Development of Cost-Effective Rapid-Setting Concrete for Improved Bridge Joint Performance

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Goal and Objectives

- Primary goal of the study is to assess durability and structural performance of rapid setting concrete (RSC) mix designs used in current VTrans accelerated bridge construction (ABC) projects
- Objectives:
  - Assess RSC for their durability performance and structural contributions as connection via laboratory testing.
  - Explore standard mix designs for RSC for VTrans ABC projects
  - Technology transfer, tools for research implementation, and quantify research benefits

Project Breakdown

- Task 1: Literature Review
  - Limited information regarding laboratory testing and characterization of field cast bridge connections using non-proprietary products
- Task 2: Laboratory Evaluation of RSC
  - Focus of lab testing is on durability and structural contributions using an experiential plan developed with three approved VTrans mix designs as baselines
- Task 3: Exploration of Standard RSC Designs
  - Will focus on the development of standard mix designs using task 2 results and cost information

Experimental Design

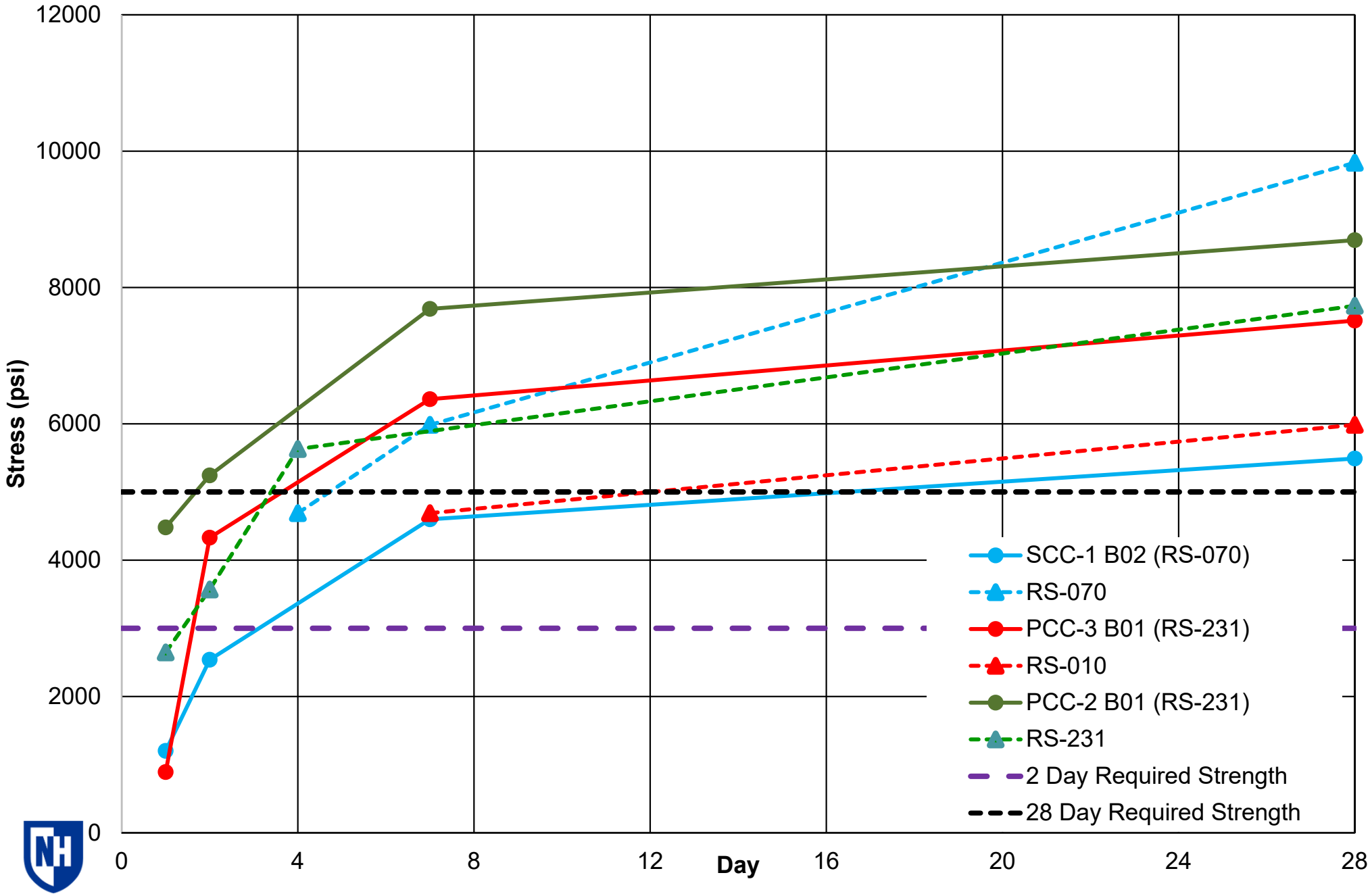
ID	Cementitious Content (lbs./CY)	Target Air Content (%)	Target Workability (Slump/Spread)	Coarse Aggregate Source	Fine Aggregate Source
SCC-1 (RS-070)	900 (P,S,F)	6	27 (Spread)	Original	Original
SCC-1a	800 (P,S,F)	6	23 (Spread)	Original	Original
SCC-1b	1000 (P,S,F)	6	27 (Spread)	Original	Alter-1
SCC-1c	900 (P,S,F)	6	18 (Spread)	Alter-1	Original
PCC-2 (RS-231)	900 (B)	6	8 (Slump)	Original	Original
PCC-2a	750 (B)	6	6 (Slump)	Original	Alter-1
PCC-2b	825 (B)	4.5	8 (Slump)	Alter-1	Original
PCC-2c	1050 (B)	7.5	6 (Slump)	Original	Original
PCC-2d	900 (B)	4.5	9 (Slump)	Alter-2	Alter-2
PCC-2e	1200 (B)	6	8 (Slump)	Original	Original
PCC-3 (RS-010)	730 (P, FA)	6	6 (Slump)	Original	Original
PCC-3a	900 (P, FA)	6	6 (Slump)	Alter-1	Alter-1

P: Portland cement, S: Slag; F: Silica Fume; FA: Fly Ash; B: Blended Cement

Early Results

- Materials in excess of 5 tons have been sampled
- Laboratory testing is currently underway
  - Three UNH control mixes have been made to compare with the 3 main VTrans baselines and have were tested for workability, fresh properties, and compressive strength
    - *An increase in workability is needed in lab*
    - *Strength is mostly on target*
  - Full batches of designs underway

Early Results



Thank you for your attention!

Image from Graybeal (2016): Pulaski Skyway Bridge in NJ

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