

# Center for Research and Education in Advanced Transportation Engineering Systems (**CREATEs**)



# In this presentation...

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- ❑ What is CREATEs?
- ❑ Pre-CREATEs Research
- ❑ CREATEs Heavy Vehicle Simulator
- ❑ Potential Research at CREATEs
- ❑ Instrumentation Capabilities
- ❑ NJDOT Project: Life Expectancy of Thin Asphalt Overlays
- ❑ Questions



# Rowan CREATEs





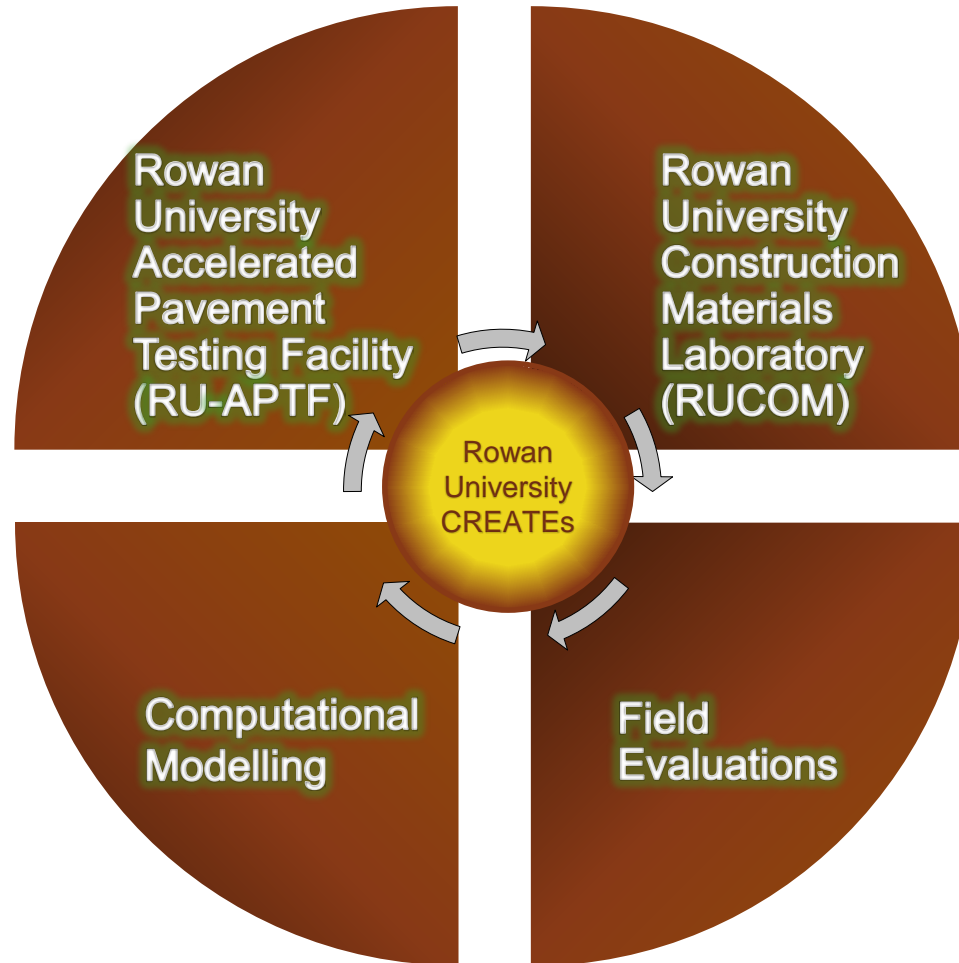
# Rowan CREATEs

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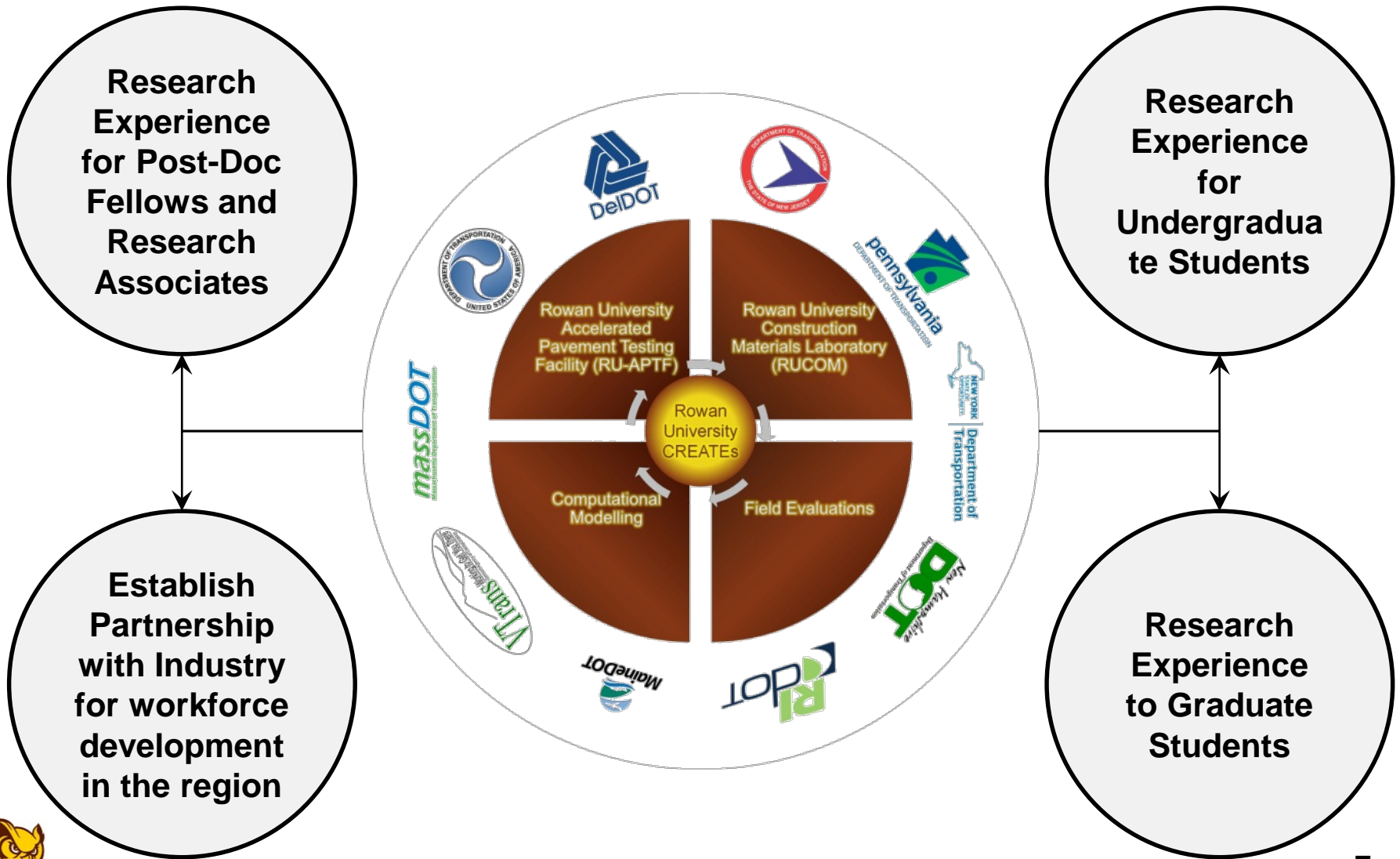
- ❑ Established through a partnership with United States Army Corps of Engineers/US Department of Defense and the State of New Jersey.
- ❑ Officially opened on September 14, 2016.
- ❑ Construct up to 16 full-scale pavement sections (30 ft. long by 12 ft. wide).



# Rowan CREATEs

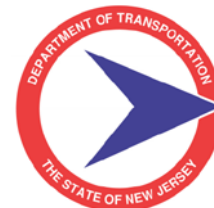
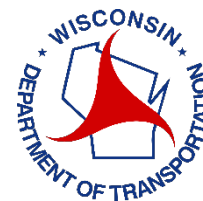


# CREATEs Mission



# Past Research

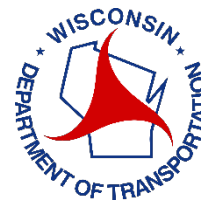
- A Cross-Linking Agents on Morphology & Rheology of Polymer Modified Binders
- B Green Technologies: Warm Mix Asphalt & Reclaimed Asphalt Binder
- C Rejuvenators and their Impact on Hot Mix Asphalt Performance
- D Methods for Incorporating a Broad Range of Polymers in Asphalt Binders





# Past Research

- E Alternatives to Nuclear Density Testing of Unbound Pavement Layers
- F Evaluation of New Design Methods for NJDOT, FHWA, and NCHRP
- G Developing Construction and Pavement Design Specifications
- H Methods for Incorporating a Broad Range of Polymers in Asphalt Binders



# Past Research

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I	Performance of Waste Derived Oils in Neat and Polymer Modified Binders
J	Evaluation of Degree of Blending of RAP and Binders with Various Rejuvenators
K	SARA and GPC Analysis of Binders and Impact of Rejuvenators or Light Fractions
L	Evaluation of Use of Aggregates from Incinerated Waste in Construction Materials

Sponsored by Industry Partners



# CREATEs Heavy Vehicle Simulator

- ❑ Rowan University acquired a HVS (Mark IV model) from the United States Army Corps of Engineers (USACE)
- ❑ Typically used to evaluate flexible (asphalt) and rigid (cement) pavements
- ❑ Currently housed at the South Jersey Technology Park as a part of Rowan University Accelerated Pavement Testing Facility (RU-APTF)



# CREATEs Heavy Vehicle Simulator

- ❑ Uni-directional and bi-directional loading (with 10,000 and 20,000 passes respectively)
- ❑ Wheel load applied from 20 to 100kN
- ❑ Truck tire pressure of 80-100psi / C-141 aircraft tire pressure up to 210psi
- ❑ Wheel wander up to 30 inches
- ❑ Loading has an effective length of 20 feet



# Arrival of HVS



# Arrival of HVS



# Grand Opening (September 14, 2016)



# Rowan CREATES

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# Potential Research at CREATEs

## Pavement Evaluation

Green technologies: Binder and mixture characterization

Cementitious materials characterization

Flexible and rigid pavement evaluation

New/Innovative Pavement Technologies Evaluations

Trucks and Airplanes Loading Impacts Evaluations

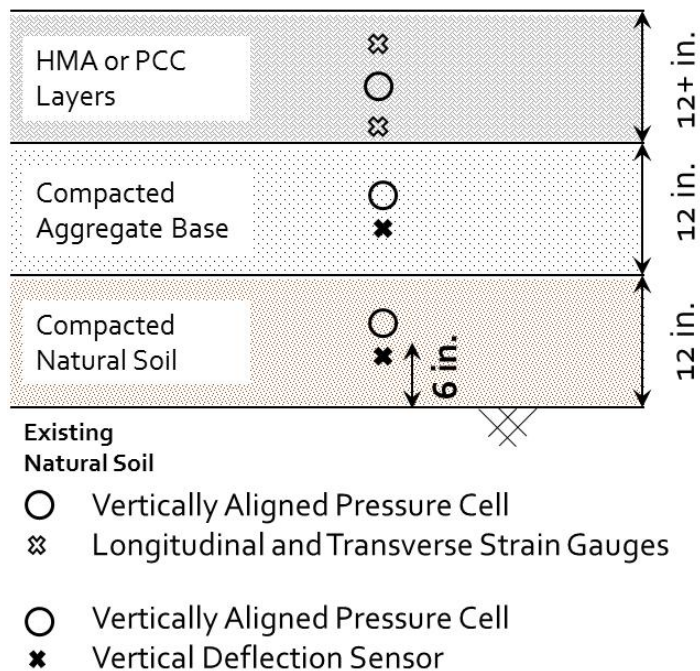
Others (Environmental Impacts and Wander Patterns)



# Instrumentation Potential



# Instrumentation Potential



- Characterizes rutting and cracking potential of HMA pavements
- Ability to characterize warping of PCC pavements
- Ability to evaluate subgrade layer rutting potential.



# Life Expectancy of Thin Asphalt Overlays





# Why Thin Asphalt Overlays?

- ❑ Around 50% of NJDOT's roads are PCC pavements.
- ❑ These roads are generally in poor condition.
- ❑ Thin overlays are typically utilized to extend the life of these pavements.
- ❑ However, these overlays have been performing poorly in the field.





# Goal

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- ❑ Conduct accelerated full-scale pavement testing to predict the expected life of four thin asphalt overlay treatments used on Portland Cement Concrete (PCC) pavements.



# Research Approach

- 1 Conduct Laboratory Testing  
[Overlay Tester, Asphalt Pavement Analyzer, & AASHTO T283](#)
- 2 Construct six full-scale pavement sections at CREATEs ([includes instrumentation](#))
- 3 Apply accelerated loading on each section using a Heavy Vehicle Simulator (HVS)
- 4 Monitor performance as loading progresses.



# Overlays Considered

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A	9.5 mm. NMAS Superpave Mix ( <u>Control</u> )
B	12.5 mm. NMAS Stone Matrix Asphalt (SMA)
C	High Performance Thin Overlay (HPTO)
D	Binder Rich Intermediate Course (BRIC)

B, C, and D are NJDOT's Specialty Mixes



# Full-Scale Pavement Sections

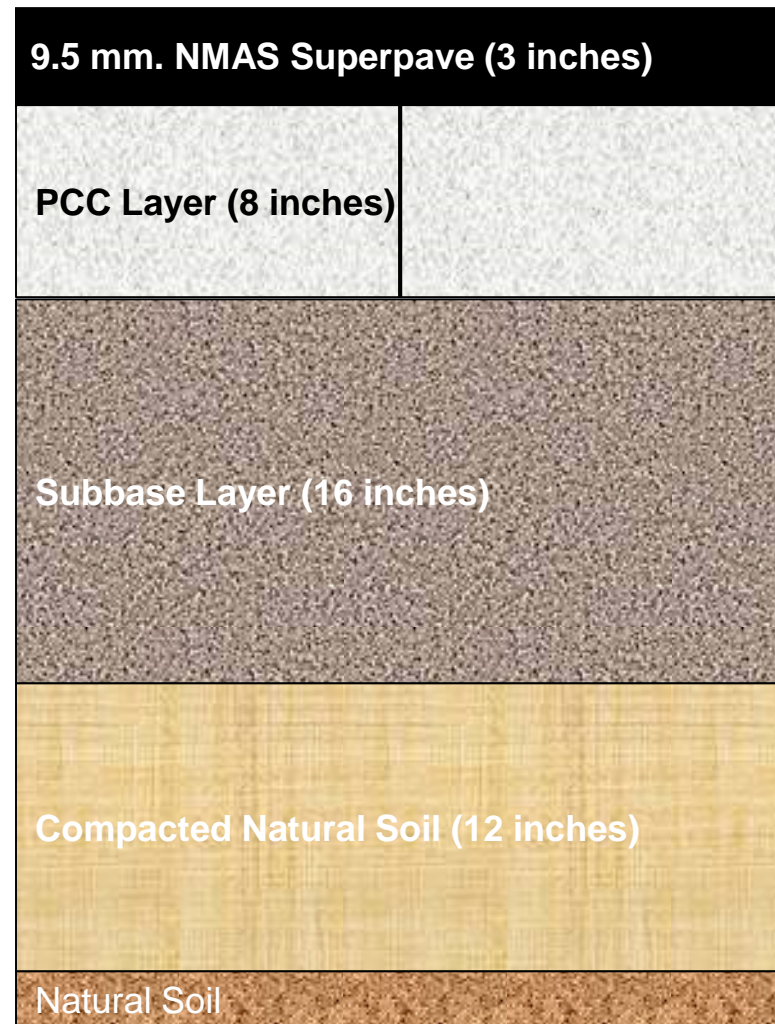
- ❑ A total of six sections were constructed at CREATEs accelerated pavement testing facility.
- ❑ Combinations of the four overlays with varying thicknesses.
- ❑ The supporting PCC pavement structure was similar for all sections.



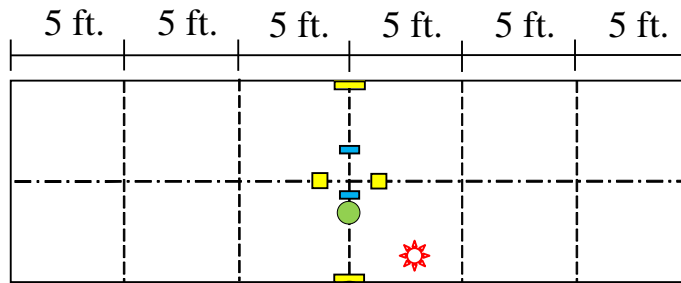
# Full-Scale Sections







## Section No. 1:

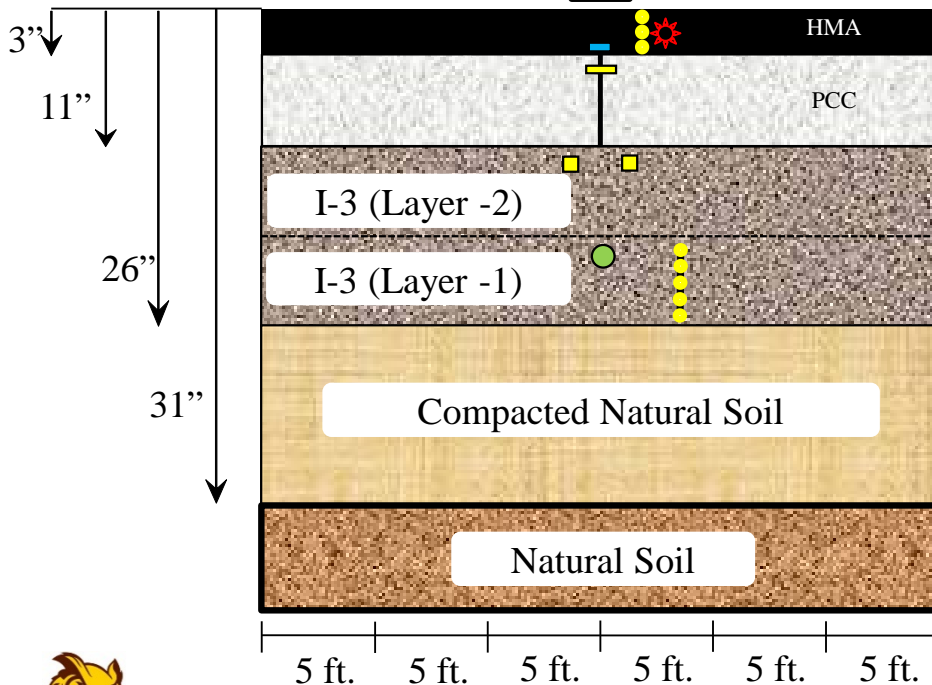
- 9.5 mm. NMAS Superpave Overlay
- 8 inch PCC Intermediate Course (BRIC) Mixes.
- BRIC is a Specialty NJDOT Overlay mix



# Sections Instrumentation



-  Longitudinal Asphalt Strain Gauge (Total: 2)
-  Pressure Cell (Total: 1)
-  LVDT (Total: 2)
-  Soil Compression Gauge (Total: 2)
-  HMA Temperature Sensor (Total: 3 T-type Thermocouples)
-  Type T thermocouples will be used for temperature measurements.



# Sensor Installation (Pressure Cell)



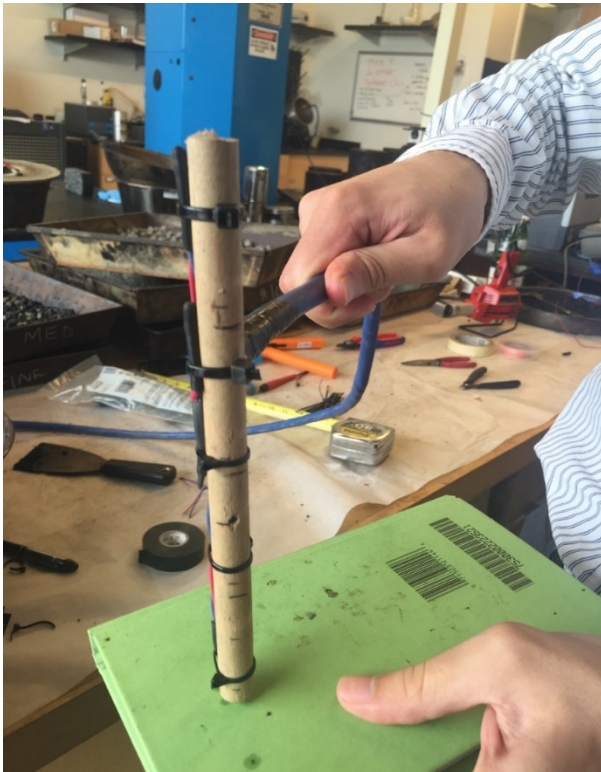
# Sensor Installation



# Sensor Installation



# Sensor Installation (Thermocouples)





# Sensor Installation (SCGs)

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# Sensor Installation (SCGs)

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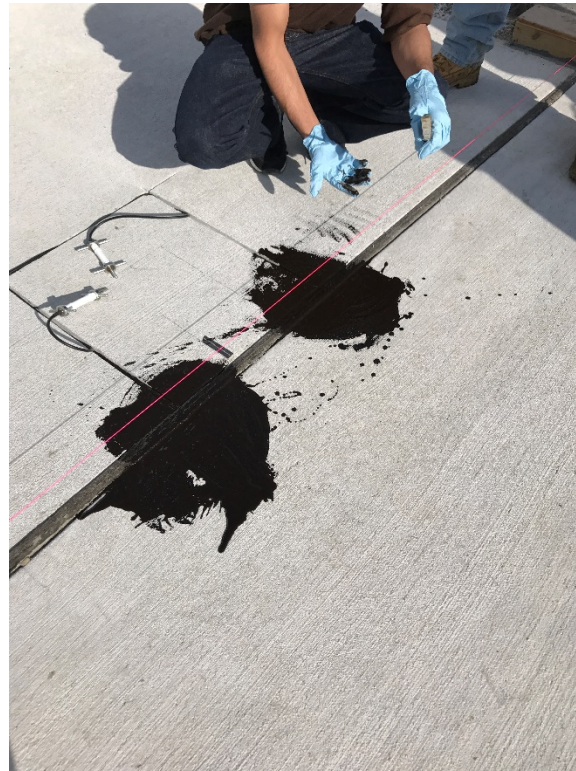
# Sensor Installation (SCGs)



# Sensor Installation (LVDTs)



# Sensor Installation (ASGs)



# All Sections



Questions?  
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Thank You!

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