
**Advanced Stabilization Technology**

# The World's Most Advanced Stabilization Technology for Earth Materials Construction

EMC SQUARED

- **Builds Better Roads Faster**
- **Lowers Construction Costs**
- **Reduces Environmental Impacts**

**Setting the Performance Standard for Over 30 Years**

# *Concentrated Stabilizing Power*

# EMC SQUARED® System

**The similarity in name with Einstein's famous energy equation, $E=MC^2$, is no accident. The amount of stabilizing energy that this advanced technology delivers is amazing.**

**The EMC SQUARED System is unique and unequaled in performance. A Quantum Leap Forward in Earth Materials Construction**

# *Fundamental Benefits* of the EMC SQUARED® System


**Increases Bearing Strength, Compressive Strength, Density, Modulus, Shear Strength, Tensile Strength, and Stability of Compacted Earth Materials**

**Reduces Permeability, Hydraulic Conductivity, Moisture Susceptibility, and Frost Heave**

# What is the EMC SQUARED® System?

## Concentrated Liquid Product Technology for stabilizing Soil, Aggregate, and Recycled Pavement Materials.

**Environmentally Friendly and Safe to Handle**

- Non-Toxic
- Non-hazardous
- Non-corrosive
- Neutral pH

**Available in drummed and bulk containers**


**Application of EMC SQUARED® System Treatment by Water Truck**


# Compaction and Mixing with Cross-Shaft Rotary Mixer


# Compaction of EMC SQUARED® System Treated Soil

# Partial List

## EMC SQUARED® System Applications

- Freeways
- Highways
- Roads
- Streets
- Railways
- Landing Strips
- Industrial Yards
- Parking Lots
- Bare Earth Erosion Control
- Military Supply Routes
- Construction Haul Roads
- Renewable Energy Sites
- Landfill Closure Caps
- Medians & Road Shoulders
- Earthen Structures
- Oil Field Access Roads
- Forest Access Roads

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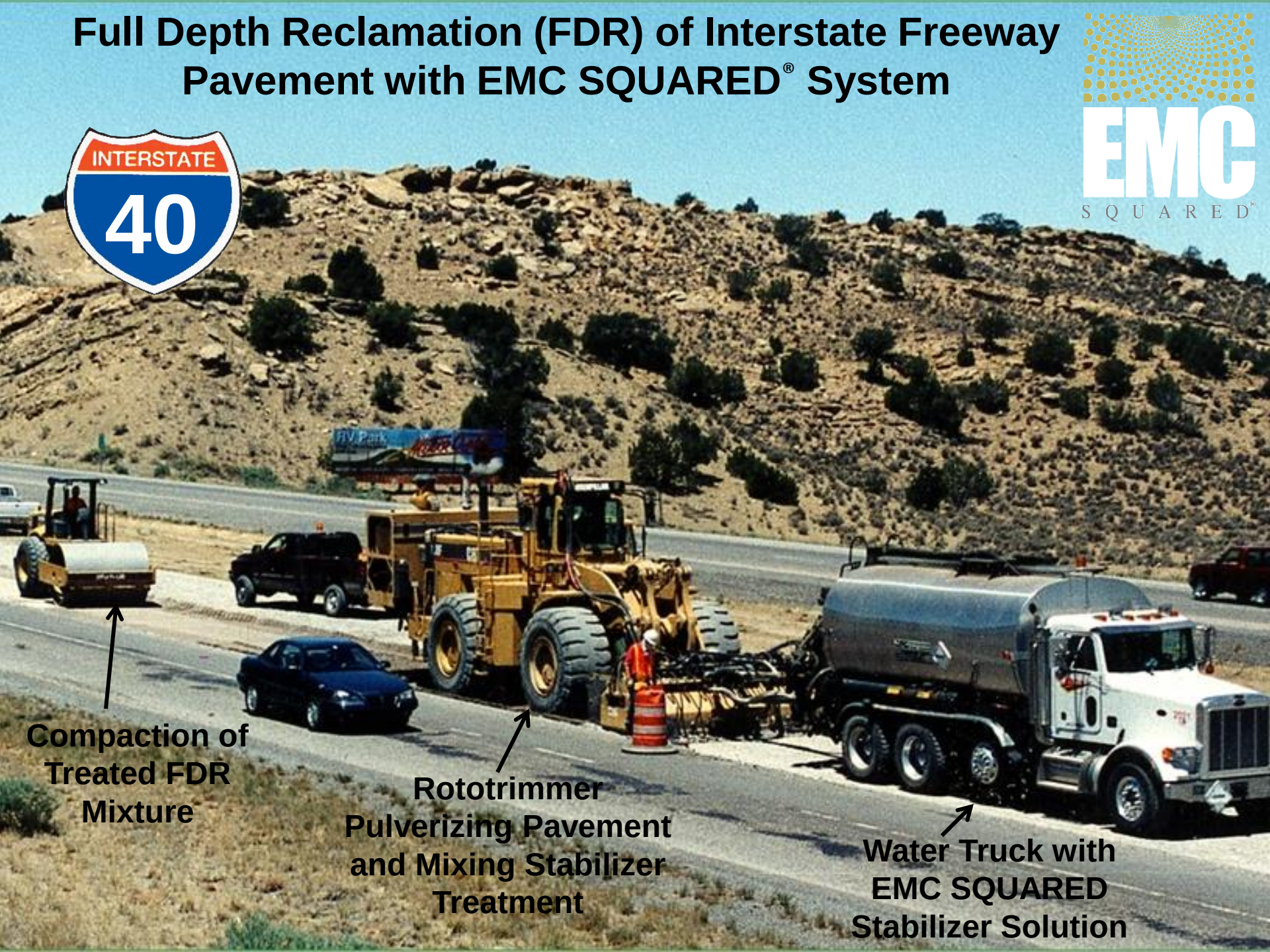
# *Advantages* of the EMC SQUARED® System


- **Broad Spectrum Effectiveness with Soil, Aggregates, and Recycled Pavement Materials**
- **Climate Friendly Alternative to Asphalt, Cement, Lime, and Crushed Aggregate Materials**
- **More Cost Effective than Asphalt, Cement, Lime, Geogrid, and Geotextile Products**
- **Superior All-Around Performance**

# Full Depth Reclamation (FDR) of Interstate Freeway Pavement with EMC SQUARED® System



# *Faster Construction* with EMC SQUARED® System Treatments


**Speed construction by stabilizing locally available soils instead of importing expensive aggregate materials by trucking hauls that slow road building**

*Speeding Up Millions of Years of Natural Processes Into Hours*

# EMC SQUARED® System

## Converting Soil and Aggregate into Stone-like Materials in Combination with Modern Construction Equipment and Engineering

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- Claystone
- Conglomerate
- Mudstone
- Sandstone
- Shalestone
- Siltstone

# *Improved Productivity* with EMC SQUARED® System Treatments


**Fast and easy application and rapid curing provide major advantages in daily productivity over cement, lime, and asphalt-based products**

# Doing More with Less

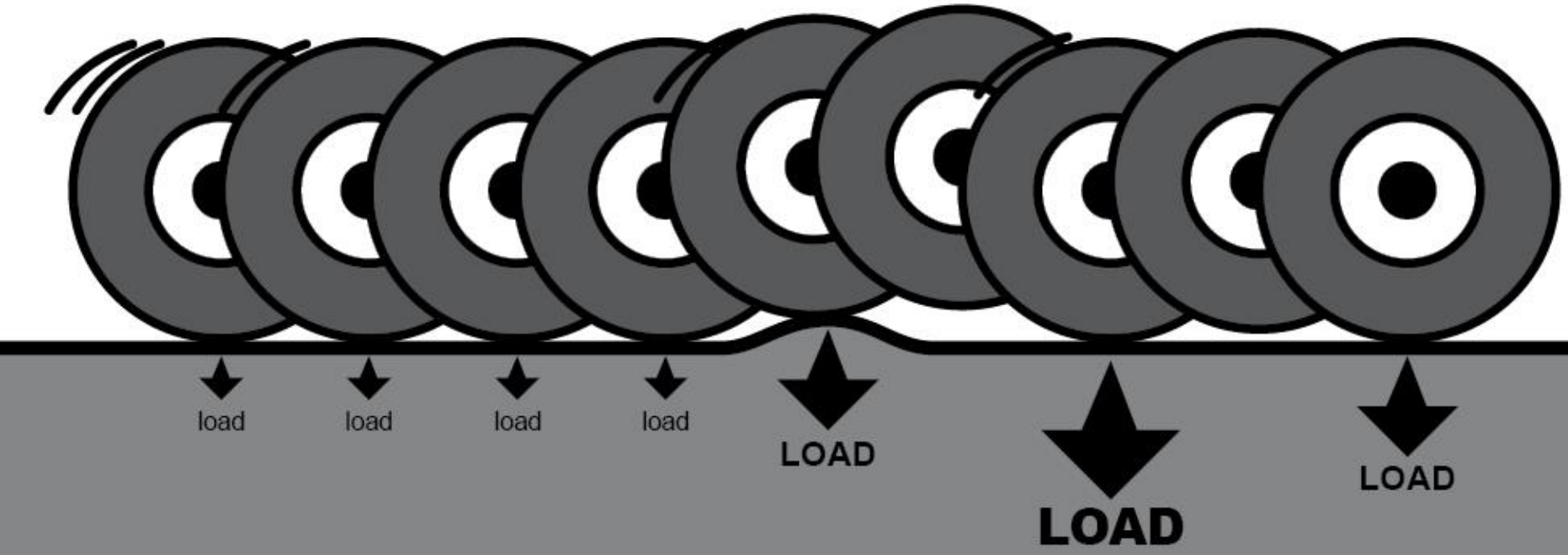
The **EMC SQUARED® System** is the very Definition of Sustainability

**The Clean and Concentrated Alternative to Bulk Truckloads of Asphalt, Cement, Lime, and Crushed Aggregate Materials — products whose manufacturing processes are leading sources of global carbon emissions**

# *EMC SQUARED® System for Smoothest Running Roads, Streets, and Highways*

**Smooth running roads provide the longest service life and reduce fuel consumption of cars and trucks and the related carbon emissions**

**Pavement Smoothness Is Evaluated by IRI Measurements**




Pavement roughness leads to higher dynamic loads on localized pavement sections, which increases pavement deterioration and fuel consumption as well as lowering ride quality. This also leads to a cycle of escalating deterioration rates with increasing roughness severity.

*“The best riding section of Interstate 30 in the district…”*


**Pavement Smoothness Is Evaluated by IRI Measurements**

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# *After 18 Years – Surface Condition and IRI Rating*

Synthesis Summary of Projects in Dallas, Texas — ARA Report No. 003563-1*

| Project Identification | Surface Condition | IRI Category |
|---|---|---|
| Interstate Highway 30 (TxDOT-Dallas Fort Worth Turnpike) | Excellent | Good |
| SH 161 (NTTA – President George Bush Turnpike, DNT-346) | Excellent | Good |
| SH 190 (NTTA – President George Bush Turnpike, DNT-323) | Excellent | Good |
| Interstate Highway 636 Frontage Road (TxDOT–LBJ Freeway) | Excellent | Good |
| Luna Road (TxDOT) | Good | Good |

**The five projects that were constructed in Year 2000 and evaluated in 2018, as shown above, were all built on top of highly problematic soils. As of the date of this study, these freeway and highway projects with EMC SQUARED Stabilized subgrades had been in service for eighteen years.**

**Pavement Smoothness Is Evaluated by IRI Measurements**

*Harold L. Von Quintus, P.E., Applied Research Associates, Inc.

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"It is my professional opinion that all subgrades should be stabilized and the EMC SQUARED System product is the most cost effective, easiest to handle and apply, and long lasting stabilizing product I have worked with."

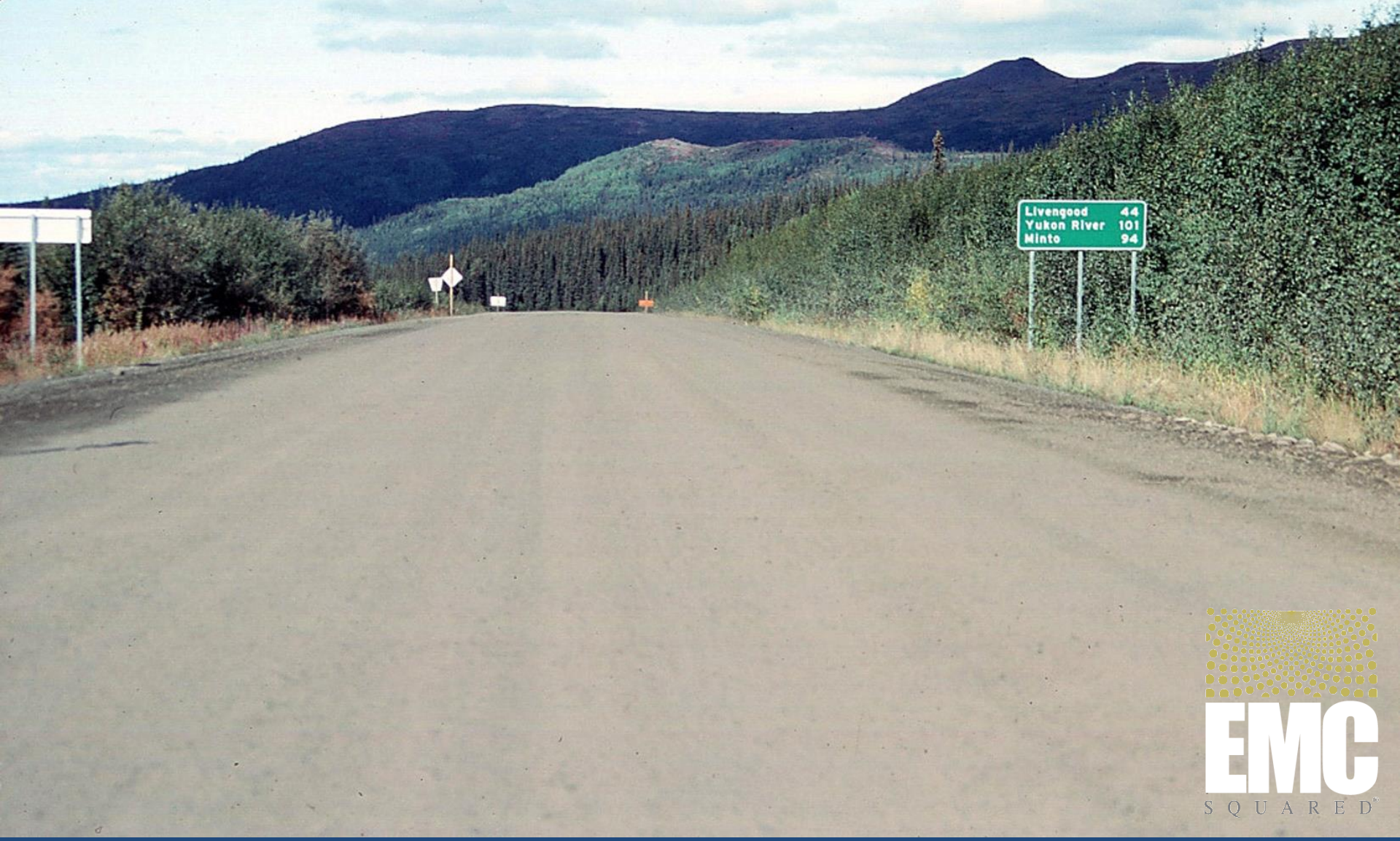
*Ray Pederson - P.E., Area Engineer*
*Federal Highways Administration (FHWA) &*
*Bureau of Indian Affairs (BIA)*

# Interstate 40 Freeway 10-year Performance Data

| | Monitoring Dates* | | | | |
|---|---|---|---|---|---|
| | February 19, 2001 | February 26, 2008 | March 18, 2009 | March 25, 2010 | |
| **Average IRI Measurement** | | | | | **Smoothness Lost** |
| Lime Stabilized Subgrade | 38.9 | 51.6 | 53.0 | 56.9 | 31.59% |
| Unstabilized & Reinforced Subgrade | 41.0 | 52.3 | 55.6 | 59.0 | 30.41% |
| EMC2 Stabilized Subgrade | 41.4 | 47.8 | 49.6 | 52.8 | 21.65% |
| **Percent of Theoretical** | | | | | **Design Life Lost** |
| Lime Stabilized Subgrade | 109.6 | 81.4 | 78.7 | 71.4 | 38.2% |
| Unstabilized & Reinforced Subgrade | 104.5 | 80.3 | 73.7 | 67.6 | 36.9% |
| EMC2 Stabilized Subgrade | 103.6 | 89.2 | 85.5 | 79.0 | 24.6% |
| **Number of Theoretical** | | | | | **Design ESALs Lost** |
| Lime Stabilized Subgrade | 41,545,099 | 30,867,798 | 29,826,403 | 27,058,832 | 14,486,268 |
| Unstabilized & Reinforced Subgrade | 39,453,798 | 32,880,788 | 28,298,269 | 28,289,425 | 13,164,373 |
| EMC2 Stabilized Subgrade | 39,275,357 | 33,814,686 | 32,416,488 | 29,945,054 | 9,330,302 |

*Testing conducted by New Mexico Department of Transportation on an annual basis starting in 2001.

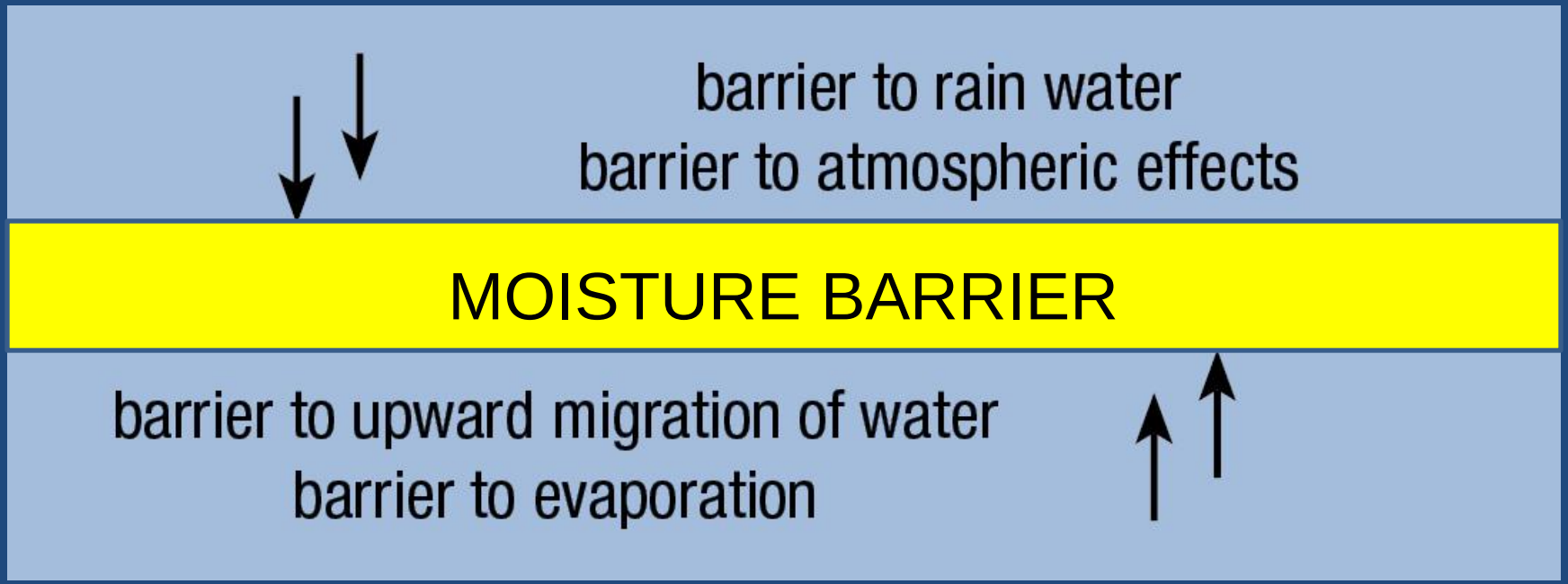
The first monitoring of this project took place on February 19, 2001 and the results at that time largely reflected the smoothness quality of the initial road construction work, as defined by the International Roughness Index testing (from which the initial Theoretical Design Life and the Theoretical Design ESALs are calculated), rather that a measurement of the influence of the various types of subgrades over time. As the annual monitoring of pavement smoothness progressed over subsequent years, the influence of the different subgrade treatments on pavement smoothness becomes apparent.




# EMC SQUARED® Stabilized Aggregate Pavement in Alaska Retains Smoothness Better Than Hot Mix Asphalt Pavement

# *The Secret Behind Exceptional Pavement Smoothness?*

**EMC SQUARED® System Base Courses and Subgrades Counteract Fluctuations in Moisture Content and Water Flow Through Native Soils Below the Stabilized Layer, Reducing Movement in the Soils Below the Road**

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# *Elasticity and Resiliency*

**EMC SQUARED® System treatments increase strength and resistance to moisture infiltration without producing stiff and slab-like layers like cement treated materials that are subject to cracking because of their excessively rigid and brittle nature.**

**Greater Elasticity Equals Superior Resiliency**

# *Dynamic and Repetitive Loading*

## Test Methods for Evaluation of Resilient Strength (Modulus)

**Internationally recognized repetitive loading test methods such as Repeated Load Triaxial, Resilient Modulus, and Dynamic Modulus, document strength improvements for soils of three to four times (300% to 400%) and for select aggregate and recycled pavement materials of five to fifteen times (500% to 1500%).**

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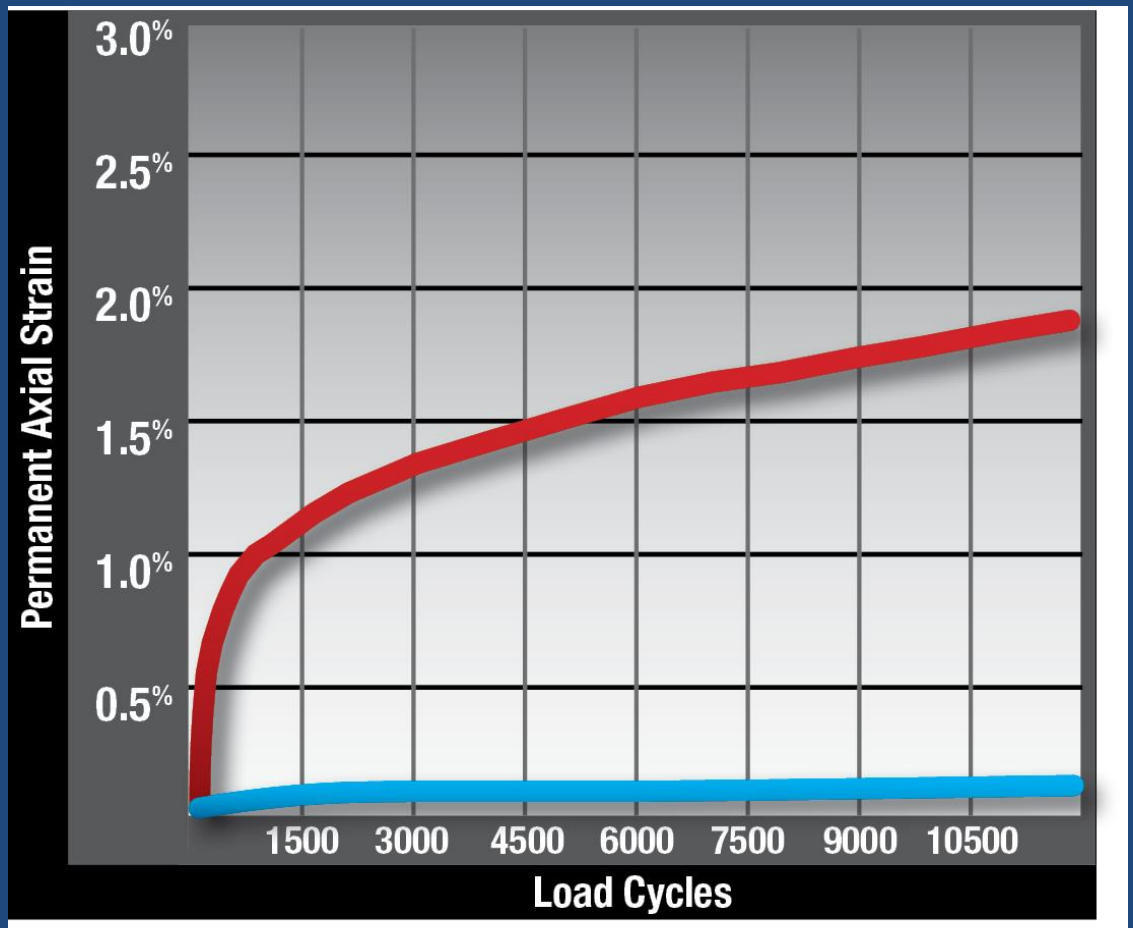
# Permanent Deformation Curves for Typical Hot Mix Asphalt Materials and EMC SQUARED® Stabilized Aggregate

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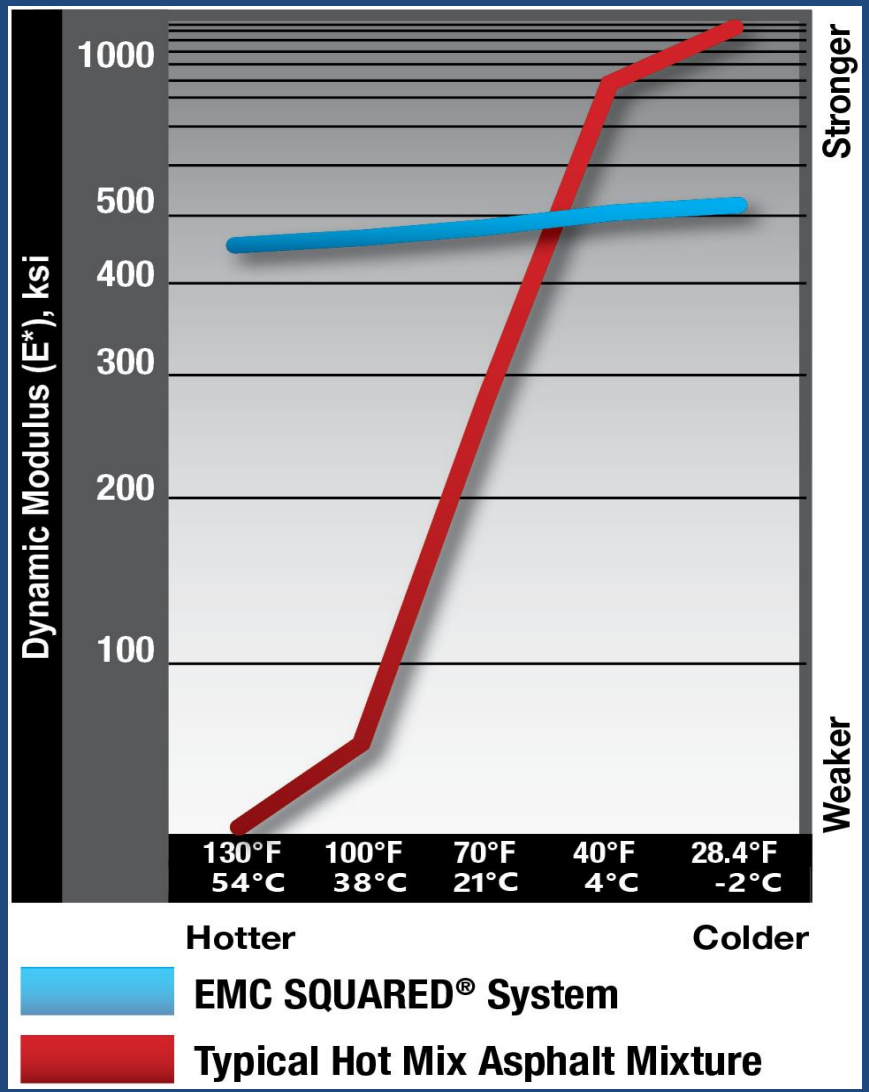
# Dynamic Modulus Data for Typical Hot Mix Asphalt Materials and EMC SQUARED® Stabilized Aggregate

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# *Results Favorable* to EMC SQUARED® Stabilized Aggregate *in Comparison* with Hot Mix Asphalt in Dynamic Modulus and Repeated Load Triaxial Tests

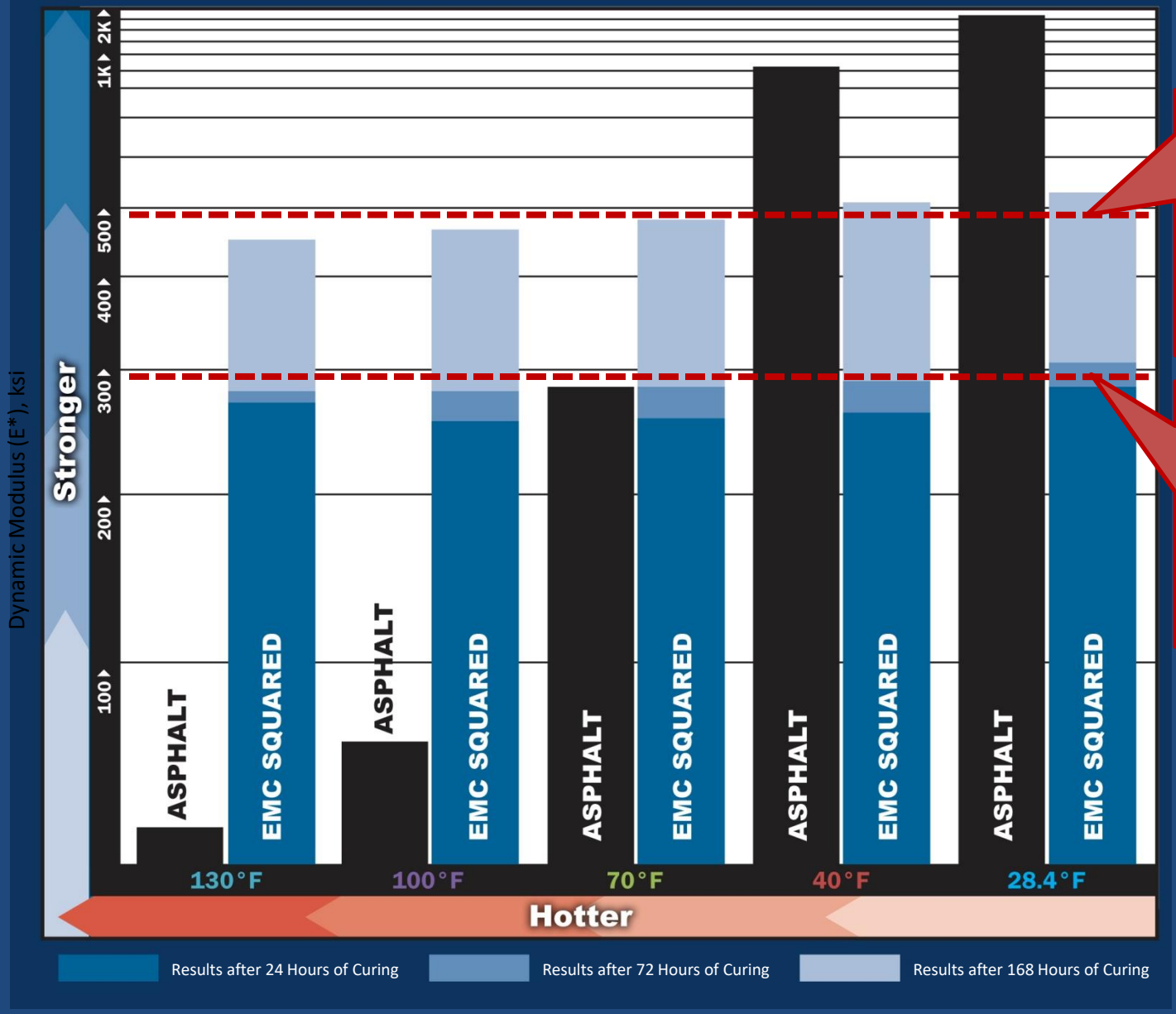
## Hot Mix Asphalt Material —

Subject to Permanent Deformation (rutting) and dramatic loss of strength under heavy loading or warm temperatures

## EMC SQUARED Stabilized Aggregate —

Resistant to Permanent Deformation (rutting) after 12,000 loading cycles and retains consistent strength regardless of temperature or heavy loading

# Dynamic Modulus Data for Typical HMA Mixture and EMC SQUARED® Stabilized Aggregate Mixture




**Average Dynamic Modulus for EMC SQUARED All Temperatures after 168 Hours**

**475,000 psi**

**475 ksi**

**Average Dynamic Modulus for EMC SQUARED All Temperatures after 72 Hours**

**291,000 psi**

**291 ksi**

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# EMC SQUARED® System *Economics*

**Cost savings on projects constructed according to engineering designs incorporating EMC SQUARED System treatments range from 25% to 50%, most often resulting from stabilizing native soils or recycled pavement materials instead of importing manufactured aggregate materials. Strengthened road base and subgrades also reduce pavement thickness requirements and dependence upon costly Hot Mix Asphalt materials**

# *Saving More Than $20 Million USD*

## Designing with EMC SQUARED® System

**A project with a $60 million budget to construct 70 miles of Military Supply Routes based on conventional design realized savings of $20 million by stabilizing native soils for road subbase construction instead of hauling in over one million metric tons of crushed aggregate. Cost savings were used to expand the length of road construction to a total of 117 miles.**

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# Adding EMC SQUARED® System Stabilizer with Compaction Water into Water Truck


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# Mixing EMC SQUARED® System Treatment with Native Soils using Tractor-Drawn Construction Disc

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# Compaction of Treated Soils After Application of EMC SQUARED® System Stabilizer


NOTE: According to the AASHTO Guide for Design of Pavement Structures, CBR 100 and R-Value 85 Are Equivalent to a Modulus of 30,000 psi


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