

ALKALI-SILICA REACTION AT SEABROOK STATION

UPDATE ON TESTING PROGRAMS



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STRUCTURAL TEST FACILITY



CAPABILITIES

FABRICATION

LARGE SCALE

IN-HOUSE
MACHINING

IN-HOUSE
WELDING

TESTING

MULTI-AXIAL

HIGH
TEMPERATURE

CLOSED LOOP CONTROL

INSTRUMENTATION

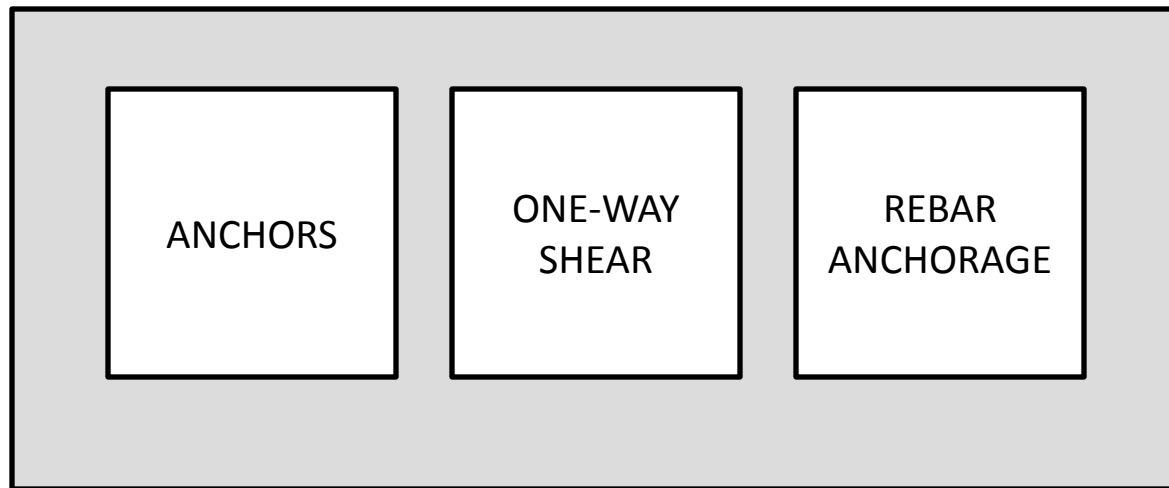
HIGH SPEED

NON-CONTACT

HIGH PRECISION

AGENDA

SEABROOK TESTING PROGRAMS



ANCHOR PROGRAM

ANCHOR PROGRAM

Wedge Anchors



Large size anchors, deep embedment



Medium size anchors, medium embedment



Small size anchors, shallow embedment

Undercut Anchors



Medium size anchors, deep embedment



Medium size anchors, medium embedment

Half of all ASR-affected anchors installed
before development of ASR.

ANCHOR PROGRAM



Deep Anchor Test Setup



Shallow Anchor Test Setup

PROGRESS TO DATE



Specimen fabrication completed October 2012.

Control tests completed in November 2012.

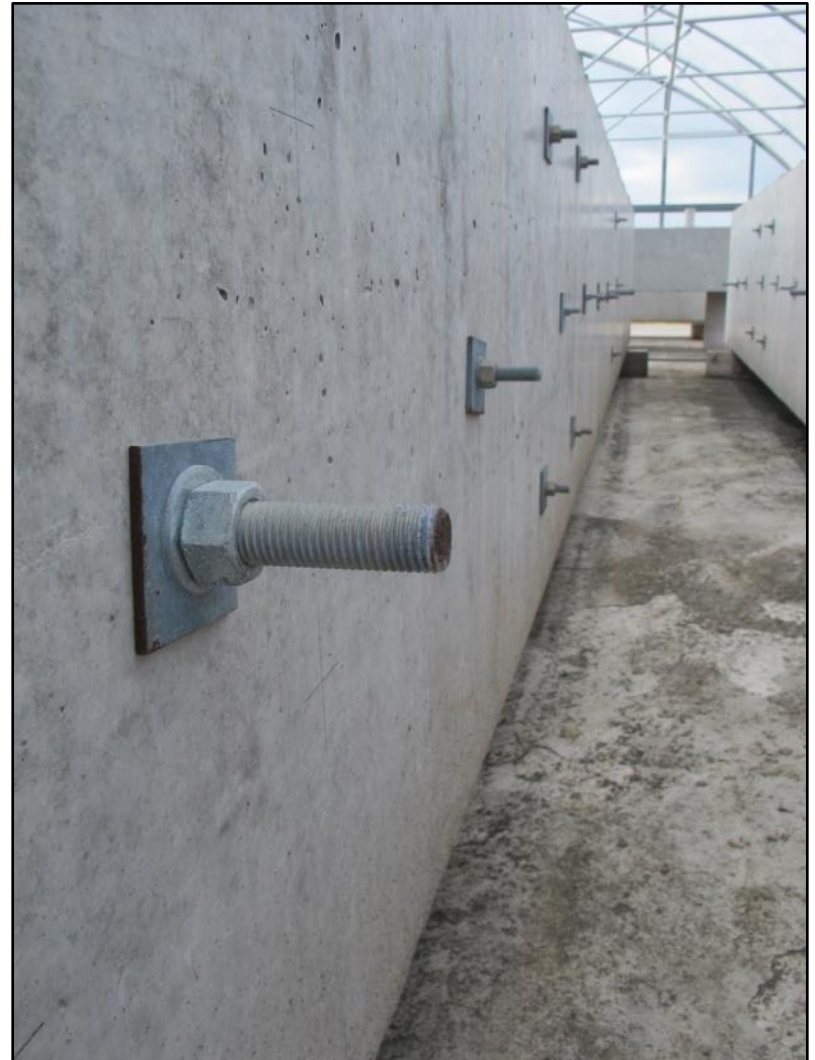
Post-installed anchors tested at low level of ASR in
November 2013.

Deep Anchor Test Setup

Shallow Anchor Test Setup

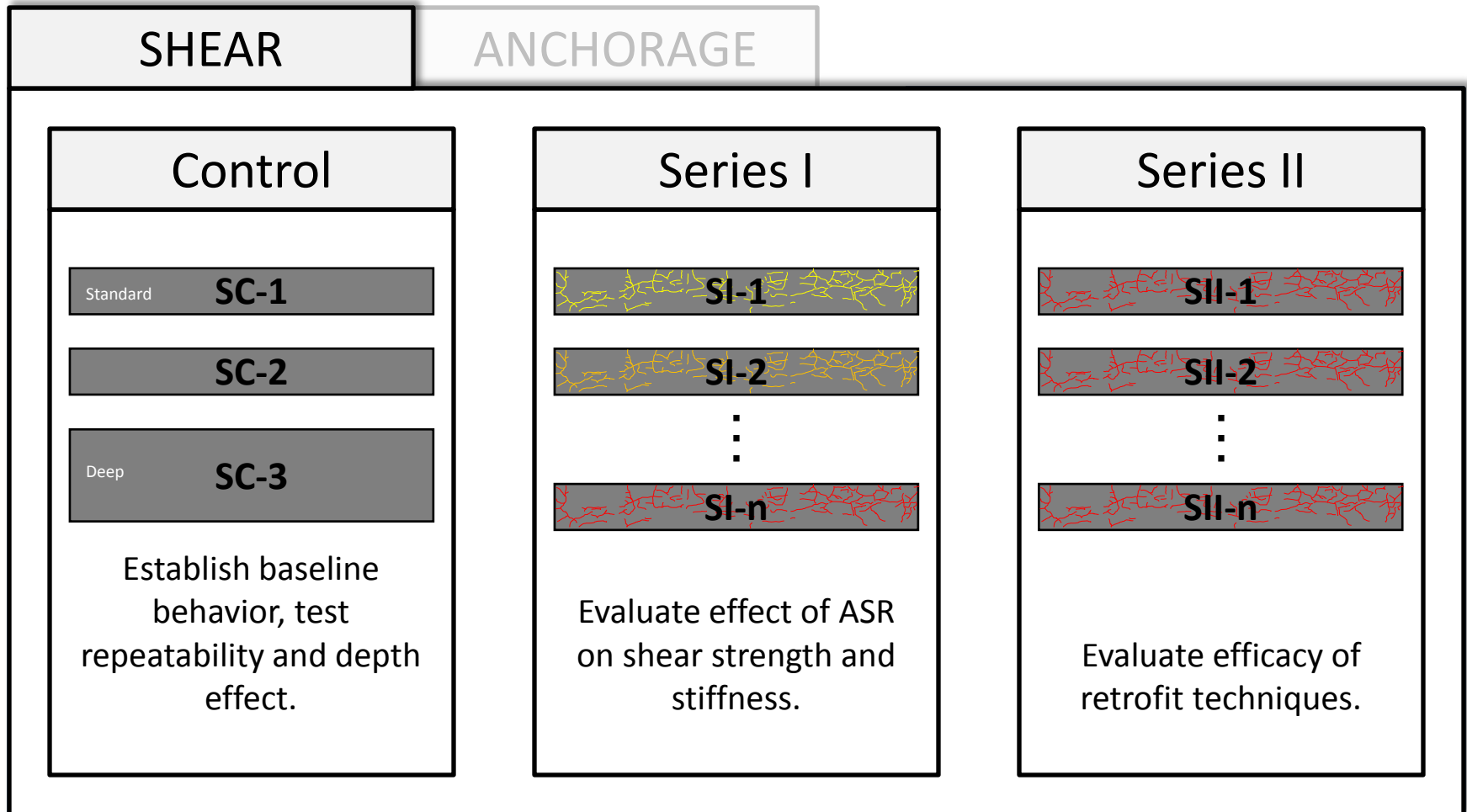
OUTLOOK

- Environmental conditioning of blocks and beams is ongoing at FSEL
- Testing of pre-installed anchors at a low level of ASR is to be completed in December 2013.

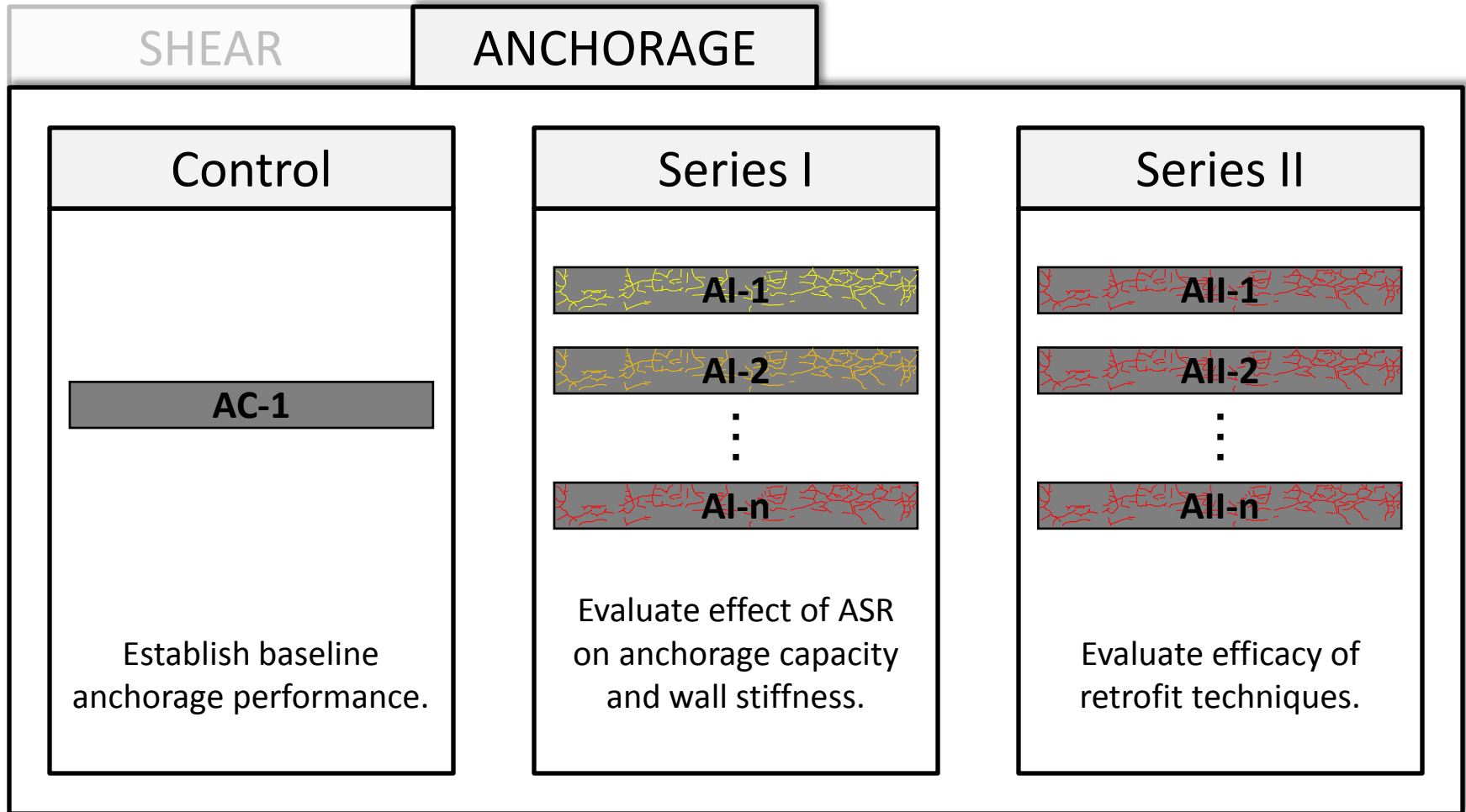


BEAM PROGRAM

BEAM PROGRAM



BEAM PROGRAM



REPLICATION OF SEABROOK DETAILS

The reinforcement detailing...

- ... represents the lack of through-thickness reinforcement within structural walls

- ... will enable focused study of shear and anchorage behavior at current and future levels of ASR

REPLICATION OF SEABROOK DETAILS

The concrete mixture...

... was developed through trial batching with representative coarse and fine aggregates

... is sufficiently reactive to obtain the necessary data in a timely manner

... yields mechanical properties that are representative of Seabrook structures

CONCRETE MATERIALS



Santa Ana CA
Lafarge Aggregates
Bernalillo, NM



Jobe
Cemex
El Paso, TX



Type I/II
Dragon Cement
Thomaston, ME



Maine
Pike Industries
Westbrook, ME

BEAM PROGRAM WORKFLOW



AGGREGATE DELIVERY



AGGREGATE STORAGE



SIEVE ANALYSIS



FABRICATION AREA



CAGE FABRICATION



FORMWORK



READY MIX TRUCK



AGGREGATE BATCHING EQUIPMENT



AGGREGATE BATCHING



AGGREGATE MOISTURE CORRECTION



SODIUM HYDROXIDE ADDITION



WATER ADDITION



CEMENT BATCHING



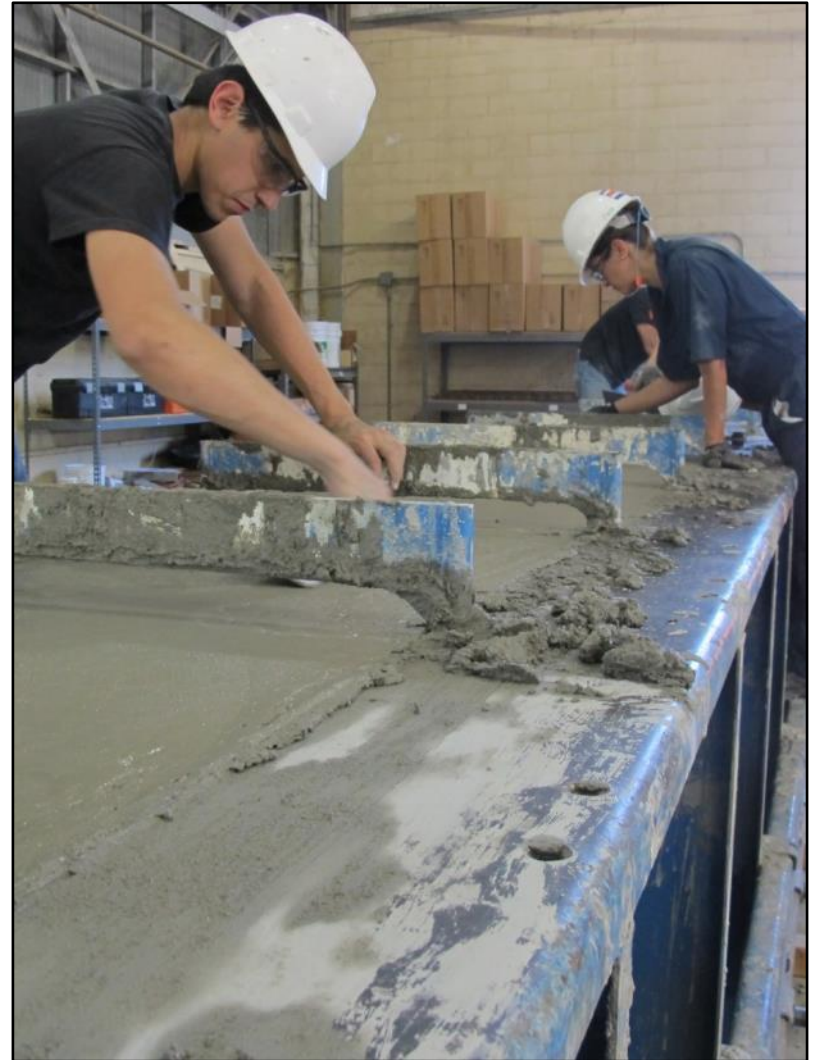
CONCRETE SAMPLING EQUIPMENT



SLUMP TESTING



CONCRETE PLACEMENT



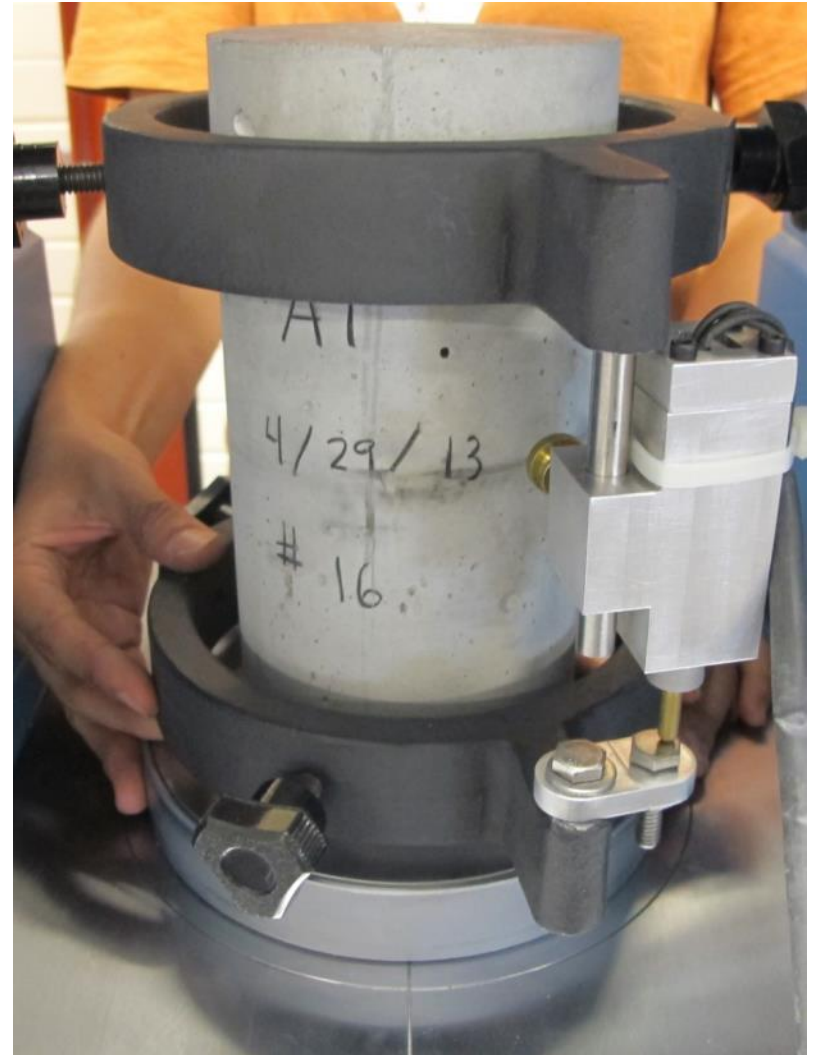
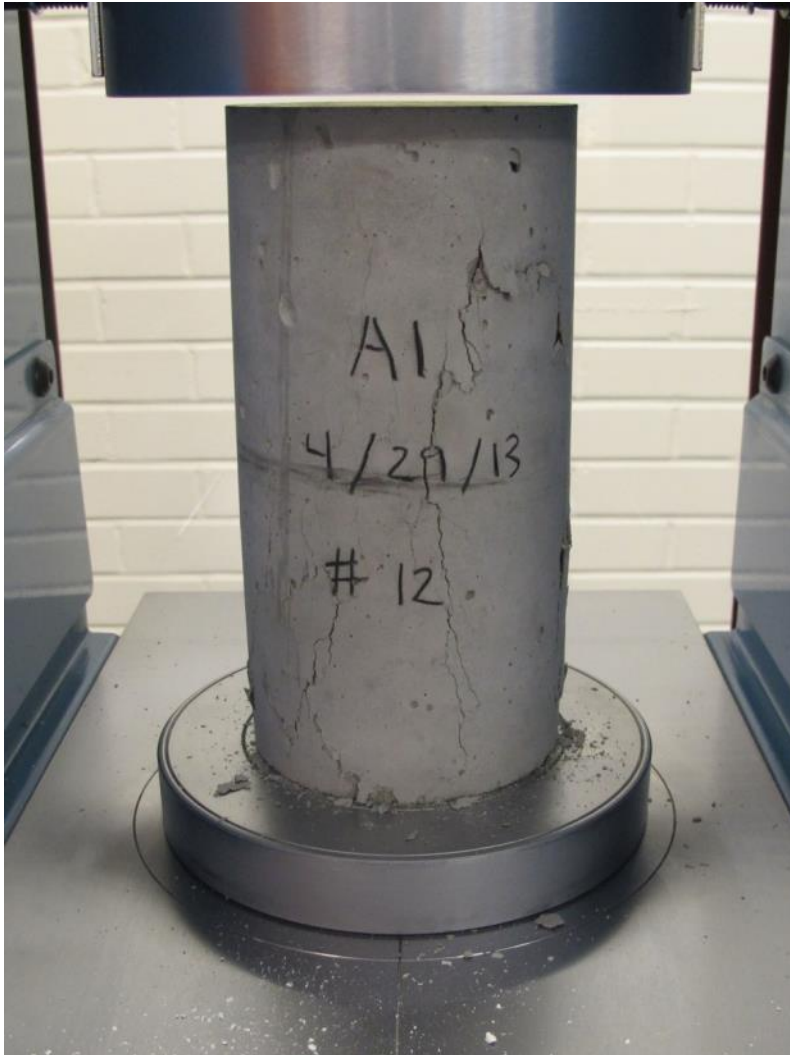
BEAM IDENTIFICATION



CURING



COMPRESSION TESTING



HANDLING



CONDITIONING



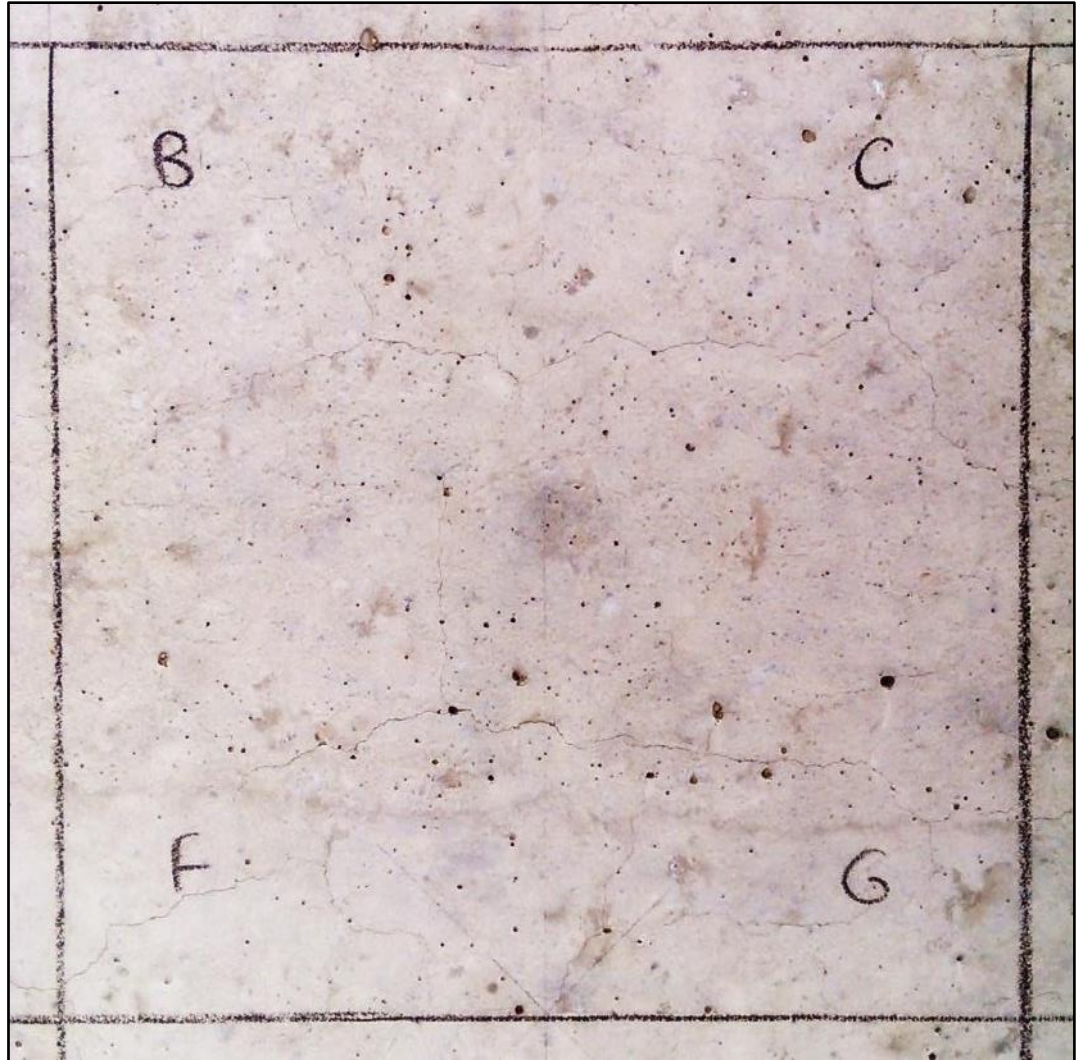
EXPANSION MONITORING GRID



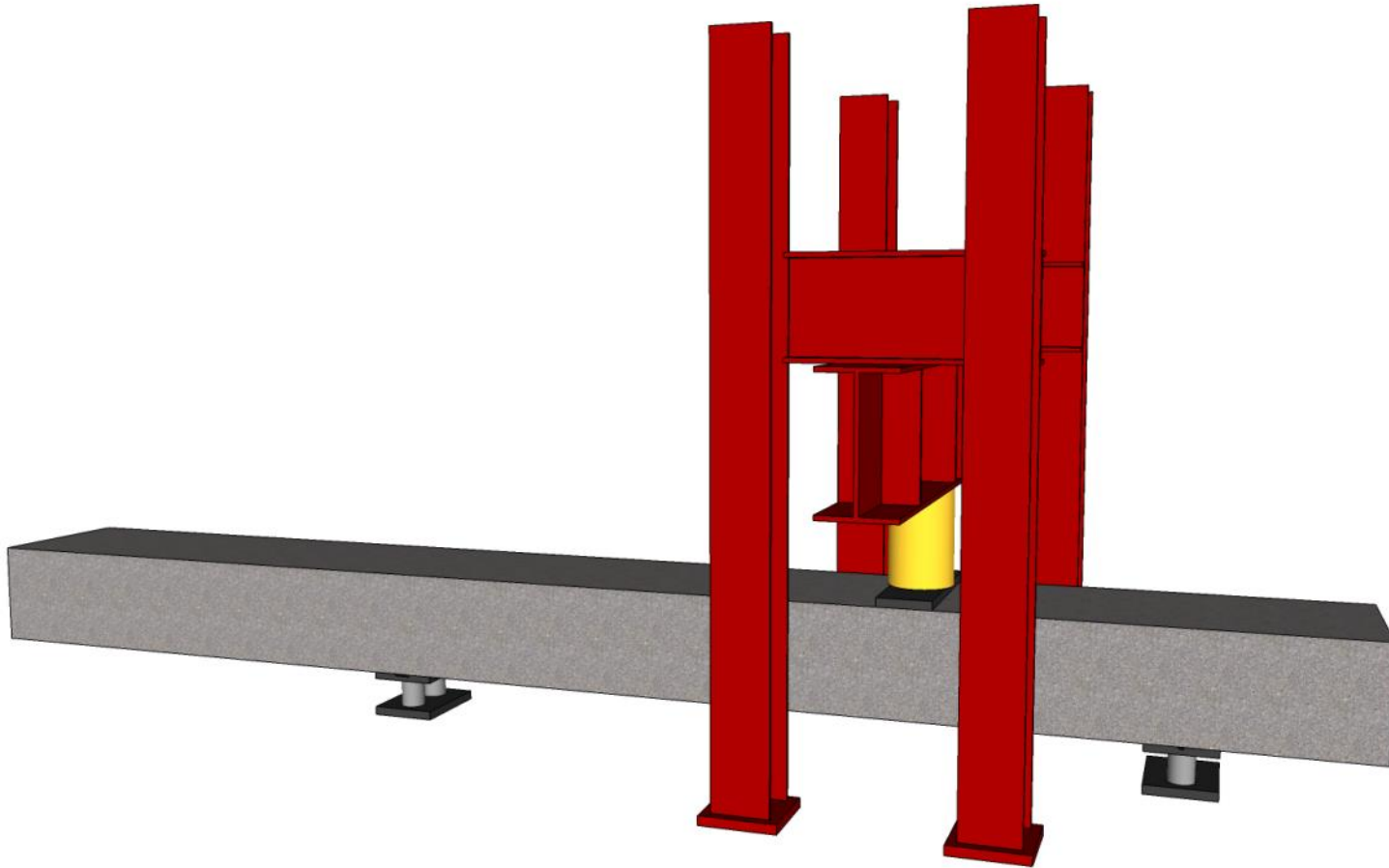
EXPANSION MEASUREMENT



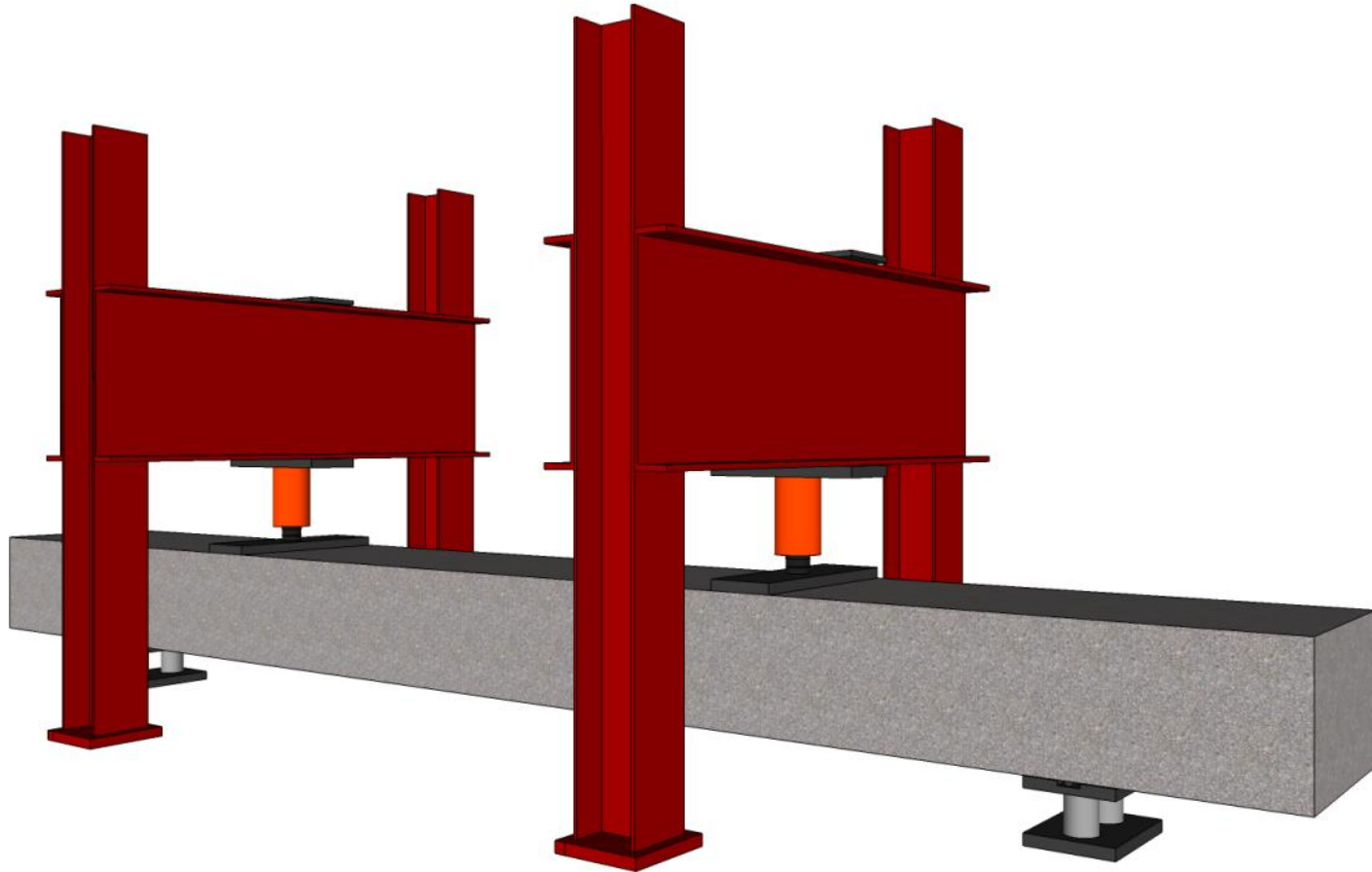
CRACK MEASUREMENT



SHEAR TESTING



ANCHORAGE TESTING



PROGRESS / OUTLOOK

SHEAR	ANCHORAGE	
Control	Series I	Series II
Standard SC-1	SI-1	SII-1
1 st control test currently scheduled for Q1 of 2014.	2/3 of the shear beams fabricated.	
SC-2	SI-2	SII-2
Establish baseline behavior, test repeatability and depth effect.	<i>Fabrication, conditioning and monitoring efforts to continue until desired levels of ASR are achieved.</i>	
	Evaluate effect of ASR on shear strength and stiffness.	Evaluate efficacy of retrofit techniques.

PROGRESS / OUTLOOK

SHEAR	ANCHORAGE
<div data-bbox="141 426 627 521">Control</div> <div data-bbox="166 664 602 949"> <p>1st control test currently scheduled for Q1 of 2014.</p> </div> <div data-bbox="166 1021 602 1120"> <p>Establish baseline anchorage performance.</p> </div>	<div data-bbox="720 426 1207 521">Series I</div> <div data-bbox="1207 426 1694 521">Series II</div> <div data-bbox="745 585 1761 721"> <p>2/3 of the anchorage beams fabricated.</p> </div> <div data-bbox="745 813 1761 1028"> <p><i>Fabrication, conditioning and monitoring efforts to continue until desired levels of ASR are achieved.</i></p> </div> <div data-bbox="745 1028 1207 1120"> <p>Evaluate efficacy of retrofit techniques on anchorage capacity and wall stiffness.</p> </div> <div data-bbox="1207 1028 1787 1120"> <p>Evaluate efficacy of retrofit techniques.</p> </div>

Thank you!