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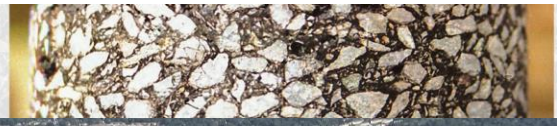

A History of Paving at IMS

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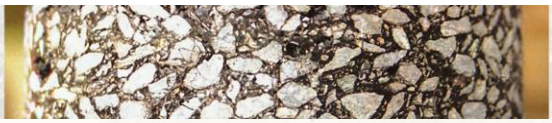

1st Indy 500 – May 30, 1911

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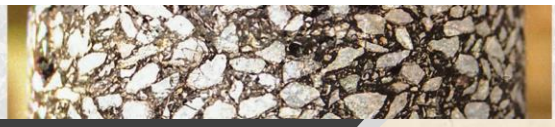

Asphalt – The *KyRock* Years…

- **1936** – Asphalt patches applied to portions of turns
- **1937** – All turns completely paved with "Ky Rock"
- **1938** – Short chutes paved
- **1939** – Back stretch paved, but ~1900' of front stretch still brick

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Asphalt – Early *Resurfacing*…

- **1955** – All existing asphalt portions resurfaced with "Ky Rock"
- **1961** – Remaining bricks covered on front stretch
- **1964** – Back stretch and turn 3 resurfaced
- **1969** – Front stretch and turns 1, 2 and 4 resurfaced

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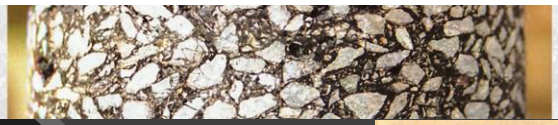

1976

- 1st Complete Resurfacing
- **$175,000**
- Cracks sealed with AE-150 & sand
- 1/2" Leveling course ~2400 tons
- 1" ACBF Slag Surface course with AP-5 (60-70 Pen AC) ~4400 tons

THURSDAY, JULY 15, 1976

'NEW' ROW OF BRICKS — The original three rows of bricks at the start-finish line of the Indianapolis Motor Speedway were dug up and replaced yesterday as the final touch of a $175,000 resurfacing project for the 2½-mile track. More then 700 bricks were dug up by John Moore of the IMS staff and about half of them had to be replaced from the dwindling supply of original bricks from 1911. (Star Photo by Greg Griffo)

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1988 (12 yrs later)

- 2nd Complete Resurfacing
- Pits also paved
- Extensive treatment of cracks
- 1/2" to 3/4" Leveling course
- 1" ACBF Slag Surface course
  - 9.5% AC 20
  - 50 Blow Marshall

Paving: 10,500 tons of material used in '88

● Continued from A-1

Slag also is used on state highways and interstates, though it isn't common on city streets or parking lots, he said.

"The main selling feature is the skid resistance," Scheper said.

About 10,500 tons of material were used in the 1988 paving, including the paving of the pit area, he said.

That partially includes the yard of bricks.

Bricks removed

So the cars wouldn't fall into a ditch each time they passed the start-finish line, the contractors had to remove the bricks and replace them later.

"The bricks were removed, we put stone to bring it up to the elevation of the old asphalt, and paved over and marked it. Then it was saw-cut and removed and the bricks put back" by Speedway employees, Scheper said.

Track superintendent Thompson said, "It's smooth."

Core section of track surface
Trinidad tar is first layer

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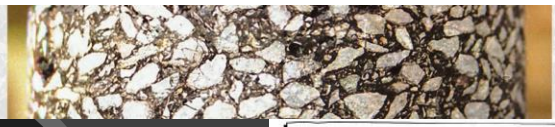

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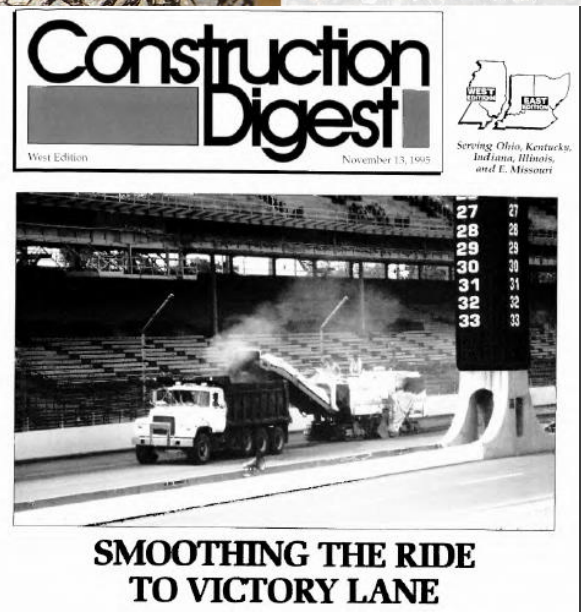
1995 (7 yrs later)

- 3rd Complete Resurfacing
- 1st Time Entire Oval Was Milled
- 1st Use of PG AC (64-34)
- 1/2" to 3/4" Leveling Course
- 1" ACBF Surface Course
- Rehab Strategy to Address Weepers



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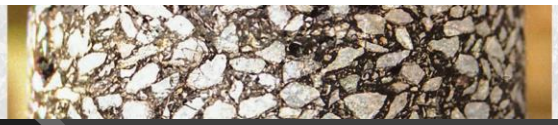

2004

- 4th (**CURRENT**) Complete Resurfacing
- Main Oval, Pit Lanes and Warm-up Lanes
- **SMA Utilized for Both Lifts**
- Extensive Treatment of Longitudinal Joints

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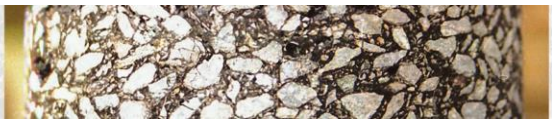

Essential Qualities In a Race Track Surface…

- Must be reliable & consistent so drivers have confidence in the "**stage**" they are racing on:
  - Smooth, no vertical accelerations
  - Surface must not ravel or shove (it simply can NOT lose stability)
  - Joints must not ravel
  - Texture must be consistent
- Surface must dry quickly (impermeability)
- Must control cracking

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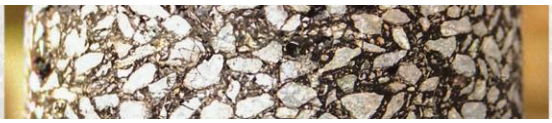

Goals of 2004 Rehabilitation

- ***Longer*** Life (1976, 1988, 1995, 2004…)
- ***Less*** Cracking
- ***Less*** Permeability (water infiltration)
- Exceptionally **Smooth**
- ***Similar*** Surface Texture and Friction Characteristics of Existing Road Course


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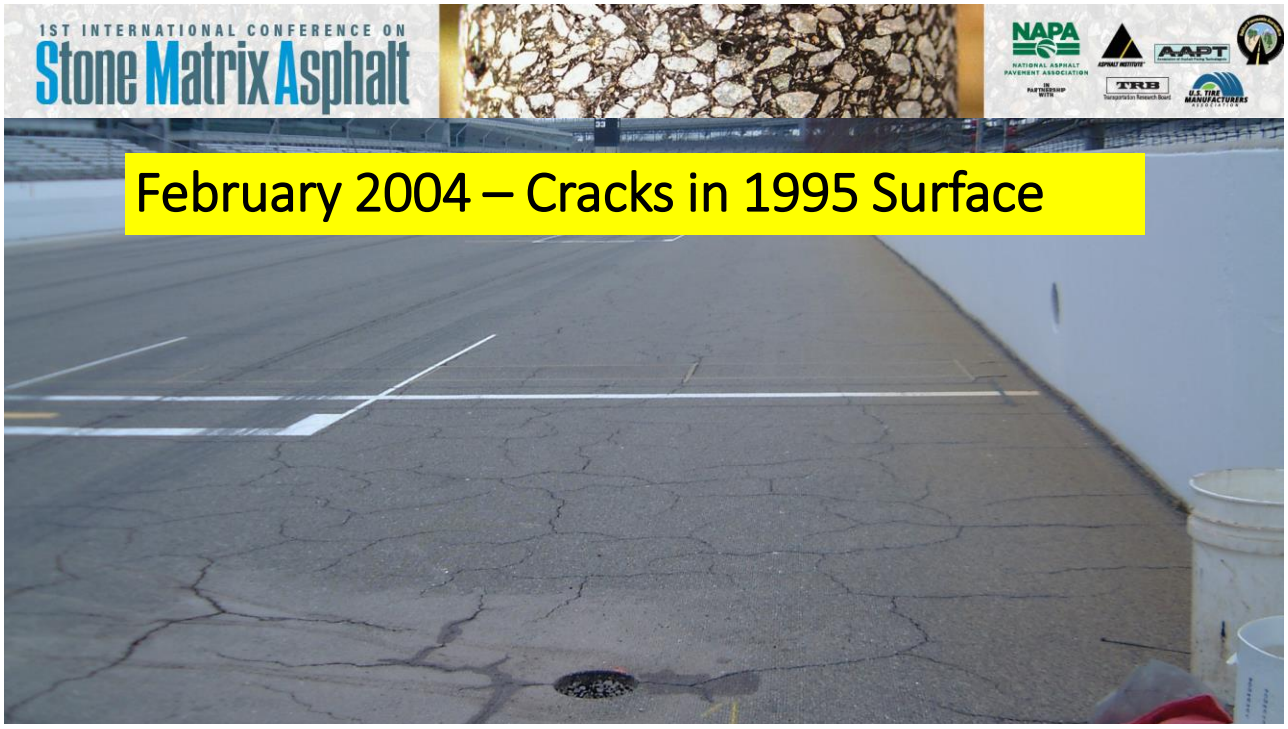
Weepers!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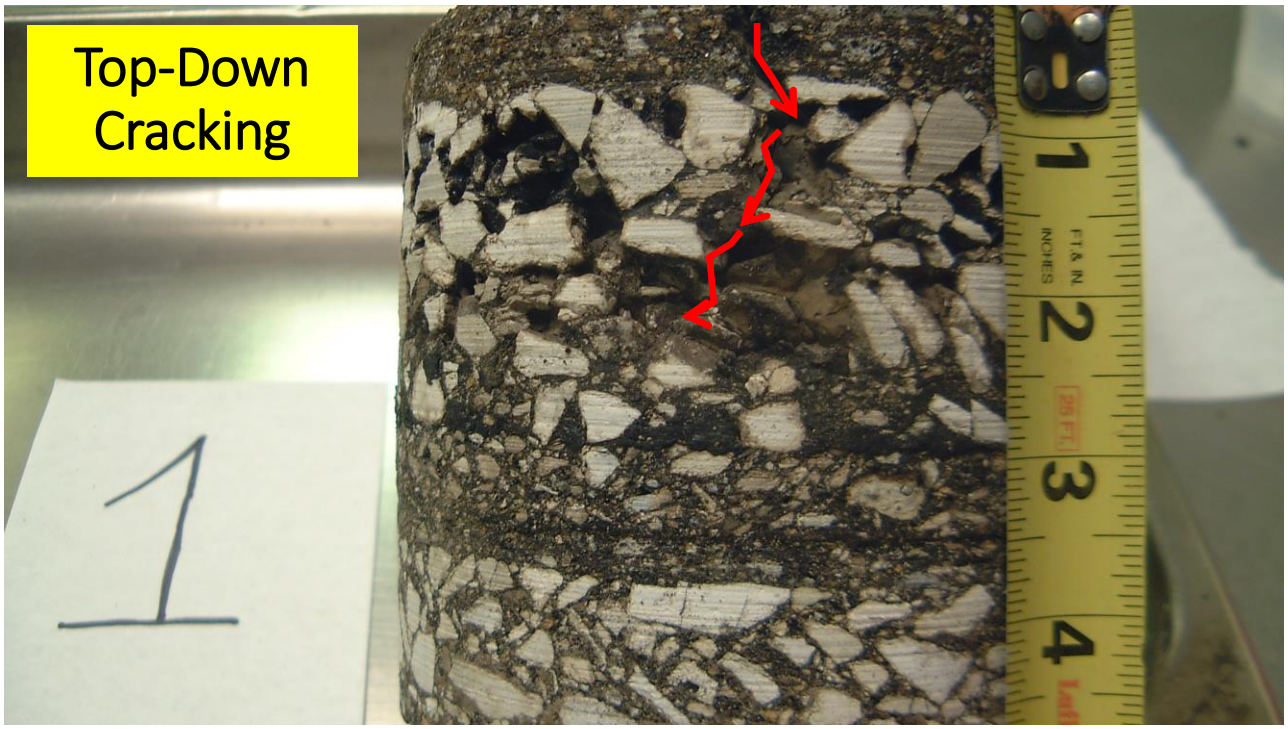
February 2004 – Cracks in 1995 Surface


Top-Down Cracking
1

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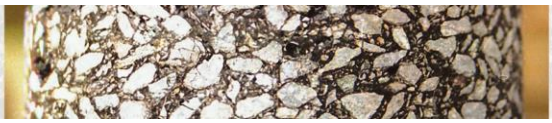

Results of 2004 Existing Condition Survey

- Extensive Surface Cracking Due To:
  - Long-term binder absorption by the ACBF Slag CA and FA
- Longitudinal Joints Separated Due To:
  - Shrinkage from long-term binder absorption
  - Low density
- Weeping Due To:
  - Roof water infiltrating structure via longitudinal joints, cracks, voids in the low density surface

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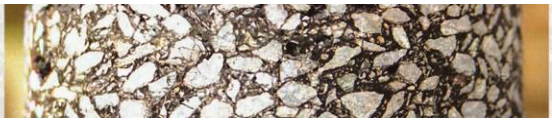

Proposed Solutions for 2004 Project

- Mill 2-1/2”
- Replace SAMI
- Place **1-1/2” of 9.5mm Dolomite SMA** PG 76-28 / PG 82-22
  - Increase durability of intermediate layer
  - Provide macro-texture to mechanically lock surface to intermediate layer
- Place **1” of 4.75mm Steel Slag SMA** PG 76-28 / PG 82-22
  - Provide a durable, high friction racing surface

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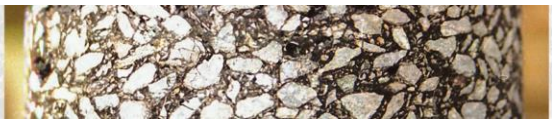
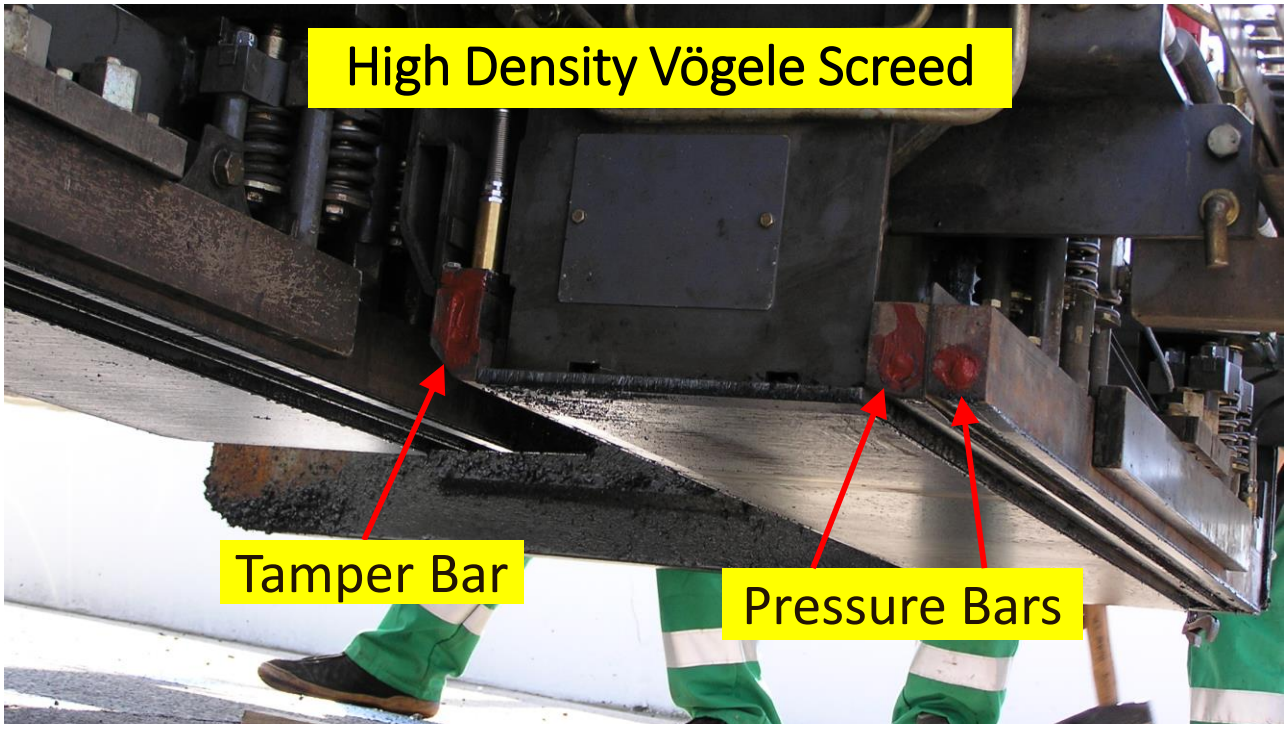


Proposed Solutions for 2004 Project

- Treat Longitudinal Joints:
  - Reduce raveling and reduce permeability
  - Treat vertical face and across joint
- Use Latest in Paving Equipment Technology to:
  - Increase lane widths
  - Improve compaction
  - Provide necessary smoothness
  - Insure consistent macro-texture


High Density Vögele Screed
Tamper Bar
Pressure Bars


The Experts!
SUPER 2100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2-1/2” Milling


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TRB
Milled Surface


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ETNYR
GRADY BROTHERS
SAMI Application


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1st Lift
1-1/2" 9.5mm Dolomite SMA

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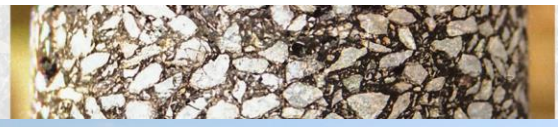

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Warm-up Load at Start of Day


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9.5mm *Dolomite* SMA

Sieve	DMF	QC AVG
12.5	100	100
9.5	88	92
4.75	35	36
2.36	23	21
1.18	18	17
0.600	16	14
0.300	13	13
0.150	12	12
0.075	9.3	9.3
A.C.	6.5	6.3
Voids	3.1	3.0
VMA	17.3	17.3

9,750 Tons
16 Samples

Avg. Core Density (N=34) 94.8% of G_{mm}


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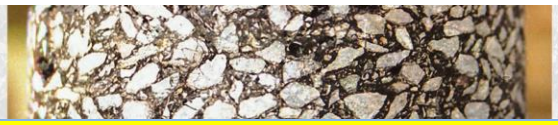
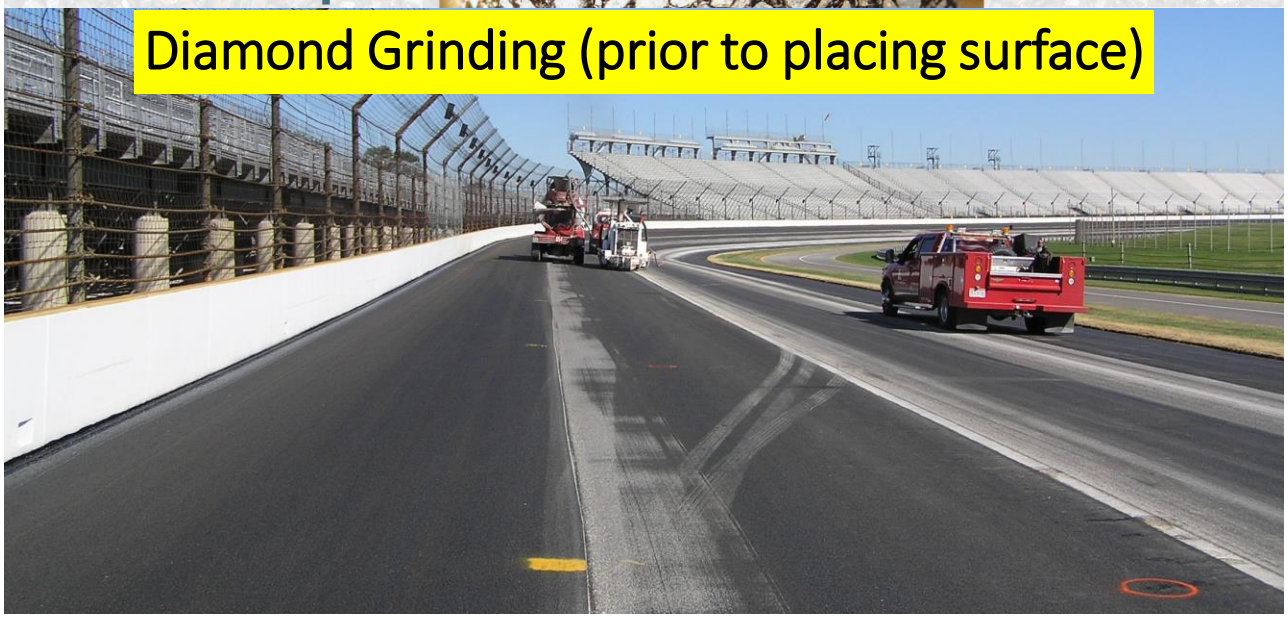


Diamond Grinding (prior to placing surface)

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RPE Tack Prior To Steel Slag SMA


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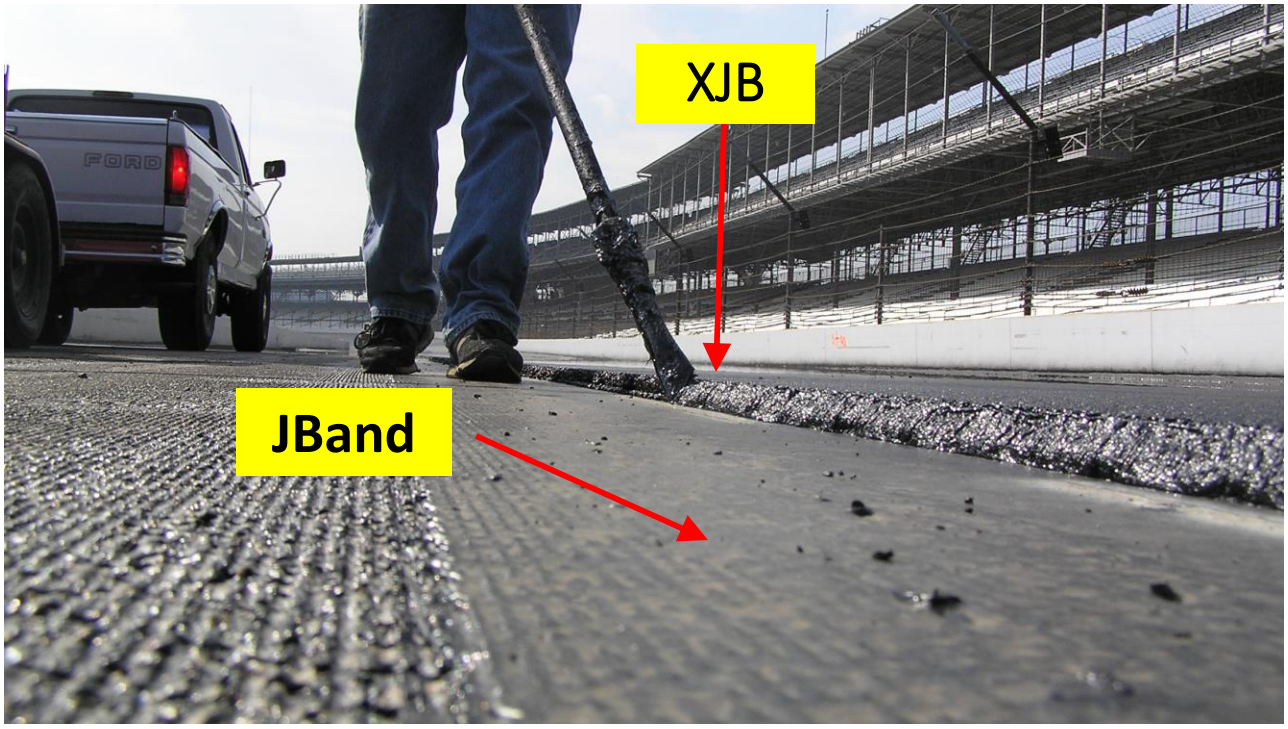
Lane 1 – 1” of 4.75mm Steel Slag SMA


XJB
JBand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Last Lane – 4.75mm Steel Slag SMA

4.75mm *Steel Slag* SMA

Sieve	DMF	QC AVG
9.5	100	100
4.75	91	91
2.36	32	29
1.18	22	20
0.600	19	17
0.300	17	16
0.150	15	14
0.075	11.8	10.7
A.C.	6.8	6.7
Voids	3.1	2.8
VMA	18.7	18.3

8,420 Tons
13 Samples

Avg. Core Density (N=25) 94.3% of G_{mm}

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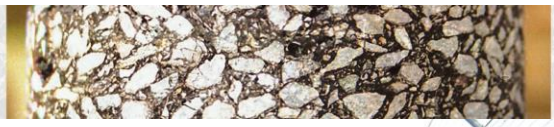

2004 – Waiting for Cars!

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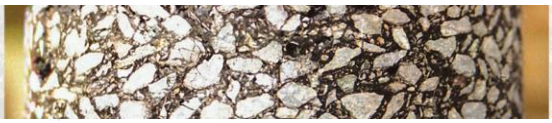

How's It Performing Today?


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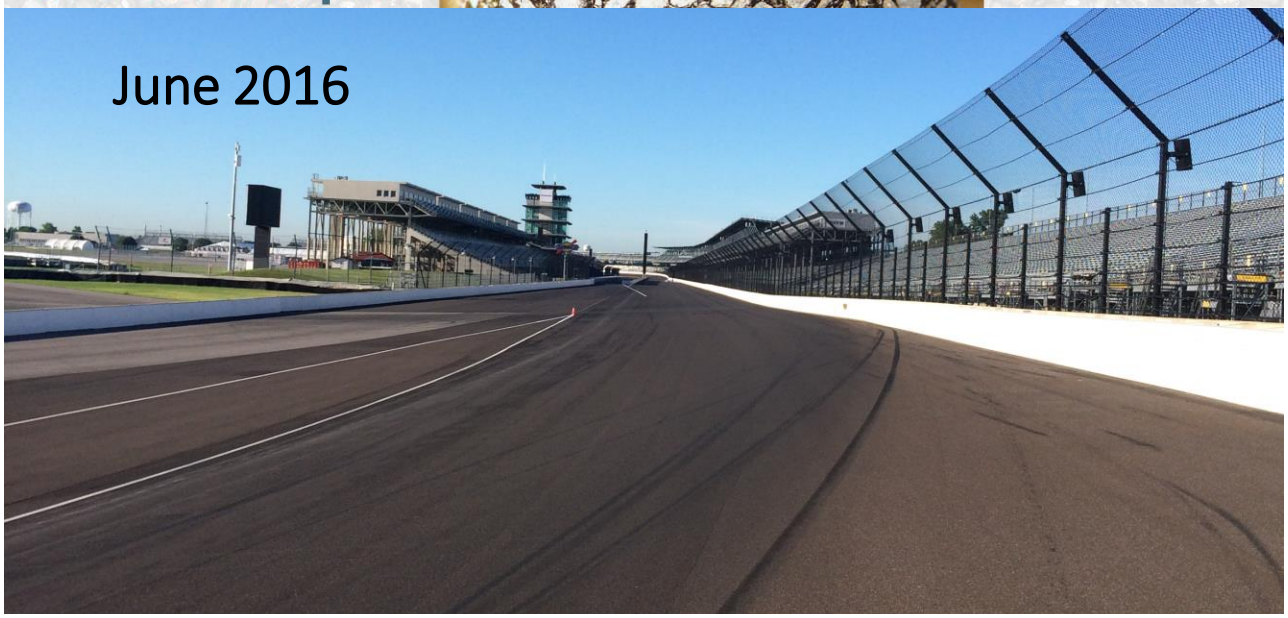


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November 2017

~ 13.5”

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November 2017

What's Missing?

You want to crack seal with what?

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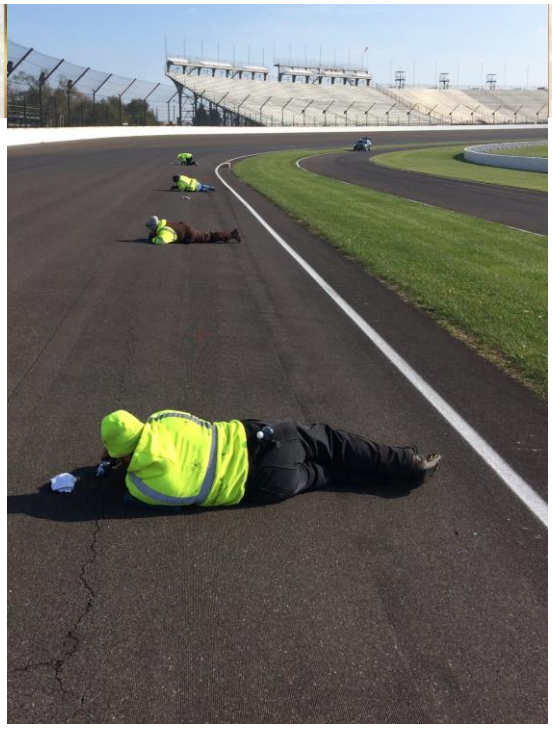

Tedious and Time Consuming Doesn't Begin to Describe the Effort it Took!

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The Finished Product…

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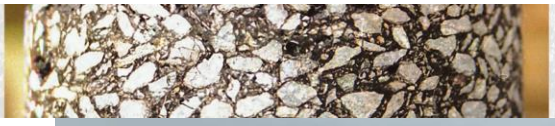

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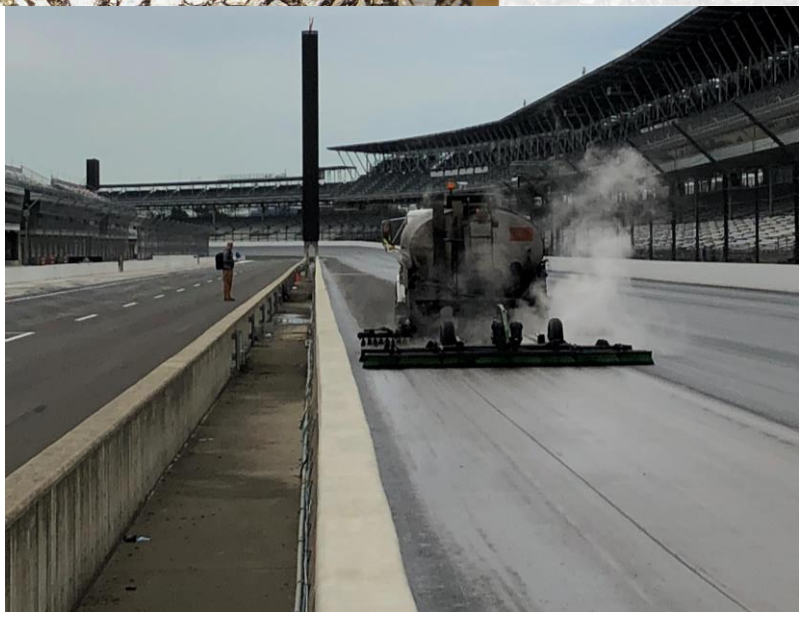
Pavement Preservation Continued…

Using RPE



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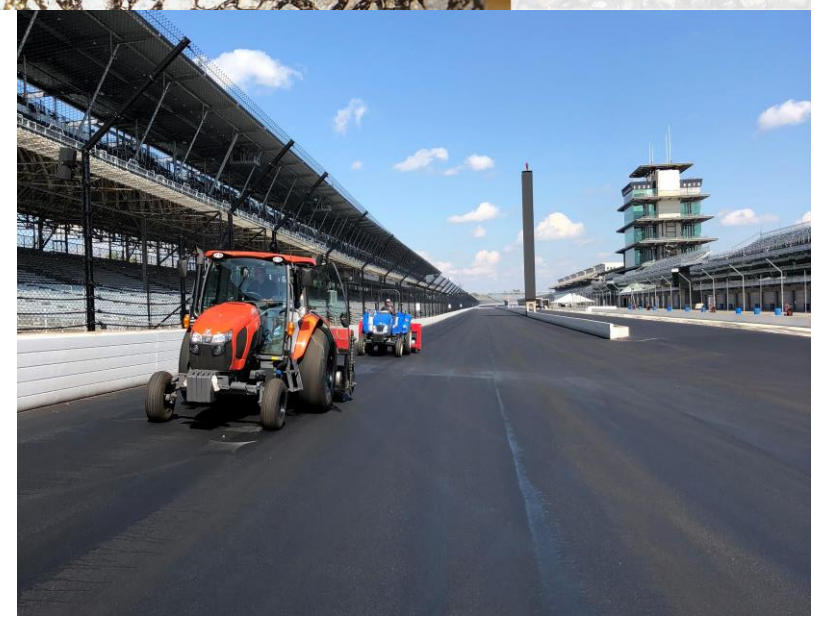
The Tire Dragons…



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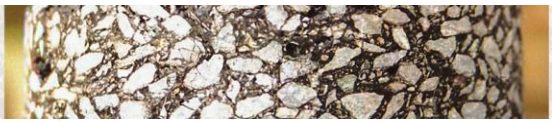

So…How's Friction Now?


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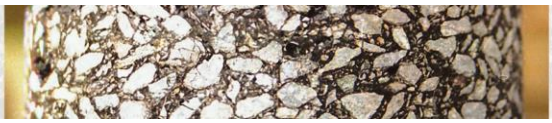
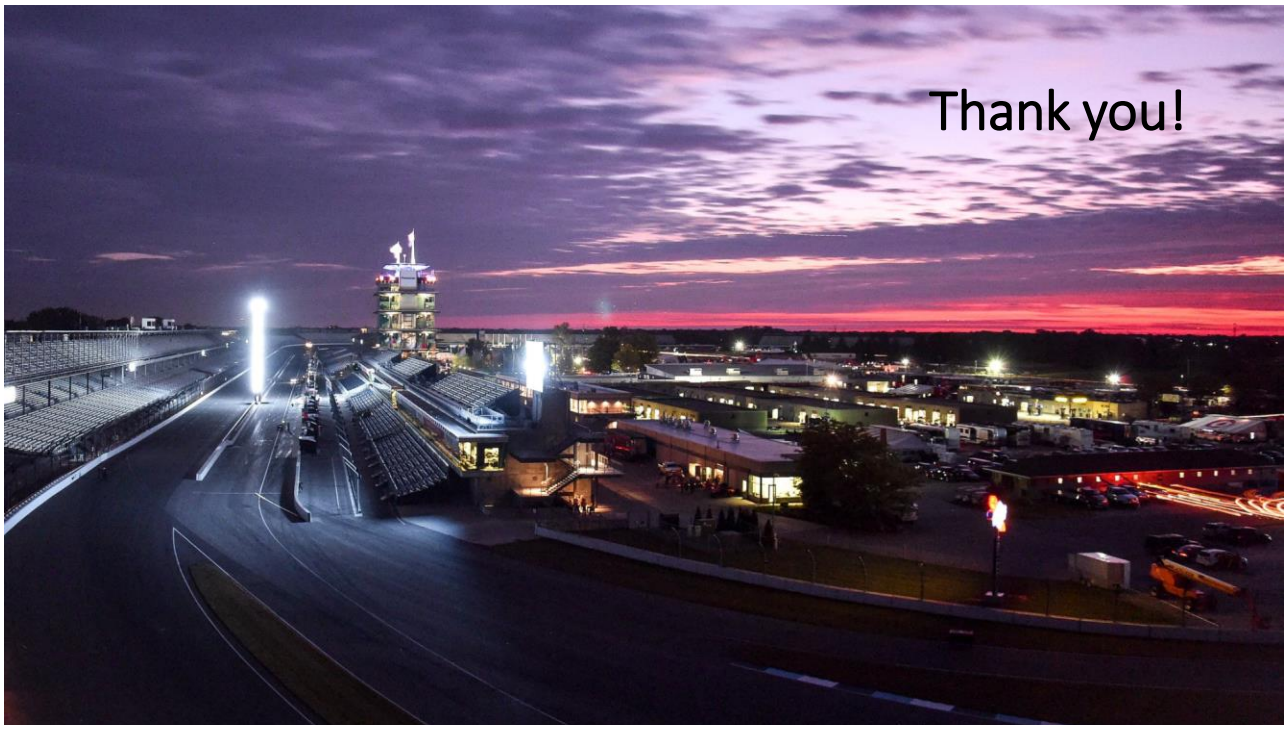


What Have We Learned?

- Investigate distress issues ***thoroughly***
- Mix shear strength is ***very important***!
- Utilize ***low abs*** aggs for durability
- Achieve ***low*** in-place mix permeability
- Utilize ***polymer*** mod AC's and emulsions
- ***Follow*** known best practices (design, plant and laydown)
- ***Everyone*** plays a role in **QC**!
- Have ***backup*** equipment!
- For future projects, there may be a role for IC and/or WMA Technology…


Thank you!