

DESIGNERS MEETING

Minutes for April 17, 2025

10:00 AM – 11:00 AM

Erin Brewer, Secretary

TOPICS

- **Topic 1: Cracking of Concrete**

Topic 1: Concrete Cracking in Cast-In-Place Concrete Decks

- We will not be using LP concrete for the foreseeable future since Class A concrete easily meets the Class LP permeability specifications. LP concrete typically has more cement paste, which leads to greater shrinkage and cracking
- We are having concrete cracking issues on our decks and will be implementing solutions to try and fix this issue
- Overall condition of bridge decks is declining
- Transverse cracking occurs on a large percentage of our bridge decks shortly after bridge is constructed and action is needed to minimize the prevalence of cracking
- Concrete Shrinkage
 - Plastic shrinkage – shrinkage caused by evaporation while concrete is still plastic, prior to hardening
 - Drying Shrinkage – shrinkage caused by evaporation after the concrete has hardened and no free moisture remains (post-wet cure)
 - Autogenous/Chemical shrinkage – shrinkage caused by use of mix water in hydration reaction which causes volume reduction and capillary void pressure changes (typically in concrete with w/c ratio less than 0.4)
- Factors
 - Concrete mix design
 - Pay Factors
 - Minimum permeability but no maximum permeability
 - Air content has a minimum and a maximum value
 - Strength has a minimum but no maximum
 - Construction methods
 - Design
 - Jason suggests staggering top and bottom transverse reinforcement
 - Research indicates that closer spacing with smaller bar sizes provide better crack control
 - Elastic modulus is directly related to concrete compressive strengths
 - Design of 4 ksi, typical actual mix strength of 6.2 ksi
 - Shrinkage stresses increase with increased compressive strength
 - Higher compressive strength = higher shrinkage stress

- Higher strength causes more shrinkage cracking with wider cracks than intended
 - Would there be differences in GFRP and other rebar cracking requirements in the code?
- Innovative Materials/Methods
 - Optimized aggregate gradations (Tarantula curve)
 - Shrinkage reducing admixtures (SRAs)
 - Internal Curing (ICC)
 - Fiber Reinforcement to help with plastic shrinkage
 - Shrinkage Compensating Admixtures (SCAs)
- Specification Changes
 - Increased wet cure duration to 14 days
 - New class of concrete for decks
 - Overnight deck placements
 - Trying to place the concrete when the steel of the girders has stopped expanding and has started to contract (possibly afternoon)
 - Temperature differential requirements (try to keep it within 25 degrees)
 - Pay factor calculation changes
 - We will need industry feedback on any spec changes that we may decide on

Active Construction Pilot Projects

- We have some proposed pilot projects in 2025 where we are trying to make some adjustments
- It may be beneficial to pull the research team in for help
- Need a way to document our findings from the pilot projects
 - Count cracks per square area
- For projects going out to bid this year, see the Fabrication team for any Special Provisions that may be added to help with the concrete cracking
- Seal cracks with something on the top side of the deck (such as methacrylate) if cracks do develop in the field

2025 Projects + Proposed Modifications

WIN 021721.00 Falmouth, Johnson: Change LP to A for sidewalk/curbs. Use SRA at 1% dose with 7-day wet cure and curing compound application.

WIN 022603.00 Brunswick-Topsham, Frank J. Wood: Change LP to A and max. cementitious to 580lb/cy for sidewalks and barrier concrete.

WIN 021726.00 Freeport, Approach: Change LP to A and max. cementitious to 580lb/cy for shared-use path and barrier.

WIN 023627.00 Freeport, Merrill: Change LP to A and max. cementitious to 580lb/cy for shared-use path and barrier.

WIN 021725.00 Freeport-Yarmouth, Route 1 over Cousins: Change LP to A and add fibers to mix for shared-use path and barrier.

WIN 023138.00 Waterville-Winslow, Ticonic: Change LP to A and add fibers to mix for downstream sidewalk.

WIN 021672.00 Augusta, Western: Change LP to A and add fibers to mix for sidewalk and curb.

WIN 022268.00 Winslow, Fish: Change LP to A and max. cementitious to 580lb/cy for deck and curbs.

WIN 025299.00 Albion, Puddledock: Change LP to A and use optimized mix design for deck and curbs.

WIN 022511.01 Old Town, Stillwater #2: Use lightweight fine aggregate for internal curing for all superstructure concrete.

WIN 022512.01 Old Town, Stillwater #1: Use lightweight fine aggregate for internal curing for all superstructure concrete.

WIN 022630.00 Stonington, Oceanville: Change LP to A and wet cure for 14 days for deck and curbs.

WIN 026574.00 Bar Harbor, Cromwell: Change LP to A and wet cure for 14 days for deck and curbs.

WIN 026105.00 Charlotte, Round Pond: Change LP to A and wet cure for 14 days for deck and curbs.

WIN 023515.00 Mount Desert, Babson: Change LP to A and max. cementitious to 540lb/cy for deck, curb, and sidewalk.

WIN 022250.00 Macwahoc PLT, Kingman: Change LP to A and add shrinkage reducing admixture for deck and curbs.