

Ohio Research Institute for Transportation and the Environment

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Shad Sargand
Russ Professor
Department of Civil Engineering
Ohio University



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Perpetual Pavement

WAY-30 Project Background

- The WAY-30 bypass consists of 2 research projects:
 - Assessment of the perpetual pavement concept for asphalt concrete.
 - Determination of mechanical properties of materials used.
- These projects, designed by ODOT, will incorporate new and innovative design procedures, specifications, test procedures, and construction techniques.

Project Objectives

- Review design procedures used by ODOT.
- Develop comprehensive instrumentation plans to monitor environmental and load response parameters.
- Monitor dynamic responses of the pavement structure during non-destructive testing and controlled vehicle tests.
- Determine mechanical properties of the pavement materials used during construction and in-service.

Benefits of Research

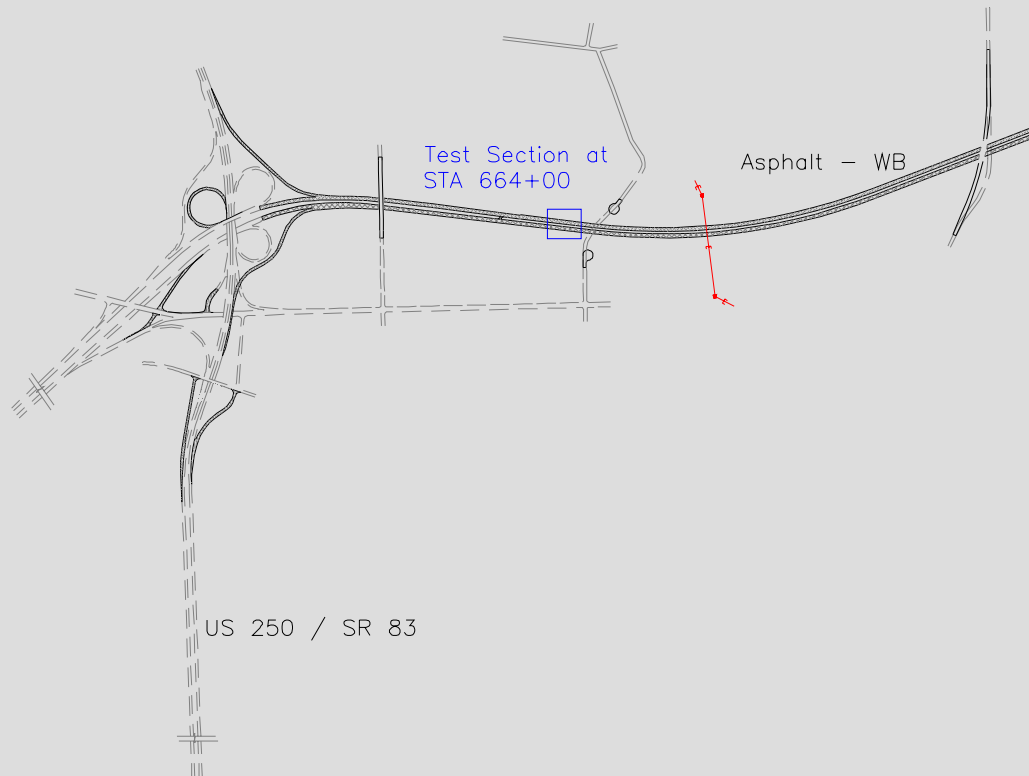
- Data obtained can be used to validate current pavement analysis procedures and develop new design procedures and models.
- Longer lasting pavements will reduce traffic congestion, user delays, and life-cycle costs.

Instrumentation Plan

- ORITE's instrumentation plan will monitor environmental and response parameters in each pavement type.
- Environmental parameters to be monitored in only one section of each pavement type.
- Dynamic load responses will be collected in duplicate sections

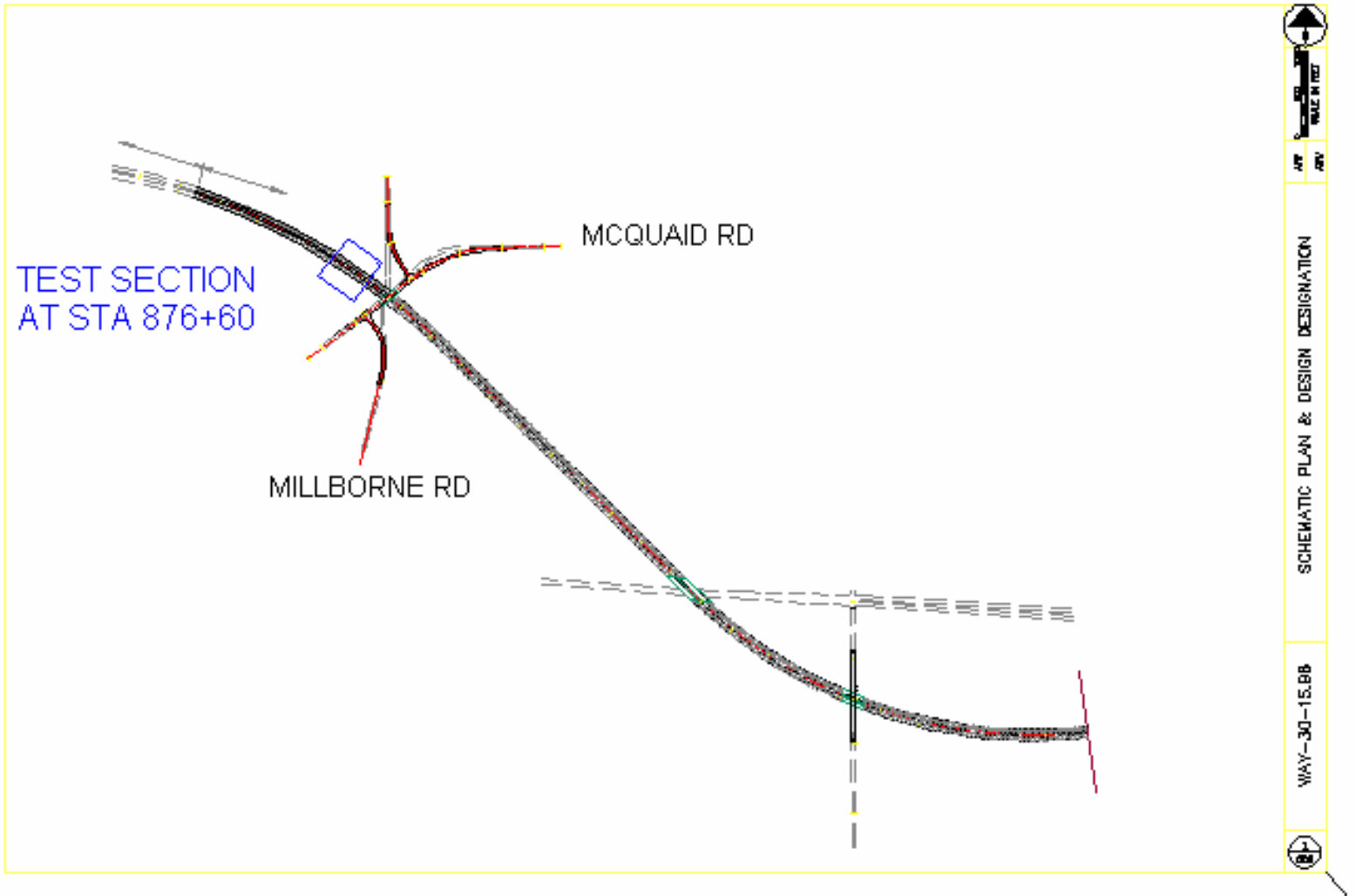
WAY-30 Instrumentation

US 30 Bypass of Wooster, Ohio



Test Section at Geyer's Chapel





Test Section at McQuaid Road



Instrumentation

Asphalt Concrete Test Sections

Environmental Parameters

<u>MEASUREMENT</u>	<u>LAYERS</u>	<u>MANUFACTURER</u>	<u>SENSOR</u>
Temperature	Pavement, Base and Subgrade	Measurement Research Corp.	MRC Thermistor
Moisture	Base and Subgrade	Campbell Scientific, Inc.	TDR Probes

Automatic weather station installed to collect data related to air temperature, precipitation (rain and snow), wind speed and direction, relative humidity, and incoming solar radiation.

Instrumentation

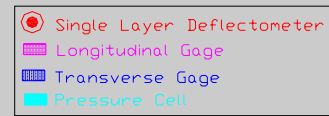
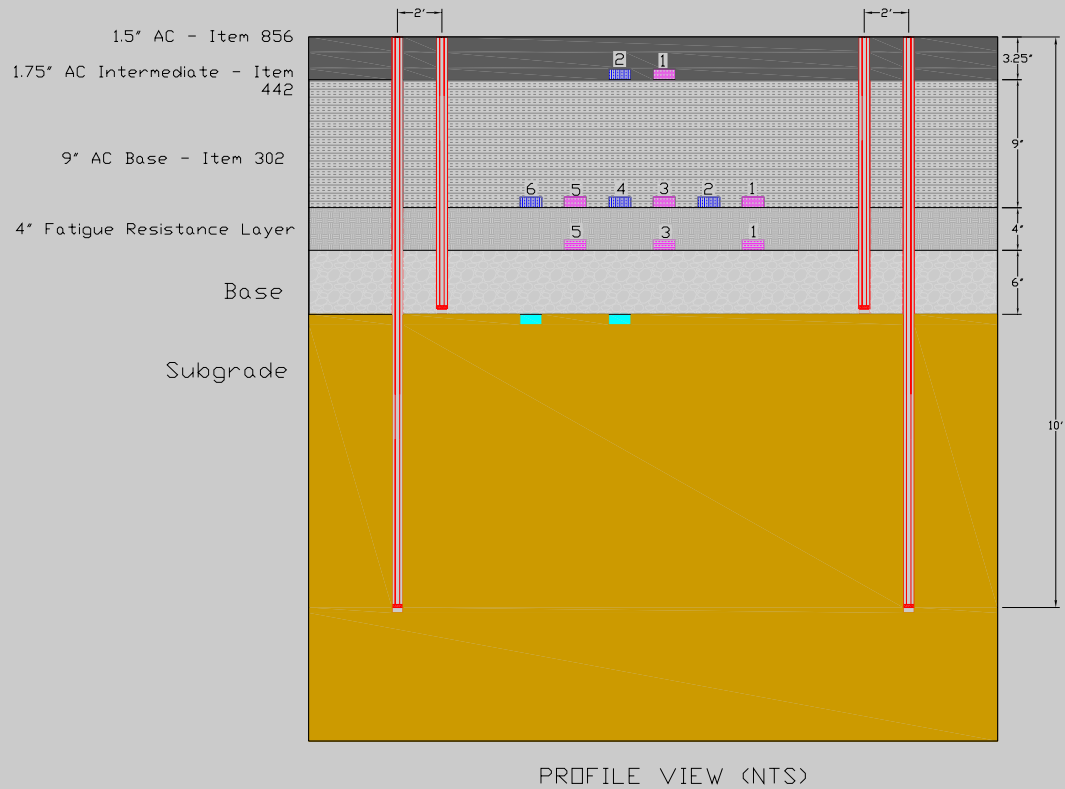
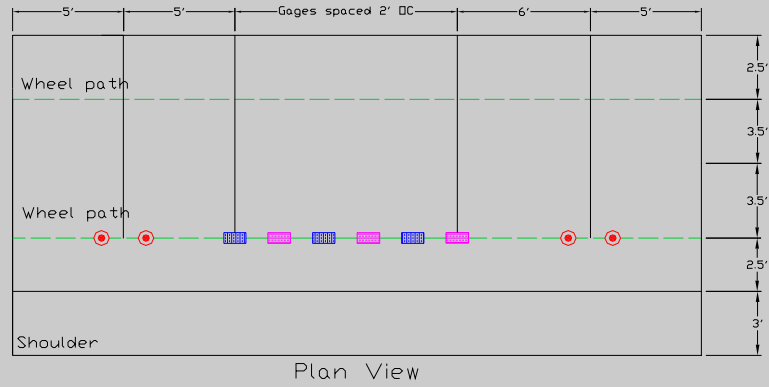
Asphalt Concrete Test Sections

Response Parameters

<u>MEASUREMENT</u>	<u>PARAMETERS</u>	<u>MANUFACTURER</u>	<u>SENSOR</u>
Displacement	Load Response and Seasonal Response	Macro Sensors	Macro Sensors LVDTs (Linear Variable Displacement Transducer)
Pressure	Load Response and Seasonal Response	Geokon Inc.	Geokon 3500 Pressure Cell
Strain	Longitudinal and Transverse Strain	Dynatest	Dynatest PAST II Strain Transducer

AC Section A

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AC STN 876 SECTION A LABELING

Instrumentation

- Shallow LVDTs will monitor displacement above the subgrade
- Deep LVDTs will monitor the total displacement in the pavement system
- This combination of LVDTs help distinguish the movement between the subgrade and base.
- Two pressure cells will measure the vertical pressure applied to the base as a measure of support in each section.
- Strain gauges are placed in the wheel path of varying layers to measure transverse and longitudinal strain during controlled vehicle testing.

Instrumentation



TDR Installation

Drilling of Deep LVDT rods and TDRs



LVDT Preparation



LVDT stakeout after initial survey



Core drilling LVDT pits

TDR Probes and Pressure Cells



TDR Probes at various depths



Pressure cells aligned in AC wheel path

LVDT Preparation



Deep and shallow LVDT references



Strain Gauge Installation



Strain Gauge Installation



Strain Gauge Installation



Large aggregate is removed by sieve, then asphalt is placed over gauges prior to paving.

Strain Gauge Installation



Strain Gauge Installation



Strain Gauge Installation



Strain Gauge Installation



Strain Gauge Installation



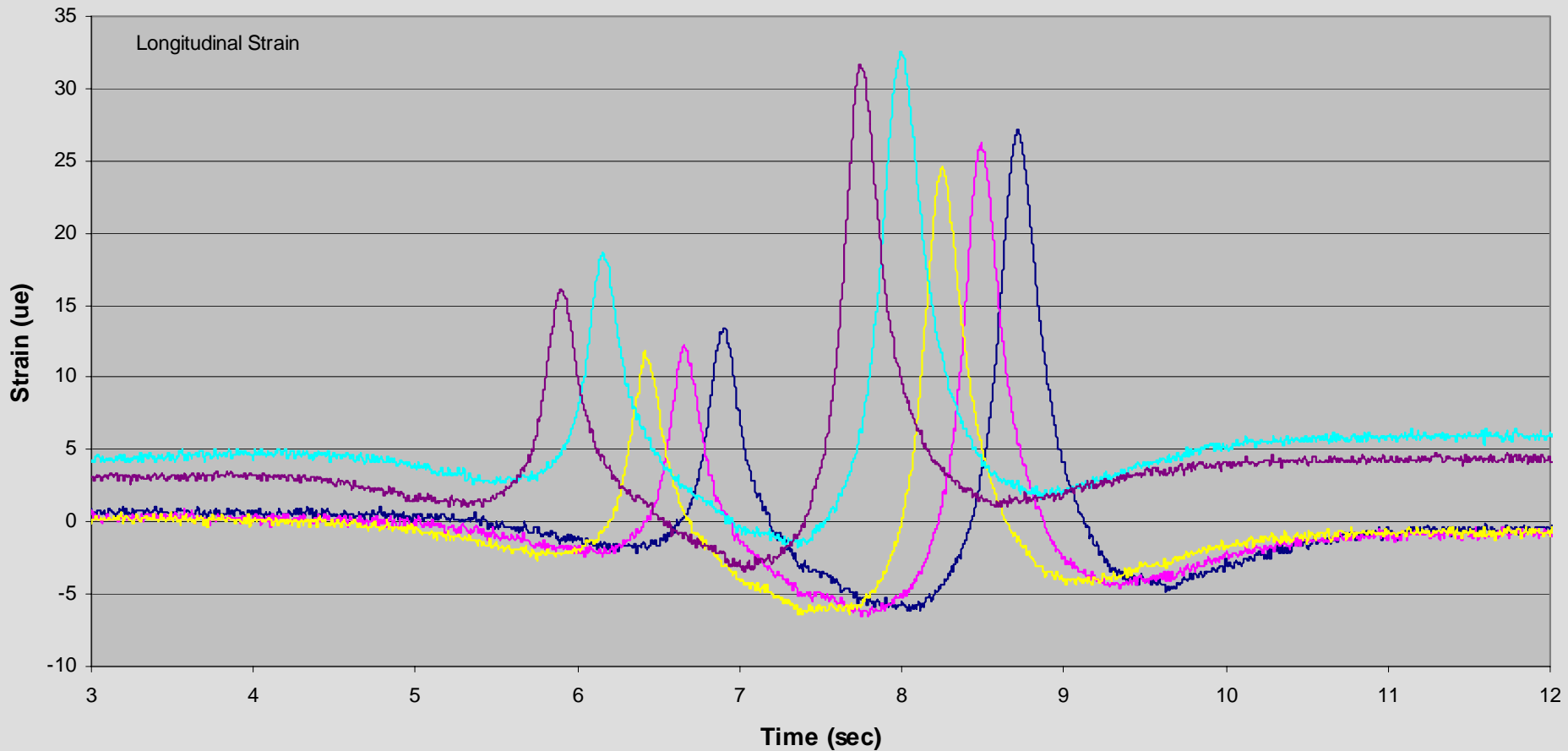
Testing

Asphalt Concrete Sections

- Dynamic Cone Penetration and Falling Weight Deflectometer testing performed on base and subgrade prior to paving. FWD performed twice per year after completion.
- Dynamic strain response and pressure readings collected for speeds of 5 – 50 mph during controlled testing.
- Deflection also monitored during controlled testing.

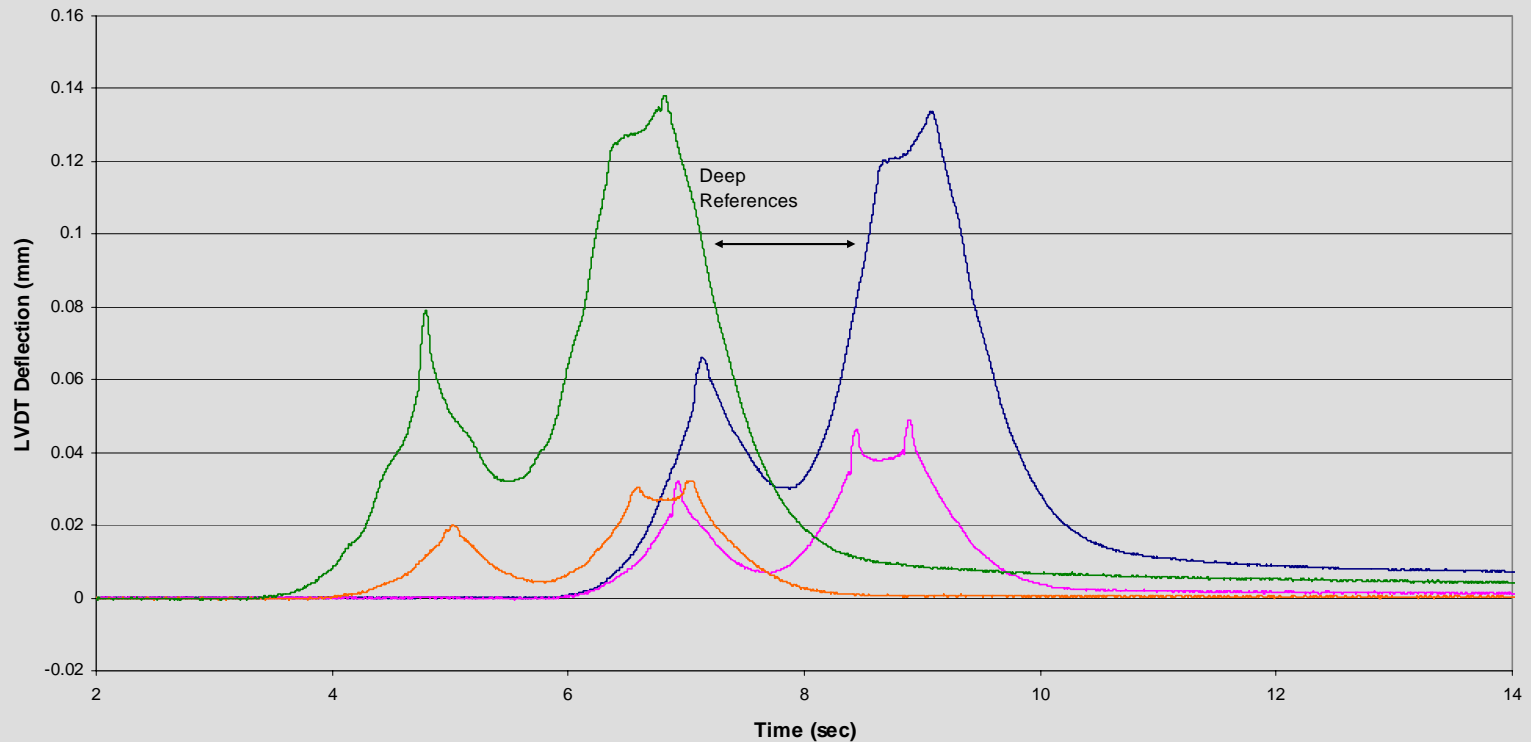
WAY-30 FRL Strain Response

5 mph Test: ODOT 28.2 Kip Single Axle Truck



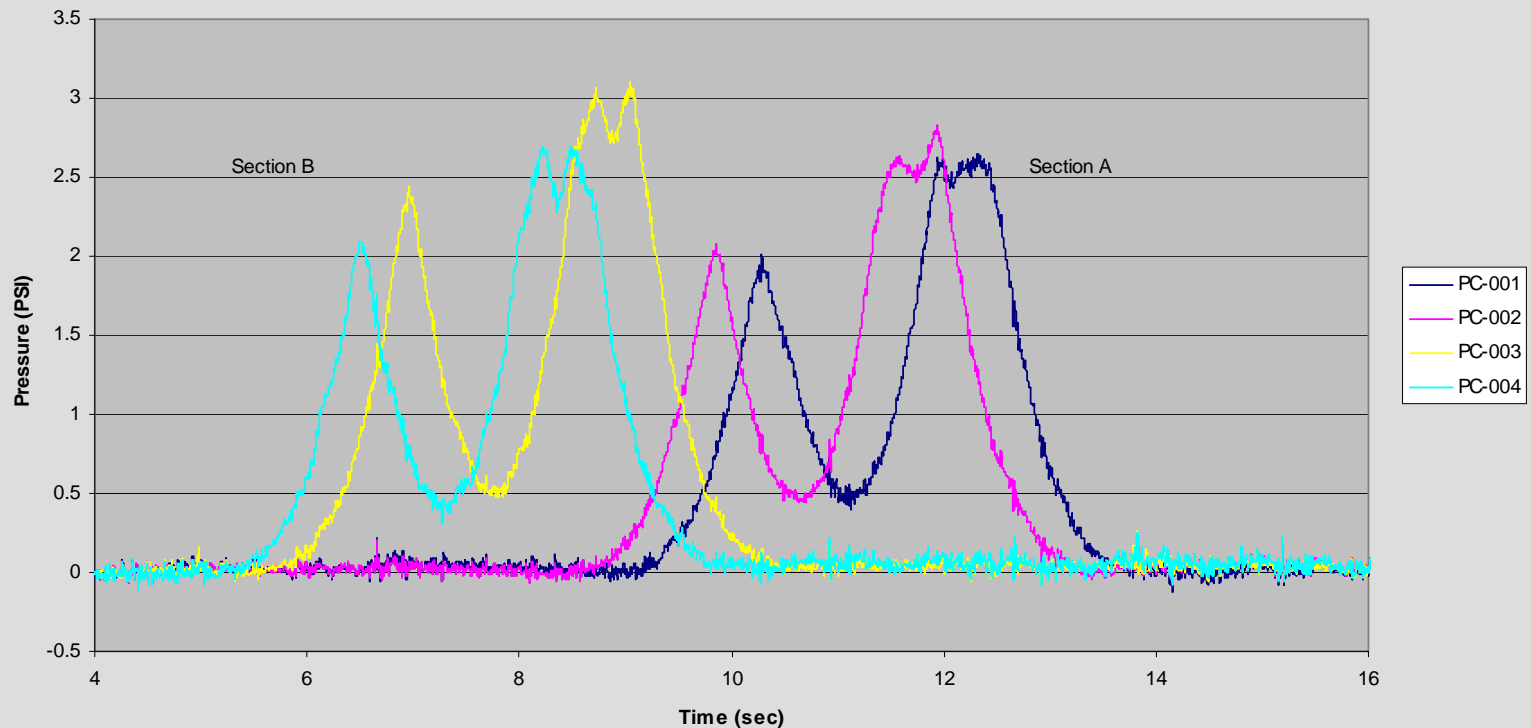
WAY-30 LVDT Response

5 mph Test: ODOT 40 Kip Tandem Axle Truck



WAY-30 Pressure Cell Readings

5 mph Test: ODOT 40 Kip Tandem Axle Truck



AC Segregation

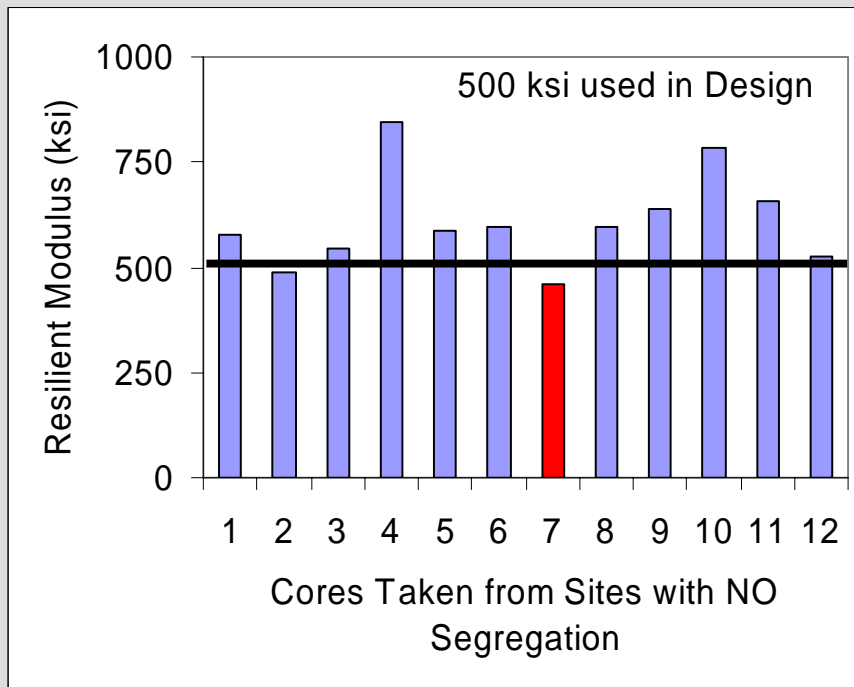


AC Segregation

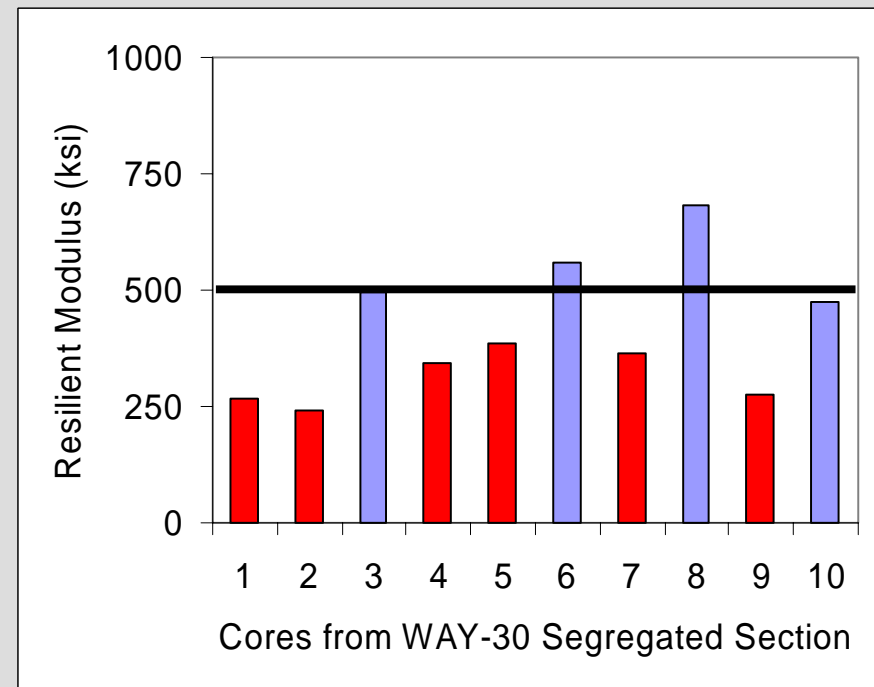


Resilient Modulus 302 Mix

6" Cores without Segregation

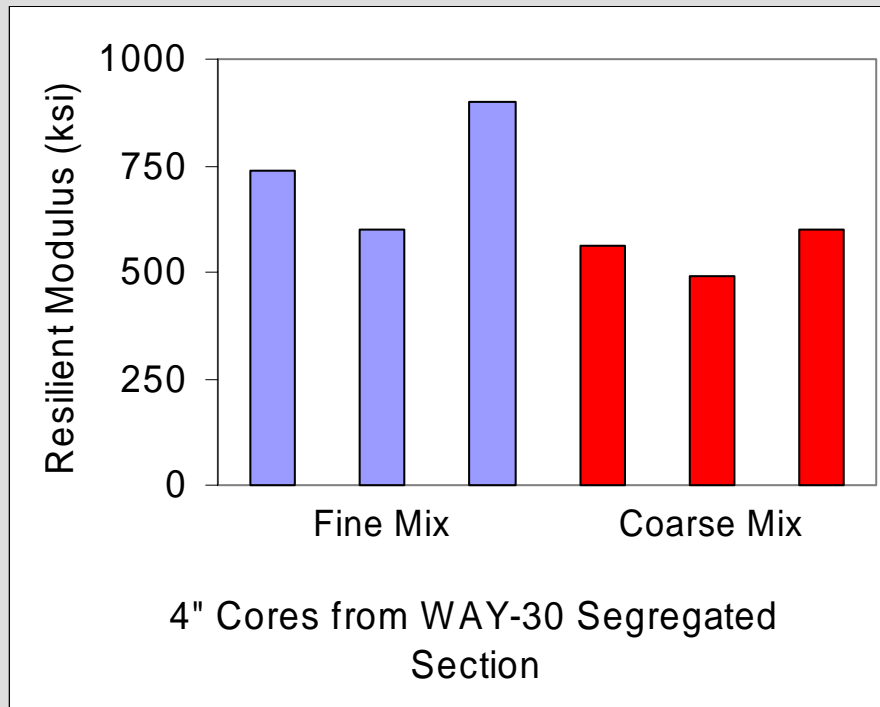


6" Cores with Segregation

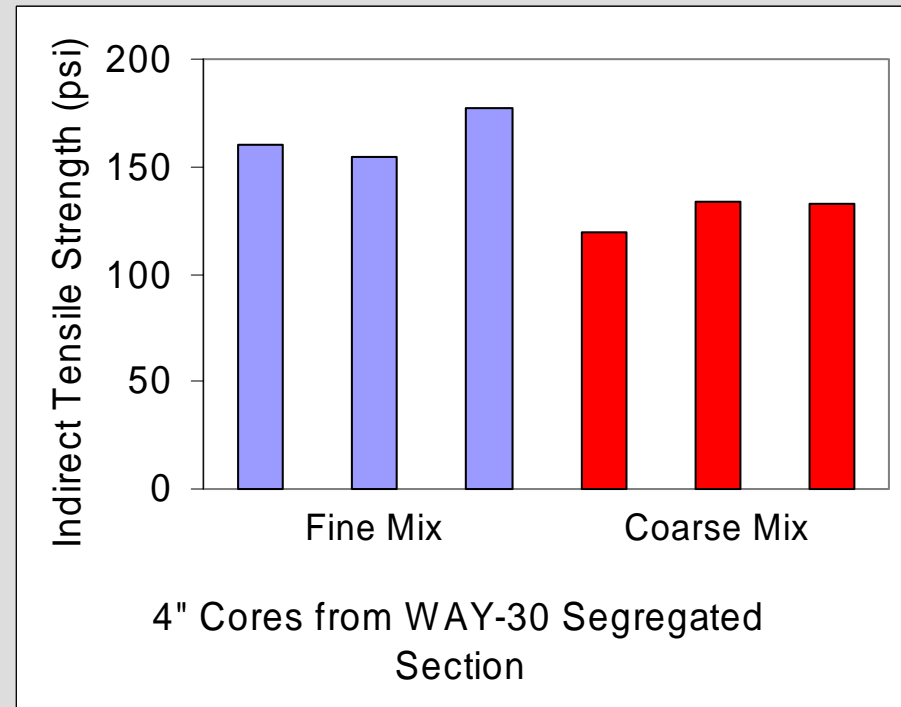


4" Cores from Segregated Way30

Resilient Modulus



Tensile Strength



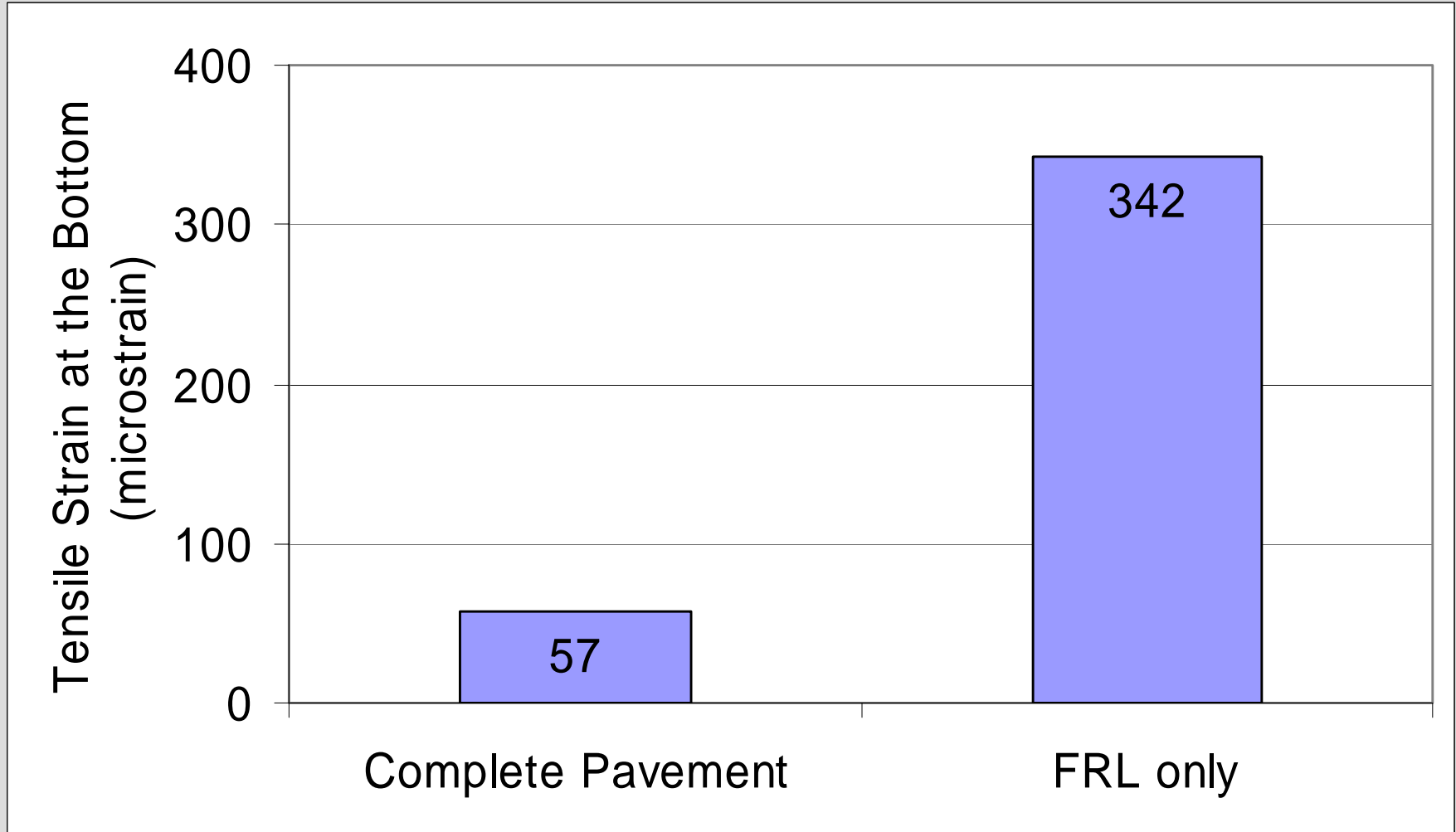
AC Section Removal



AC Section Removal

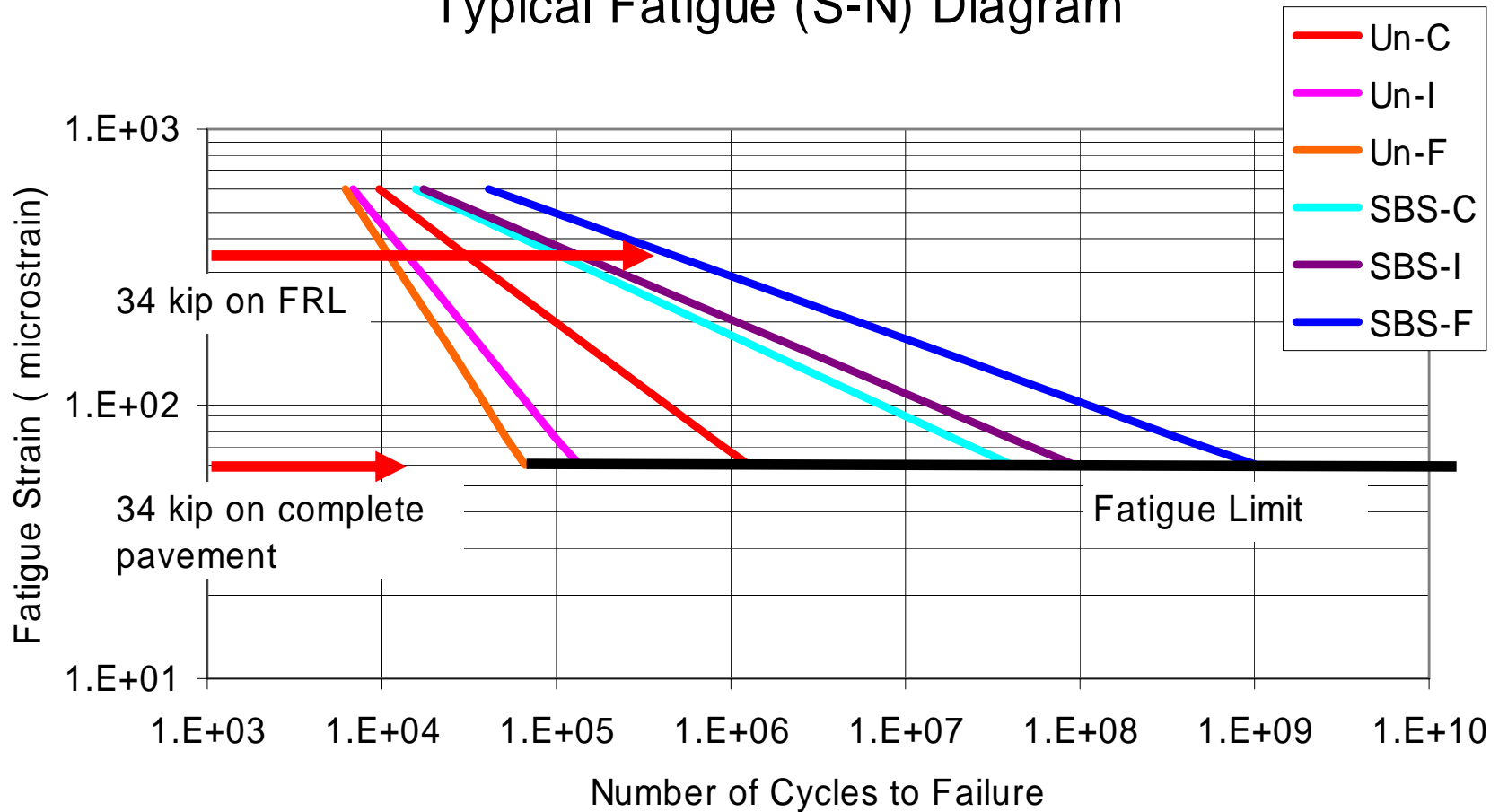


Tensile Strain Induced by 34 kip Truck



Truck Traffic on fresh FRL

Typical Fatigue (S-N) Diagram



AC Section Removal



Rutting



Cracking



Cracking





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