

National Airport Pavement Test Facility Update

Presented to: Airport Pavement Working Group

By: Don Barbagallo P.E.

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Federal Aviation
Administration



Acknowledgement

This presentation overview represents the work of many individuals including:

- FAA Pavement Group
- SRA International
- Gemini Technology



Recently Completed Projects at NAPTF

- CC5 (Flexible Pavement)
- CC6 (Rigid Pavement)

New Projects Underway

- CC7 Construction (Flexible Pavement)
- CC8 Planning (Rigid Pavement)

On-Going Projects

- Reflective Cracking of HMA Overlay Testing
- Alkali-Silica Reactivity Slabs
- Upgrades to the Pavement Test Vehicle

CC5 Primary Objective

Determine the effect of gear interaction on low-strength subgrade flexible pavement life.

- **Run six- and four-wheel carriages in close proximity on one half of a test item and run only the six-wheel carriage on the other half.**
- **Run 10 wheels in a single line on test item.**
- **Trafficking completed in fall 2012.**

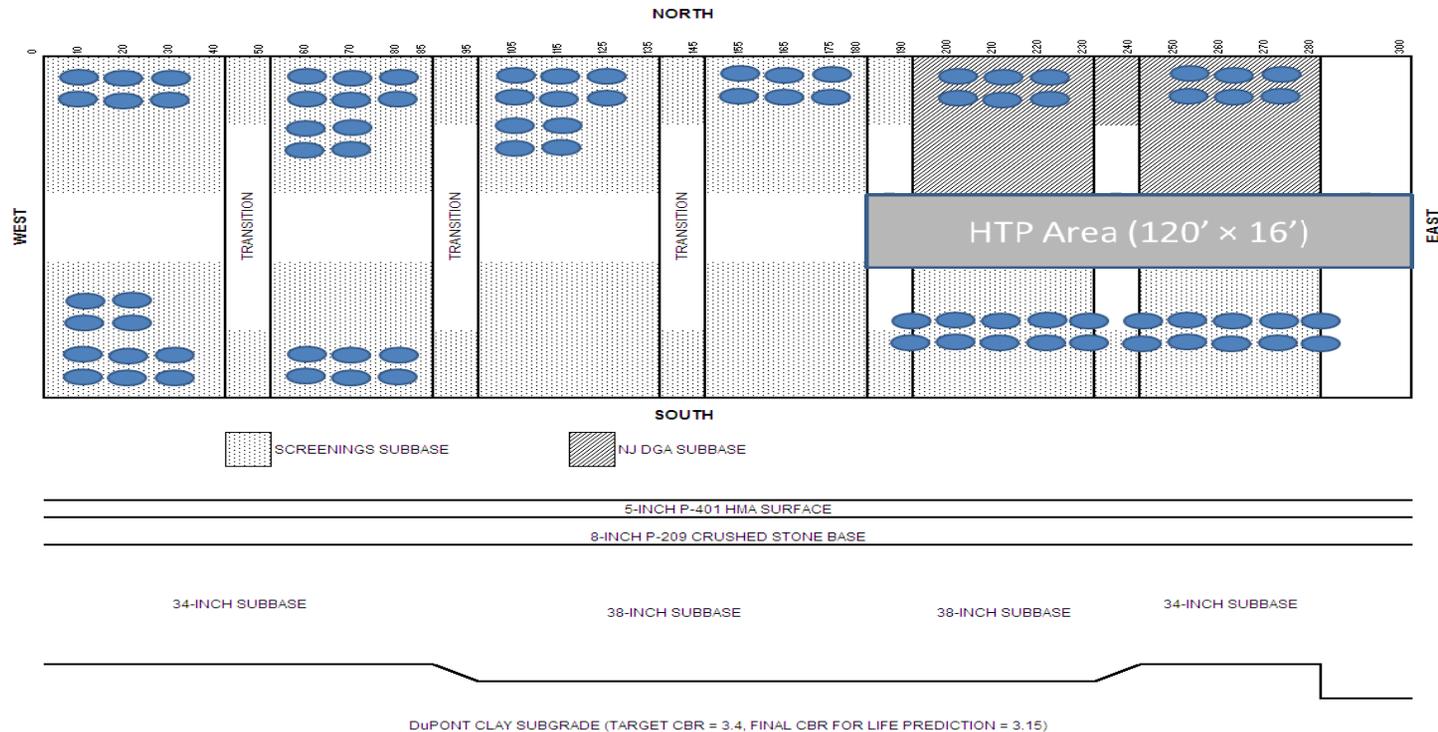


Post Traffic Testing

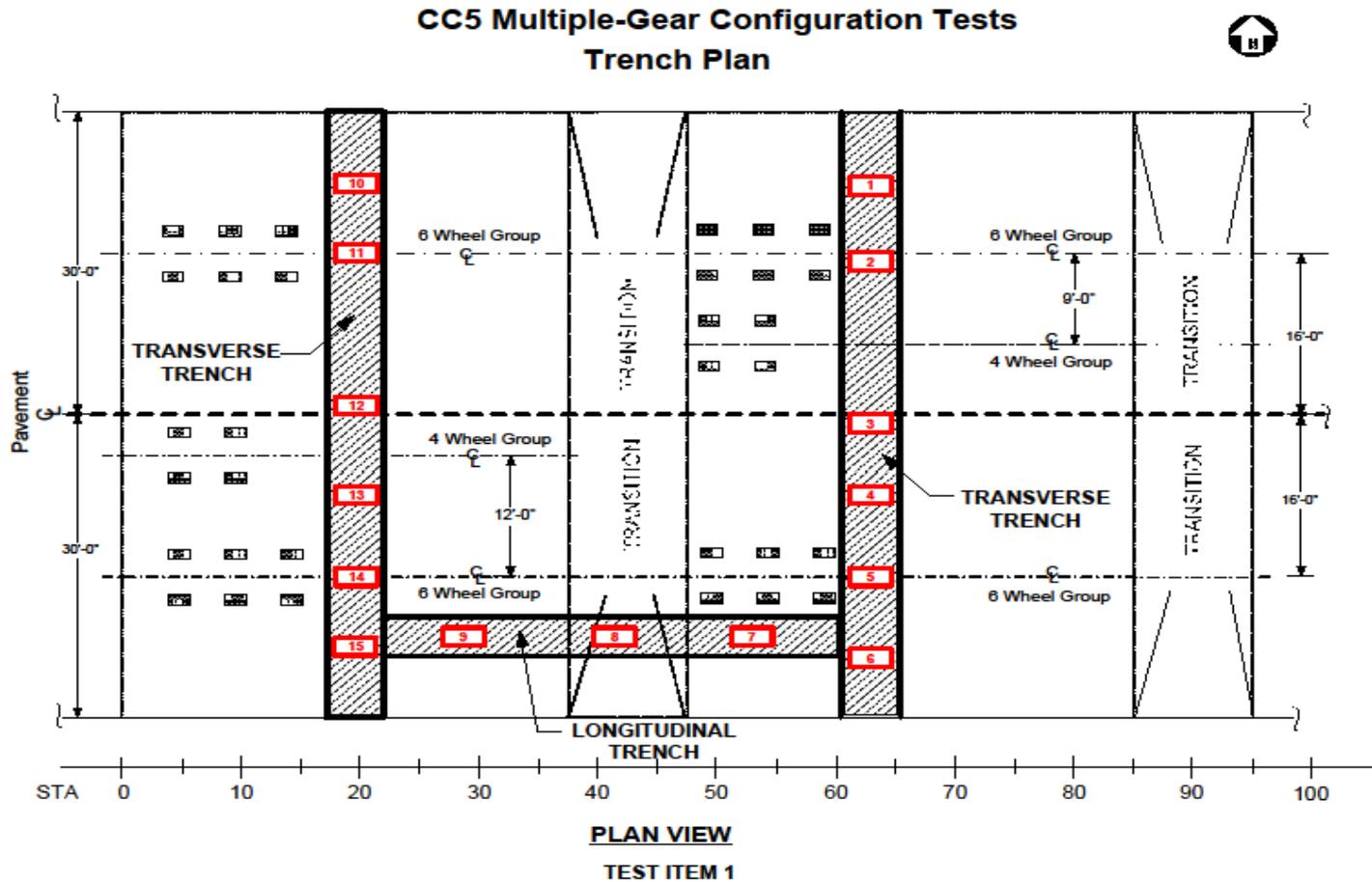
Trenching plan completed in two phases.

Phase I completed in Fall 2011

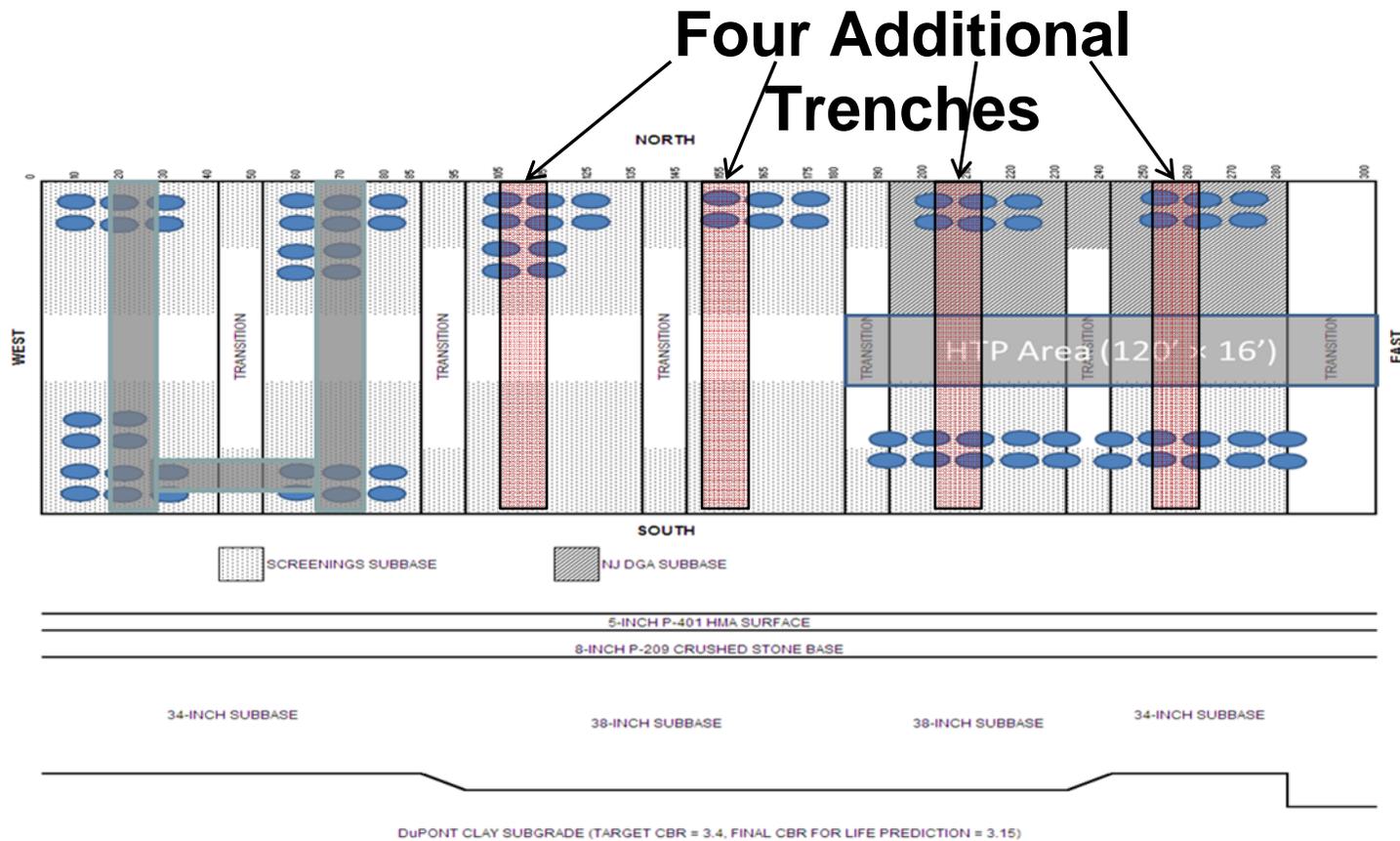
Phase II began Fall 2012 and completed March 2013.



CC5 Trench Plan - Phase I (Fall 2011)



CC5 Trench Plan - Phase II (Fall 2012)



CC5 TRENCH SUBGRADE CHARACTERIZATION



Nuclear Density



LWD



PSPA



CBR Measurement

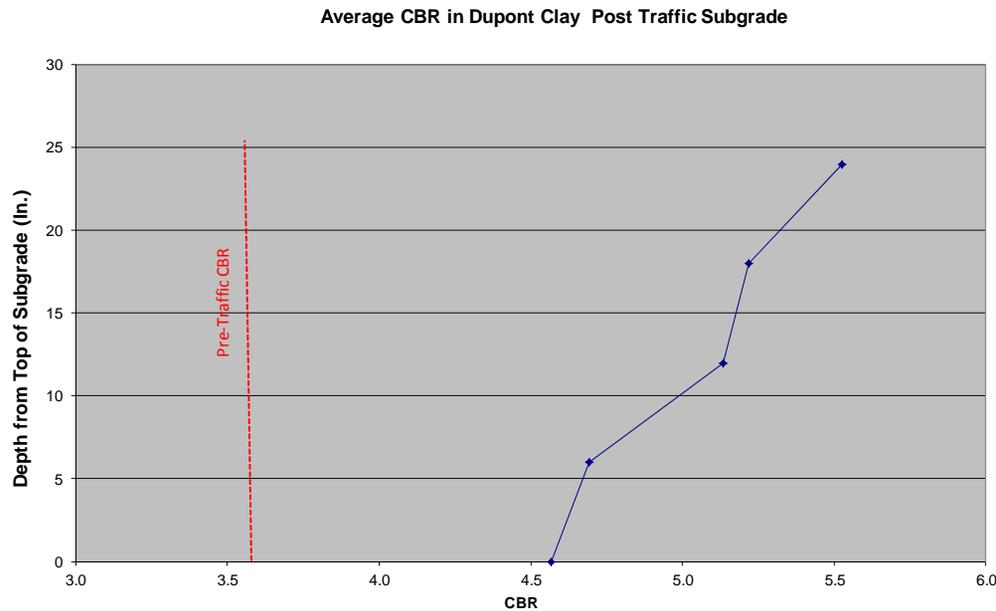


Profiles



Vane Shear

CC 5 Trench Findings



Average CBR Phase I Trench = 5.0
Average CBR Phase II Trench = 5.3

CBR Summary

Mr. Harkanwal Brar will provide further information on CC5 post-traffic testing.

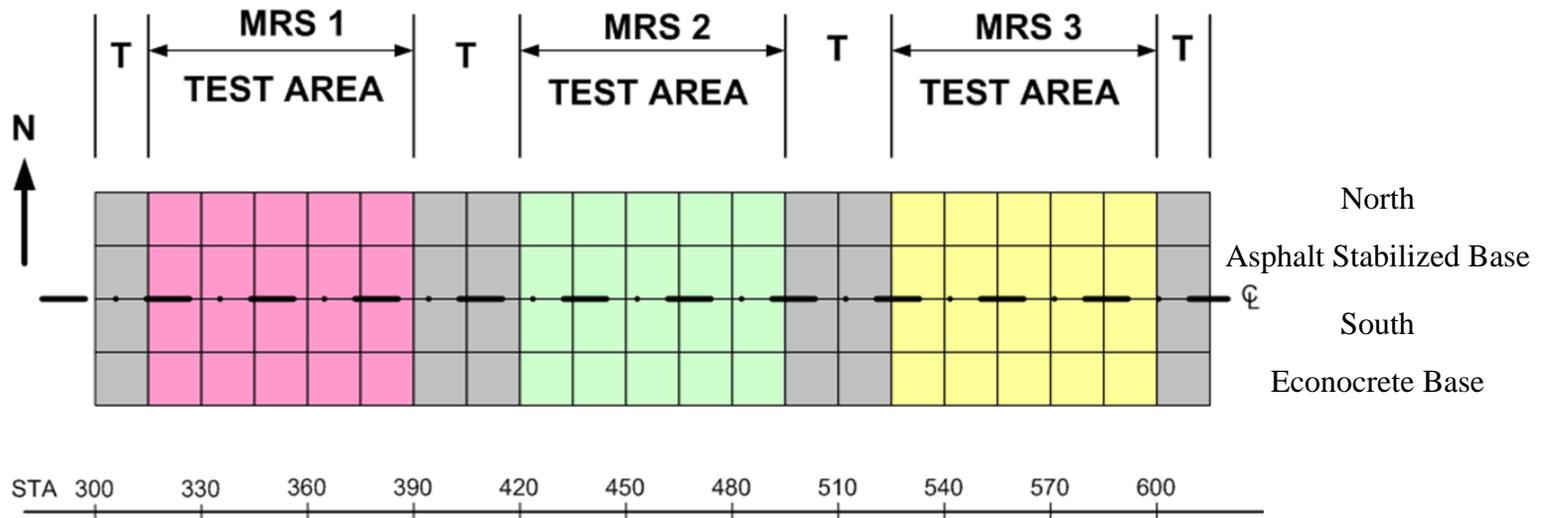
CC6 Rigid Pavement Tests

Objectives:

- **Investigate the relative performance between concretes with different flexural strengths.**
 - Will higher strengths lead to poor performance?
 - Look at current strength limitation in AC 150/5320-6E.
- **Investigate the effect of concrete stabilized subbase vs asphalt stabilized subbase on pavement performance.**

CC 6 Rigid Pavement

CC6 Plan View



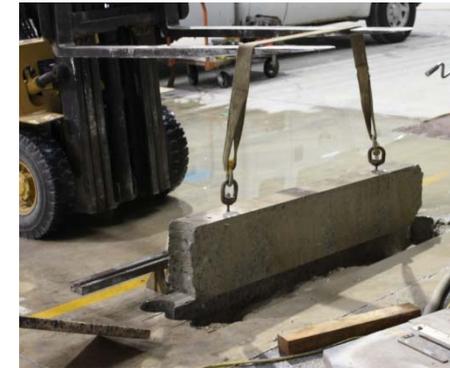
MRS 1 = 500 psi TFS Total Passes = 17,500 @ 45K

MRS 2 = 750 psi TFS Total Passes = 20,000 @ 45 + 13,529 @ 52K + 5,200 @ 70K

MRS 3 = 1000 psi TFS Total Passes = 20,000 @ 45K + 11,000 @ 52K + 7,729 @ 70K

CC6 Rigid Pavement Tests

Dr. David Brill & Dr. Hao Yin will present the update on CC6 testing & results.



New Projects Underway

NAPTF Pavement Testing

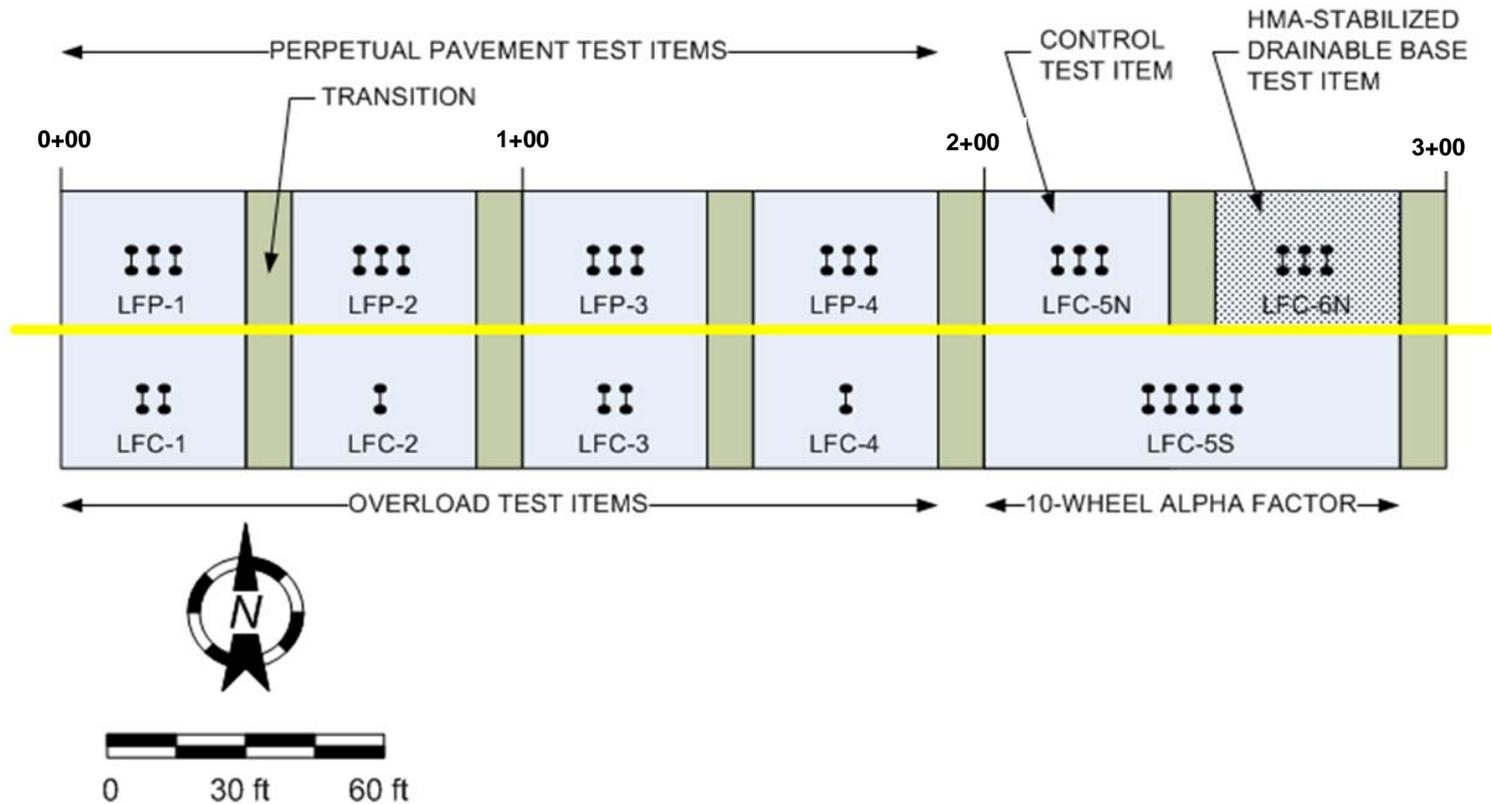
- **Construction Cycle 7 (Flexible Pavement)**
- **Construction Cycle 8 (Rigid Pavement)**



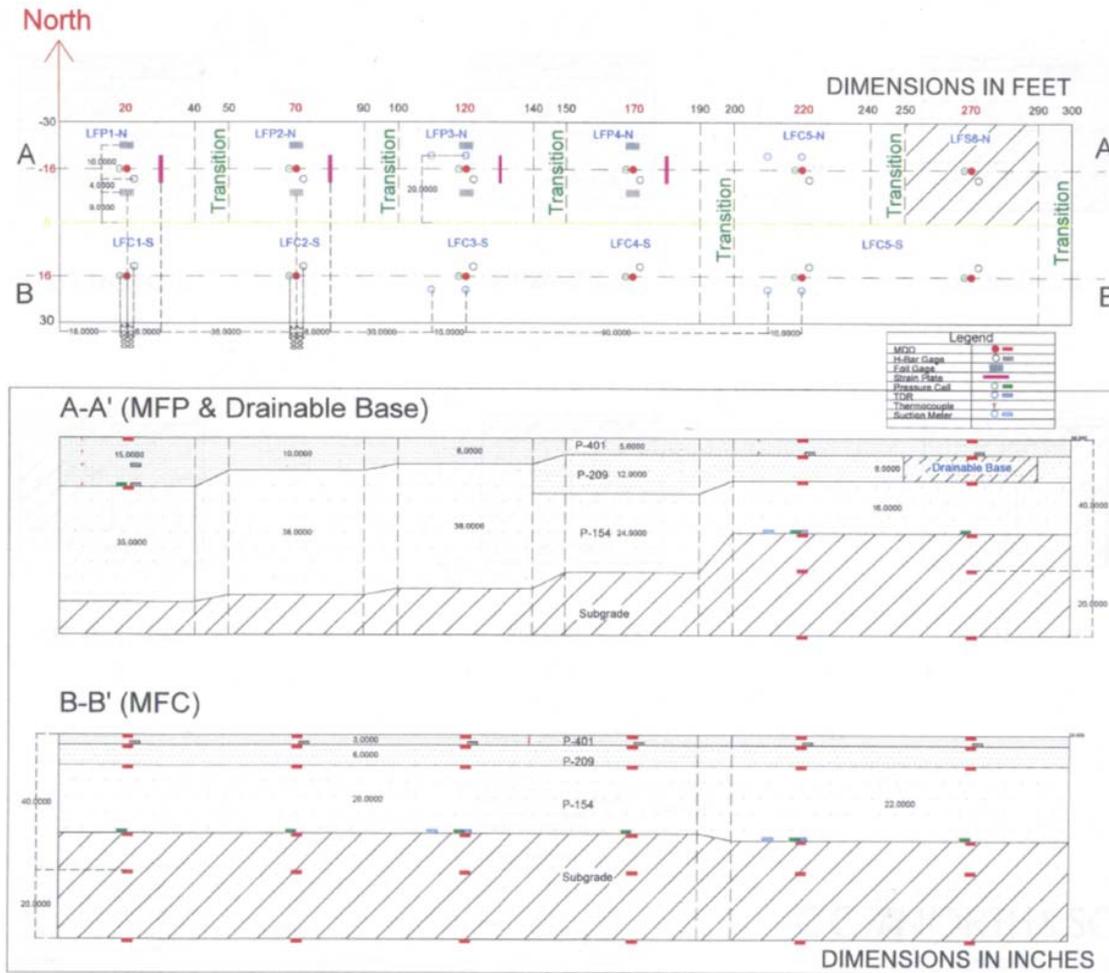
CC7 Flexible Pavement Testing

- **Construction Schedule: April 15 - June 2013.**
- **Primary Objectives**
 - **Perpetual Pavement Tests.** Develop “perpetual pavement” design criteria for airport pavements.
 - **Overload Tests.** Determine allowable aircraft overload criteria for flexible pavement.
- **Secondary Objectives**
 - Determine alpha factor for 10-wheel (5D) gear configuration.
 - Study the structural performance of drainable bases.
 - Investigate changes in subgrade CBR with moisture movement in low strength subgrade.

CC7 Plan



CC7 Instrumentation Plan



- Instruments:
- 1.MDDs
 - 2.H Bar Gages
 - 3.Foil Gages
 - 4.Strain Plates
 - 5.Pressure Cells
 - 6.Thermocouples
 - 7.Moisture Gages
 - 8.Suction Meters

Dr. Navneet Garg will provide further details on CC7 Plans.

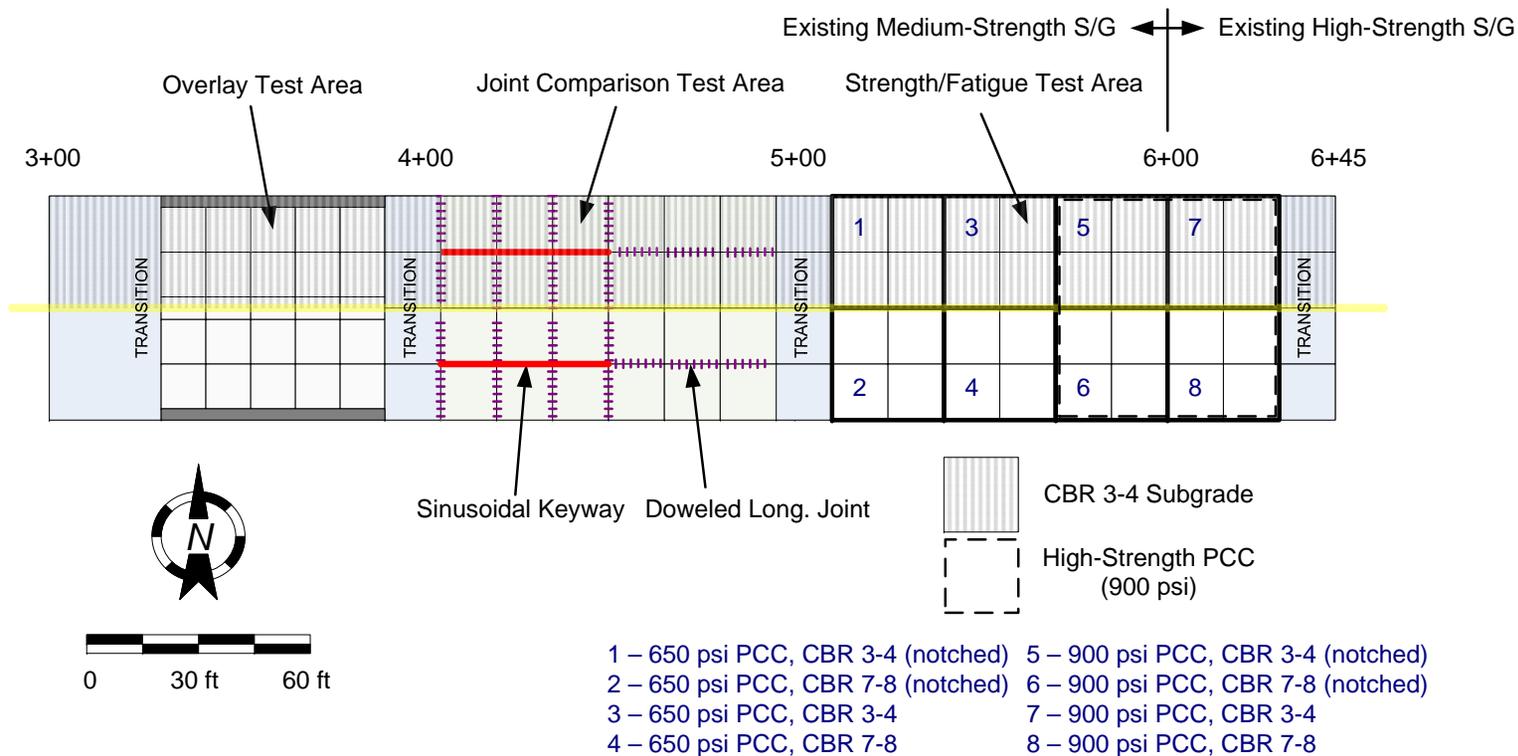
CC8 Rigid Pavement Testing

- **Construction Schedule: Summer – Fall 2013**
- **Primary Objectives:**
 - **PCC-on-Rigid Overlay Test.** Test PCC overlay on existing PCC with SCI in 50-80 range (Follow-on to CC4 overlay tests).
 - **Evaluate Comparative Joint Performance.**
 - **Longitudinal Joint: doweled versus alternate sinusoidal key.**
 - **Transverse Joint: doweled versus un-doweled (dummy).**
 - **Improve FAARFIELD Failure Model.** Test full-scale slab strength & fatigue strength for different concrete strength and foundation conditions.



CC8 Concept Layout

CC8 Concept Layout III



Dr. David Brill will provide further details.

NAPTF On-Going Projects

- **Reflective Cracking Test Rig**
- **Alkali-Silica Reactivity Testing**
- **Test Vehicle Upgrades**



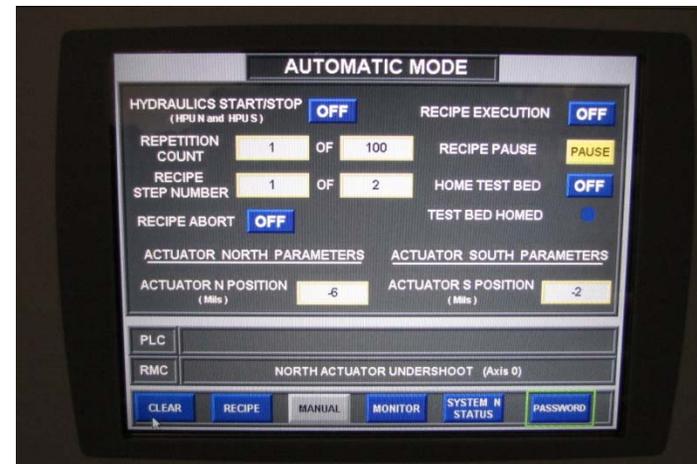
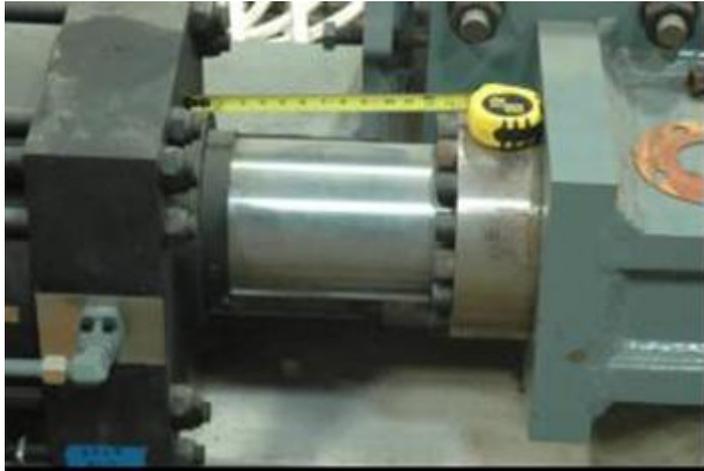
Reflective Cracking Test Rig

- **Goal: Develop design guidance for asphalt overlay of concrete pavements based upon full scale testing.**
- **AC 150/5320 - 6D purely empirical solution**
- **AC 150/5320 – 6E FAARFIELD does not address problem.**

- **First series of tests run in winter 2012.**
- **Re-Construction of test pavement occurred late fall 2012 with testing Jan-Feb 2013.**



Reflective Cracking Test Rig



Reflective Cracking Test Jan-Feb 2013

- **Environmental temperature change simulation.**
 - Interface temperature 32F
 - Movement = Sinusoidal 0 to 12 mils
 - Loading = 150 sec with 600 sec rest period
 - Total Cycle Time = 12.5 minutes
- **Instrumentation includes:**
 - Strain gages: concrete, asphalt, and surface
 - LVDT's measuring concrete movement
 - Crack detectors
 - Thermistors
- **Dr. Hao Yin of Gemini Technologies will present data.**



Alkali-Silica Reactivity Testing



- **Indoor, outdoor, & control slabs cast approx. 3 ½ years ago.**
- **Slabs contain high alkali cement and known reactive aggregates.**
- **Test slabs include fly ash (30%) and air entrained (5%) concrete.**
- **Periodic dosing with potassium acetate solution whenever slabs dry out; about every 6 - 8 weeks.**
- **Grooving of slabs to expose aggregate to potassium acetate.**

ASR Testing Results (3 Years)

- **All slabs exposed to KAc are beginning to show some distress in the top 10 mm.**
- **Indoor slabs have higher concentrations of K.**
- **Elevated levels of K observed in the paste along with some cracking of the aggregate matrix.**
- **An overwhelming presence of ASR gel not observed.**



Test Vehicle Upgrades



Load Control

New hydraulic digital servo valves with Delta controllers.



Motion Control

New electronic drives with dynamic braking.



Test Flexibility

New single wheel module with larger radial tire

Facility Upgrades

- **200,000 lb in-ground scale to facilitate calibration of test vehicle wheel loads.**
- **Permanent pit for test vehicle module change-out.**
- **Load cells for reflective cracking test rig.**
- **Rail grinding for test vehicle.**

