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Transportation Engineers' Association of Missouri 2019 Conference

Why rebuild, when you can recycle!

Presented by: Brett Gaither

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PUTTING YOU ON SOLID GROUND

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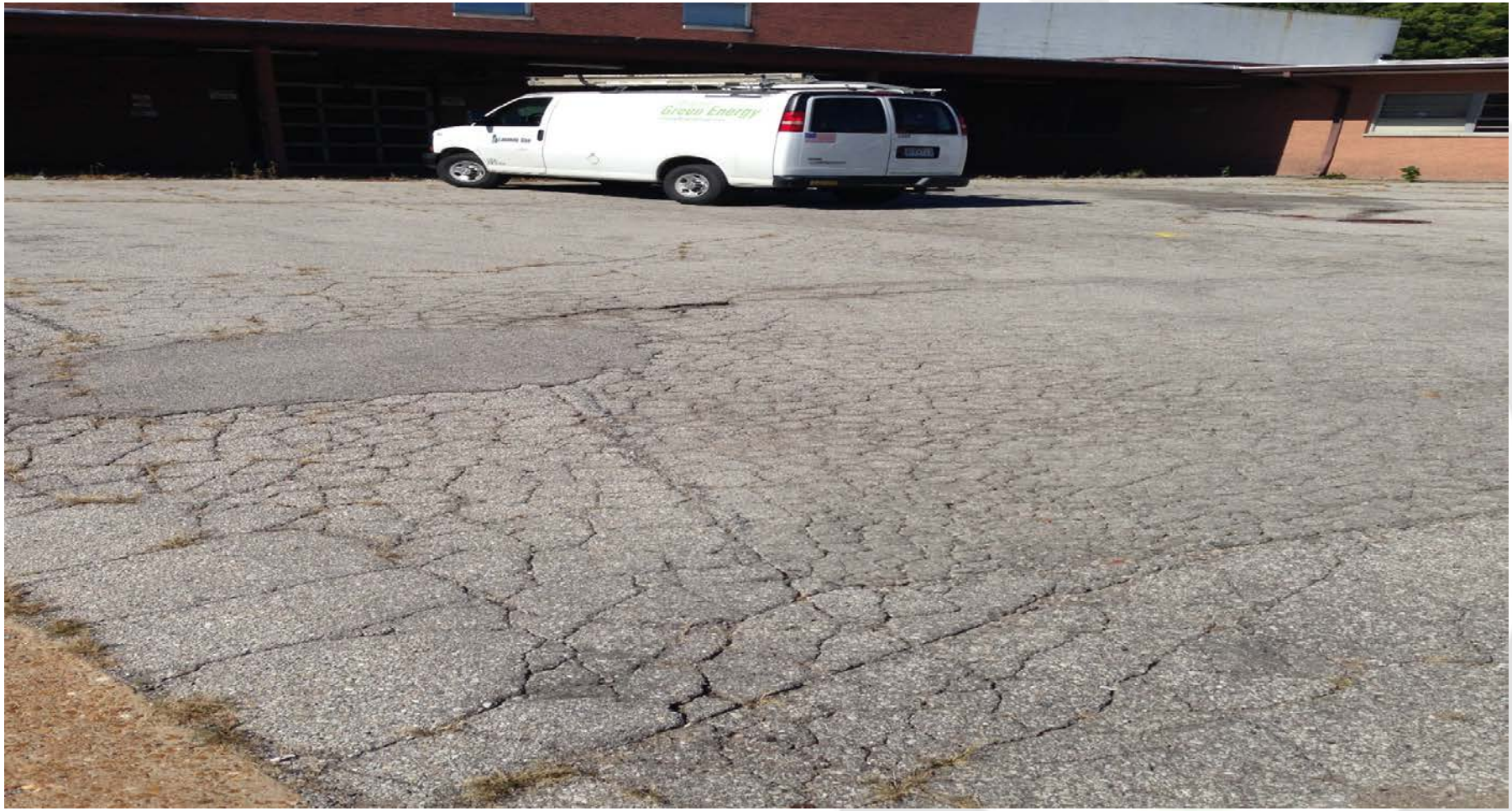

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What's The Solution?

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Asphalt Overlay

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Overlay with Paving Fabric

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Mill & Overlay

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Remove & Replace

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What If There Was A Way…

- To reduce your risk
- To reduce the cost
- To increase the strength
- To save on repairs and maintenance
- To do something good for the environment

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FDR

32ND President

Lead us out of the Great Depression & WWII

New Deal

Elected 4 times

Died 1945

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Full Depth Reclamation

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What is it?

Full Depth Reclamation (FDR) Is a pavement rehabilitation technique in which the full flexible pavement section and predetermined portion of the underlying material are uniformly pulverized or blended, resulting in a stabilized base course. (ARRA)

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Mixing

Full Depth Reclamation

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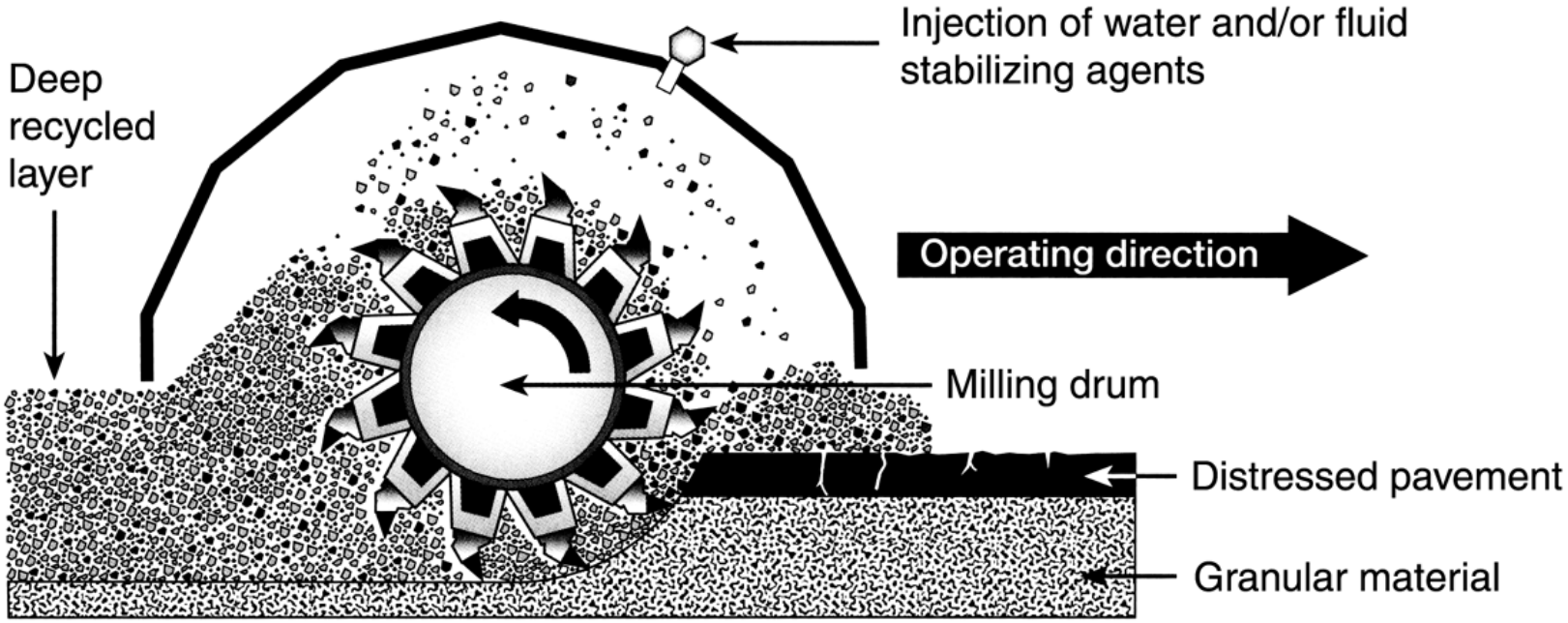

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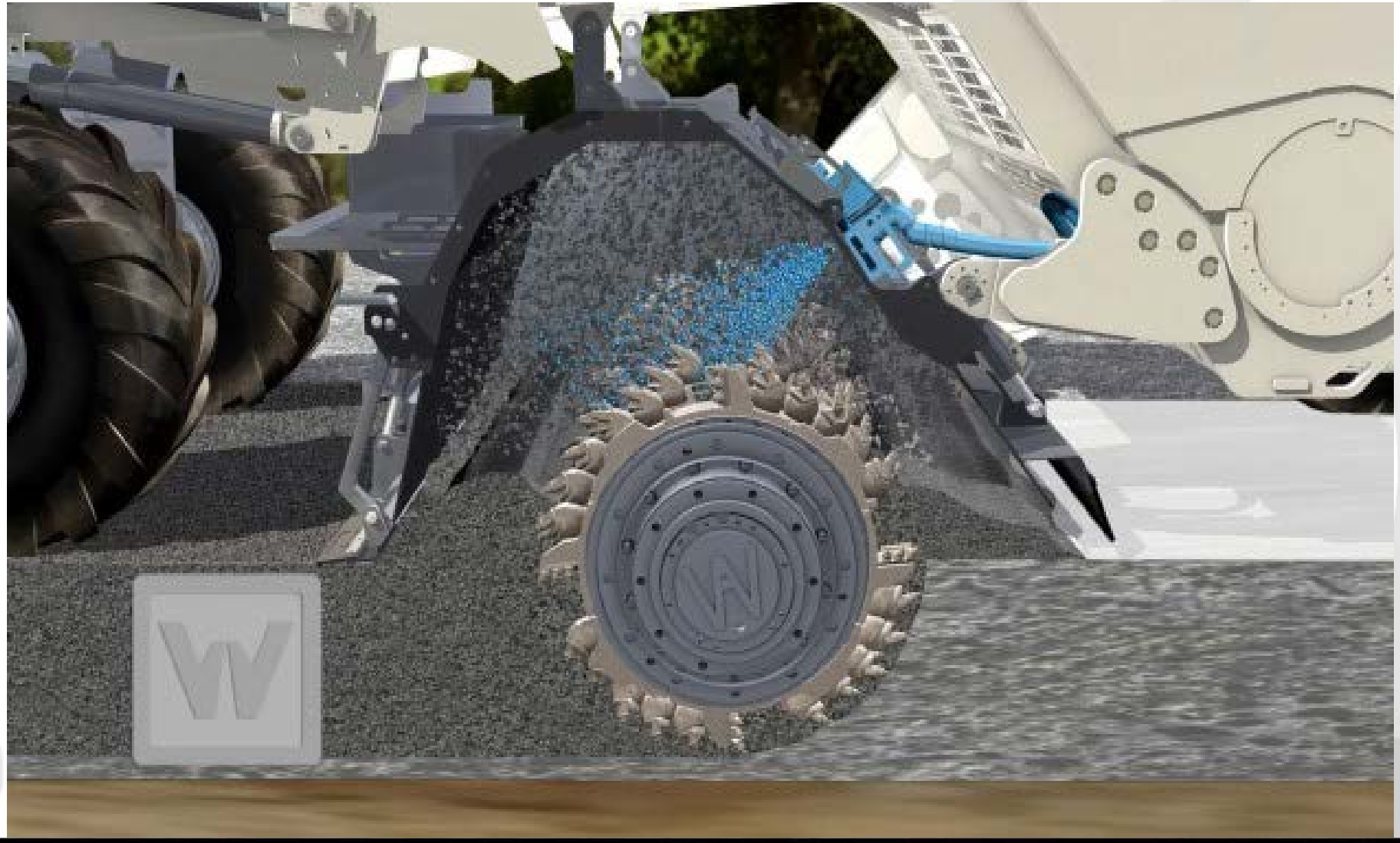

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Cutting Head

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When is FDR Applicable?

- Flexural distresses in wheel lanes
- Pavement condition index below 55
- Excessive rutting or alligator cracking
- Excessive patching (20% or more)
- Need to widen roadway
- Need to increase structural design
- Need to correct asphalt pavement cross slope

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Types of FDR

- Mechanical Stabilization
  - Aggregates
- Chemical Stabilization
  - Lime, Cement, Fly-Ash
- Bituminous Stabilization
  - Engineered Emulsion
  - Foamed Asphalt (not common in the Midwest)
- Combination

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FDR STEPS

- **Project evaluation & Mix design**
- Initial pulverization
  - Mechanical stabilization: add rock
- Compaction & grading
- Stabilization/additives: cement, asphalt emulsion, foamed asphalt, fly ash, or lime.
- Initial compaction, grading, & final compaction
- Cure
- Surface – asphalt, micro, chip-seal, concrete.

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Evaluation & Mix Design

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Initial Pulverization

- Mechanical Stabilization
  - Add Rock
- Initial Pulverization
  - Chemical
  - Bituminous

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Grading & Compaction

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Proof-Roll

- Loaded tandem truck
- Identify unsuitable areas
- Fix identified areas prior to additive

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  - Chemical & Bituminous
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Chemical Additives

- Lime
  - Quicklime
  - Hydrated Lime
- Cement
  - Portland Type 1
- Fly Ash
  - Class C

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Incorporate Water

- Cementitious
  - Cement
  - Fly Ash
  - -1 to +2 of OMC
- Lime
  - +4 of OMC
- Bituminous
  - -1 to +2 OMC

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Wet Subgrade

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Apply Rhino Slurry

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Incorporate Slurry

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Bituminous Additives

- Engineered Emulsions
  - CSS1H
    - Road Science
    - SEM
- Foamed Asphalt

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Compaction

- Cementitious
  - 10 ton Pad-foot, single/double drum vibratory roller
  - 96 to 98% Max. Dry
- Bituminous
  - 10 ton Pad-foot, pneumatic, single/double drum vibratory roller
  - 96 to 98% Max. Dry

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Final Grading & Compaction

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Final Compaction

- Single or Double Drum
  - Static Mode
- Pneumatic Tired

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FDR STEPS!

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Curing for Chemical FDR

- Maintain Moisture
- Water Curing
  - As needed
- Bituminous
  - SS1h (dilute 60%)
  - Sand Blotter (opt.)
- Strength Gain
  - 300 to 500 psi
  - 3 to 7 days

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Curing

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Curing for Bituminous FDR

- Moisture Evaporation
  - 7 to 10 days
- Gain strength
  - Immediate Strength

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New Surface

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Typical Surfaces

- Hot Mix Asphalt
- Concrete
- Chip Seal
- Micro
- Cape Seal
- Aggregate Base

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FDR STEPS to Success!

- **Project evaluation – mix design**
- Initial pulverization
  - Mechanical stabilization: add rock
- Initial compaction & grading
- Stabilization/additives: cement, asphalt emulsion, foamed asphalt, fly ash, or lime.
- Final compaction & grading
- Cure
- Surface – asphalt, micro, chip-seal, concrete.

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Typical FDR Applications

- Aggregate roads
- Aggregate staging areas/lots
- Asphalt roads
- Asphalt parking lots
- Airport taxiways (asphalt)
- Tennis courts
- Asphalt running tracks
- ALL THINGS ASPHALT

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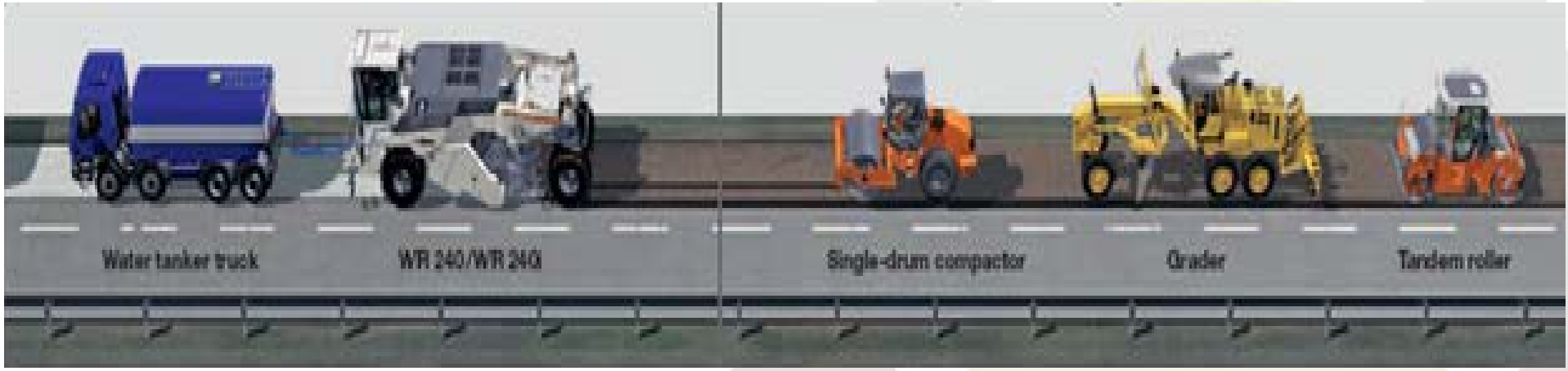
Mechanical



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Chemical

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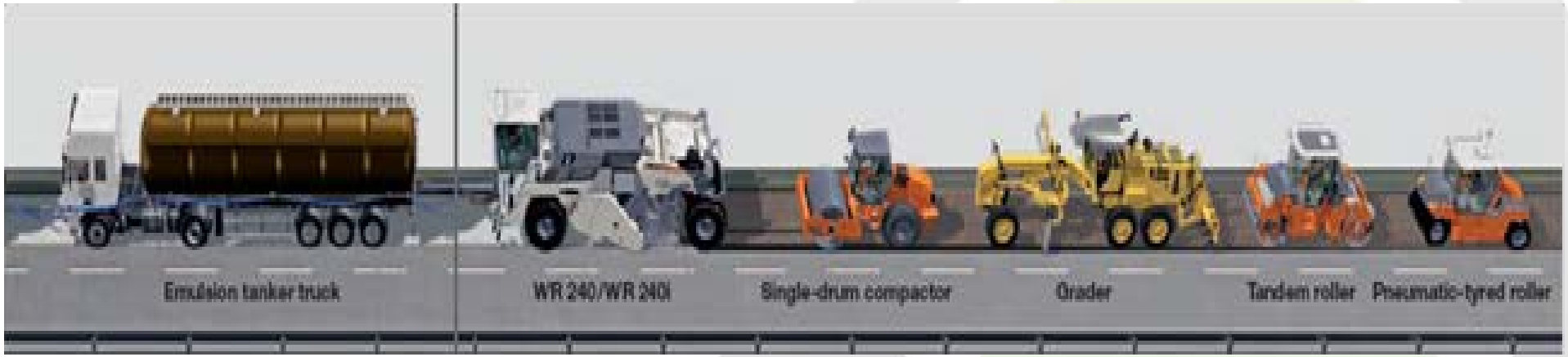
Bituminous



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FDR vs. R&R

Case Studies

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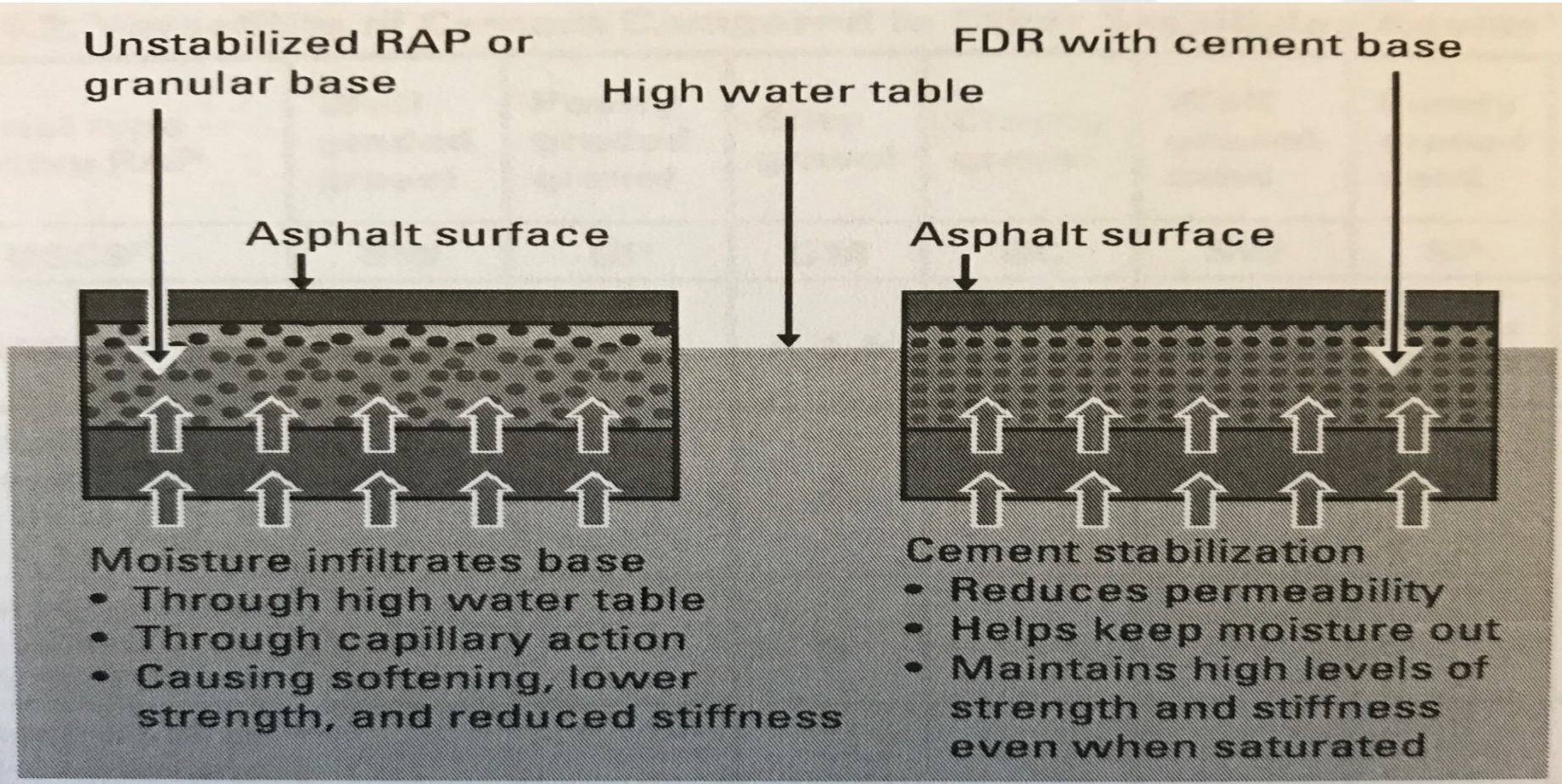
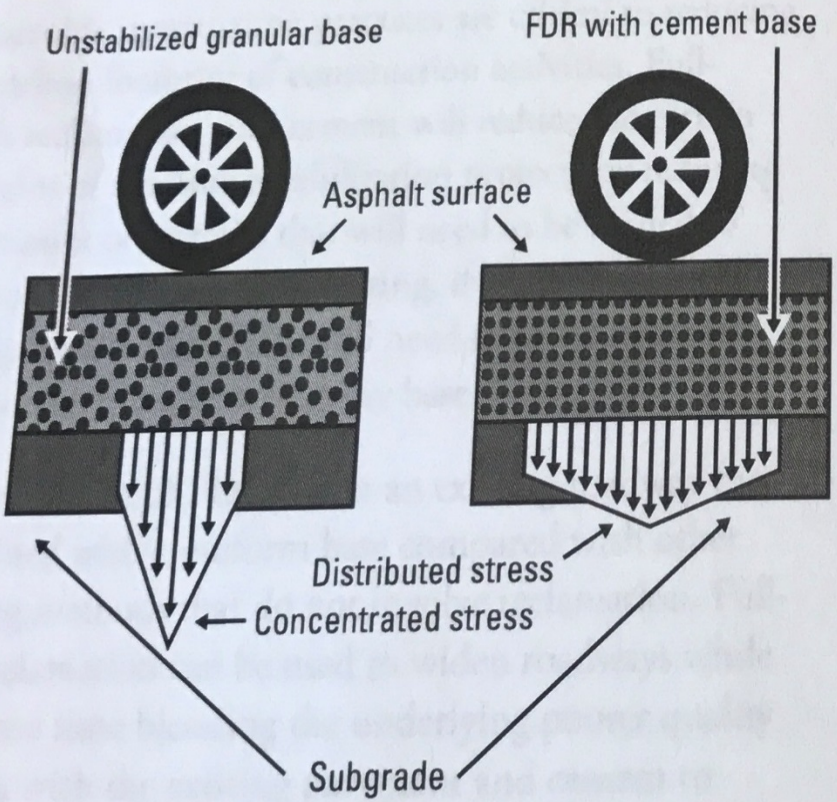


Figure 1.4. FDR with cement reduces the permeability of the base layer compared to a base of RAP or other unstabilized granular material



ure 1.2. Unstabilized asphalt base results in more concen-
ed stress on the subgrade than FDR with cement

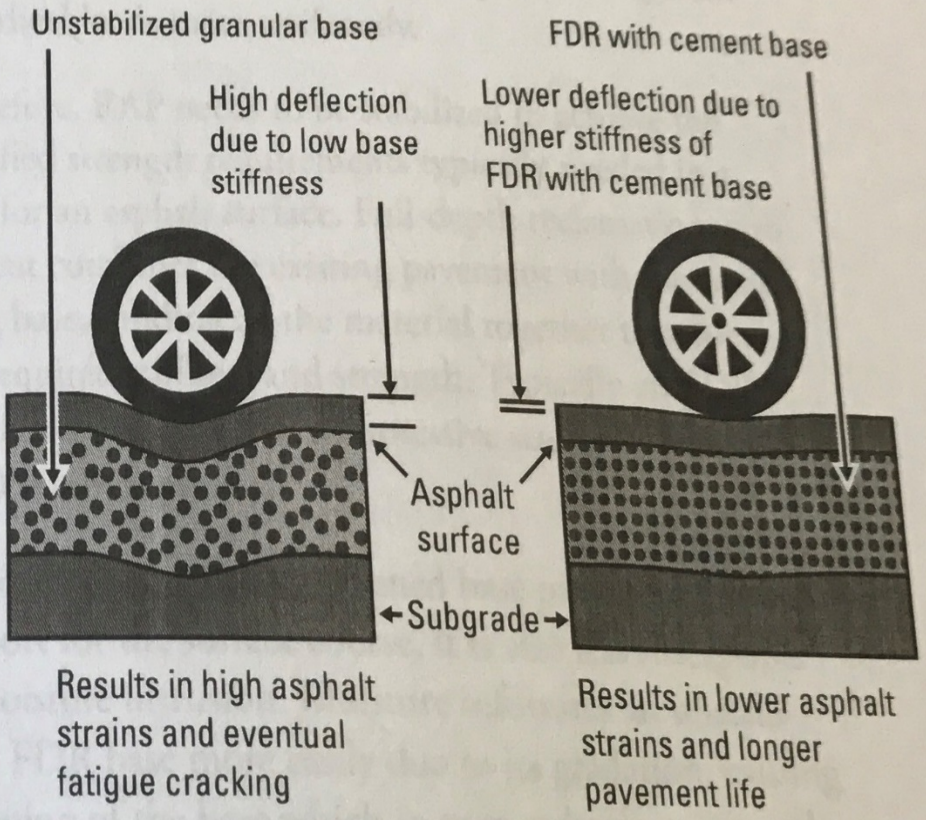


Figure 1.3. FDR with cement base reduces fatigue cracking compared to an unstabilized base

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Case Study

- Southern Illinois University Edwardsville
- Boone County – Gibbs Road
- City of Hartford – Maple Street

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6” Cement FDR with chip seal surface

Structural Coefficient = 2.175

2” Asphalt overlay

Structural Coefficient = .80

FDR treated base, with chip seal surface is almost 3x stronger than a 2” overlay.

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Structural Layer Coefficients

- Dry pulverization 0.11 per inch
- Bituminous stabilized 0.20 per inch
- Cement stabilized base 0.25 per inch
- Asphalt binder 0.40 per inch
- Cold-in-place 0.35 per inch

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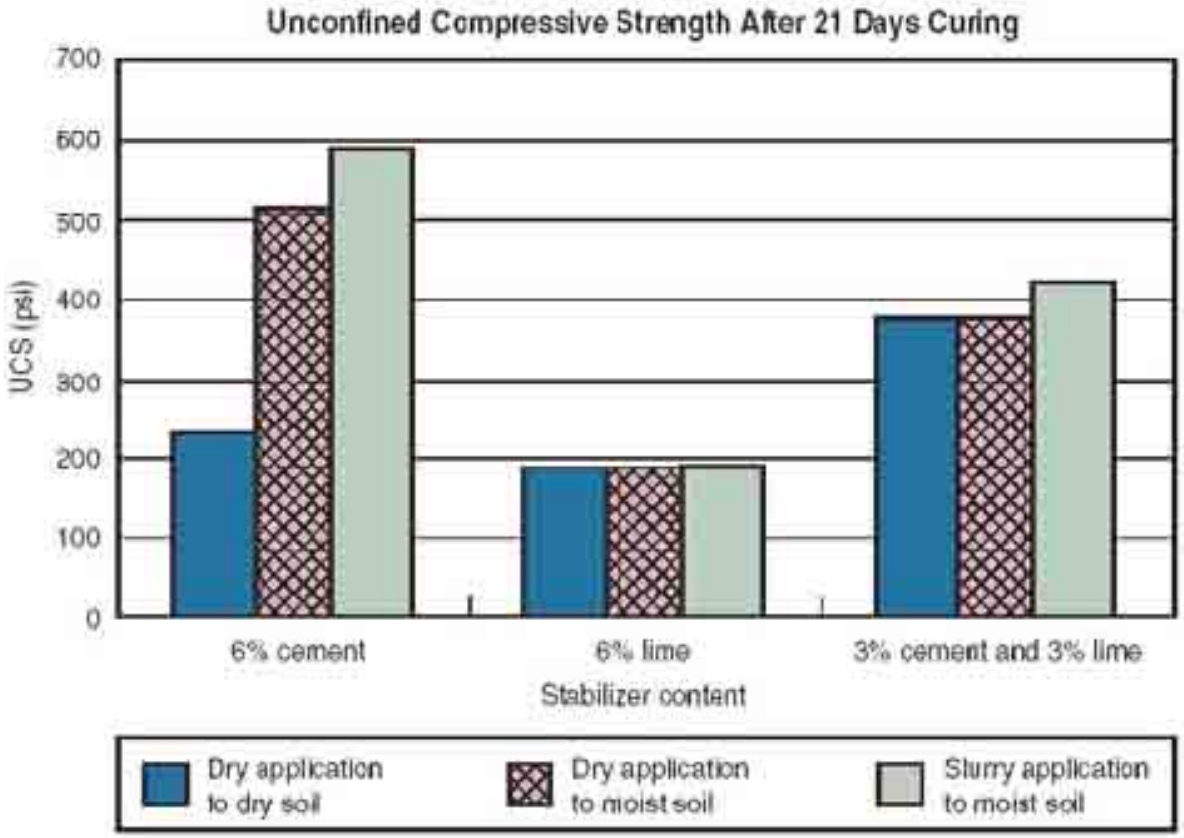

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SIUE LOT F

- 10,500 SY Parking Lot
- Cost: $300k ($28.5 per square yard)
- This included under drains installed on 50’ centers
- Removal and replacement cost $500k ($45-$50 per SY.)
- Cost savings of $200,000.00

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Boone County, Missouri
Gibbs Road

- 10,000 Square Yards
- 9-inches of treated base
- 6% Portland Cement
- 3-inch wearing surface
- 40% SAVINGS

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City of Desloge, Missouri
School Street

- 3,900 Square Yards
- 6-inches of treated base
- 4% Portland Cement
- 2-inch wearing surface
- 35% SAVINGS

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City of Hartford, Illionis
Maple Street

- 5,500 Square Yards
- 12-inches of treated base
- 5% Portland Cement
- 3-inch wearing surface
- 35% SAVINGS

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FDR vs. New Base

Based on One Mile, 24ft Wide, 6in Base

Number of Trucks Needed: 12 vs. 180

- New Roadway Material (Tons): 300 vs. 4,500
- Material Landfill (cy): 0 vs. 2,700
- Diesel Fuel Consumed (Gal): 500 vs. 3,000

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Average Unit Costs

- Processing (6”-12”): $3.00 to $6.00/sy
  - Initial Pulverization
  - Compaction
  - Grading
  - Water Curing
- Cement: $110/ton
- Emulsion: $3.00/gal

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We Can Build It Better

- Faster
- Better
- Stronger
- More uniform
- Less susceptible to moisture infiltration
- Longer life = less maintenance
- Could save 25% to 50% over remove/replace

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Thank You!

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Stabilization Division

www.byrneandjones.com

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