



# CRCP in Texas

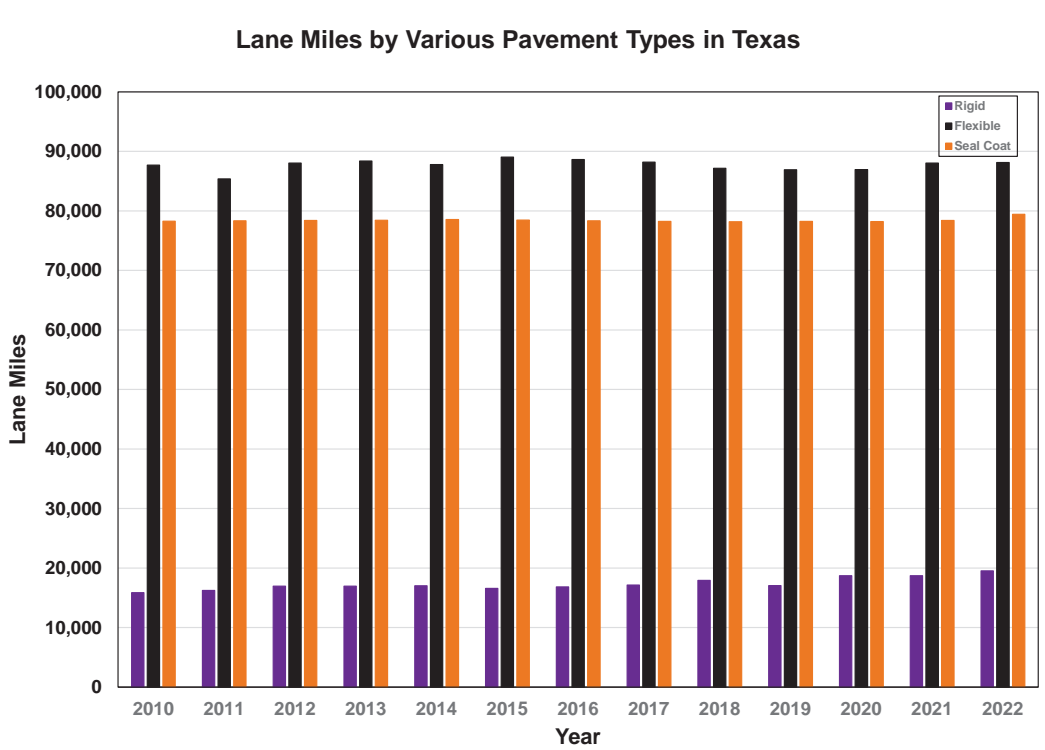
Andy Naranjo, P.E.

September 8, 2023

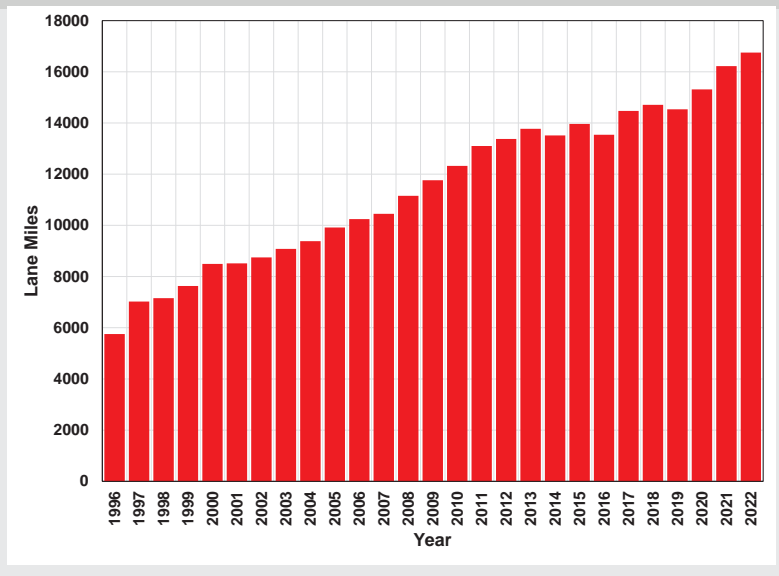
Everything is BIGGER in Texas!



# Pavement Lane Mile (All Types)

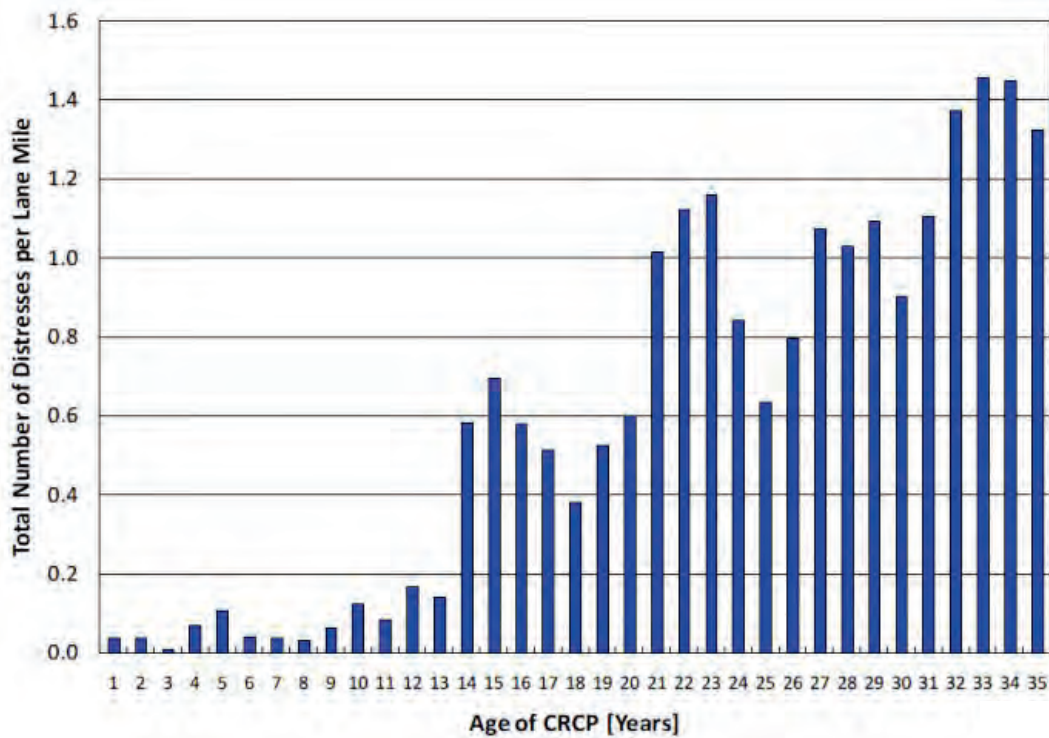


# CRCP Lane Miles

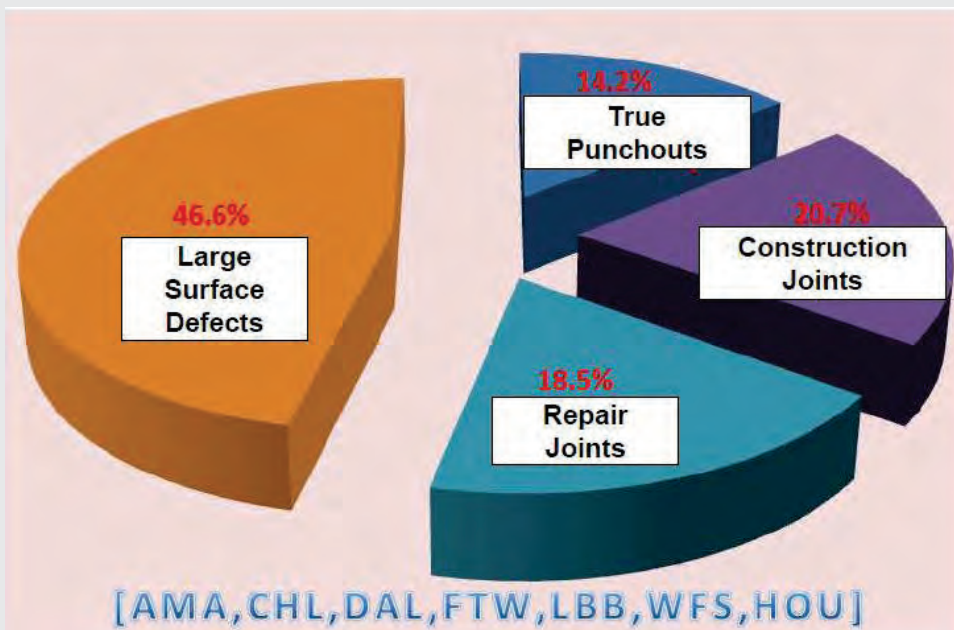


TxDOT adds approximately 400 lane miles annually

## CRCP Age vs. Distress



## Classification of TxDOT CRCP Distresses



0-6274 Project Level Performance Database for Rigid Pavement in Texas, Phase II





# Project 0-7026

Optimization of Reinforcing Steel in 12" and 13" Continuously Reinforced Concrete Pavement (CRCP)

September 8, 2023

## Are these Punchouts?





## What about these distresses?



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## Horizontal Cracking in CRCP Section



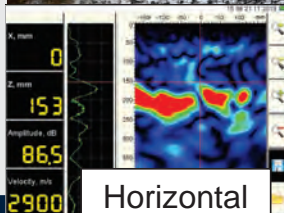
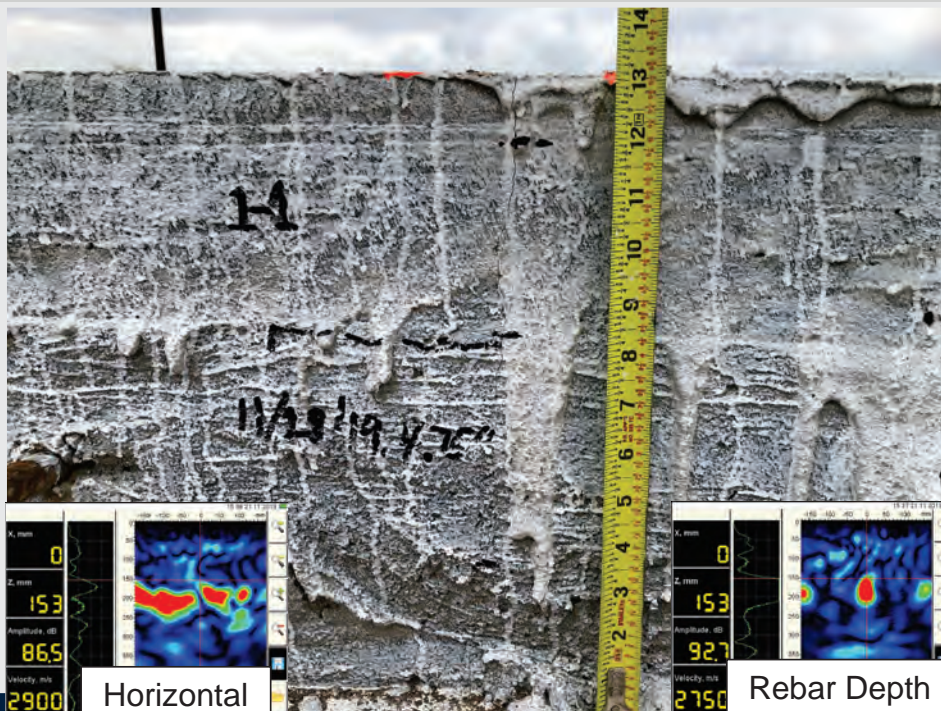
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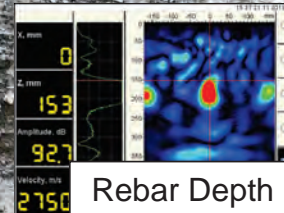
# Early-Age Horizontal Cracking



# Horizontal Cracking



Horizontal Crack



Rebar Depth



## Interaction with Reinforcement



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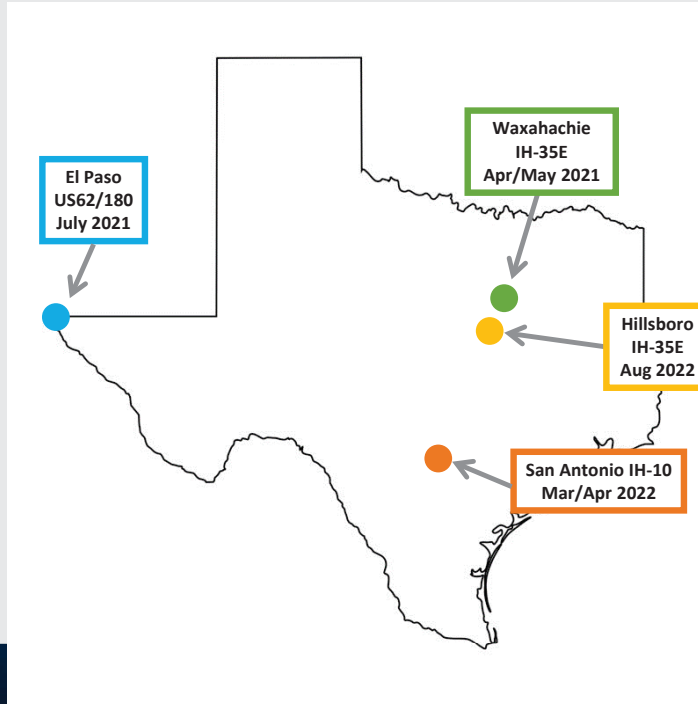
## TxDOT Research Project 0-7026



- 9/1/2019 ~ 8/31/2022
- Objective: Identify optimum steel depths for thick (12" and 13") CRCP.
- Consisted of:
  - Theoretical analysis of structural behavior of CRCP
  - Field experiments with various gages installed in actual CRCP projects
  - Data acquisition and analysis

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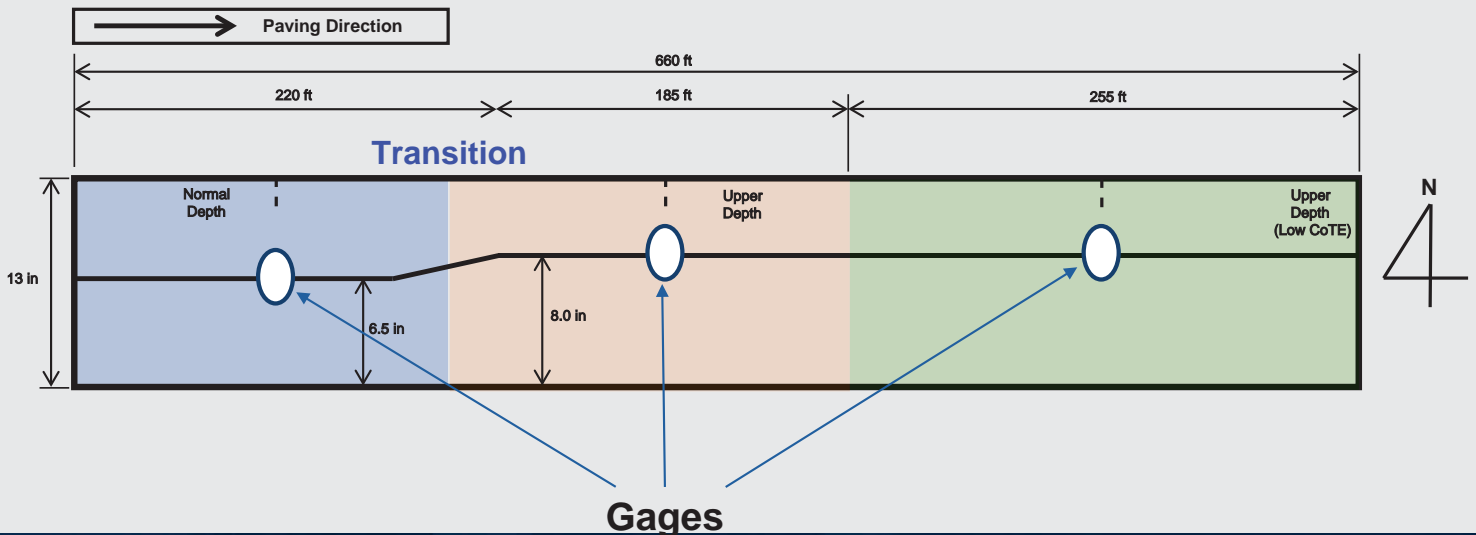
# Field Testing Locations



# Test Section Plan

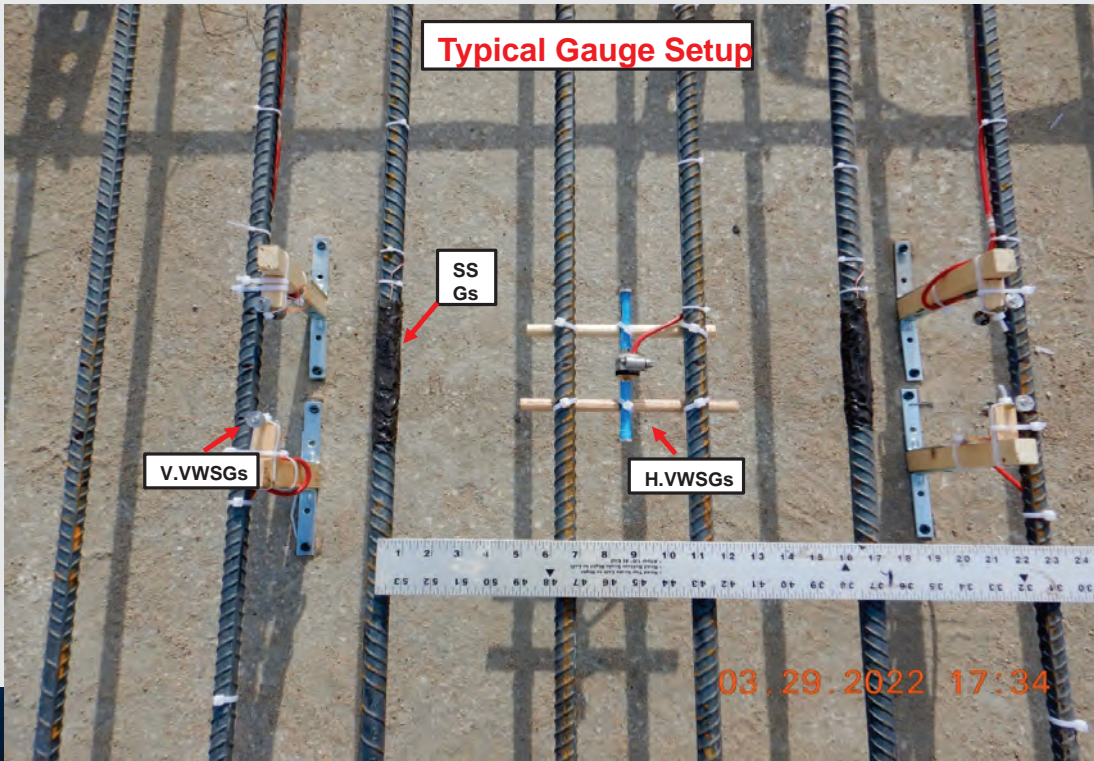


Longitudinal Cross-Section View  
NOT TO SCALE





# Strain Gauge Setup

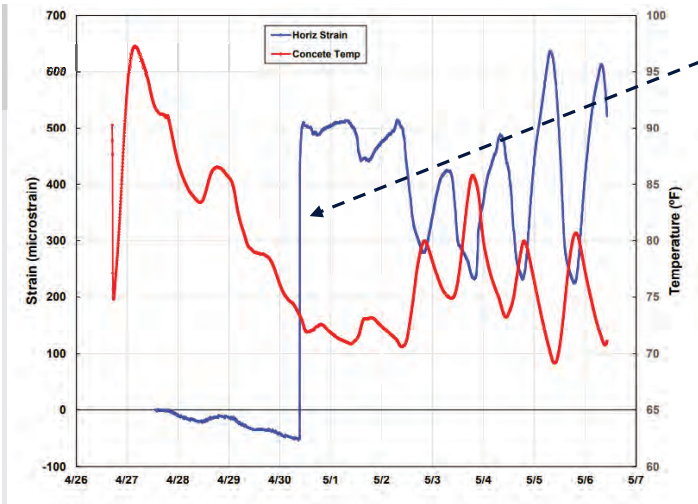
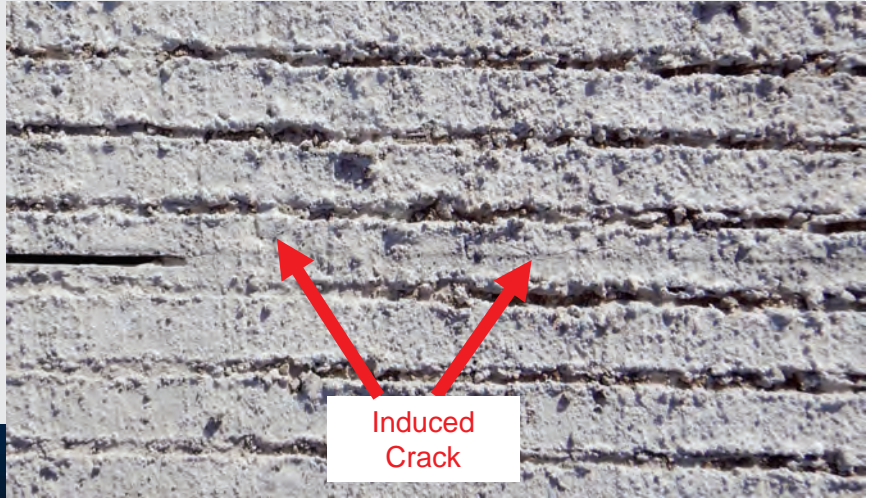


# Active Crack Control





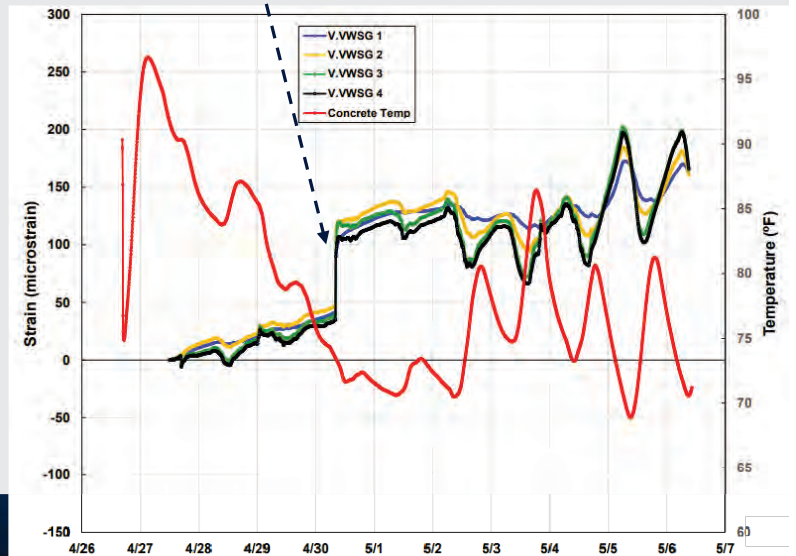
# Induced Crack



## Horizontal Strains

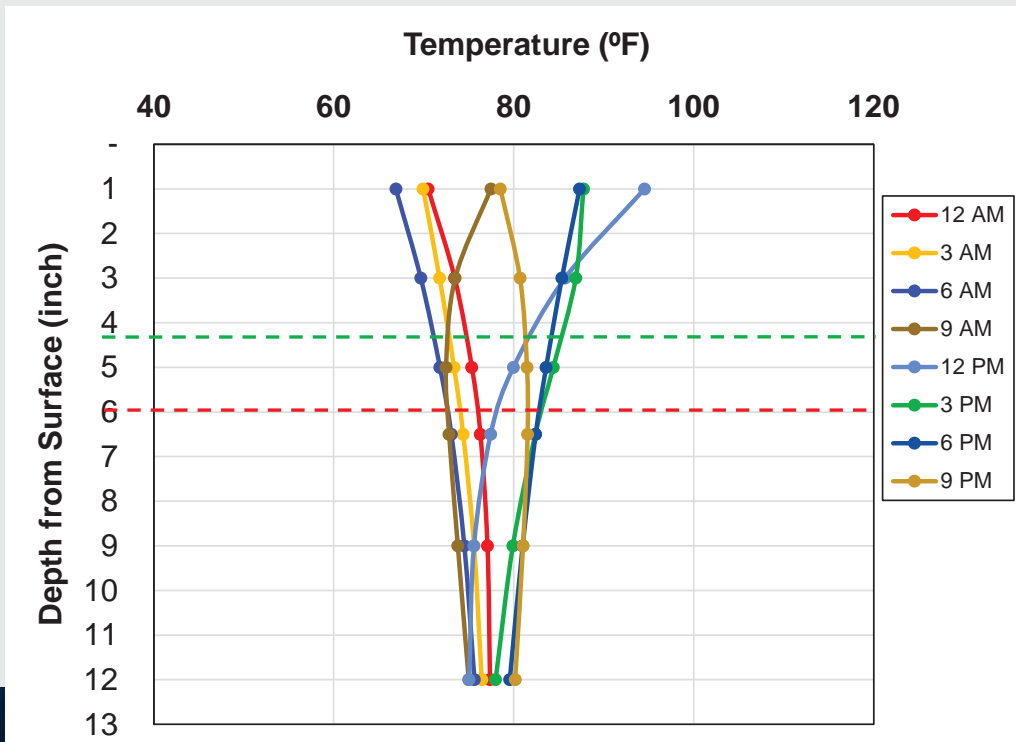


## Vertical Strains





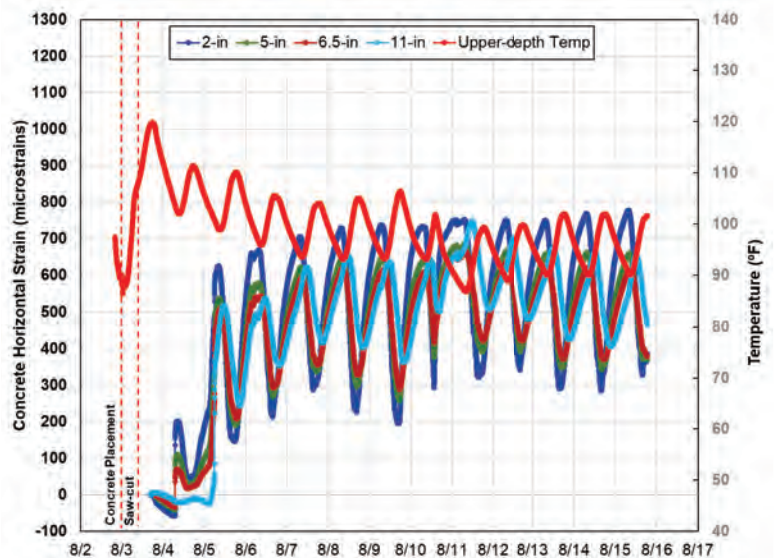
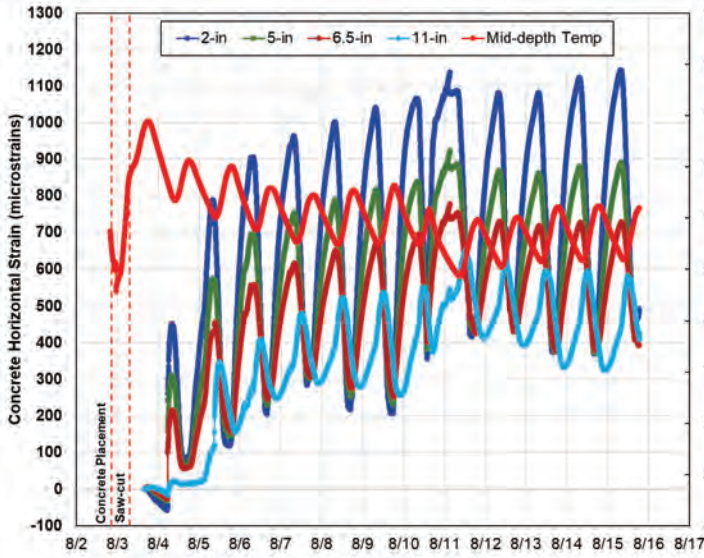
# Temperature Gradients



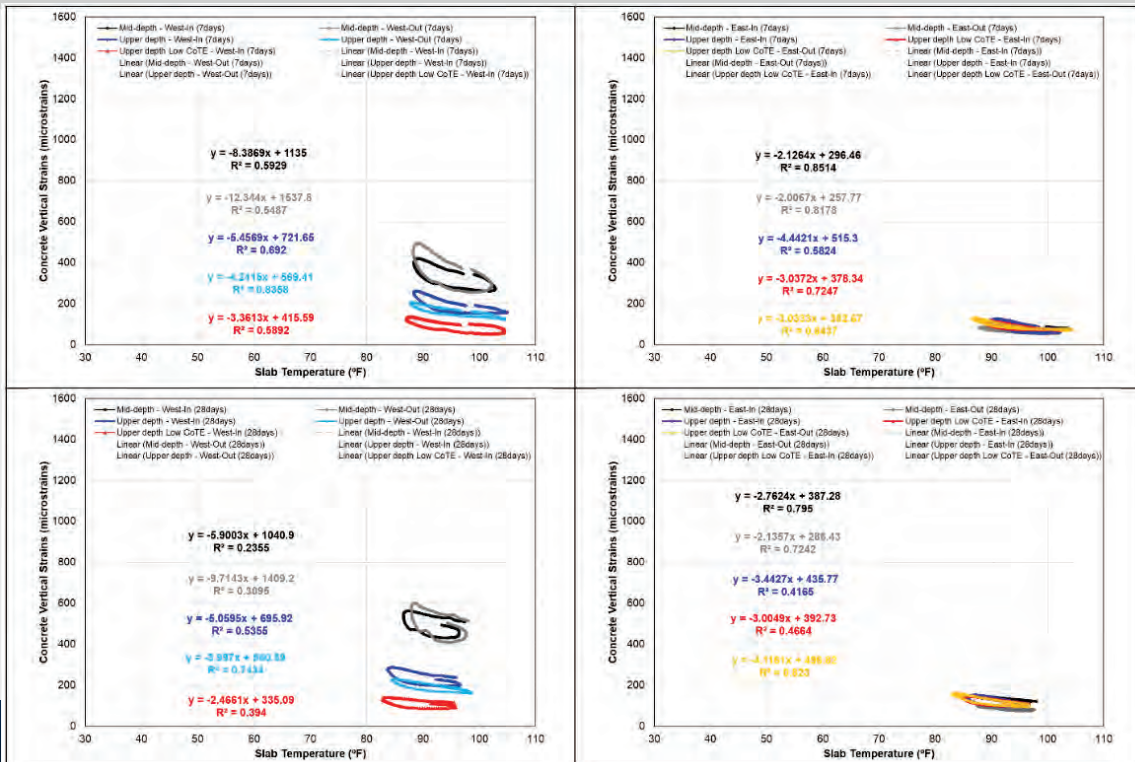
# Strain Gauge and Thermocouple Setup



# Hillsboro Early-Age Concrete Horizontal Strain Behaviors

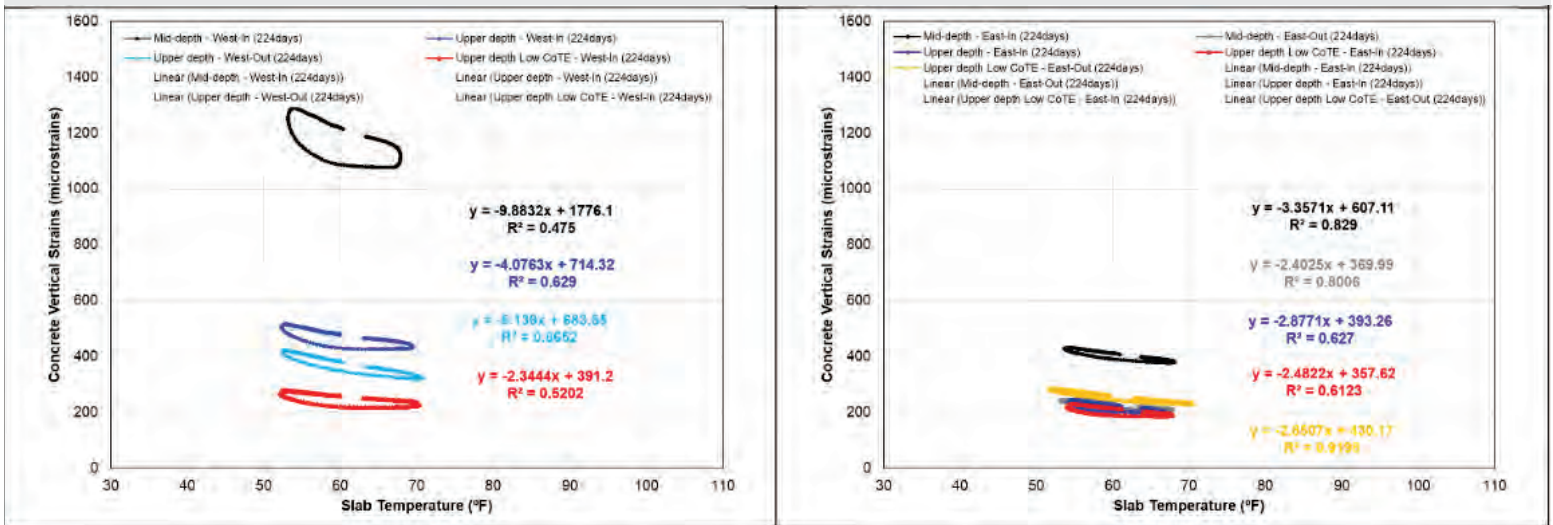


# Vertical Strain Behavior (7 and 28 days)





## Vertical Strain Behavior (224 days)



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## Where do we go from here?



- Based on research findings:
  - Changed CRCP standards
    - Depth of steel for 10.5" to 13" will be 5" from pavement surface
  - Low CTE Table?
    - More evaluation of data needed to determine if Low CTE table can get added back into standard.
- Proposing additional research project to optimize double mat steel CRCP.

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# Project 5-6910

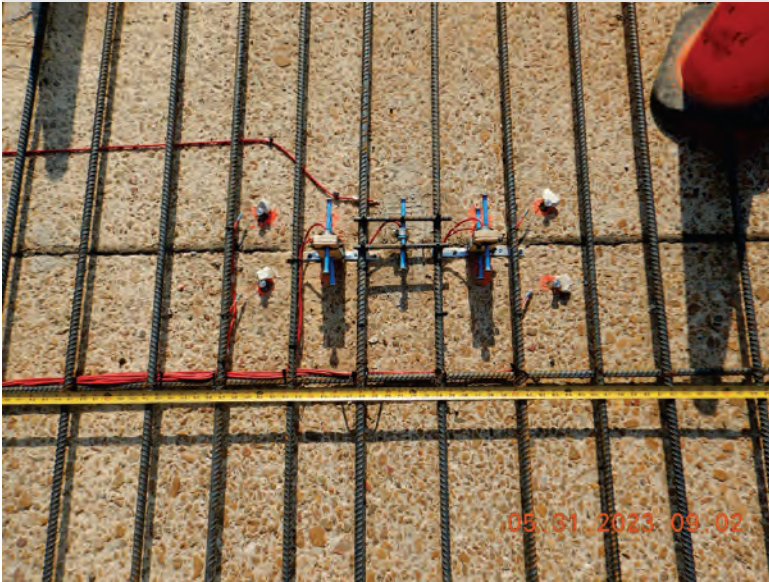
Implementation of Concrete Overlay  
Evaluation and Design

September 8, 2023

## JCP Section with Significant Issues







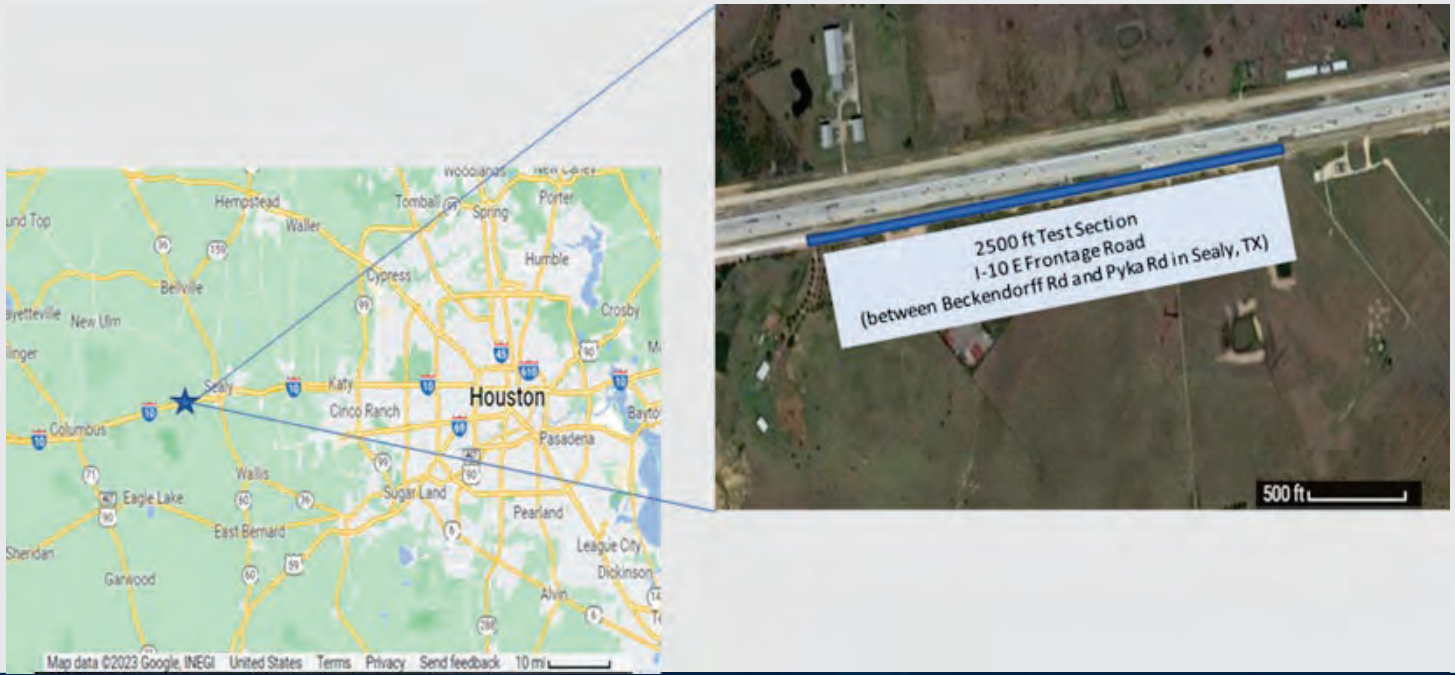
## Project 0-7074

Increase the Allowable Content of Recycled Crushed Concrete Fine Aggregate in Class P Concrete

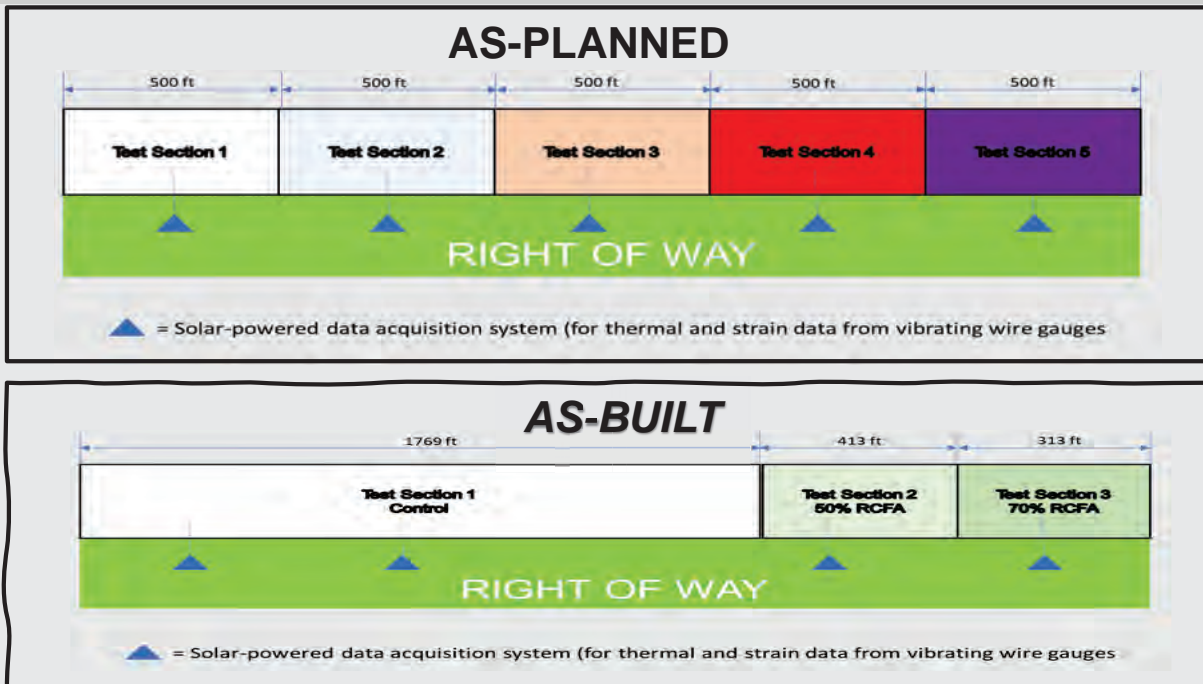




# Field Trial



# Test Sections







## 50% RCFA Test Section

- Workability and Finishing
  - No Issues



50% RCFA Section



50% RCFA Section

## 70% RCFA Test Section

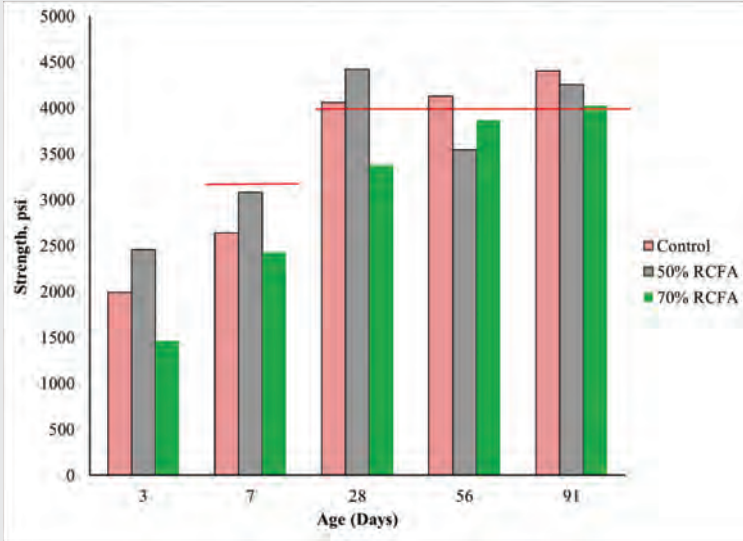


- Workability and Finishing
  - No Issues

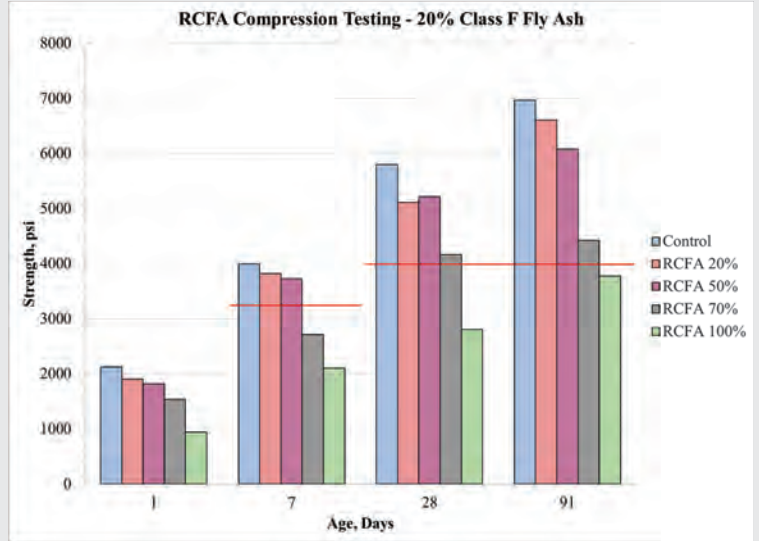


70% RCFA Section

# Compressive Strength



Field Trial Data



Previous Lab Data

# Crack Spacing

