Arizona’s Concrete Pavement Research Project (SPS-2)
But First, What Is LTPP?

Long Term Pavement Performance (LTPP)
LTPP’s GOAL is...

to provide answers to **HOW** and **WHY**

pavements perform as they do!
But First, What Is SPS-2?

Largest on Going Concrete Pavement Research Project in the World

Strategic Study of Structural Factors for Rigid Pavements

1. Thickness
2. Base Type
3. Concrete Strength
4. Lane Width
5. Drainage
How Was SPS-2 Deployed

- Statistical Design Called for 12 test sections to be constructed in each of 16 states (14 States)
- Statistical Design Called for 192 test sections to be built (168 Constructed)
- Statistical Design called for SPS-2 Core Experiment (12 TS) to have Four States in Each of Four Climate Zones (?)

[Map of the United States with climate zones labeled: Wet No Freeze, Dry Freeze, Wet Freeze, Dry No Freeze]
PCCP Design Elements

1. Thickness
2. Base Type
3. Concrete Strength
4. Lane Width
5. Drainage
It is anticipated that only a few SPS-2 projects will be built during the 1990 construction season. The remaining test sites will be selected from the identified candidates scheduled for construction in 1991, or even 1992 if necessary.
Time Line of SPS-2 Experiment

- 26 Years
- Reports
- Construction
- Guidelines

- Effects of Subsurface Drainage
- Analysis of Fault Data
- Initial Evaluation & Analysis
- Influence of Design Features
- Curl & Warp Analysis

- SPS-2 Construction
- Outlet Inspection
Traffic Levels on SPS-2 Experiments
The Arizona Concrete Pavement Experiment (SPS-2)
Google Earth Image of Test Sections

Hassyampa River

Johnson Rd

Palo Verde Rd
Approaching from the West End

MP 106 EB ↓ 611 ft
Test Section Layout

19 PCCP Test Sections

- 900 psi Flexural Strength
- 550 psi Flexural Strength
- State Supplemental @550 psi Flexural Strength

Base Types:
- Dense Graded Aggregate Base (4" & 6")
- Permeable Bituminous Treated Base (4") Note: These are the only Sections with Edge Drains
- Lean Concrete Base (6")
- Bituminous Treated Base (4")

Shoulder Types:
- 12 ft Shoulder Width
- 14 ft Shoulder Width

Design Features:
- PCCP Thickness- (2)
- Base Type- (3)
- Concrete Strength- (2)
- Lane Width- (2)
- Drained or Undrained
Arizona Project Construction Timeline (6 - 9 months)

- Removing Existing EB AC and Constructing Detour onto WB
- Over Excavating Existing Subgrade 1 ft and Recompacting
- Constructing Edge Drains
- Constructing Aggregate Base, Lean Concrete Base, and Permeable Base
- Constructing 8”, 11” and 12.5” Thick PCCP
- Constructing 550 and 900 psi Flexural Strength PCCP
- Constructed Doweled and Undoweled PCCP

[Diagram showing project timeline with key dates and activities]
Subgrade Construction

Subgrade Preparation

Overexcavation and Backfill Detail
Drained and Undrained
Base Construction
Concrete Strength

![Concrete Strength Graph]

- **550 Mix 28 day Cylinder**
- **900 Mix 28 Day Cylinder**

![Graph showing probability density function of 28 day concrete cylinder strength in psi](image)
- Night Paving September 1993
- Three Mixes Used (1" & 1.5")
- All LTPP Sections Doweled

PCCP Thickness

8" & 11"
Lane Width

12 Ft

14 Ft
So What Have We Learned After 25 Years
Subgrade Construction

Shoulder

Travel Lane
Drained and Undrained
Concrete Strength

550 PSI
900 PSI
Lane Width

12 Ft

14 Ft
PCCP Thickness

8” & 11”

Thicker is Better
Comparison of Dowelled to Undowelled

Base Types
- Dense Graded Aggregate Base (4" & 6")
- Permeable Bituminous Treated Base (4")  Note: These are the only Sections with Edge Drains
- Lean Concrete Base (6")
- Bituminous Treated Base (4")

Shoulder Types
- 12 ft Shoulder Width
- 14 ft Shoulder Width

900 psi Flexural Strength
- 214
- 218
- 220
- 224
- 226
- 250

550 psi Flexural Strength
- 215
- 219
- 221
- 225
- 229
- 250
- 255

State Supplemental @ 550 psi Flexural Strength
- 221
- 223

Un Dowelled Sections

State Supplemental Sections

SPS-2 Core Experiment 12 TS
SPS-2A JPCP 6 TS
SPS-2B JRCP 12 TS
State Supplemental Sections
What About the Other SPS-2?
Cracking Over Dowels

8” PCCP
Shoulder Type

North Dakota

Wisconsin
Issues with LTE as Performance Measure
Transverse Crack Count as Performance Measure
Conclusions (My Opinions)

- PATB Performed Best for Initial Smoothness and Rate of Progression of Roughness
- LCB performed worst with transverse cracking and most influence of Widened Shoulder
- 550 psi Mix Out Performed 900 psi
- Widened Traffic Lanes Create a Higher Potential for Longitudinal Cracking
SPS-2 Pooled Fund Reports

- NCE Report:
  - SPS-2 PAVEMENT PRESERVATION EXPERIMENT COMPARISON OF PAVEMENT ME AND ACTUAL PERFORMANCE
Questions?

Thank You!
The End!