



Thin Unbonded Concrete Overlay in Plano, Texas

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Concrete Overlays

■ Cities are being asked to do more with less...

■ Shrinking budgets

■ Increasing traffic

■ Construct it fast!

■ But make it long-lasting!



■ Concrete overlays are cost effective and can address both short- and long-term needs

Project Location



■ 6-lane
urban
arterial



Existing Pavement

- Existing OLD concrete 5 to 8 in.
- Overlaid repeatedly, 3 to 5 in. asphalt
- Distresses in underlying concrete reflecting
- Long joint spacing with extensive mid-panel cracking on numerous slabs

Existing Pavement



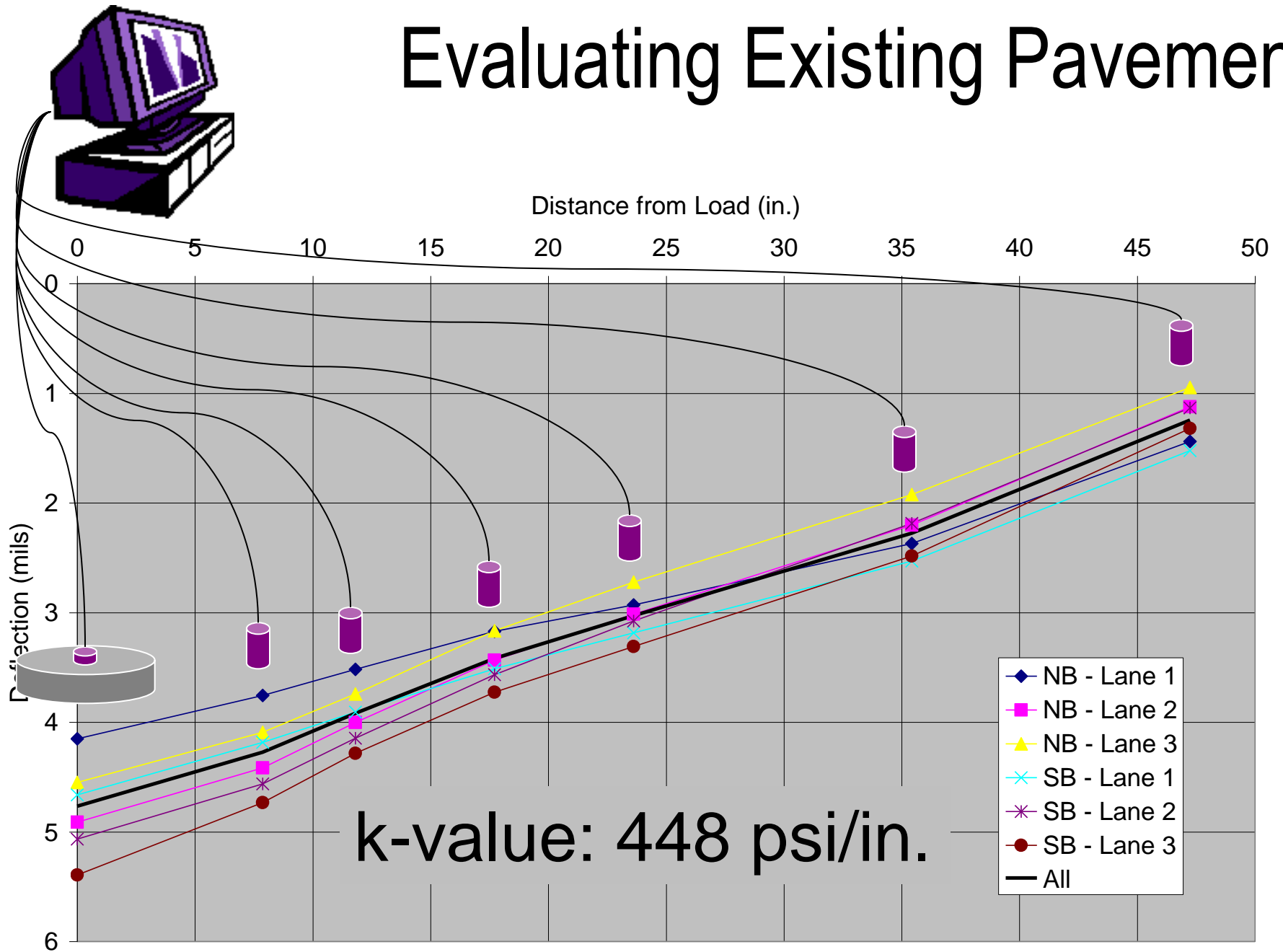
Existing Pavement



Evaluating Existing Pavement

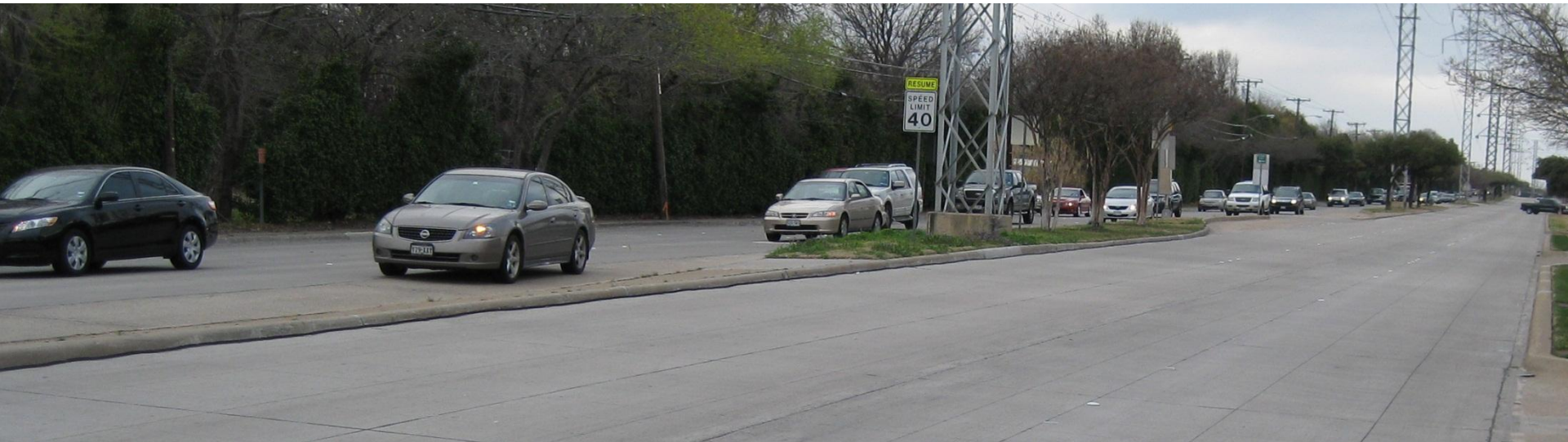


Evaluating Existing Pavement



Design Traffic

- 16,000 AADT
- Commuter route
- 1 to 3% trucks
- 20-year ESALs: 1,026,000

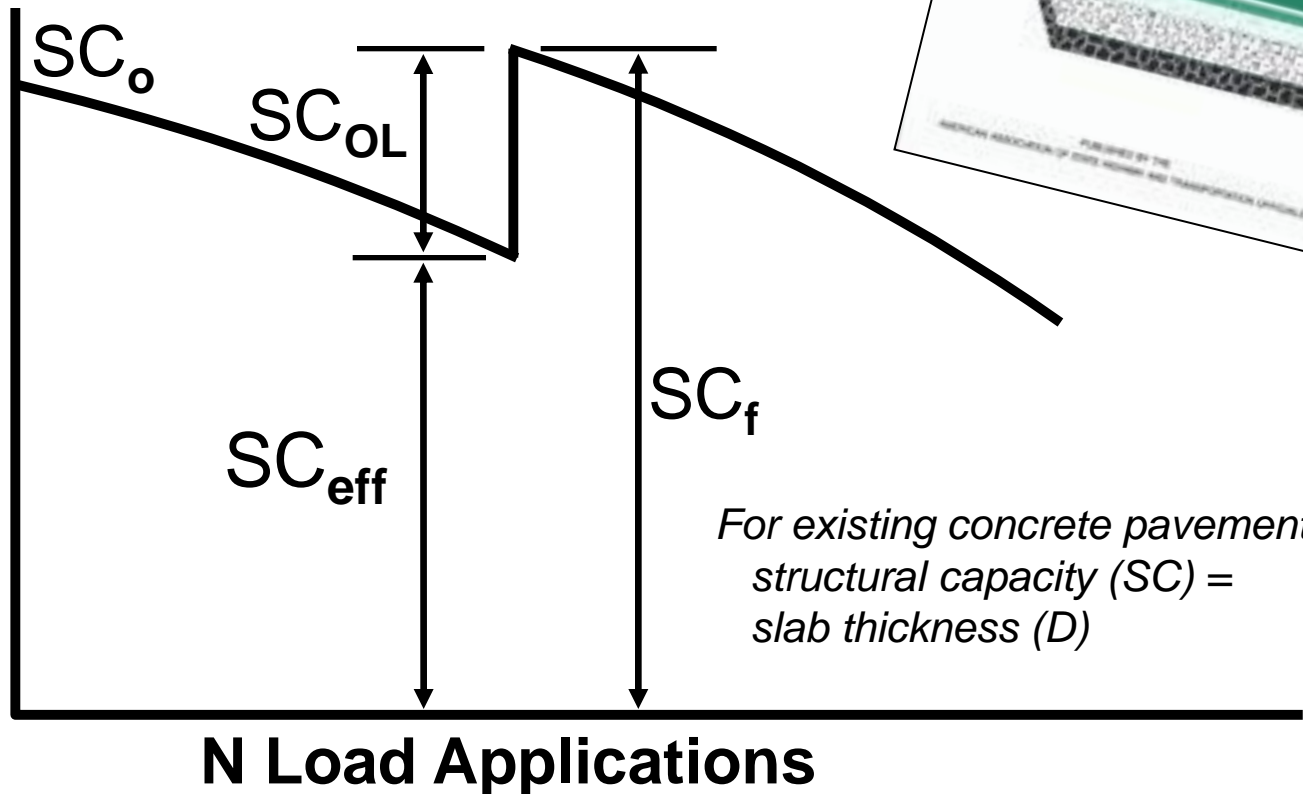


Overlay Thickness Design

- Based on structural deficiency
- The concept:



Structural Capacity



Evaluating Existing Pavement

■ Effective Thickness of Existing Concrete, D_{eff}

■ Methods for estimating:

■ Condition Survey Method

$$D_{eff} = F_{jc} * D$$

■ Remaining Life Method

$$D_{eff} = CF * D$$

■ $D_{eff} = 0.92 \times 5 = 4.6 \text{ in.}$

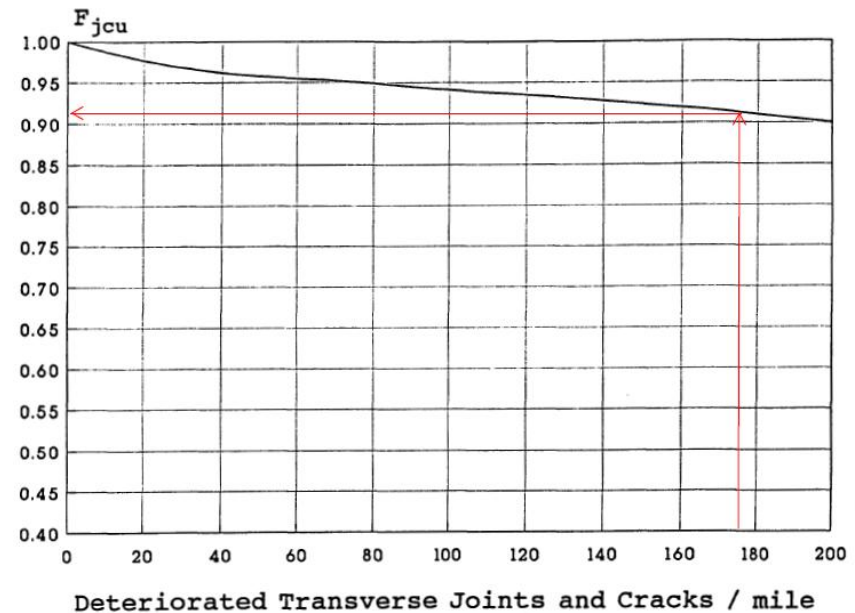


Figure 5.13. F_{jcu} Adjustment Factor for Unbonded JPCP, JRCP, and CRCP Overlays

Overlay Thickness Design

- If new construction, the thickness would be 5.2 inches, but...

$$D_{ol} = \sqrt{D_f^2 - D_{eff}^2}$$

$$2.5 = \sqrt{5.2^2 - 4.6^2}$$

- Unbonded overlay thickness, D_{ol} is 2.5 inches (established as minimum)
- Thickness typically varied from 3 to 4 inches

Separator Layer (Interlayer)

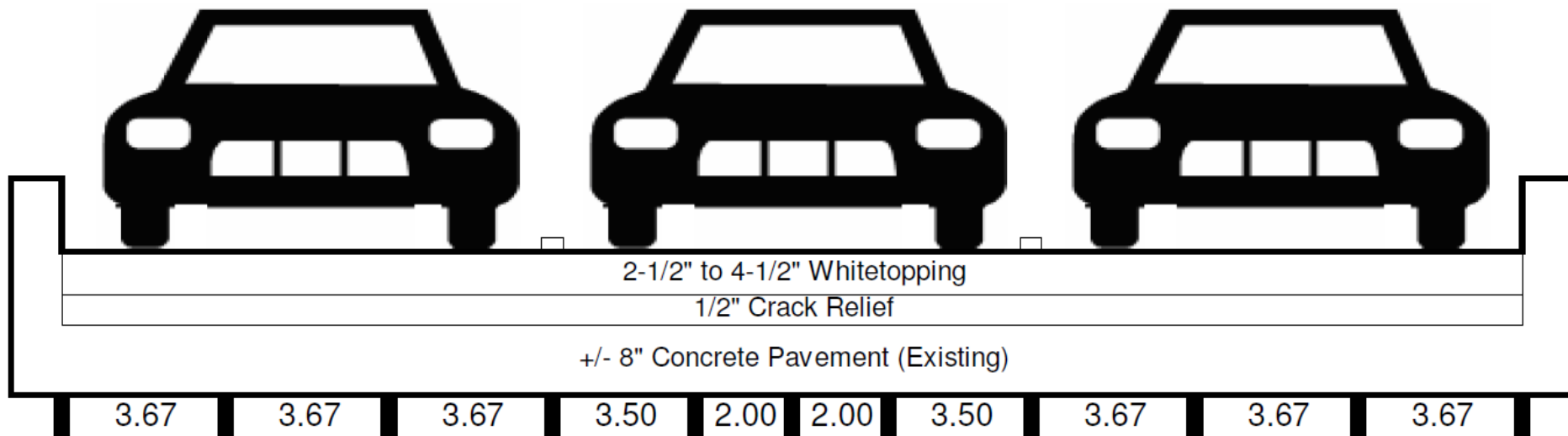
- Not trivial... affects performance
- Functions
 - Isolate overlay from underlying pavement
 - Allow differential horizontal movement
 - Provide a stable and level platform for overlay construction

Separator Layer (Interlayer)

- Remove old asphalt
- New Reflective Crack Relief Interlayer (RCRI)
- Very fine dense-graded asphalt
- PG 76-22 binder
- 1/2" thick

Joints

- Longitudinal at 1/3-points of 11' lane (3.67')
- Transverse at 4'
- Shifted slightly during construction



Concrete

■ Concrete

- Higher (not excessive) strength
- Limestone coarse agg, siliceous sand
- Synthetic fibers

■ Payment (bid items)

- Square yard for placement, AND
- Cubic yard for material



Photo from Jim Duit, Duit Construction

Construction



Final Product



- Owner: City of Plano
- Contractor: Duit Construction
- Engineer: HNTB
- Pavement Geeks: The Transtec Group

Thank you!



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