
- Three main experiments
  - Thickness, drainage, MEDPG calibration
  - 52 individual test sections