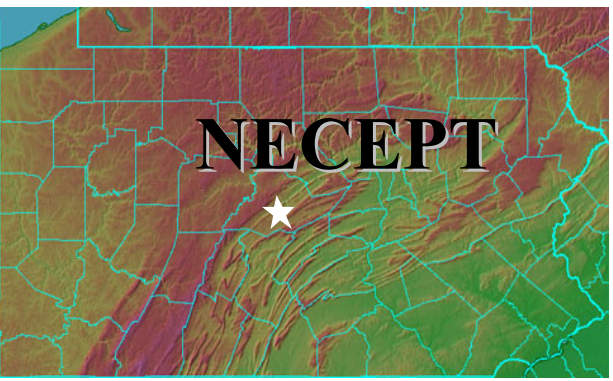
Superpave In-Situ Stress/Strain Investigation (SISSI)

AN OVERVIEW AND A LOOK AT RESULTS

Mansour Solaimanian, Ph.D., P.E.
Pennsylvania Transportation Institute
The Pennsylvania State University



NESMEA Meeting
Burlington, Vermont
October 19, 2005

Outline

1. Overview of the Project and Objectives
2. Instrumentation
3. Measurements & Data Collection
4. Analysis of Results
5. Implementation

"SISSI" Project

Superpave

In-Situ

Stress/**S**train

Investigation

- Sponsored by PENNDOT

Advisory Panel

- Apple, Roger
- Bhajandas, Amar
- Colella, Frank
- Cominsky, Ron
- Hoffman, Gary
- Liddick, Gaye
- Long, Michael
- Mattson, Gene
- Rottet, Tod
- Ramirez, Tim
- Rosenberger, Carlos
- Siddiqui, Zahur
- Speece, Christopher

- Technical Manager: Dan Dawood
- Contract Manager: Robert Garrett

Research Team

- Mansour Solaimanian
- Shelley Stoffels
- Dennis Morian (Quality Engineering Solutions)

- David Anderson
- Researchers and Many Students

Project Objectives

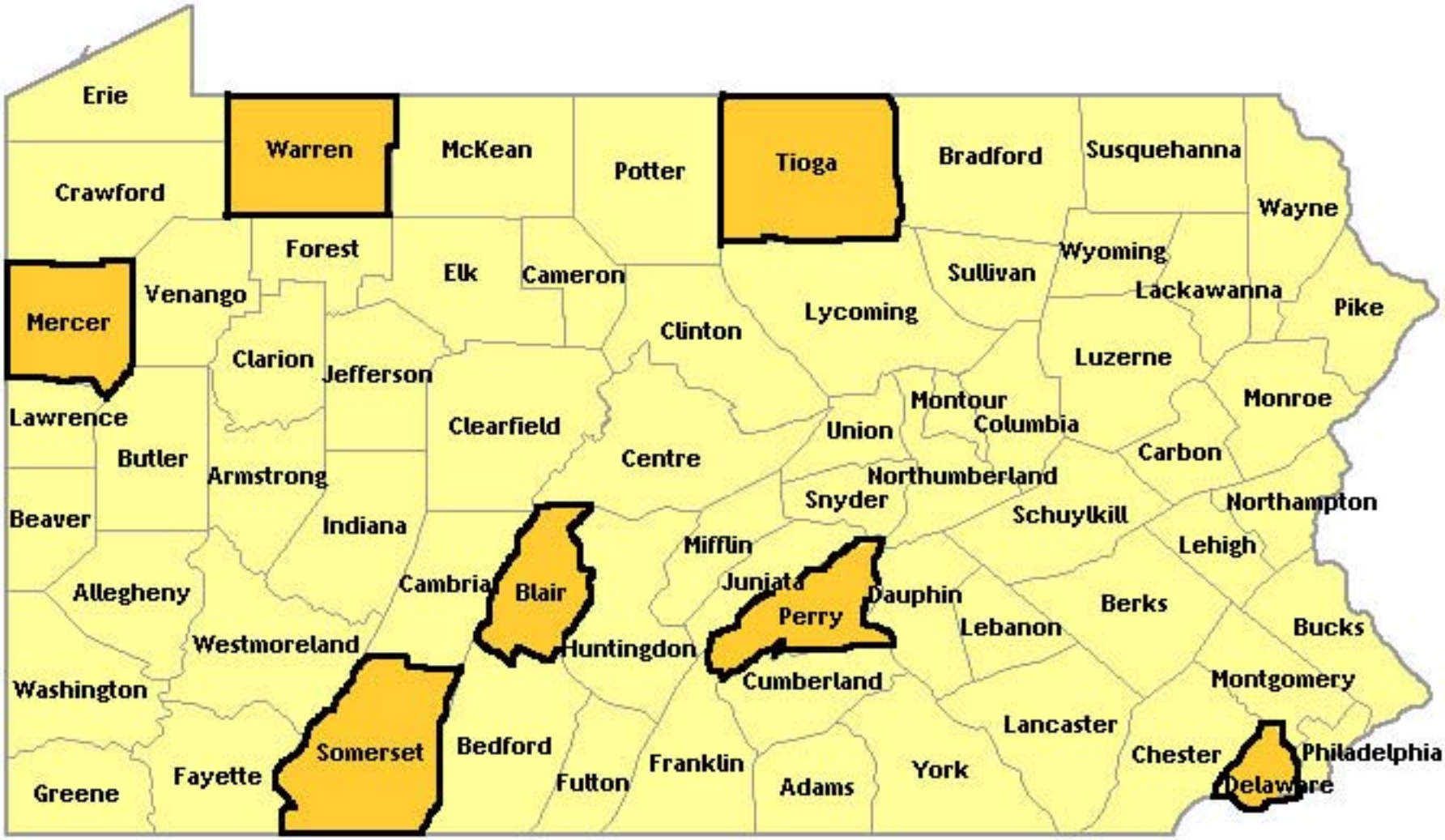
- Validation/Calibration of Superpave mixture and structural design procedures and models
- Calibration of AASHTO Pavement Design Guides
  - ✓Regional basis
- Gather long-term pavement performance data
- Develop long-term performance database

Site Selection

- Eight sites
- Two pavement types
  - ✓Structural overlays
  - ✓New full-depth asphalt construction
- Two traffic levels
  - ✓Under 30 million ESAL's
  - ✓Over 30 million ESAL's
- Two climatic zones
  - ✓North and south of I-80

Location of Sites

Location of Sites




SISSI
SUPERPAVE
TEST SITE
START
07 1001 31

Construction Years

Year 2000
Tioga County, US 15
Mercer County, I-80

Year 2001
Perry County, US 22/322
Warren County, US 6

Year 2002
Somerset County, PA TP
Delaware County, US 202

Year 2003
Blair County, SR 1001

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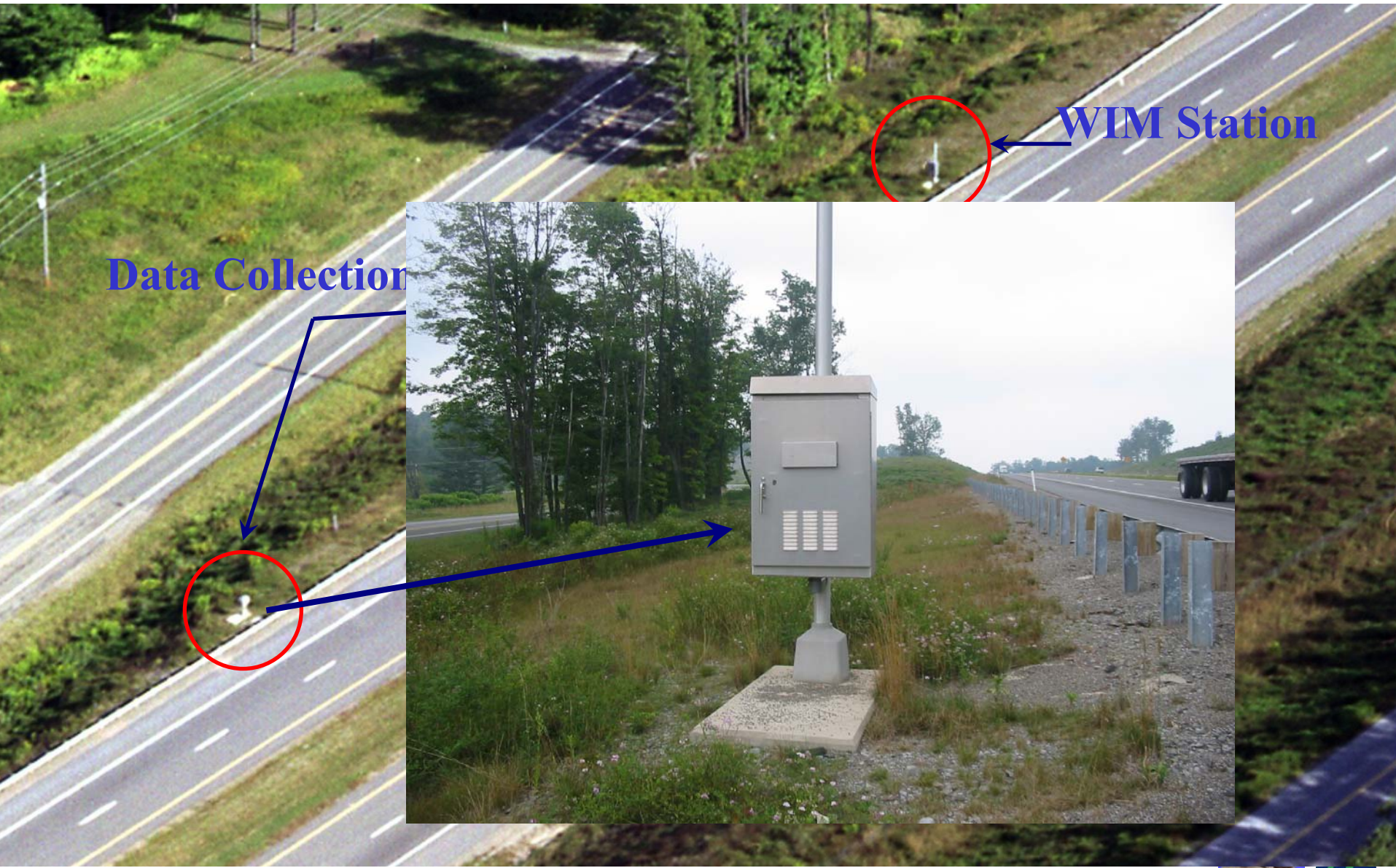
On-Site Instrumentation

- Dynamic - Pavement response to load
  - ✓Vertical stress - unbound layers
  - ✓Horizontal strain - all layers
  - ✓Deflection – layer interface

- Environmental - Pavement
  - ✓Temperature profile
  - ✓Moisture in unbound layers
  - ✓Frost depth

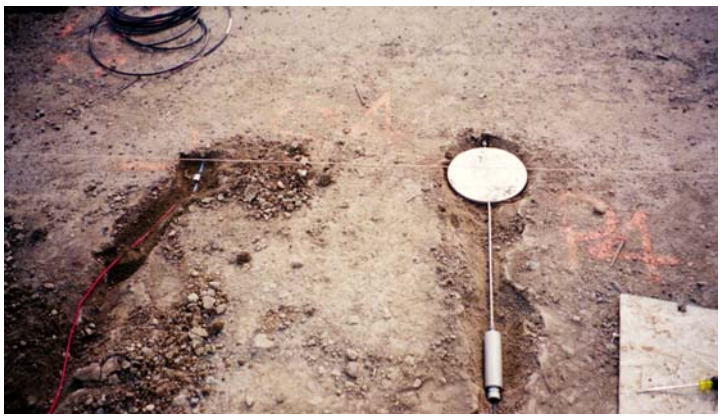
Tioga County, North Bound, Route 15

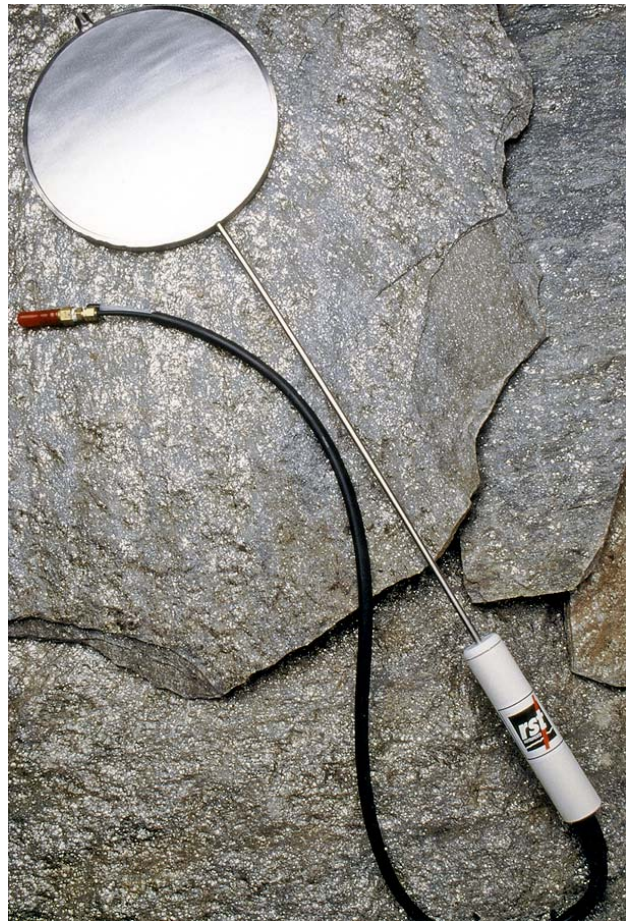


Multi-Depth Deflectometer (MDD)

Multi-Depth Deflectometer (MDD)

Strain Gage and Pressure Cell

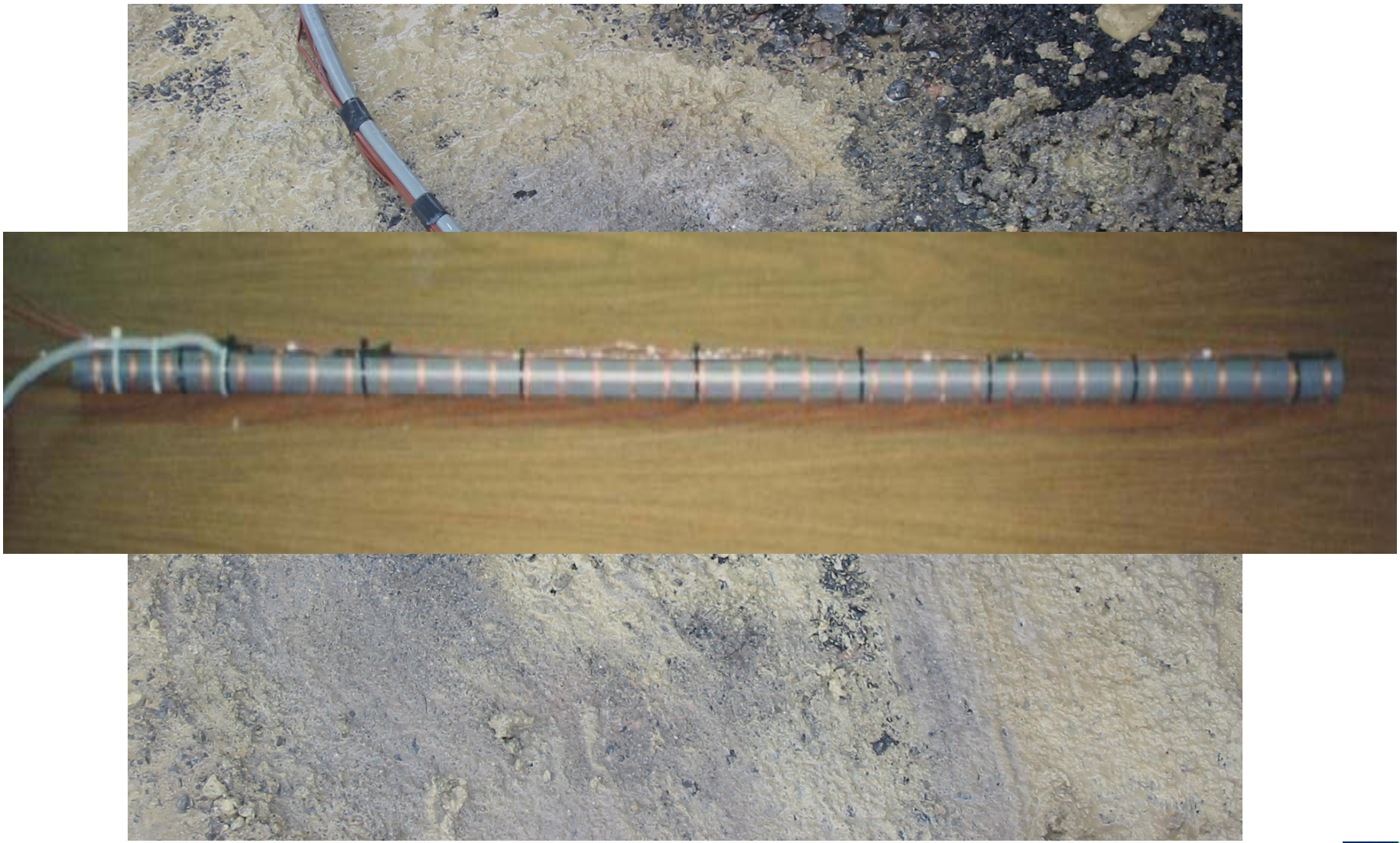




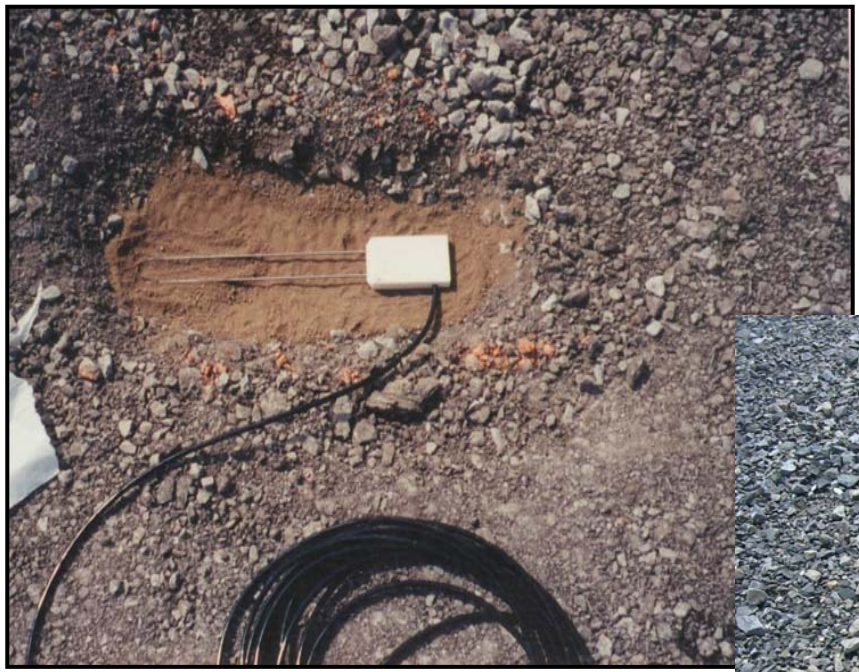
TEMPERATURE - FROST DEPTH

Thermocouples

Frost Gage (Resistivity Probe)



Moisture Content Measurement



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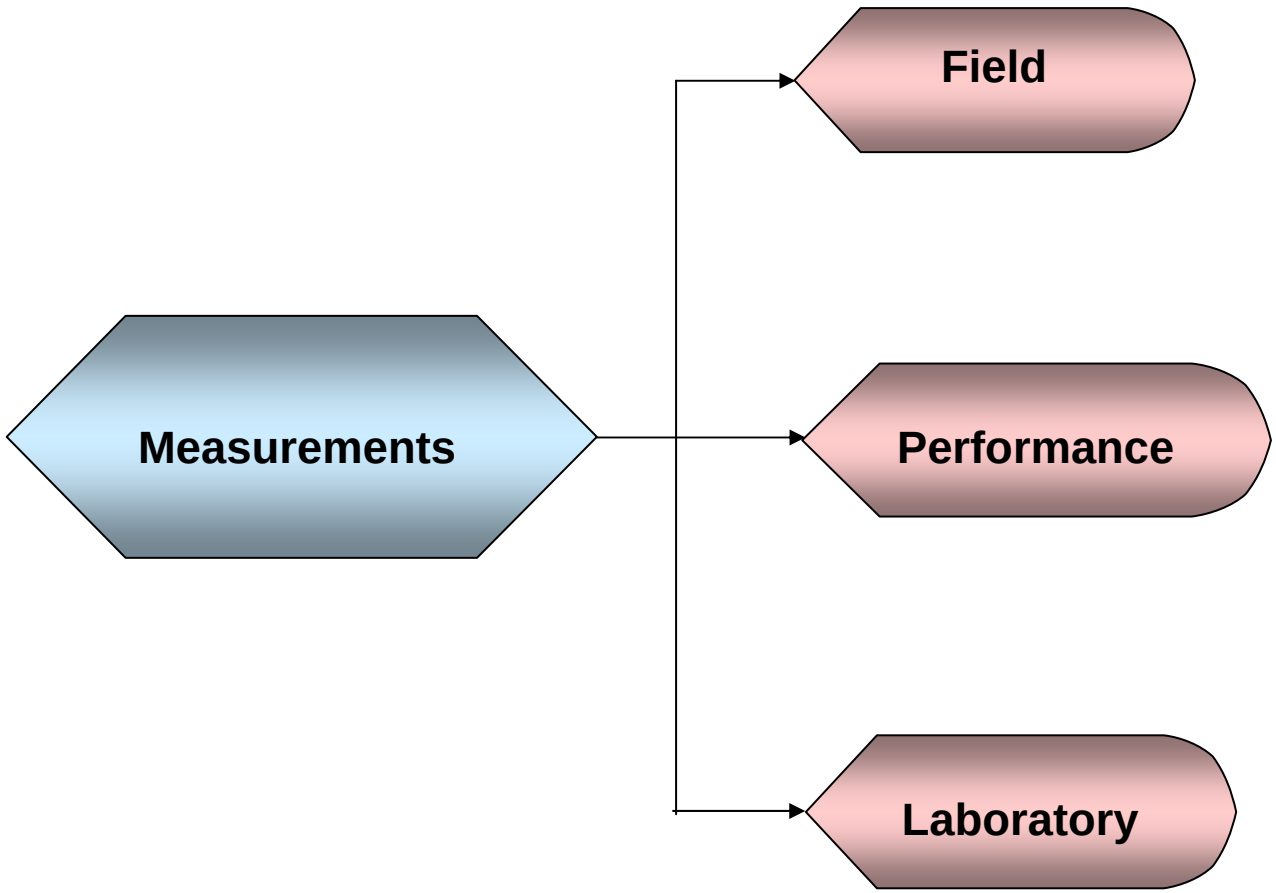
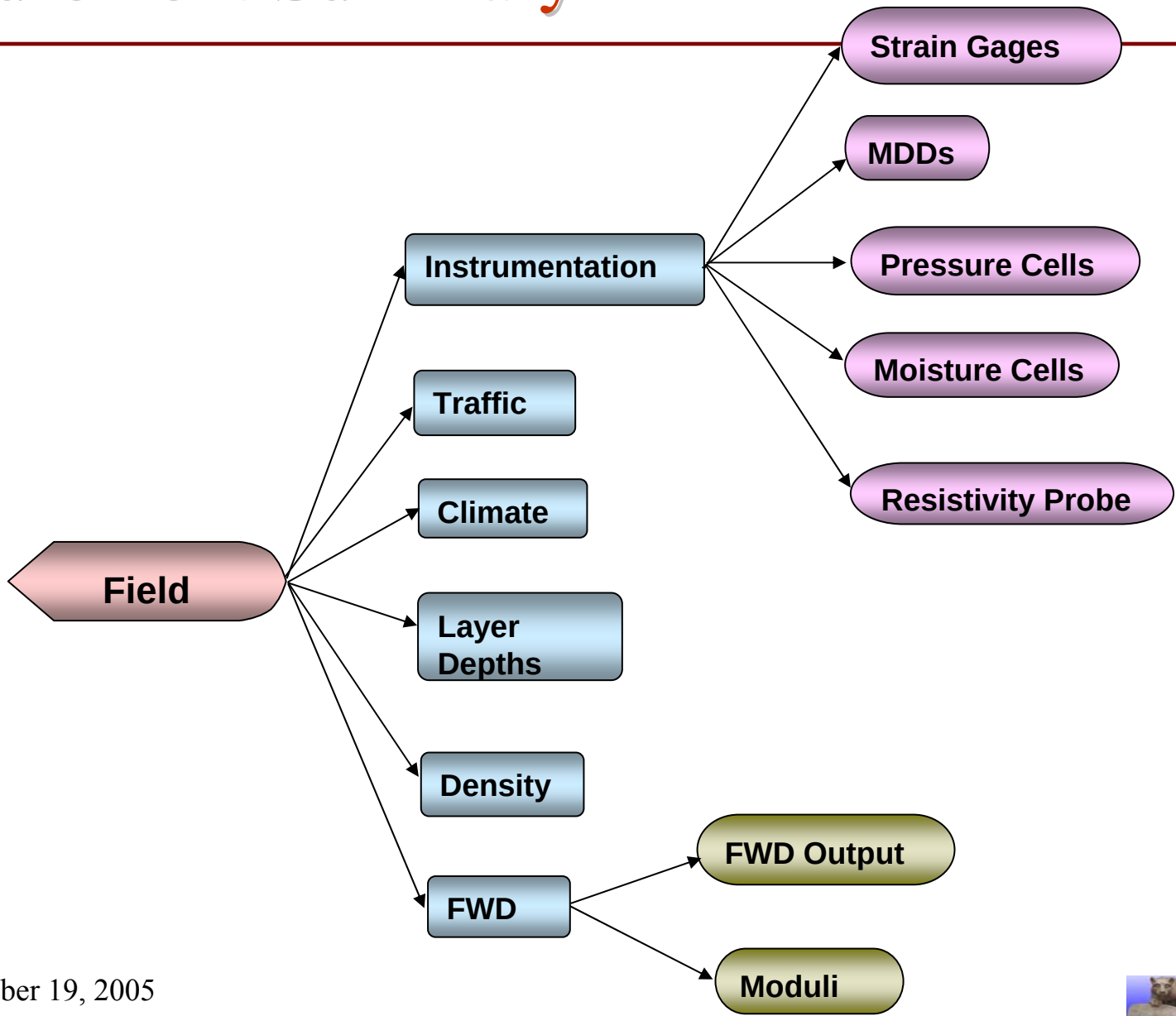
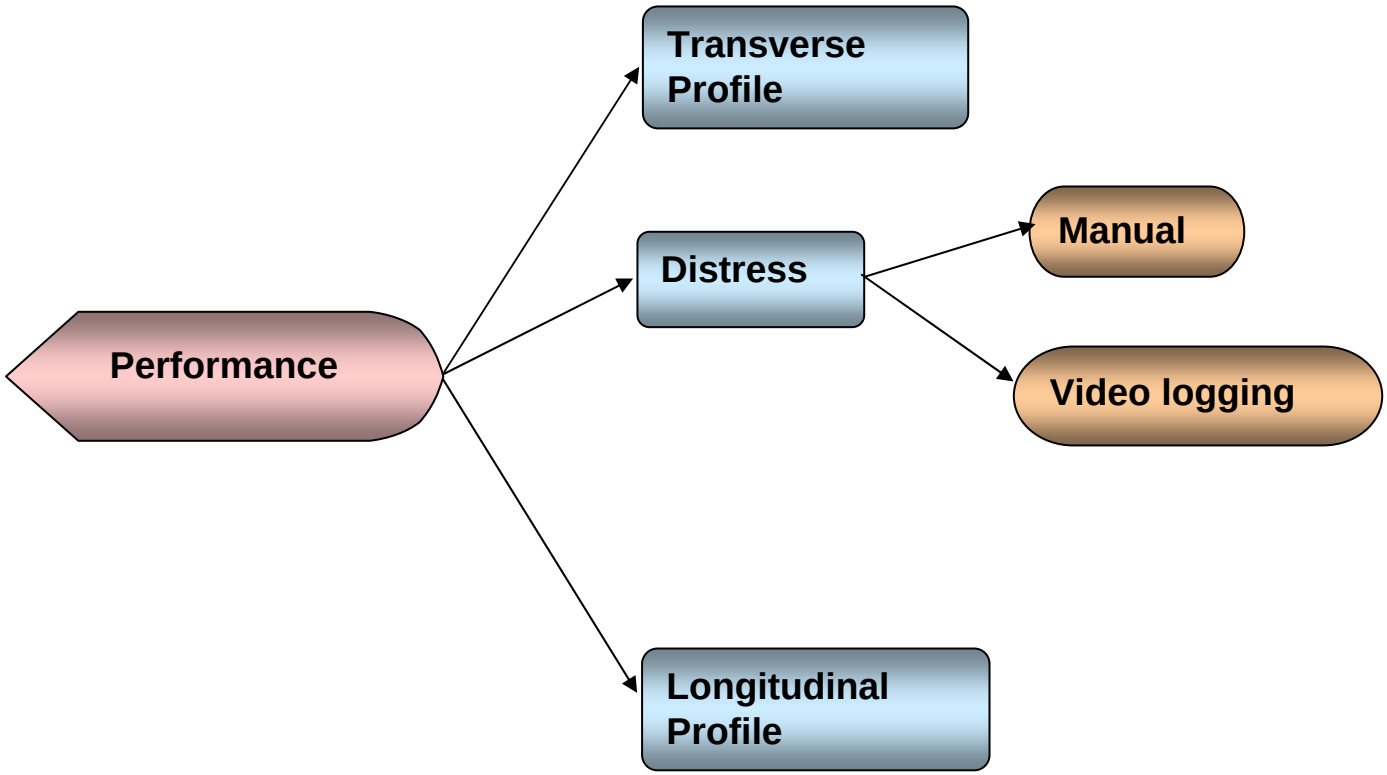
Measurement Summary



Measurement Summary

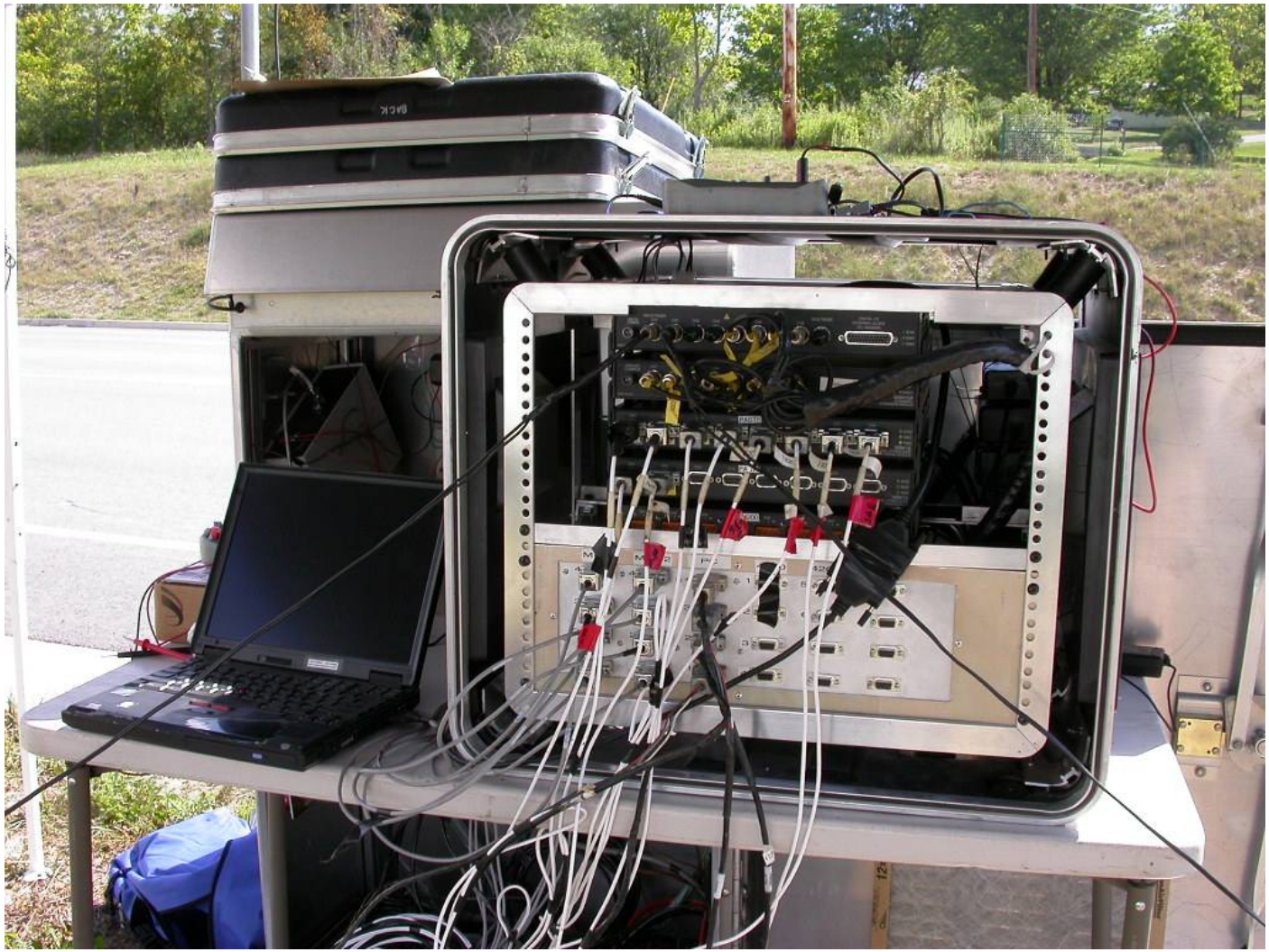


Measurement Summary



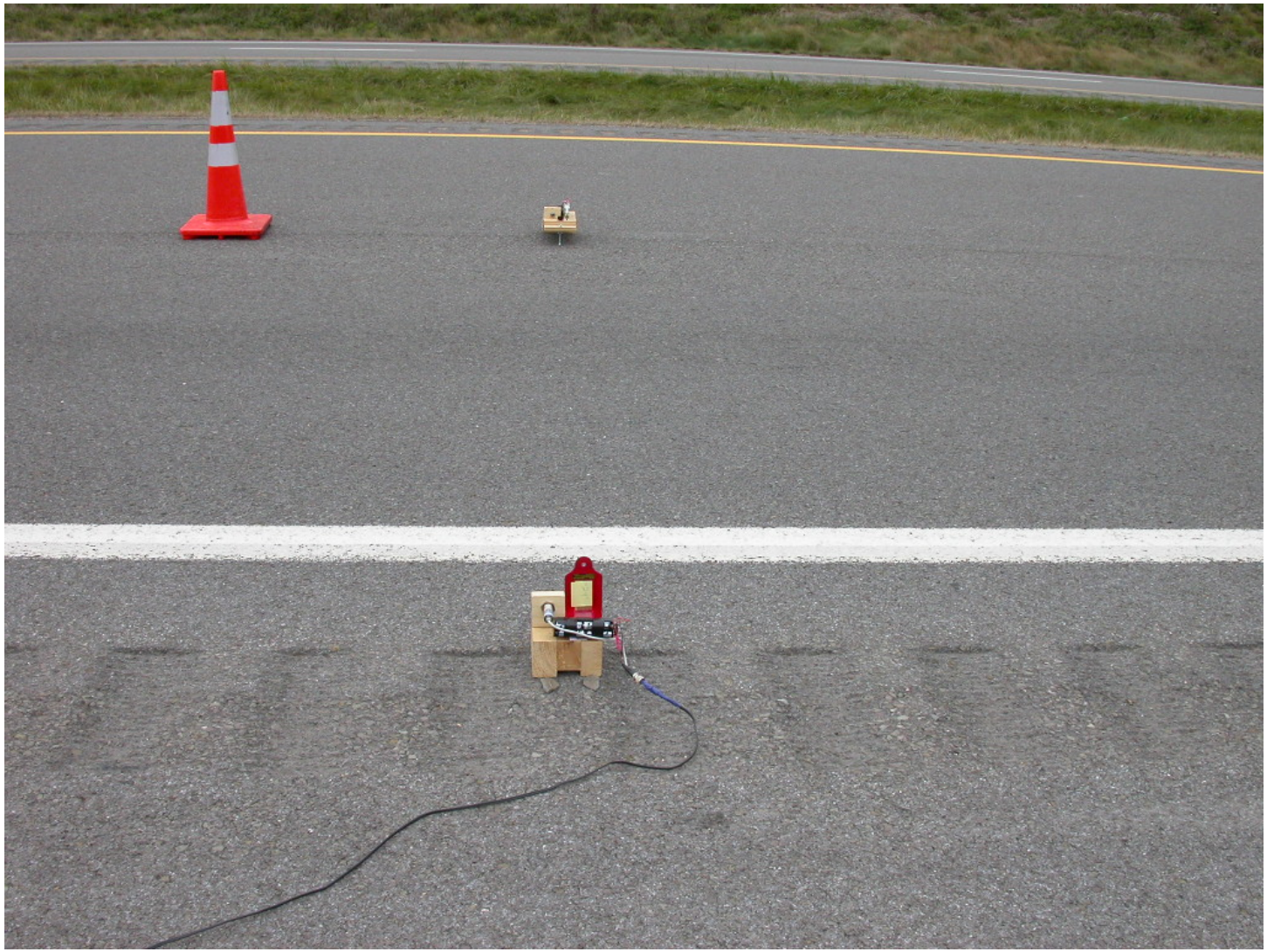
Environmental Data Collection

Dynamic Data Collection



Truck for Pavement Loading

Data Collection



Wander Measurement

Falling Weight Deflectometer

Transverse Profile

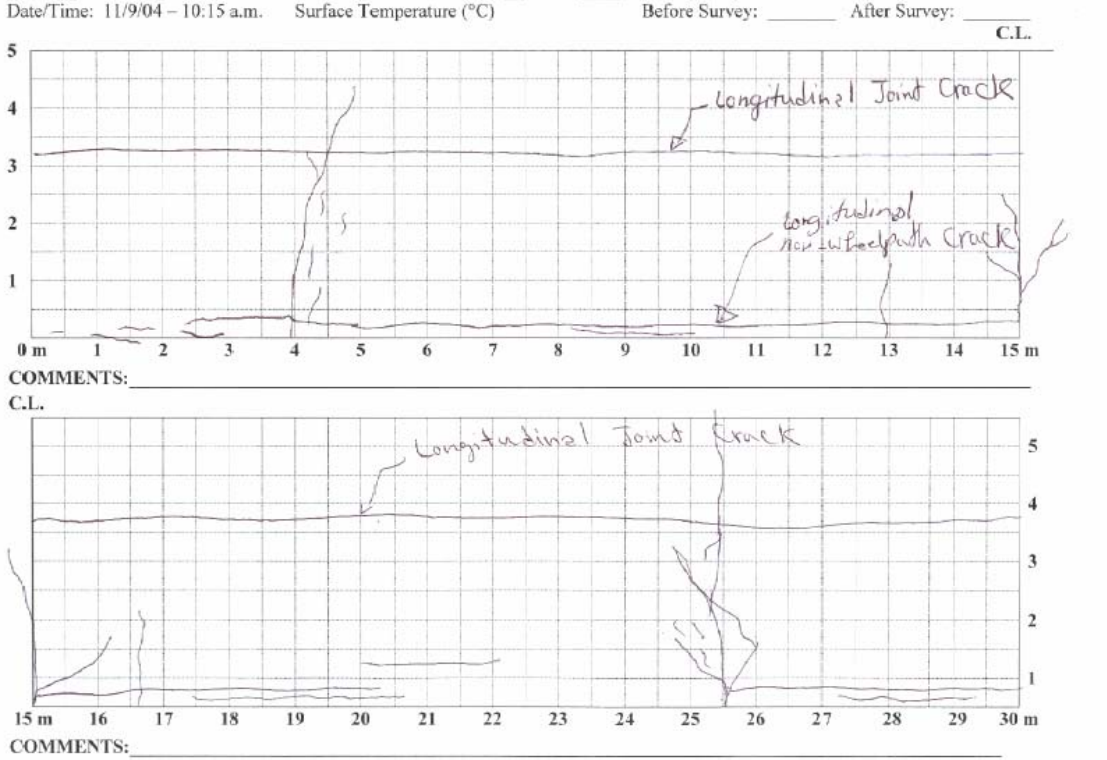
- Simple, low cost
- Easily transportable
- Measurements each time dynamic test conducted

Distress Survey

FIGURE 2. Instrumentation Location Distress Map

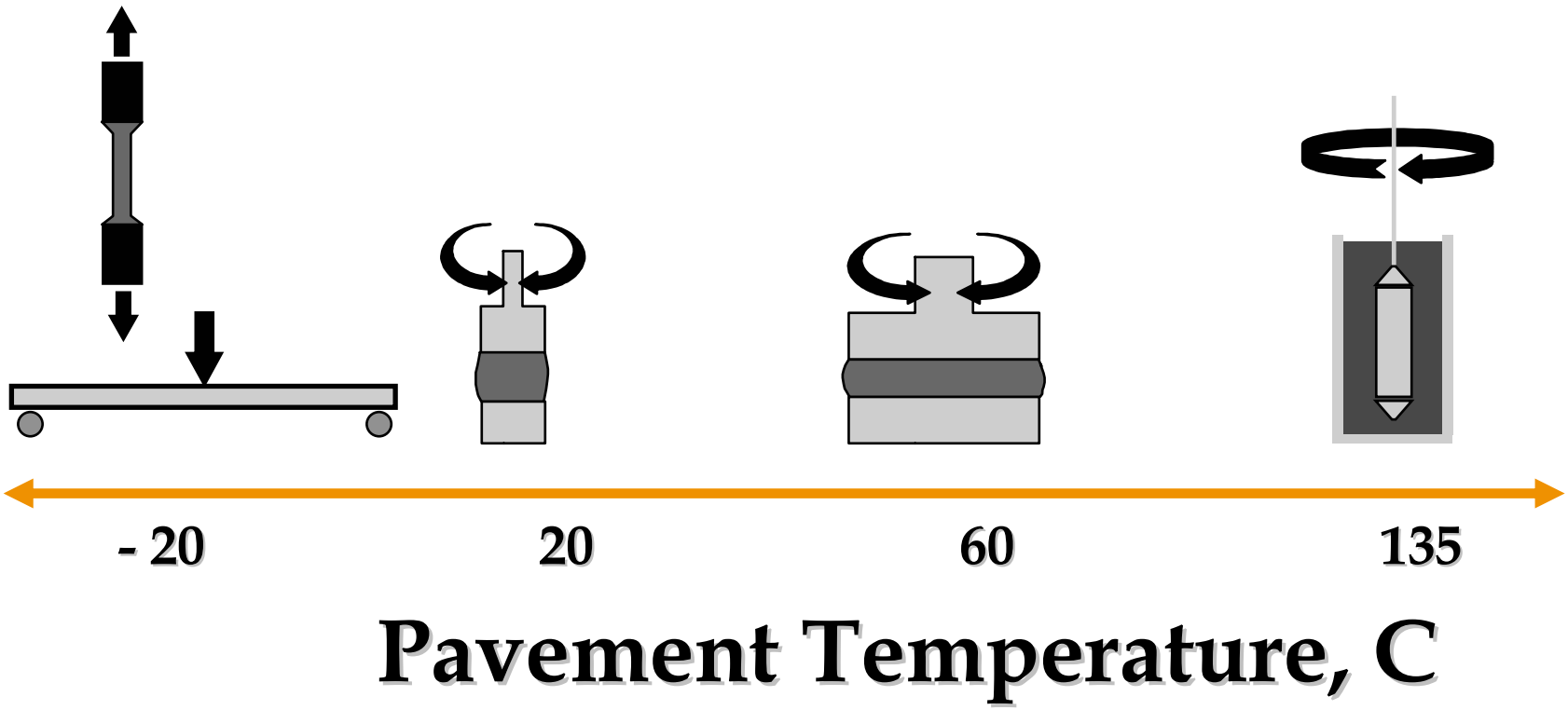
SITE: __Delaware _1 Instrumentation Location: __SR 202____ Surveyed By: Mansour Solaimanian

Date/Time: 11/9/04 – 10:15 a.m. Surface Temperature (°C) Before Survey: _____ After Survey: _____



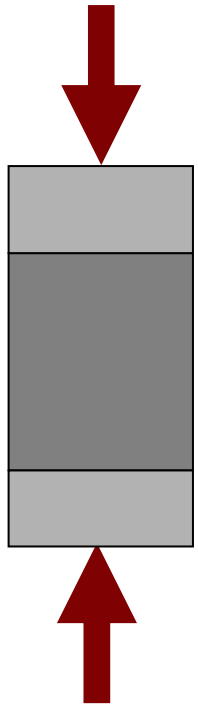
Laboratory Investigation

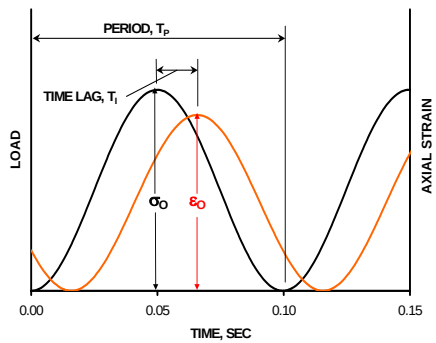
- **Performed at Different Temperatures:**



Laboratory Investigation

Dynamic Modulus Test





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Distress Analysis

Distress Analysis

Distress Analysis

FIGURE 2 Instrumentation Location Distress Map

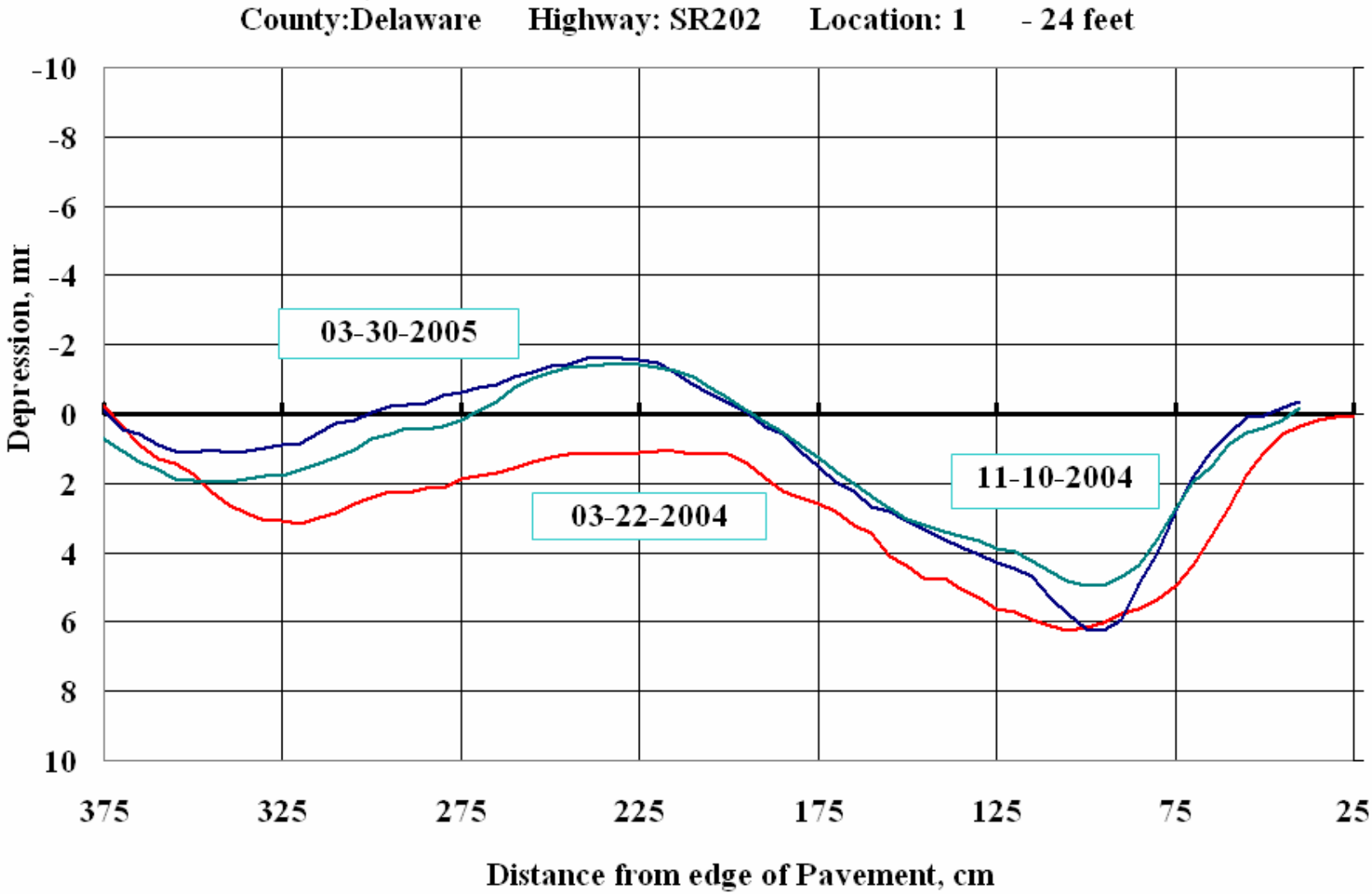
SITE: **Warren** Instrumentation Location: ONE Surveyed By: Venky

Date/Time: 08/07/03 8:30 AM Surface Temperature (°C) Before Survey: _____ After Survey: _____

COMMENTS: _____

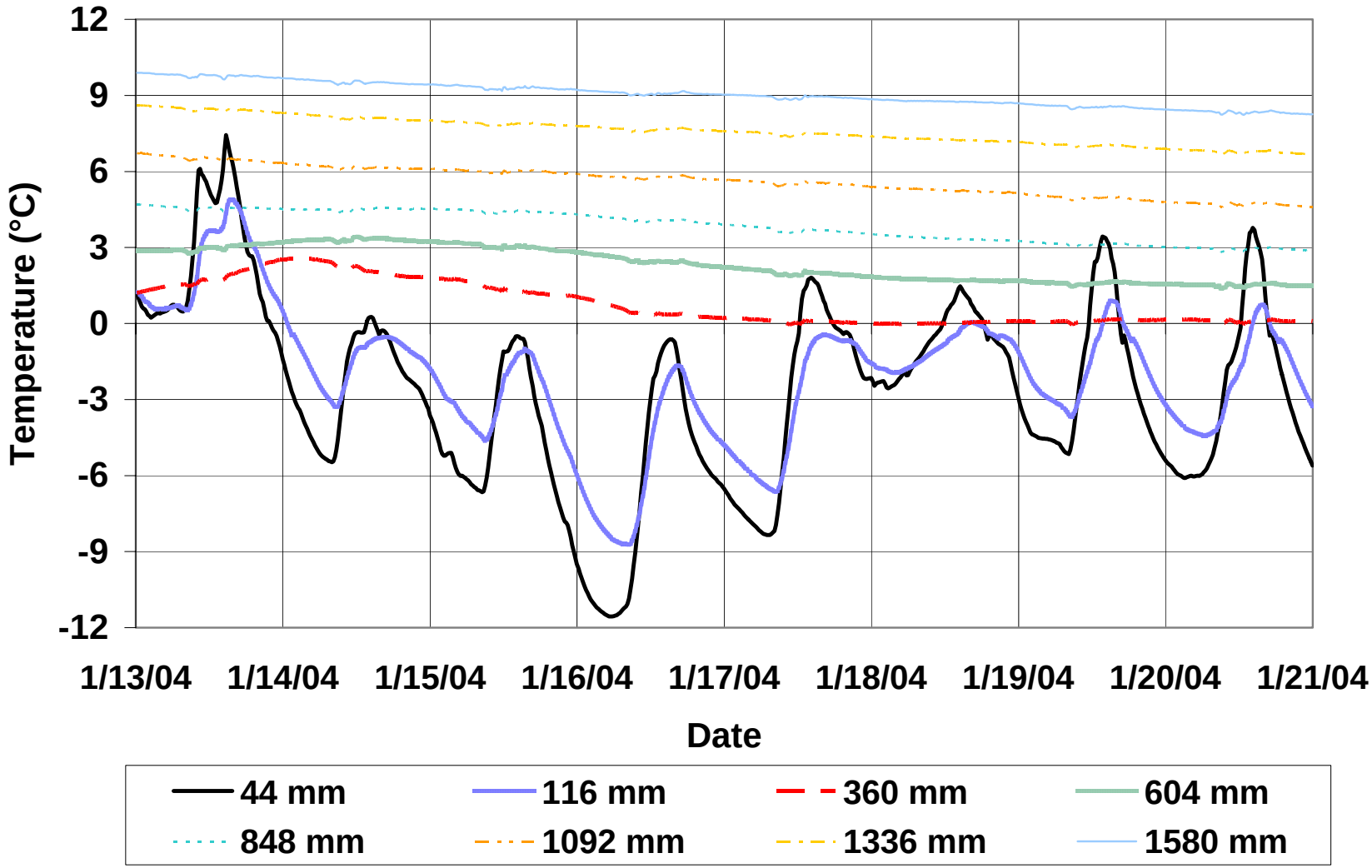
1 – Fatigue Cracking 4 a- Longitudinal Cracking – Wheel path 4 b- Longitudinal Cracking – Non-wheel path
6 L – Transverse Cracking (Low) M – Medium H-High

Distress Analysis



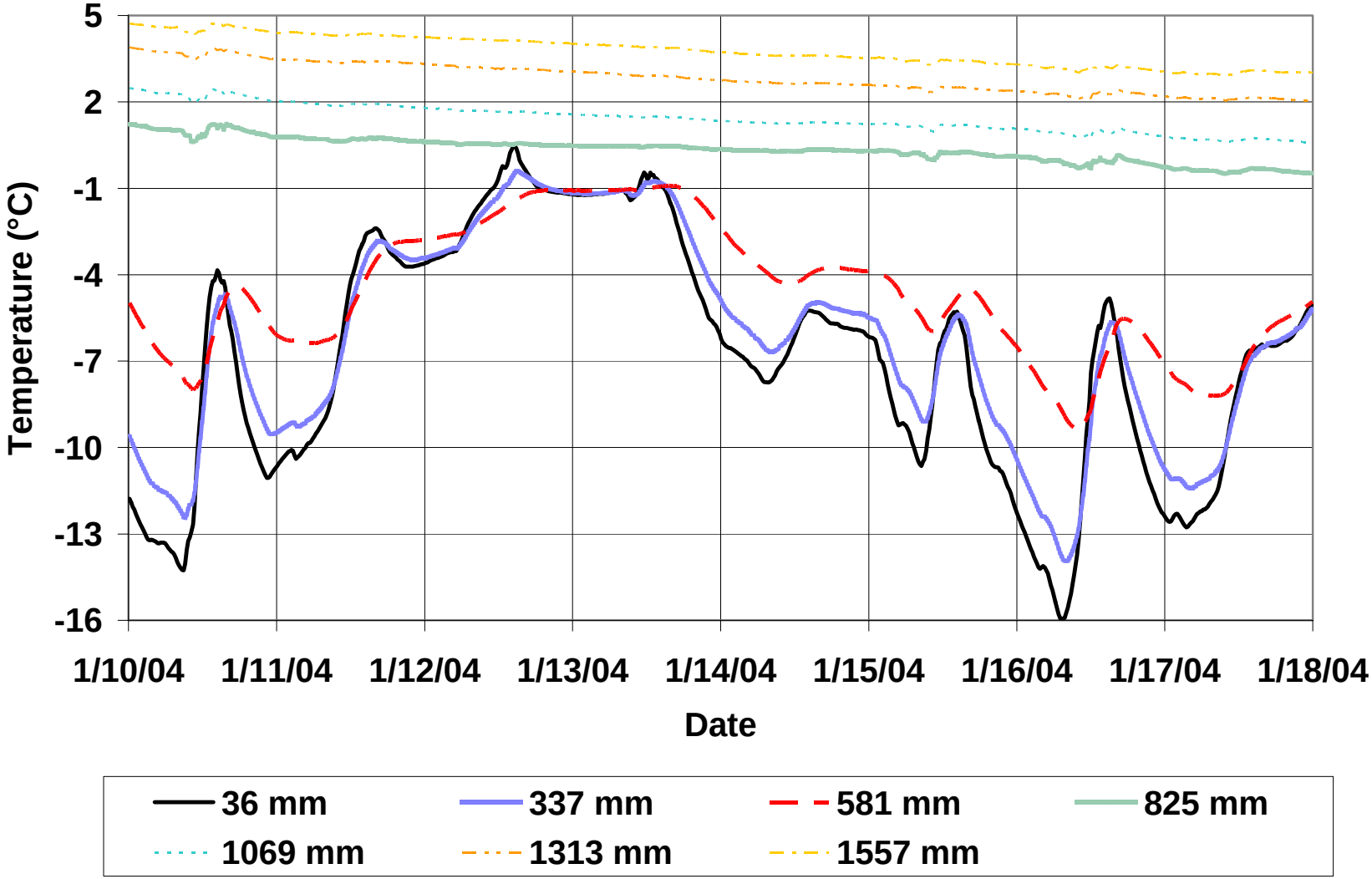
Temperature Variation – Freeze Cycles

County:Delaware Highway:SR202 Location:1



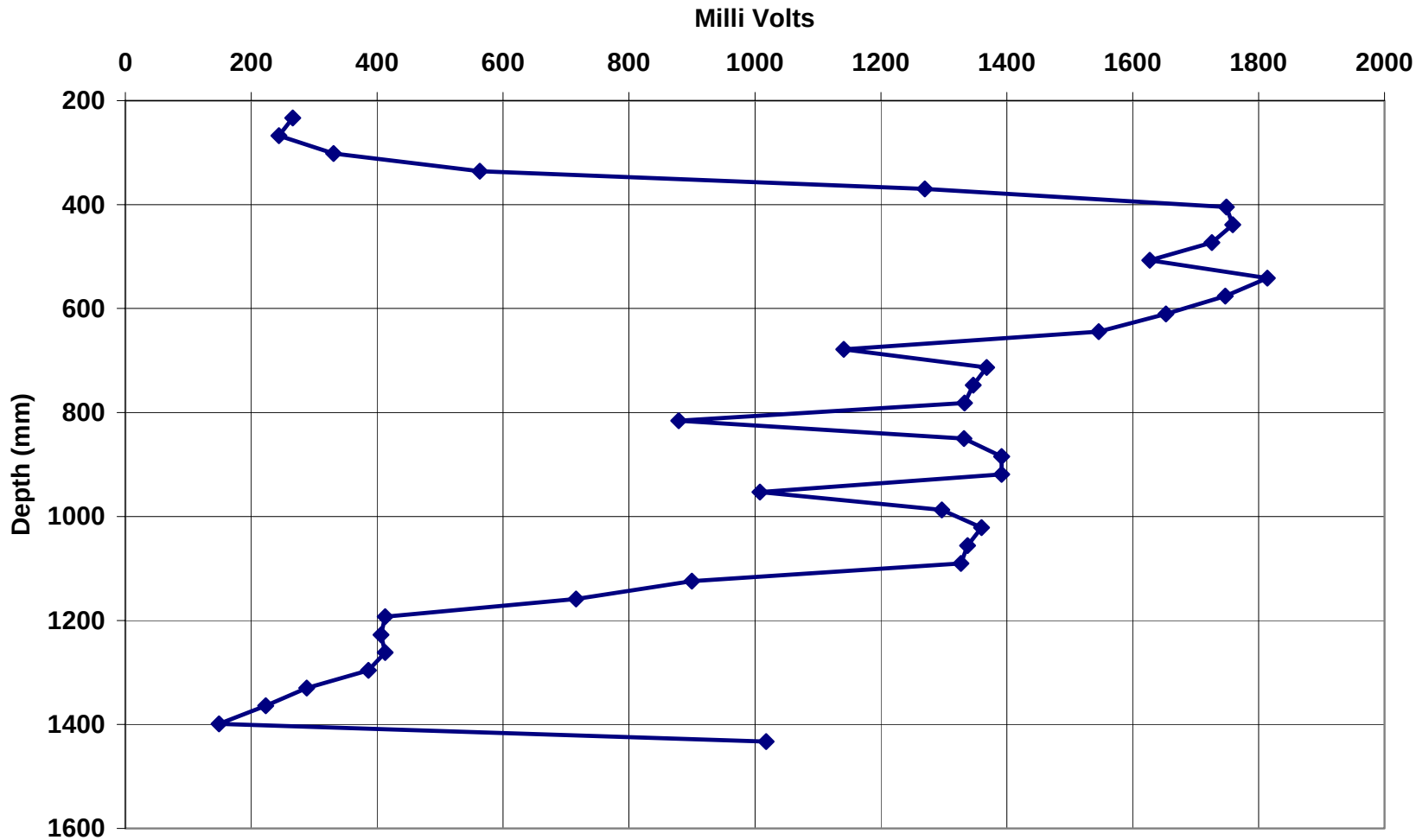
Temperature Variation – Freeze Cycles

County: Warren Highway: SR 6 Location: 2

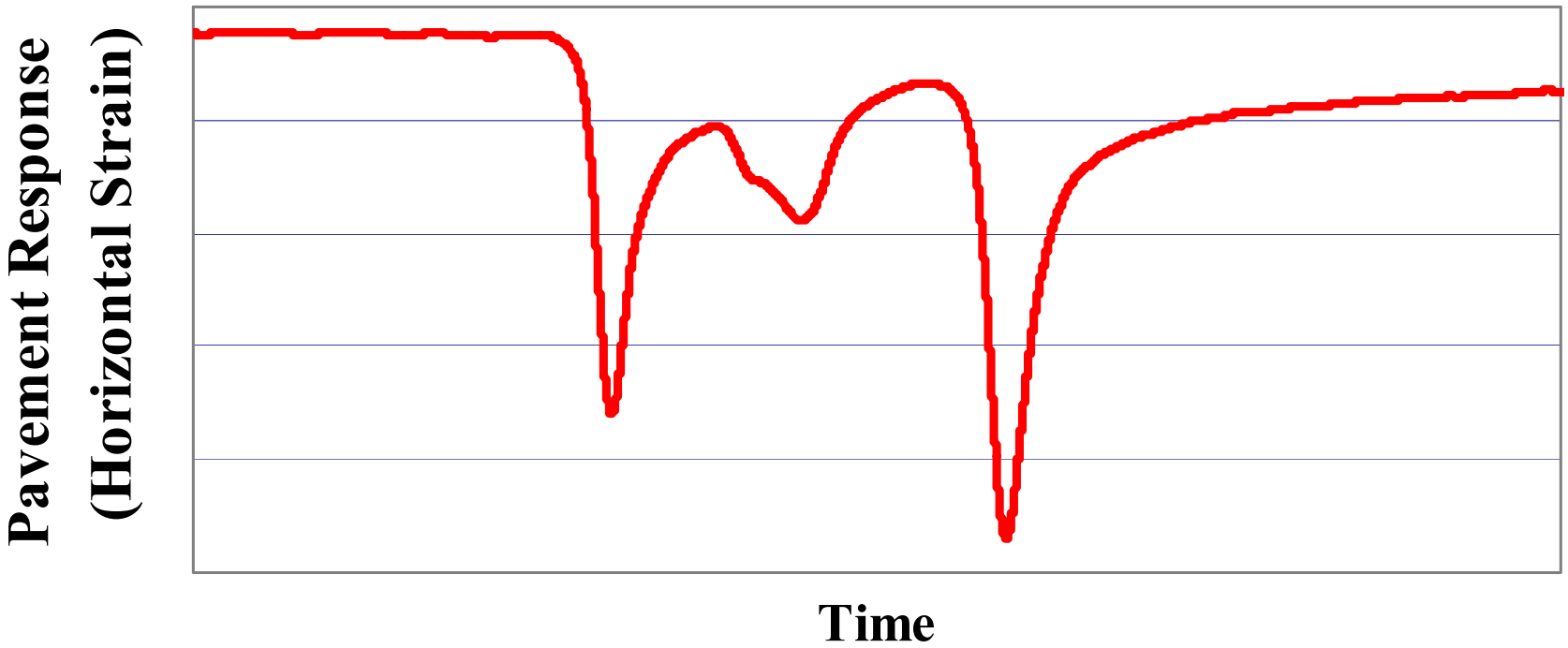


Pavement Freezing Depth

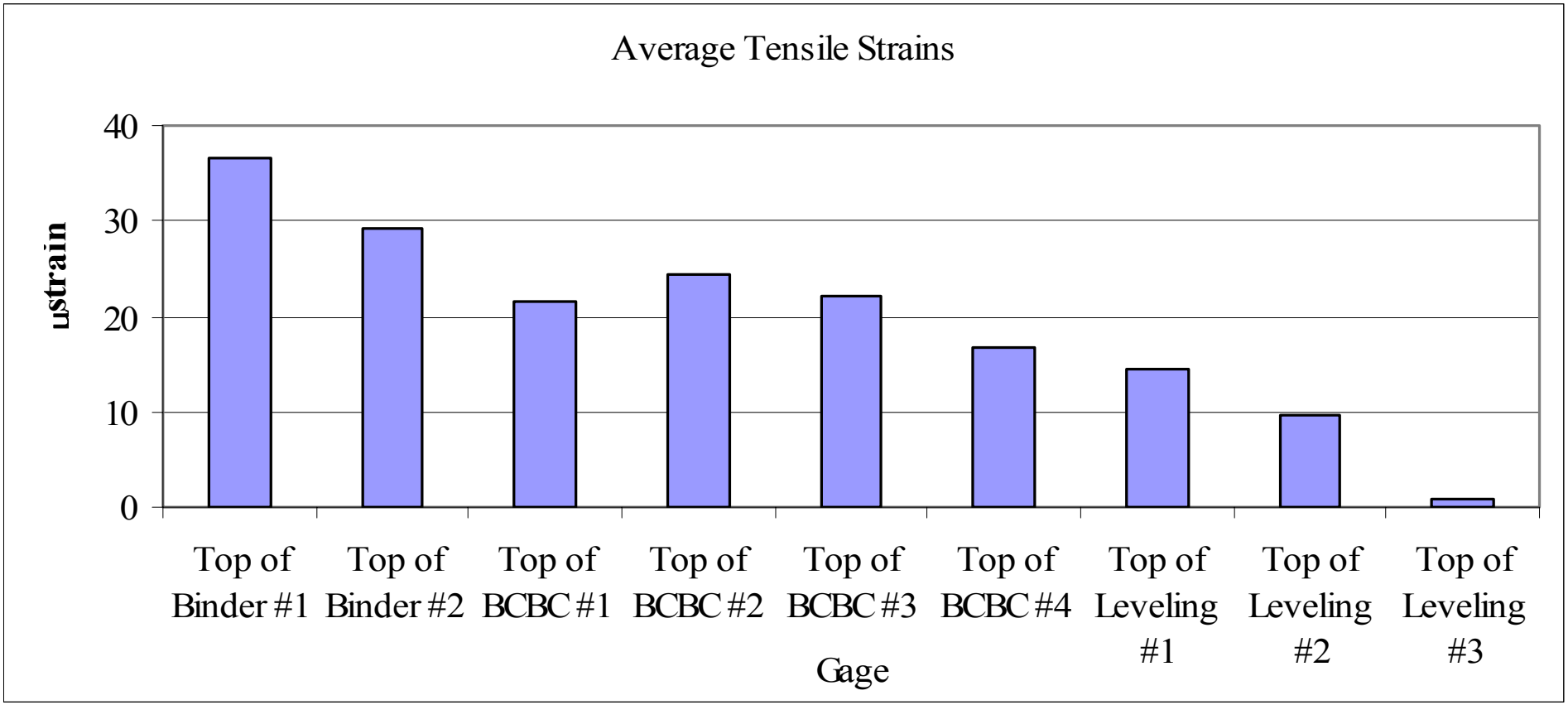
County:Perry Highway:SR 322 Location:2



Pavement Response to Load

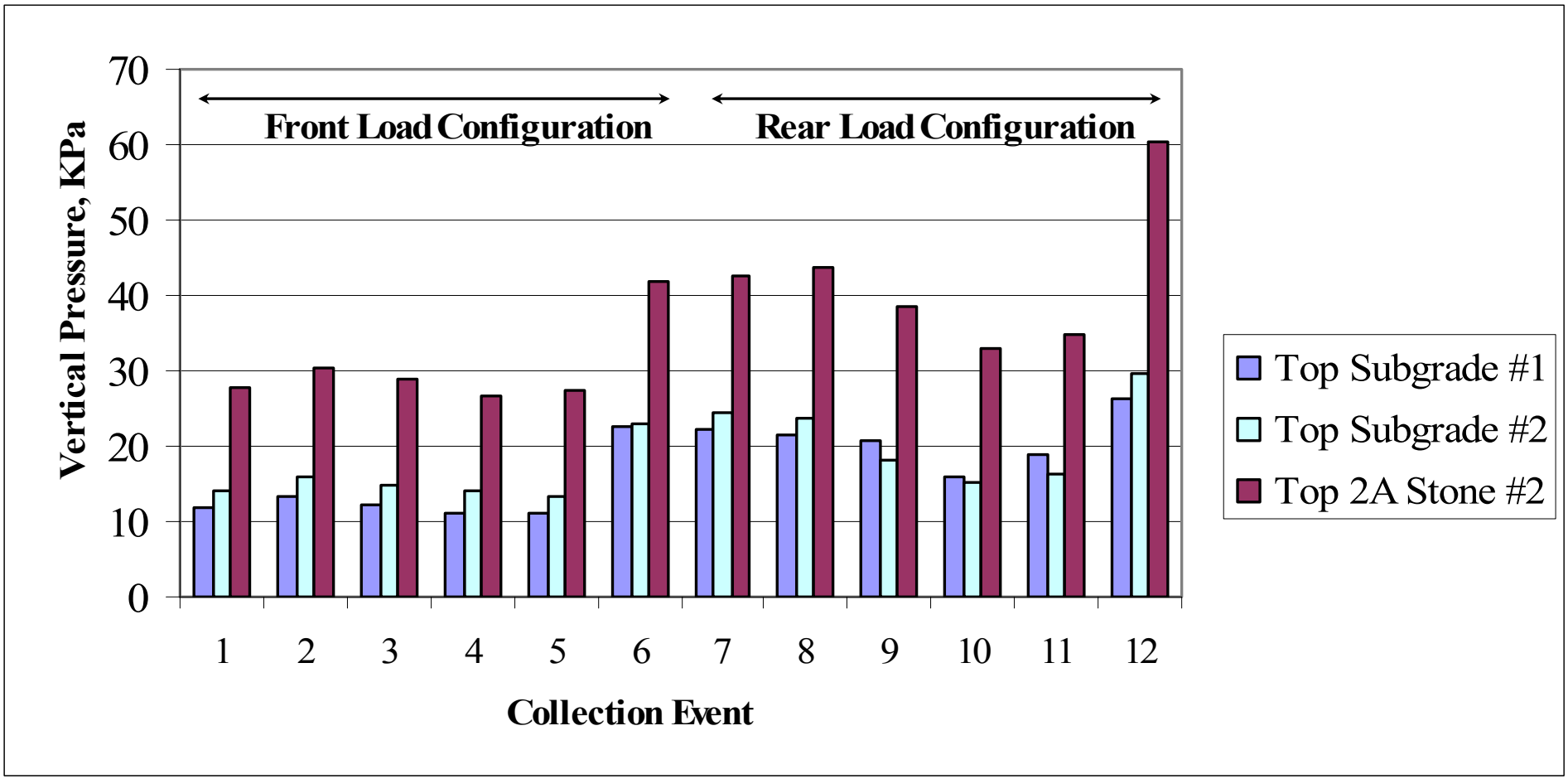


Pavement Response to Load – Position Effect



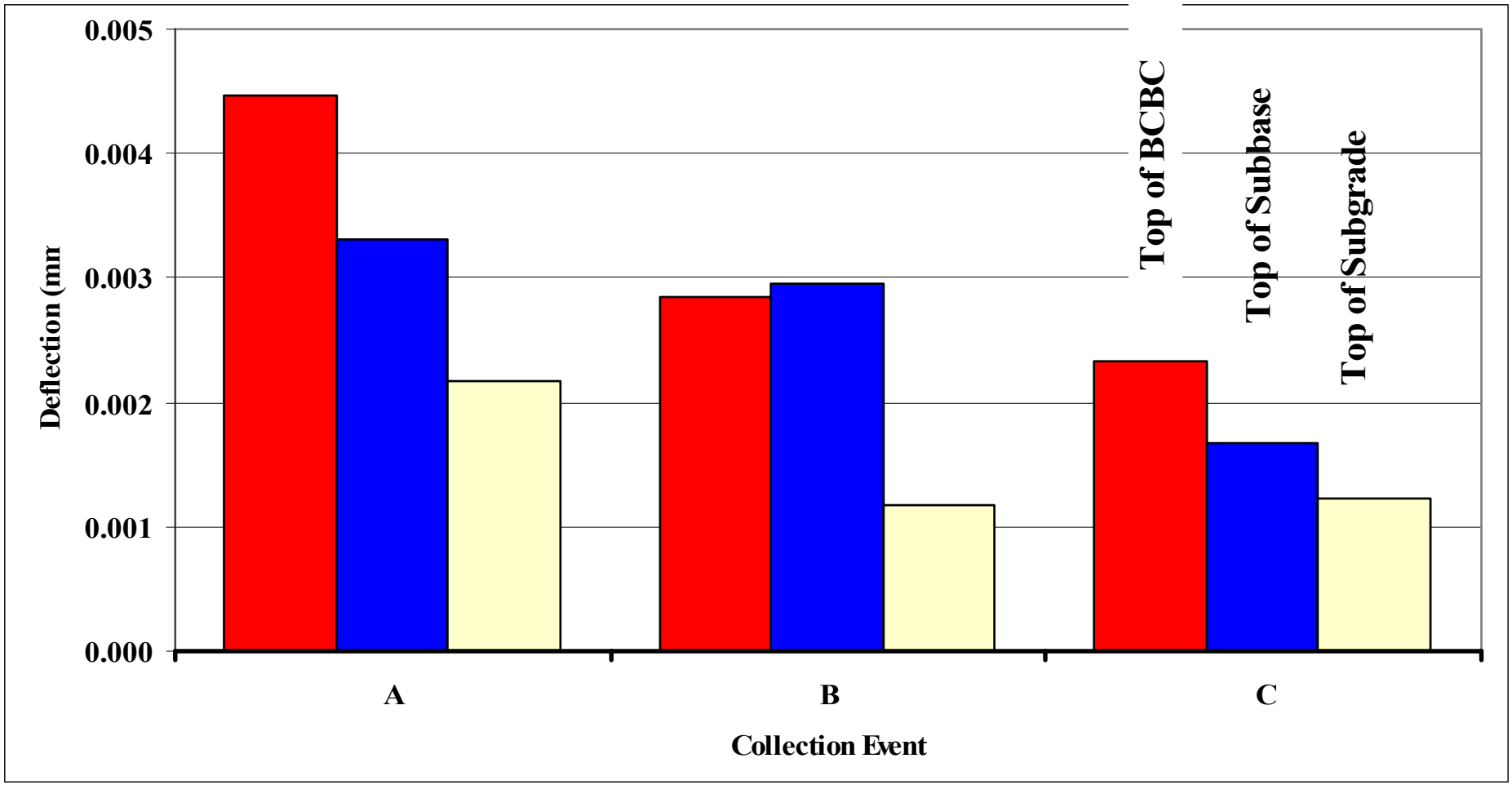
Horizontal Strain

Pavement Response to Load – Position Effect



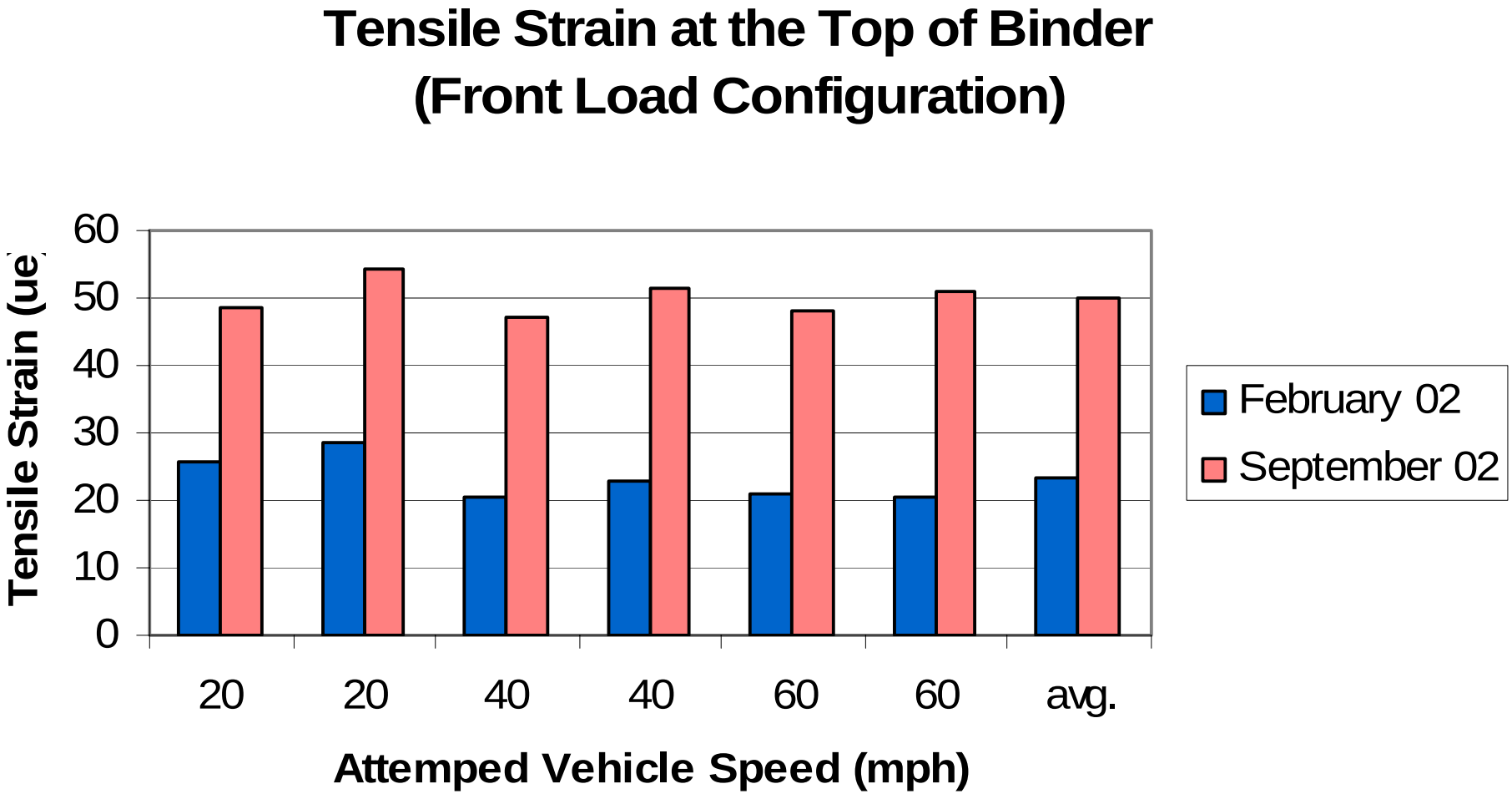
Horizontal Strain

Pavement Response to Load – Position Effect

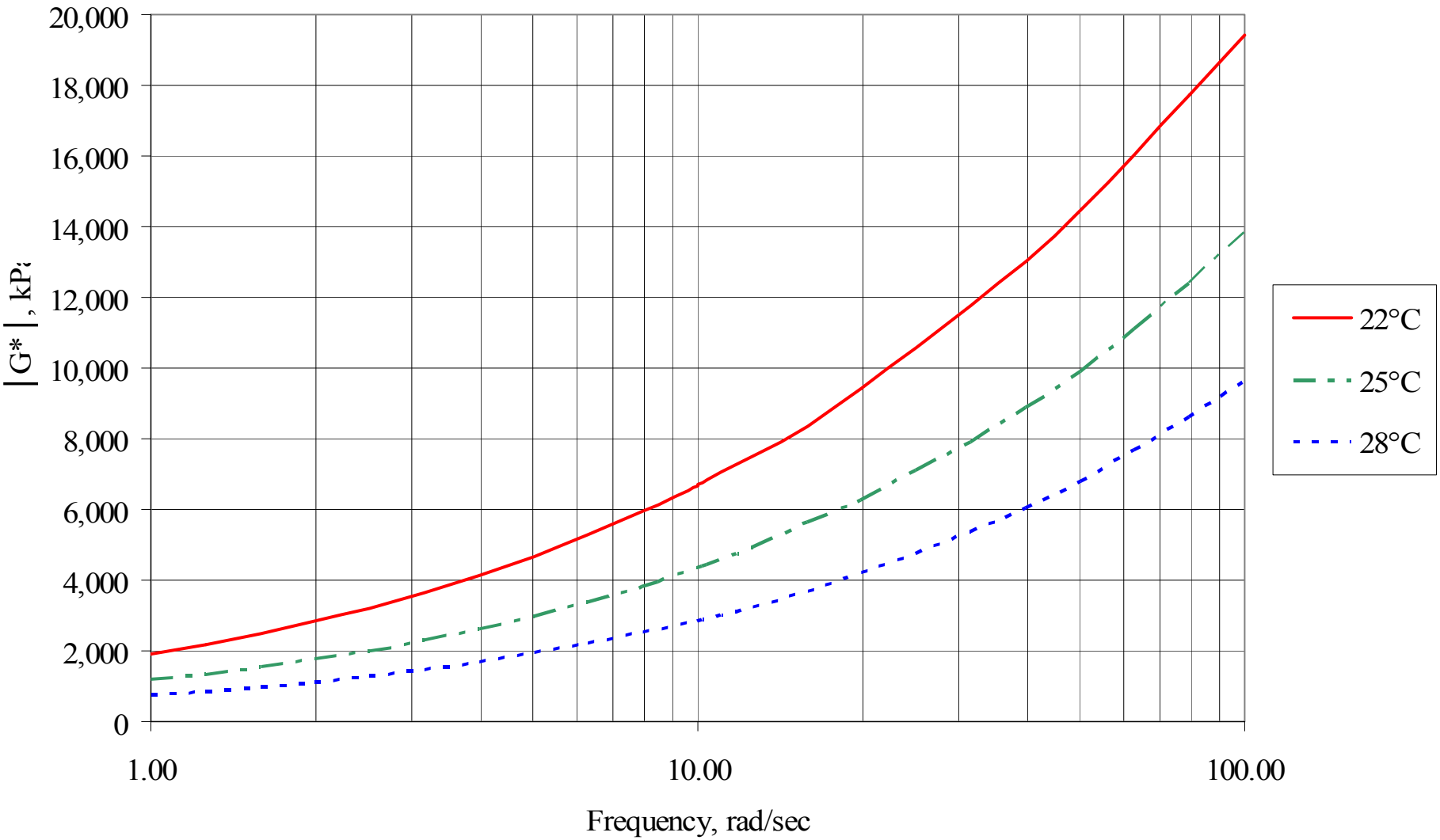


Vertical Deflection (MDD)

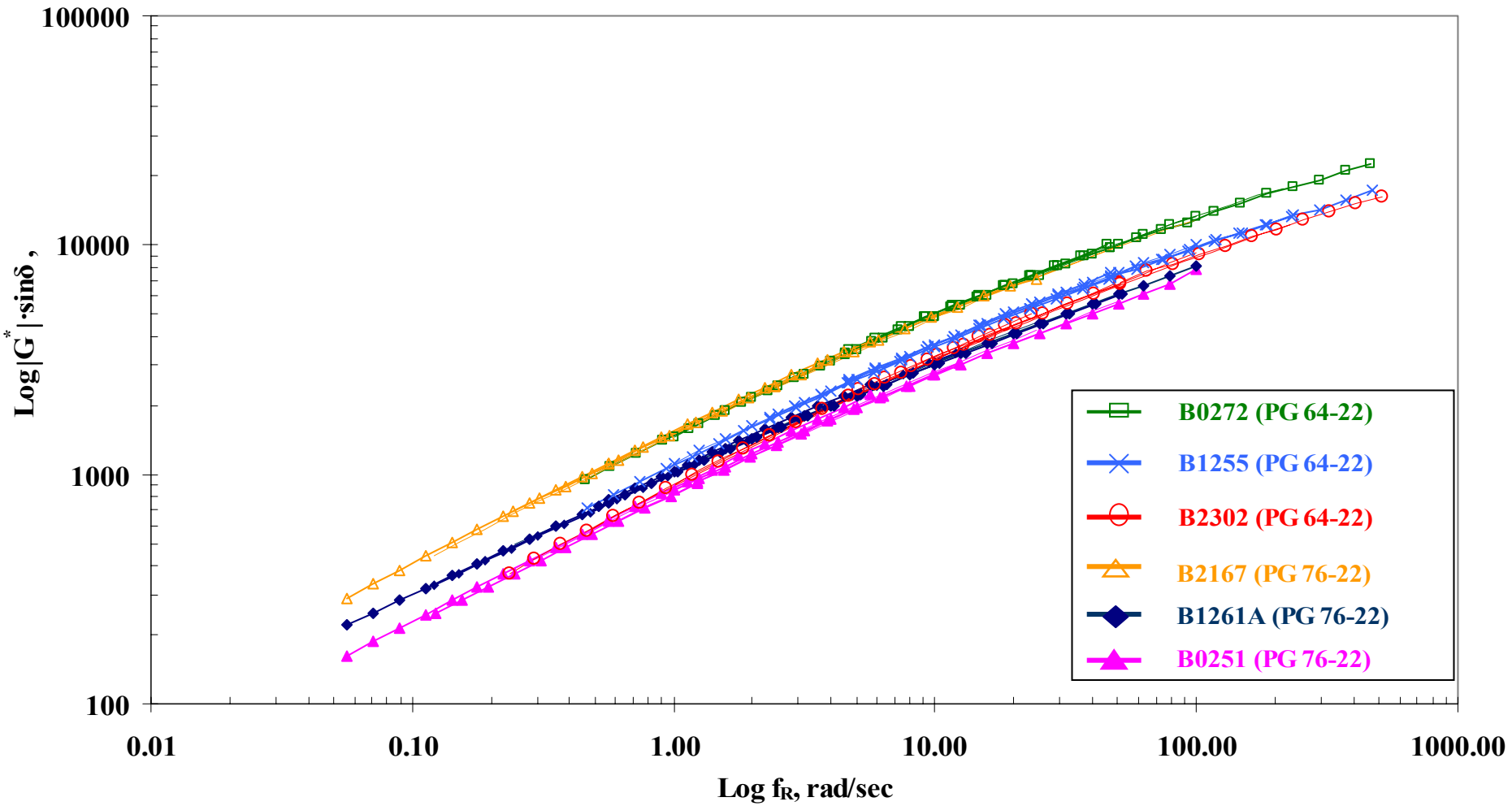
Pavement Response to Load – Seasonal Effect



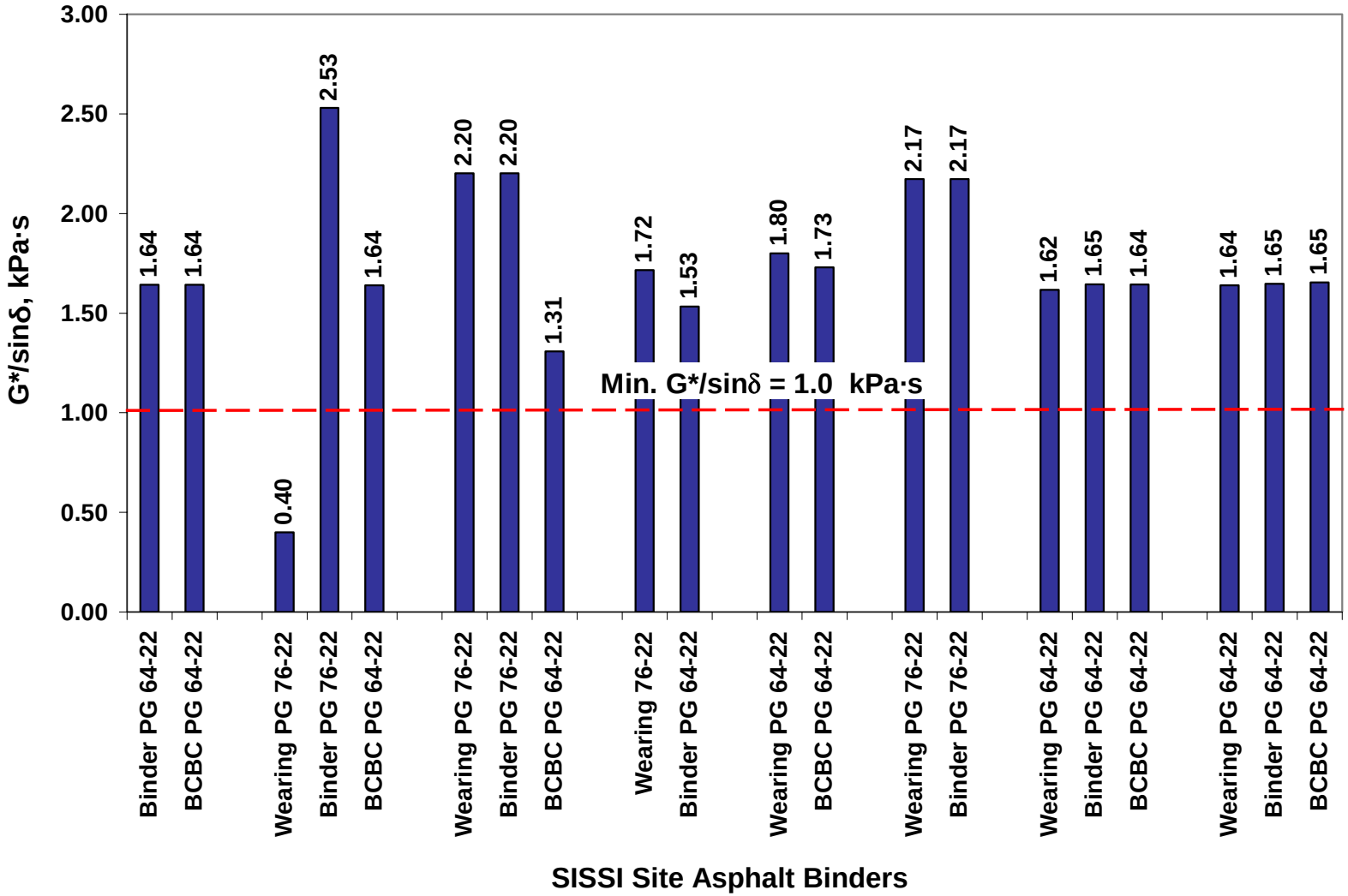
Laboratory Testing - Binder



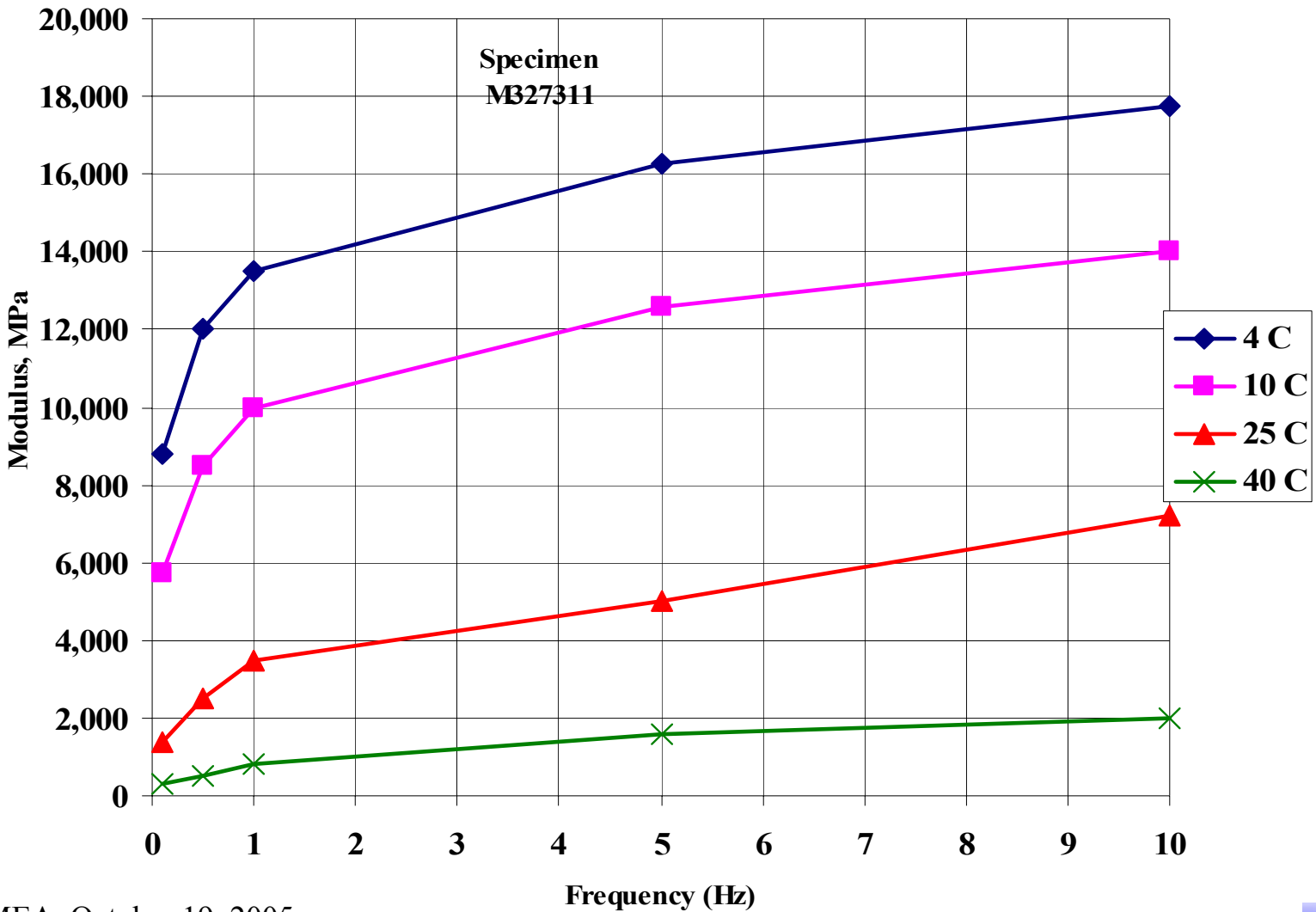
Laboratory Testing – Master Curve



Laboratory Testing - Binders



Laboratory Testing – Mix Modulus



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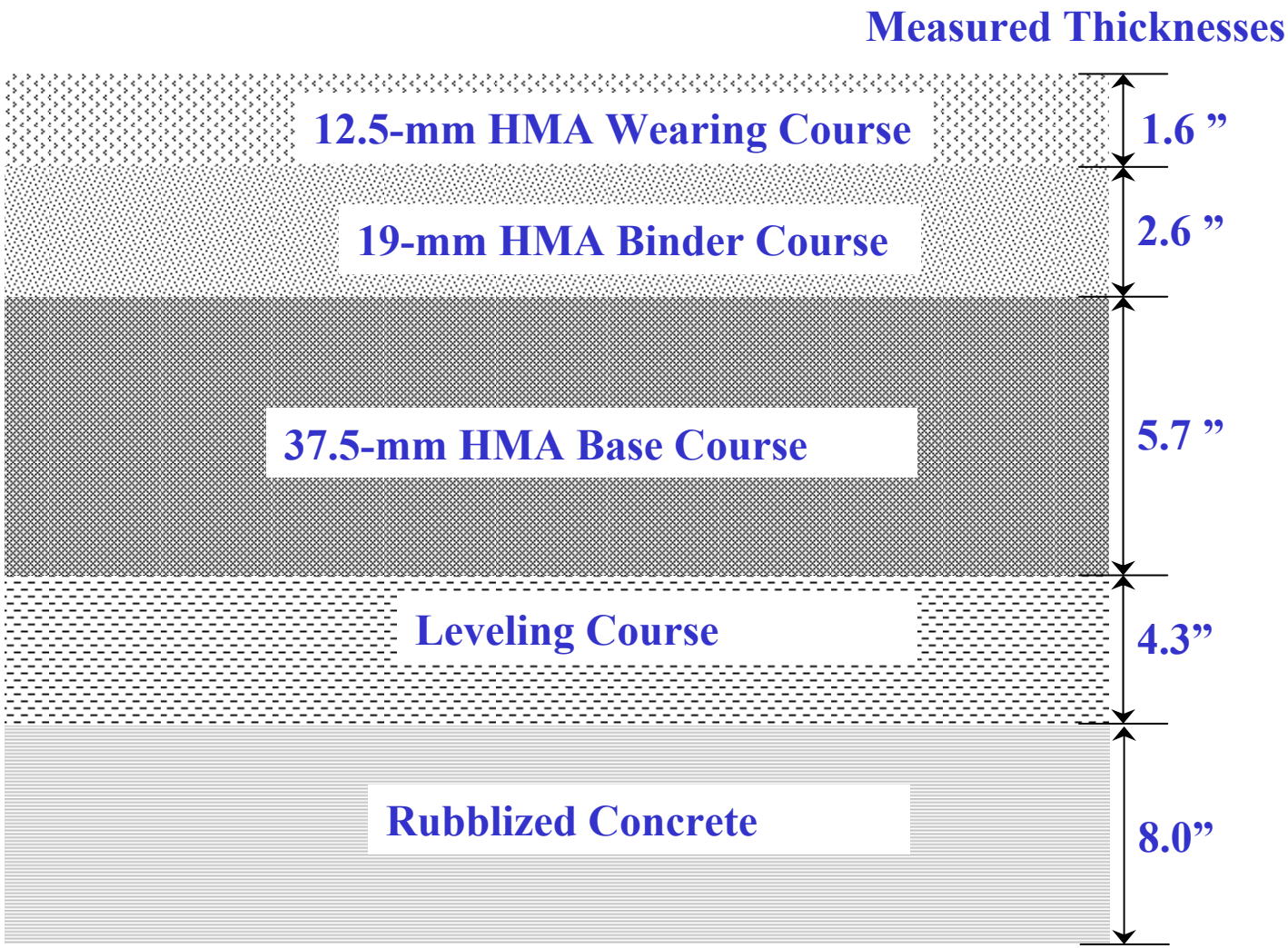
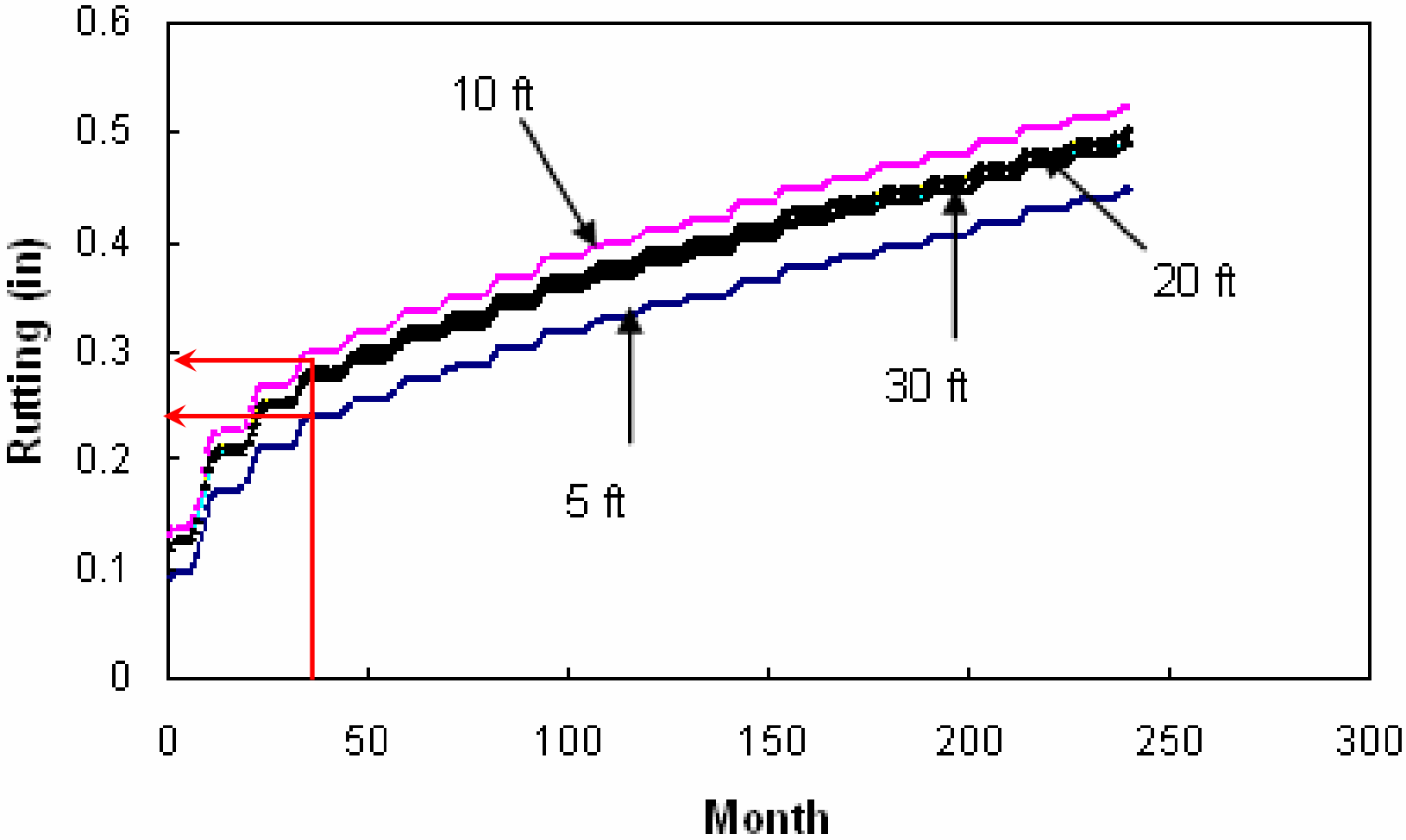
Layer Thicknesses for One of SISSI Sites



AASHTO Design Guide – Predicted Distress



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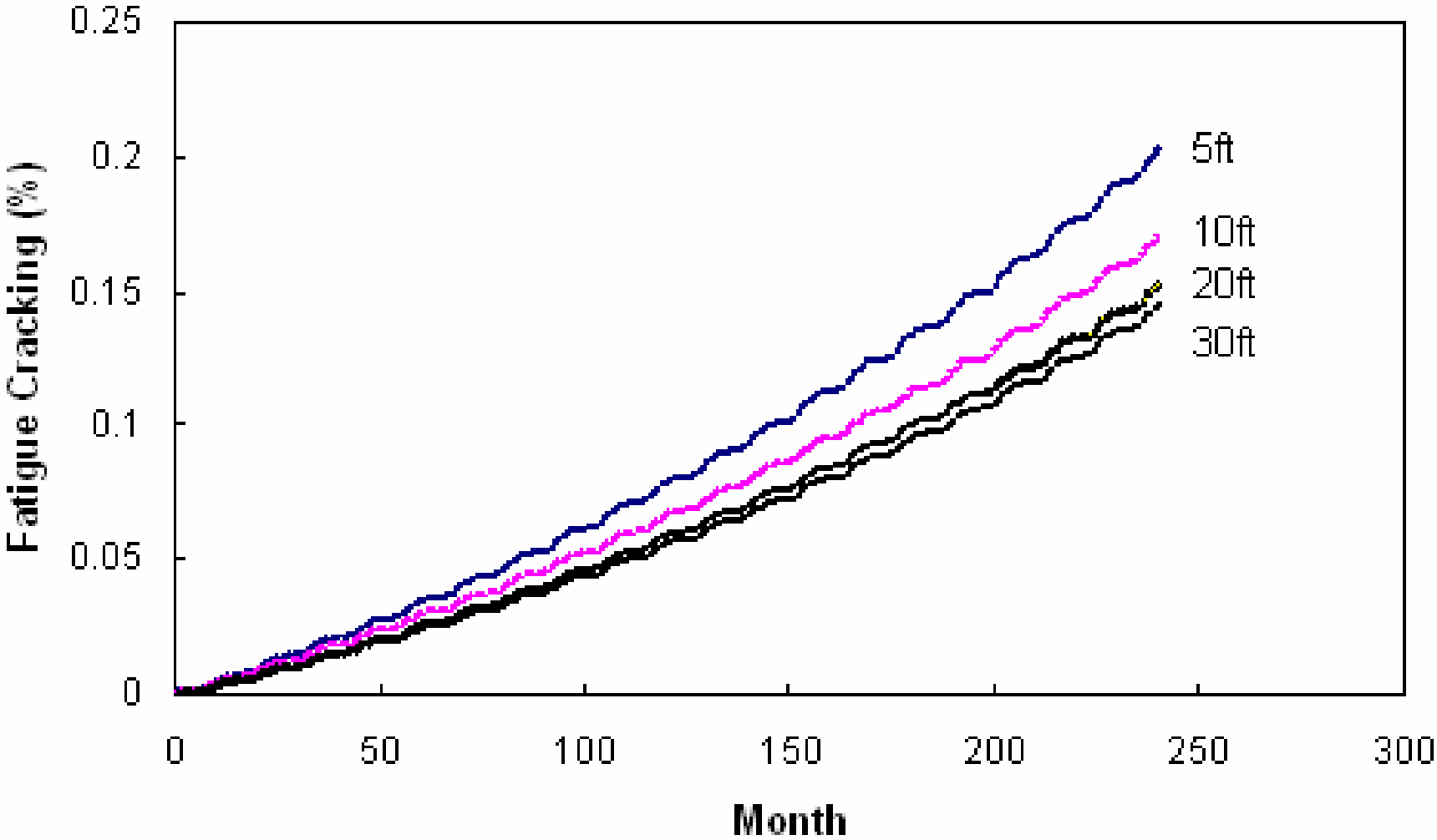

Thank You!


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Current Students
Alumni & Visitors
Parents
SEARCH
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