ALKALI-SILICA REACTION AT SEABROOK STATION

UPDATE ON TESTING PROGRAMS

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THE UNIVERSITY OF TEXAS AT AUSTIN
STRUCTURAL TEST FACILITY
AGENDA

SEABROOK TESTING PROGRAMS

ANCHORS

ONE-WAY SHEAR

REBAR ANCHORAGE
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.
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
<table>
<thead>
<tr>
<th>Control</th>
<th>Series I</th>
<th>Series II</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SC-1</td>
<td>SII-1</td>
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<tr>
<td>Standard</td>
<td>SC-2</td>
<td>SII-2</td>
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<tr>
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<td>SC-3</td>
<td>SII-n</td>
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- **Control**: Establish baseline behavior, test repeatability and depth effect.
- **Series I**: Evaluate effect of ASR on shear strength and stiffness.
- **Series II**: Evaluate efficacy of retrofit techniques.
BEAM PROGRAM

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- **Control**
  - Establish baseline anchorage performance.

- **Series I**
  - Evaluate effect of ASR on anchorage capacity and wall stiffness.

- **Series II**
  - Evaluate efficacy of retrofit techniques.
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
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

- **Maine**
  - Pike Industries
  - Westbrook, ME

- **Type I/II Dragon Cement**
  - Thomaston, ME
BEAM PROGRAM WORKFLOW

BEAM FABRICATION → CONDITIONING & MONITORING → STRUCTURAL TESTING
AGGREGATE DELIVERY
AGGREGATE STORAGE
SIEVE ANALYSIS
FABRICATION AREA
CAGE FABRICATION
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

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- 2/3 of the shear beams fabricated.
- Fabrication, conditioning and monitoring efforts to continue until desired levels of ASR are achieved.

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Evaluate effect of ASR on shear strength and stiffness.
Evaluate efficacy of retrofit techniques.

Evaluate baseline behavior, test repeatability and depth effect.
## PROGRESS / OUTLOOK

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### Control

1st control test currently scheduled for Q1 of 2014.

Establish baseline anchorage performance.

### Series I

2/3 of the anchorage beams fabricated.

Fabrication, conditioning and monitoring efforts to continue until desired levels of ASR are achieved.

### Series II

Evaluate effect of ASR on anchorage capacity and wall stiffness.

Evaluate efficacy of retrofit techniques.
Thank you!