An Overview of Accelerated Pavement Testing

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Arizona Pavement Materials Conference
Tempe, AZ, November 2011

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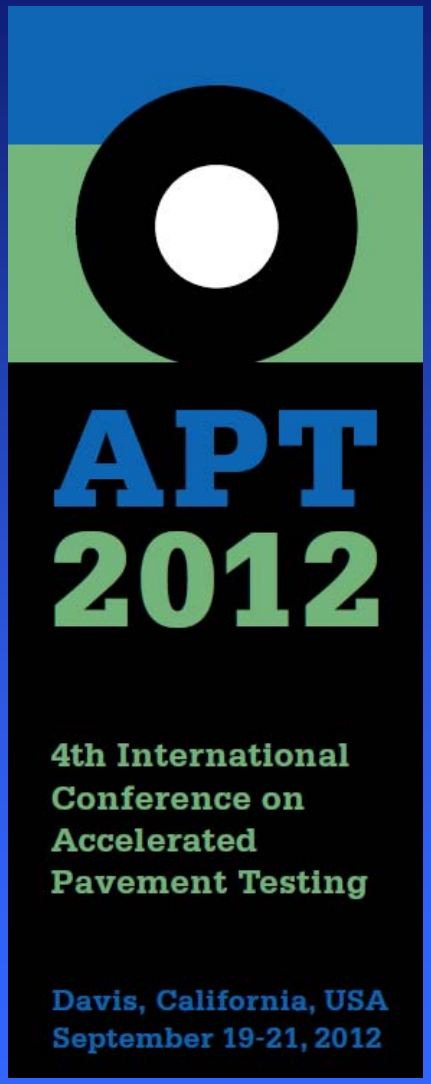
Summary

- Introduction
- What is APT?
- Why do APT?
- APT devices & programs
- Overview of the Caltrans/ UCPRC APT program
- Conclusions

Introduction

- History
  - WASHO Road Test (1951-53)
  - AASHO Road Test (1958-60)
  - Introduction of linear tracks
  - New test tracks
- Programs
  - Internationally accepted technology
  - 12 US APT programs
  - TRB research committee
  - International conference
- Personal experience
  - South Africa (1990-2005)
  - California (1995 onwards)



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What is APT?

- Controlled loading of a pavement
- Acceleration by:
  - Frequency of passes
  - Increased axle loads
  - Environmental control
    - Temperature
    - Moisture content
- APT is not fast "LTPP"
  - Snapshot in time
  - Limited climate/aging effect
  - No traffic mix
  - Limited dynamic effect

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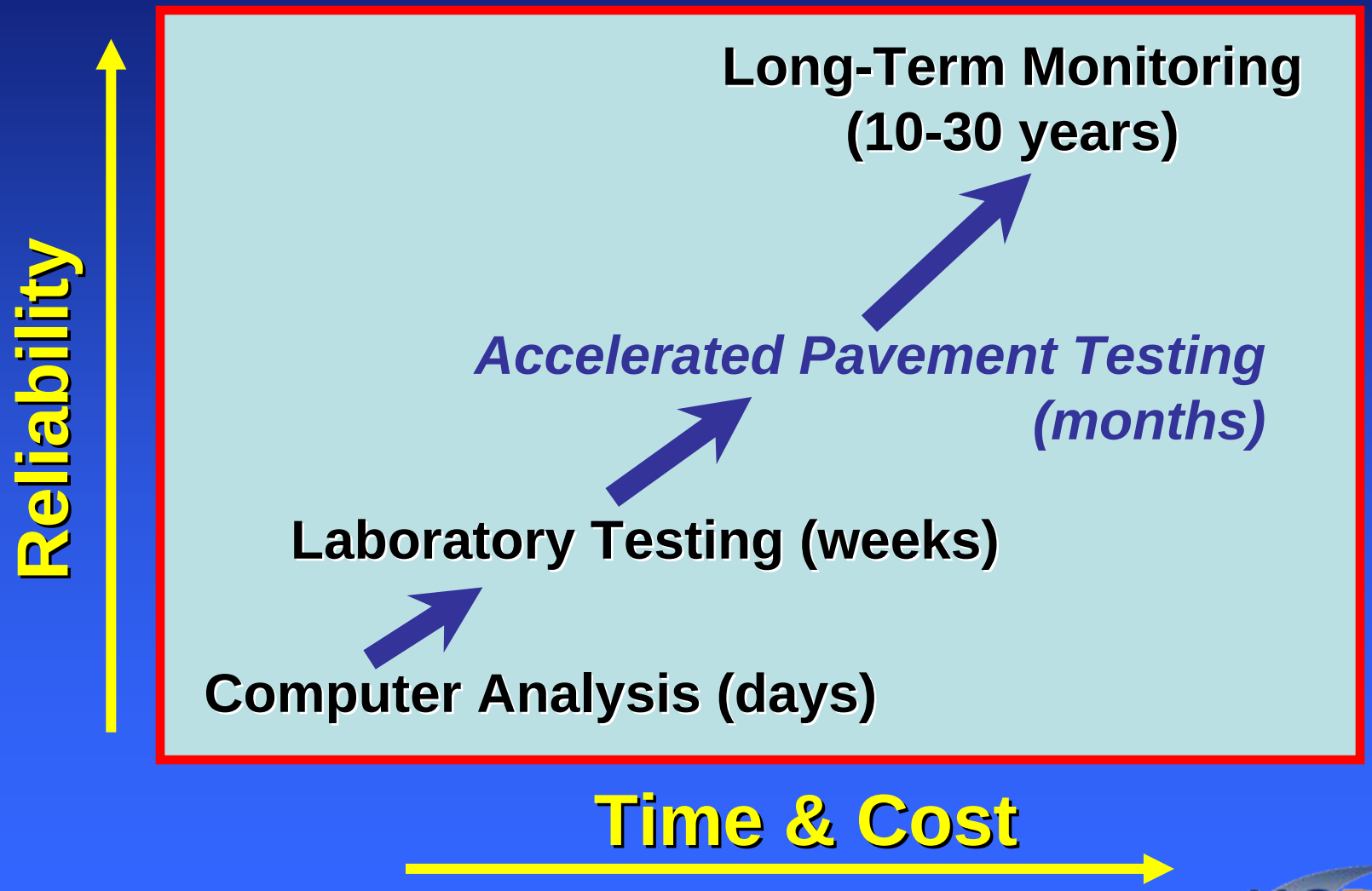
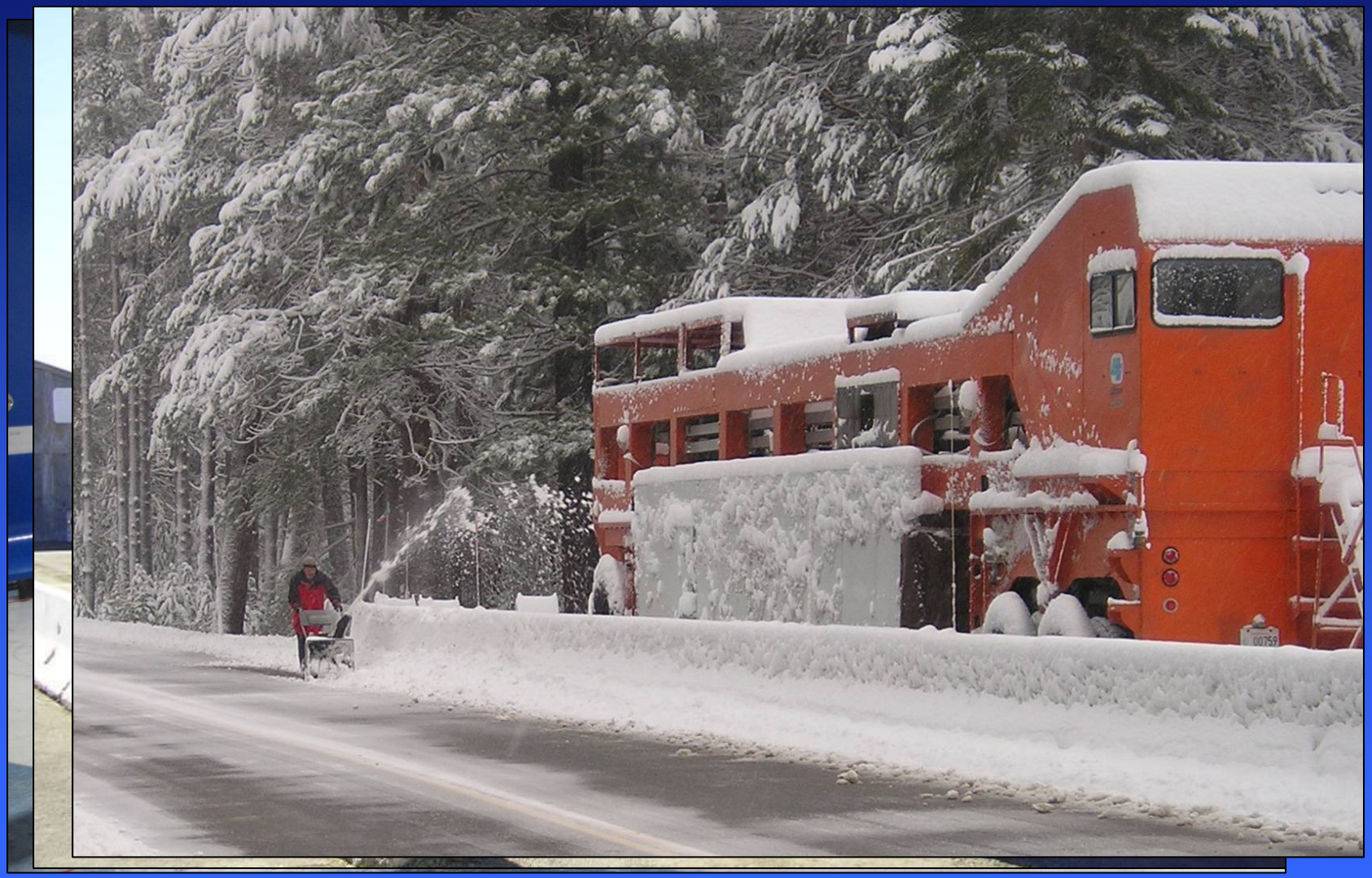
What is APT


Reliability
Long-Term Monitoring
(10-30 years)
Accelerated Pavement Testing
(months)
Laboratory Testing (weeks)
Computer Analysis (days)
Time & Cost

What is APT?

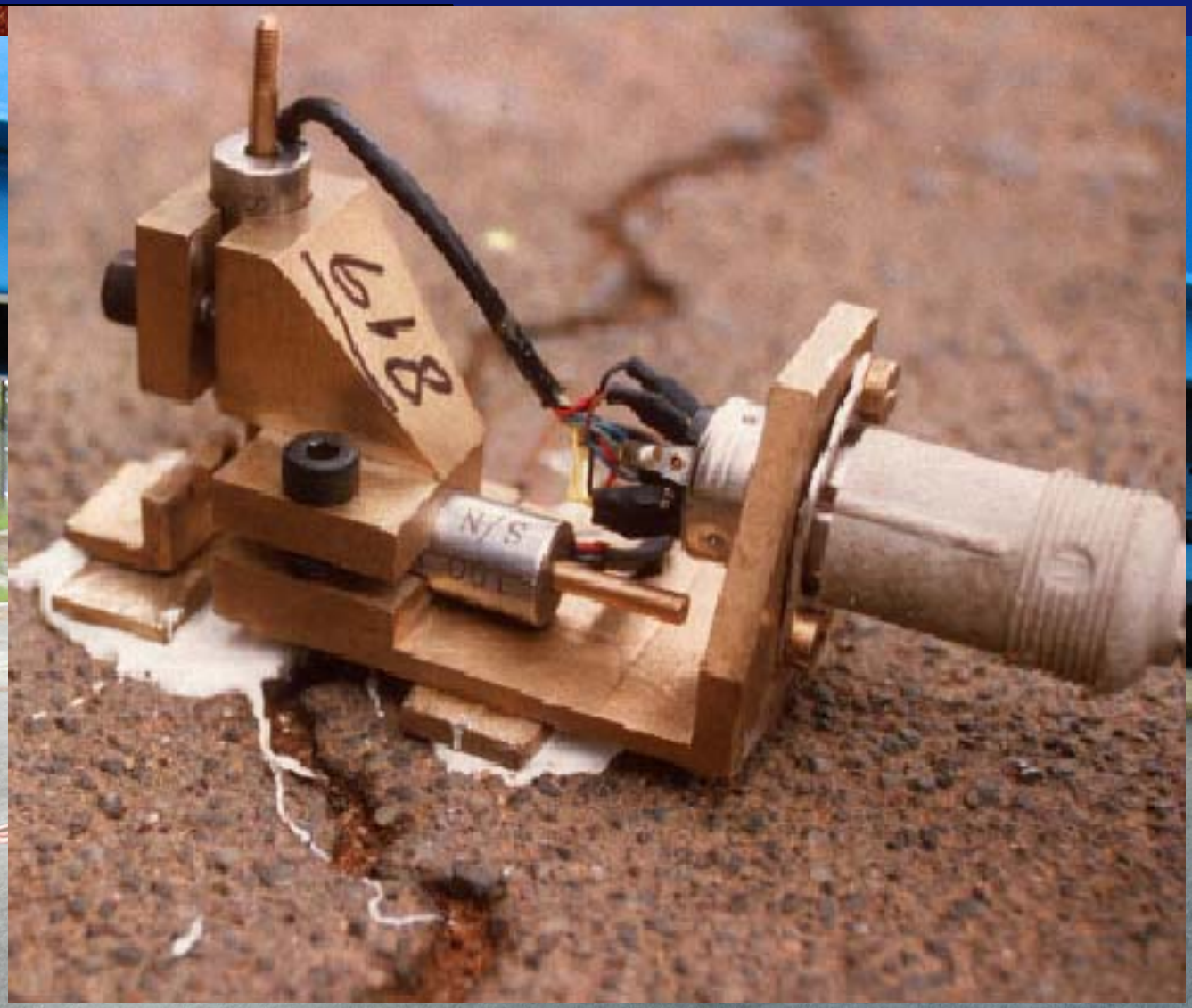


What is APT?

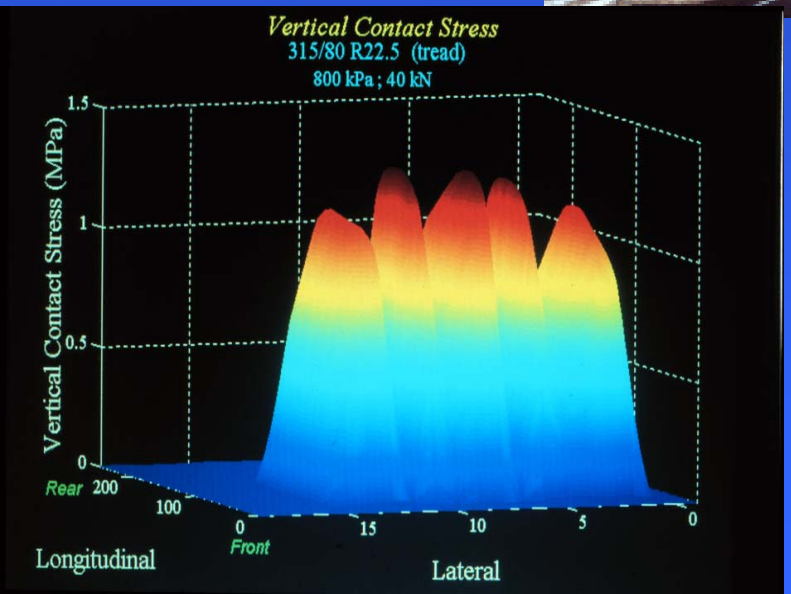
Instrumentation

Instrumentation

Instrumentation



Instrumentation



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Why do APT?

- Understand pavement behavior / response under different loading and environmental conditions
- Identify and highlight deficiencies in current practices
- Evaluate new materials, designs, specifications or construction standards before full scale implementation
- Compare different designs, materials, procedures, products, etc
- Validate/calibrate new designs and performance models
- Link laboratory test results and field observations
- Assess impacts of new vehicles, tires, tire inflation presures, load limits, etc

APT is not fast LTPP!

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Types of APT

- Two main types of APT
  - Fixed
    - Linear (HVS, ALF, ATLAS)
    - Circular (LCPC, Captif)
  - Test track
    - AASHO Road Test
    - Westrack
    - NCAT
    - MnRoad

US APT Programs

- Heavy Vehicle Simulator
  - California
  - Florida
  - USACE (CRRL and WES)
  - FAA
- Accelerated Load Facility
  - FHWA
  - Louisiana
- Other linear
  - FAA
  - Illinois
  - Kansas
  - Indiana
  - Ohio
- Test Tracks
  - MnRoad
  - NCAT
  - Westrack

Types of APT

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Fixed Devices	Test Tracks
➢Controlled temperature and moisture	➢Uncontrolled temperature and moisture
➢Slow speed trafficking	➢Highway speed trafficking
➢Ability to vary load and to overload	➢Limited ability to overload
➢Short sections	➢Longer sections
➢Controlled wander	➢Uncontrolled wander
➢Little or no suspension interaction	➢Realistic suspension interaction
➢Difficult to measure roughness	➢Meaningful roughness measurement
➢Can be moved anywhere	➢Fixed location

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APT in California

- Purchased two refurbished HVS Mk IIIs from South Africa in 1995
- Replaced one machine with HVS Mk VI in 2011
- Operated in various locations
- Project summary
  - 15 projects (>120 tests)
  - >80 million load repetitions
  - ~ 4 billion ESALs
- Cost-benefit between 4 and 10
  - Savings
  - Accelerated implementation
  - Reduced risk

APT in California

APT in California

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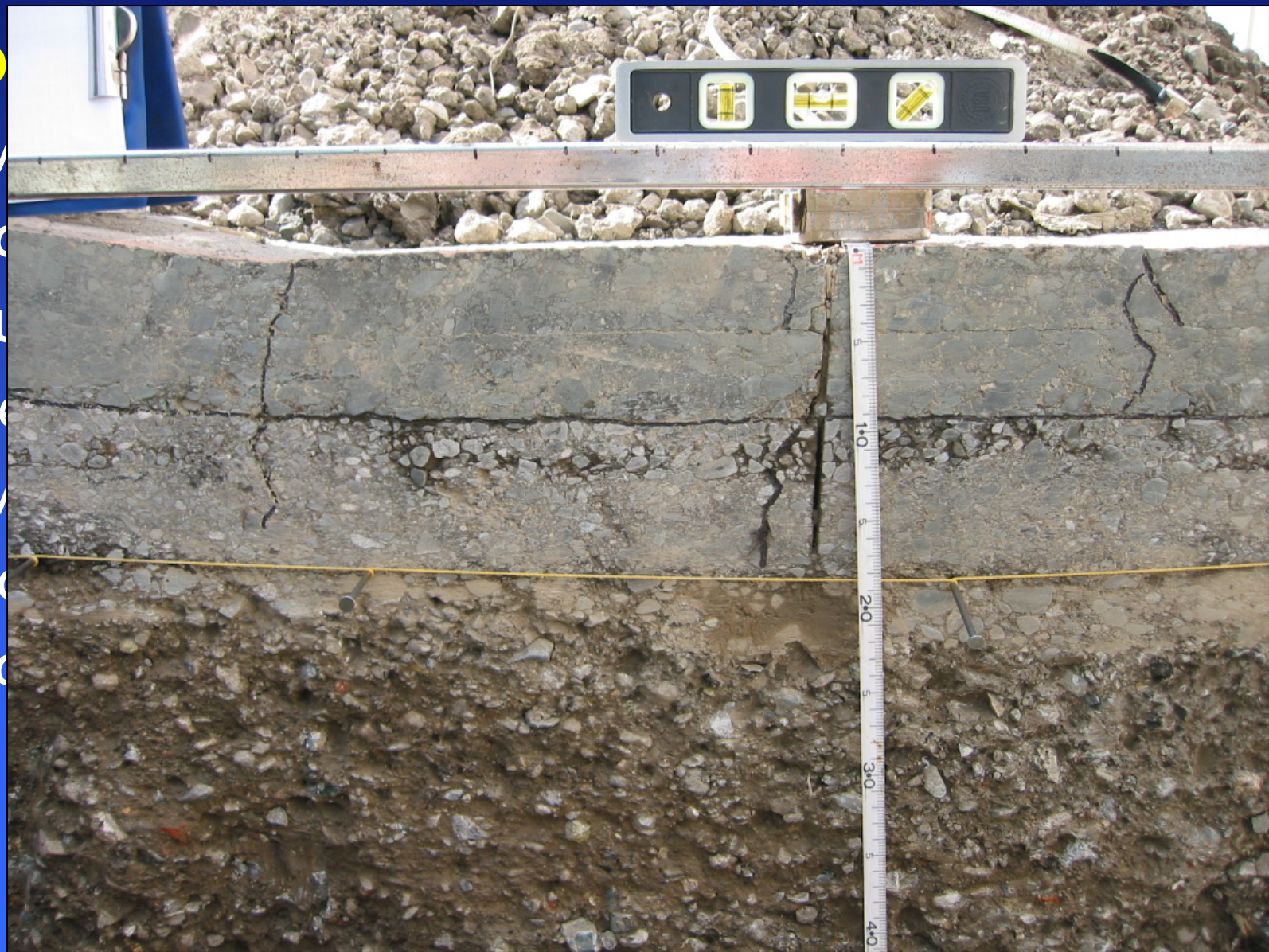
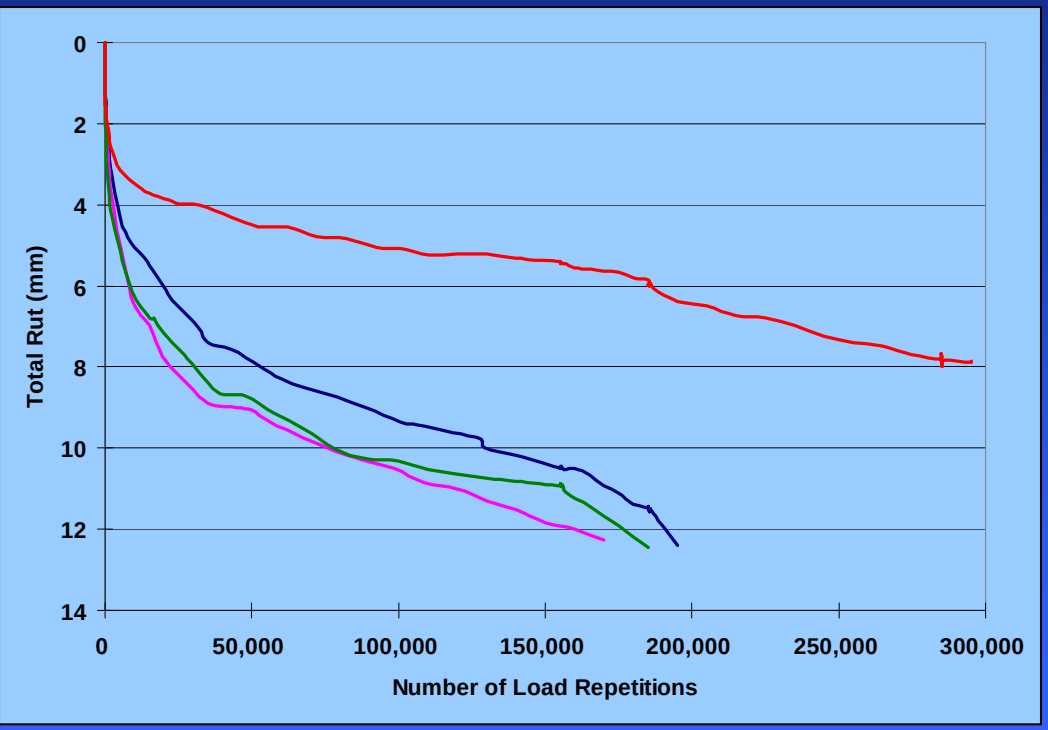
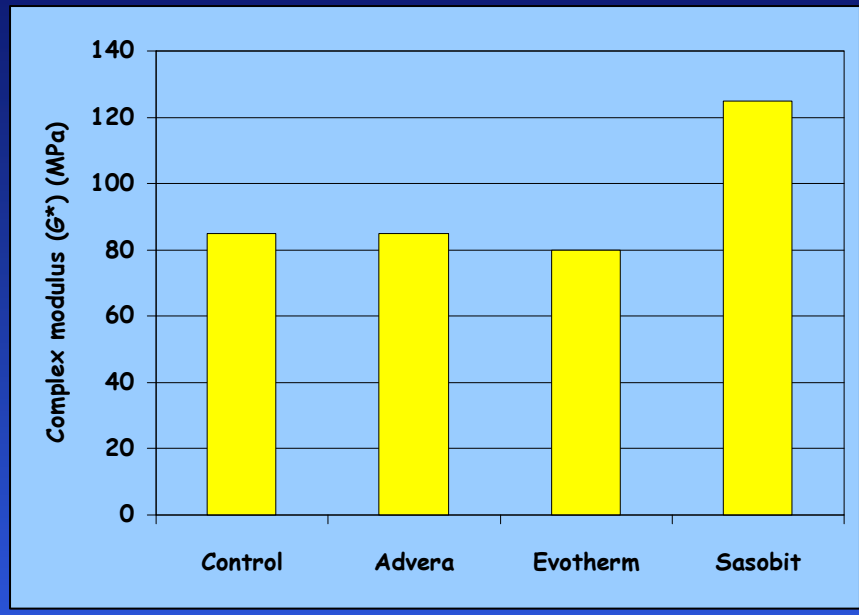
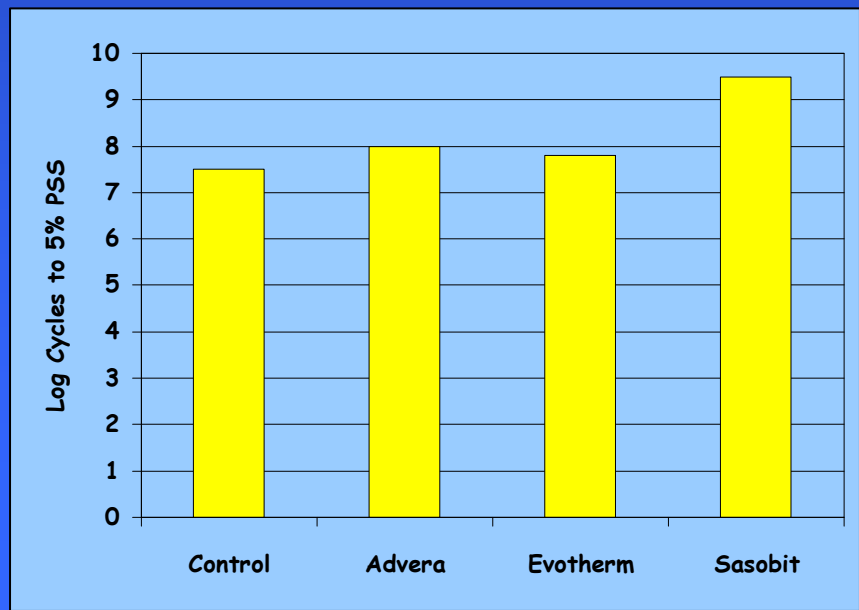
  - + Fu
  - + Te
  - + W
  - + Te
  - + Bo



APT in California

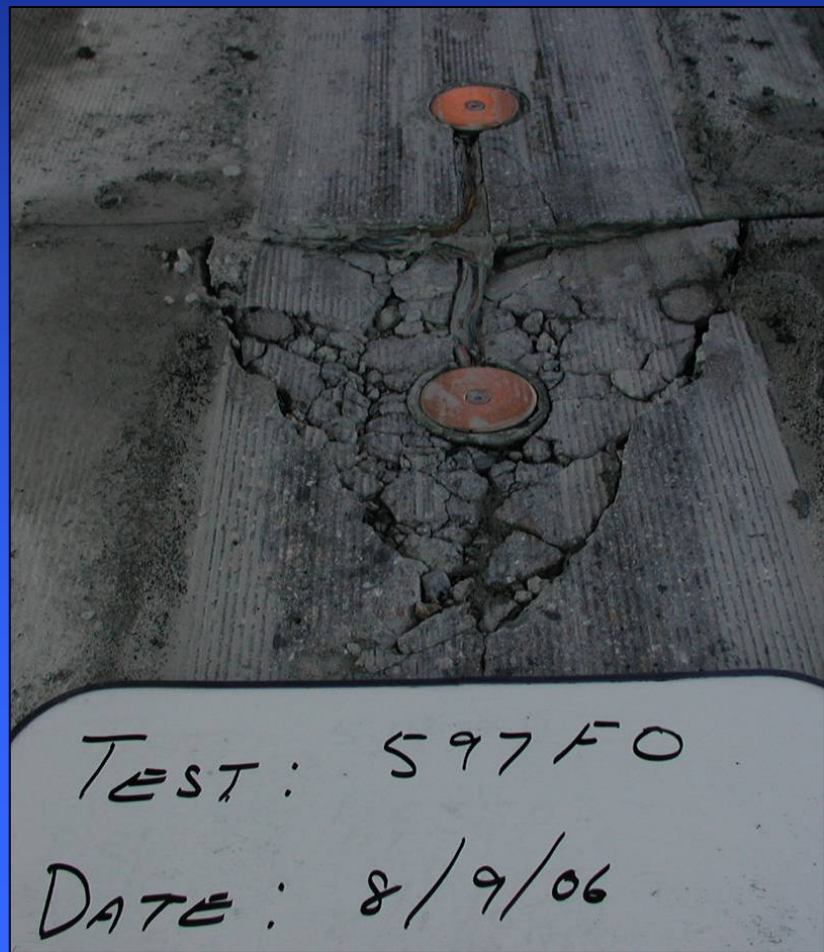






APT in California

- Concrete projects
  - Dowel bar retrofit
  - Precast slabs
  - PCC design procedures
- Other projects
  - Bay bridge deck joint



Bay Bridge Deck Joint

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Conclusions

- Proven technology for over 60 years
- 12 programs in the USA
- Documented benefits:
  - Understanding pavement behavior
  - Faster implementation of new technology with lower risk
  - Developing and calibrating performance models

Thank you!

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