

# Cold Weather Paving

Brett Warkenthien, Brosz Engineering, Inc.

Chris Boom, Morris, Inc.



- Brosz Engineering, Inc.

- Pierre, SD
  - Eagle Butte
  - Winner
  - White Lake
- Sturgis, SD
- Sioux Falls, SD
- Stanley, ND
- Bowman, ND

- Morris, Inc.

- Fort Pierre, SD

# Cold Weather / Late Season Paving

- Fort Pierre flood damage repair
  - Process, Prime, Chip & Seal (17 – 7)
  - Mill & Overlay, (11 – 6)
  - Reconstruct, (17 – 5)
  - Patching, (21 – 7)







# Reconstruction

- Process in place (by City)
- Subgrade removal
- Material laydown
- Incorporate or cap with new aggregate
- 2 – 2” lifts Class E













# Mill & Overlay

- Milling
  - Edge mill
  - Center mill
  - Full width mill
- 2" Class E overlay











# Patching

- Remove distressed surfacing
- Remove aggregate base
- Remove subbase to achieve 12" full depth section
- 8" new aggregate base
- 2 – 2" lifts Class E asphalt
- Soft / wet areas
  - Excavate 24" full depth
  - Woven geotextile for reinforcement and separation
  - 12" screened aggregate, 8" aggregate base, 2-2" lifts



# Here Comes Winter

- Switch from HMA to WMA
  - ZycoTherm by Zydex
    - Reduce mix temperature to 250° to 260°
    - Reduce receiving surface temperature to 35°
    - Increase compaction/consolidation

## PaveCool 2.4 - Simulation Results

**Input File:** PaveCool

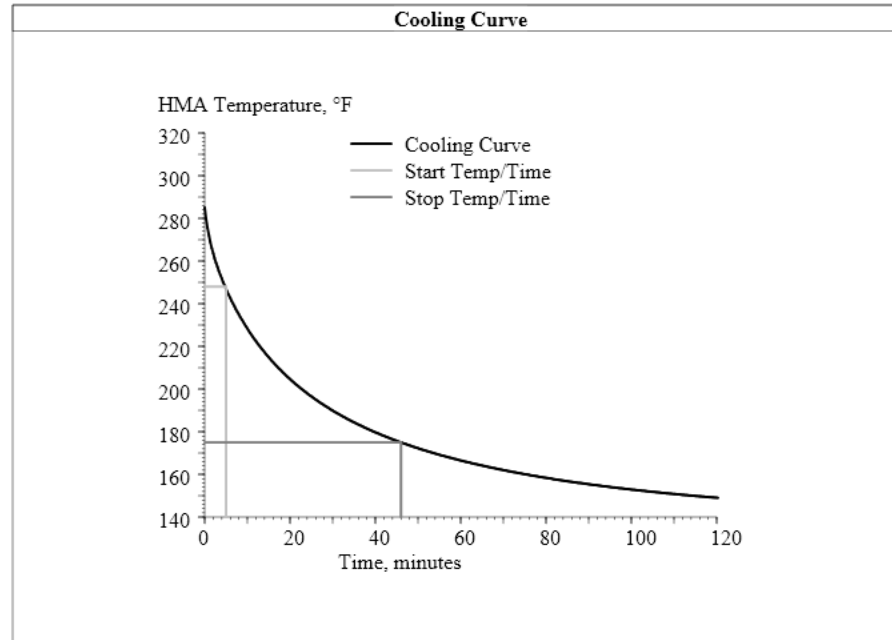
**Project:** Ft. Pierre Streets

Project Date & Time	Start Rolling*	Stop Rolling*
08/15/12 1:08 PM	5 min. (248 °F)	46 min. (175 °F)

HMA Mix Type	Binder Grade	Thickness	Delivery Temp.
Fine/Dense Graded	PG 58-28	2.00 in.	285 °F
Air Temp.	Wind Speed	Sky	Latitude
80.0 °F	5 mph	Clear & Dry	44.4 ° North
Existing Surface	Moisture	State	Surface Temp.
Unbound - Coarse	Dry	Unfrozen	85.0 °F

\* Some asphalt mixtures will require compaction start and stop times different from those recommended by this program. As always, good judgement must be exercised in order to ensure a properly compacted surface. Special considerations should be made for polymer modified asphalt binders. In this case, manufacturer guidelines should supersede recommendations made by this program. Consult the Help file for further details. In no event will the Minnesota Department of Transportation, the University of Minnesota or their suppliers be liable for damages or expenses arising out of the use of this program.

Simulation Time: 03/28/13 1:36 PM



## PaveCool 2.4 - Simulation Results

**Input File:** PaveCool

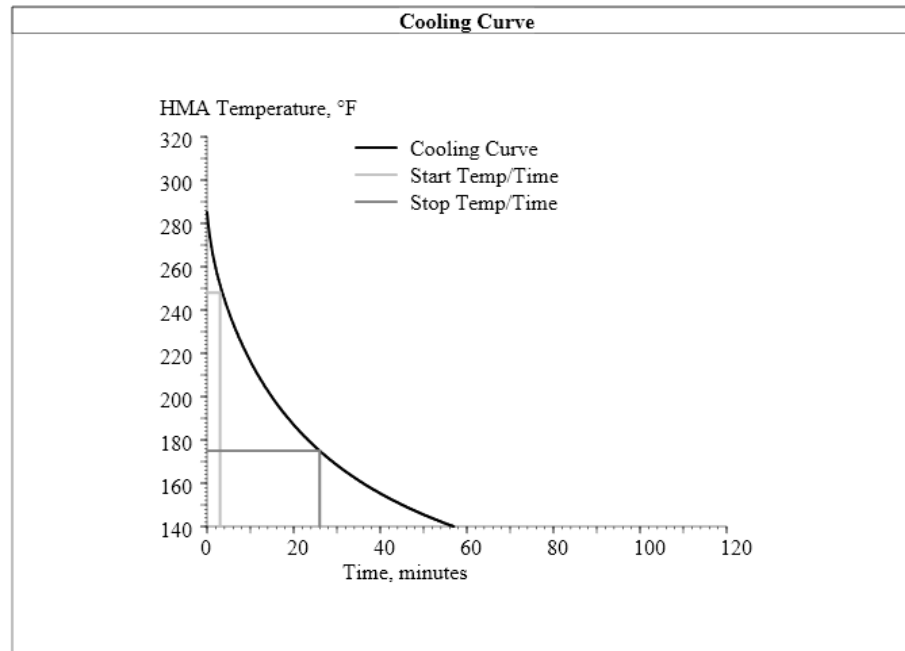
**Project:** Ft. Pierre Streets

Project Date & Time	Start Rolling*	Stop Rolling*
10/15/12 1:08 PM	3 min. (248 °F)	26 min. (175 °F)

HMA Mix Type	Binder Grade	Thickness	Delivery Temp.
Fine/Dense Graded	PG 58-28	2.00 in.	285 °F
Air Temp.	Wind Speed	Sky	Latitude
45.0 °F	5 mph	Clear & Dry	44.4 ° North
Existing Surface	Moisture	State	Surface Temp.
Unbound - Coarse	Dry	Unfrozen	50.0 °F

\* Some asphalt mixtures will require compaction start and stop times different from those recommended by this program. As always, good judgement must be exercised in order to ensure a properly compacted surface. Special considerations should be made for polymer modified asphalt binders. In this case, manufacturer guidelines should supersede recommendations made by this program. Consult the Help file for further details. In no event will the Minnesota Department of Transportation, the University of Minnesota or their suppliers be liable for damages or expenses arising out of the use of this program.

Simulation Time: 03/28/13 1:12 PM



## PaveCool 2.4 - Simulation Results

**Input File:** PaveCool

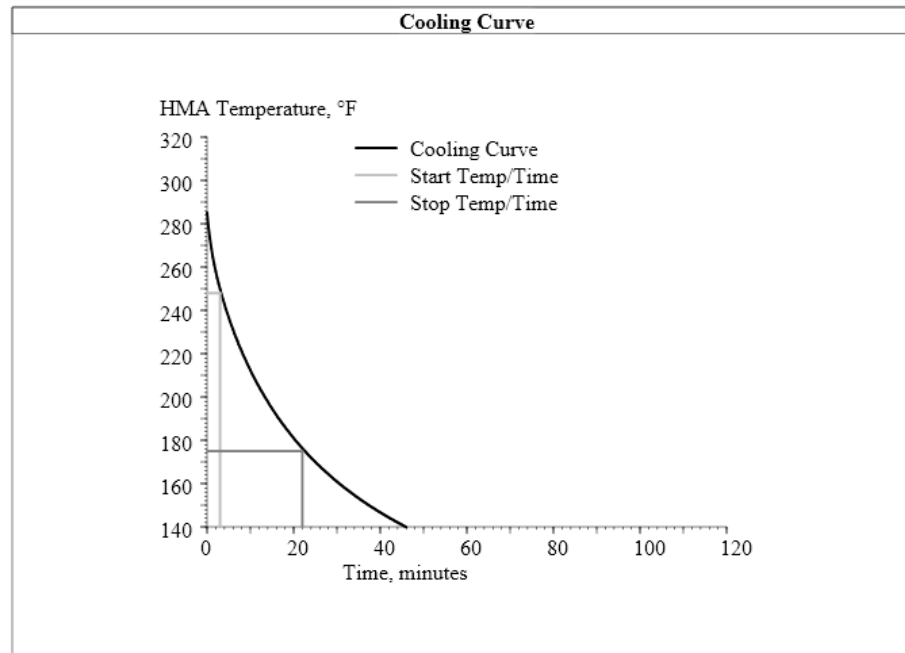
**Project:** Ft. Pierre Streets

Project Date & Time	Start Rolling*	Stop Rolling*
12/03/12 1:08 PM	3 min. (248 °F)	22 min. (175 °F)

HMA Mix Type	Binder Grade	Thickness	Delivery Temp.
Fine/Dense Graded	PG 58-28	2.00 in.	285 °F
Air Temp.	Wind Speed	Sky	Latitude
35.0 °F	5 mph	Clear & Dry	44.4 ° North
Existing Surface	Moisture	State	Surface Temp.
Unbound - Coarse	Dry	Unfrozen	40.0 °F

\* Some asphalt mixtures will require compaction start and stop times different from those recommended by this program. As always, good judgement must be exercised in order to ensure a properly compacted surface. Special considerations should be made for polymer modified asphalt binders. In this case, manufacturer guidelines should supersede recommendations made by this program. Consult the Help file for further details. In no event will the Minnesota Department of Transportation, the University of Minnesota or their suppliers be liable for damages or expenses arising out of the use of this program.

Simulation Time: 03/28/13 1:10 PM





**Terminally  
Blendable**

**Fuel  
Savings  
11-14%**

**Salt  
Resistance**

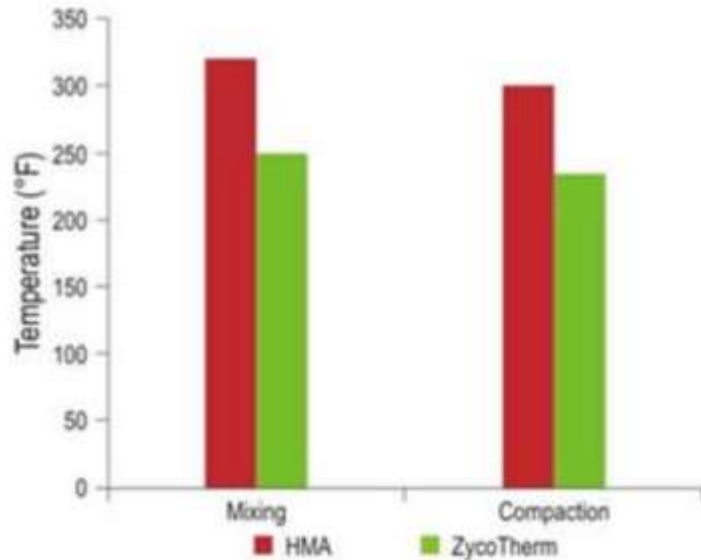
**Compatible  
with all grades of  
asphalt binder**



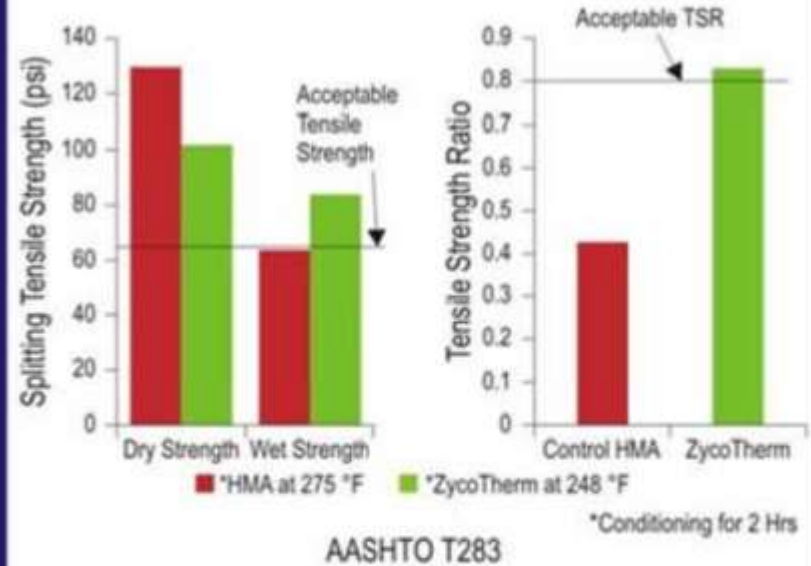
**Moisture  
Resistance,  
High TSR**

**No  
Odor**



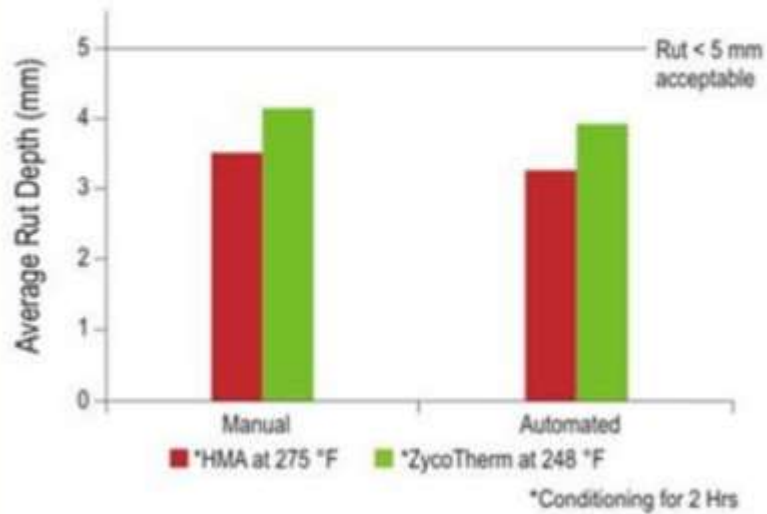


**Low Mixing & Compaction Temperatures**



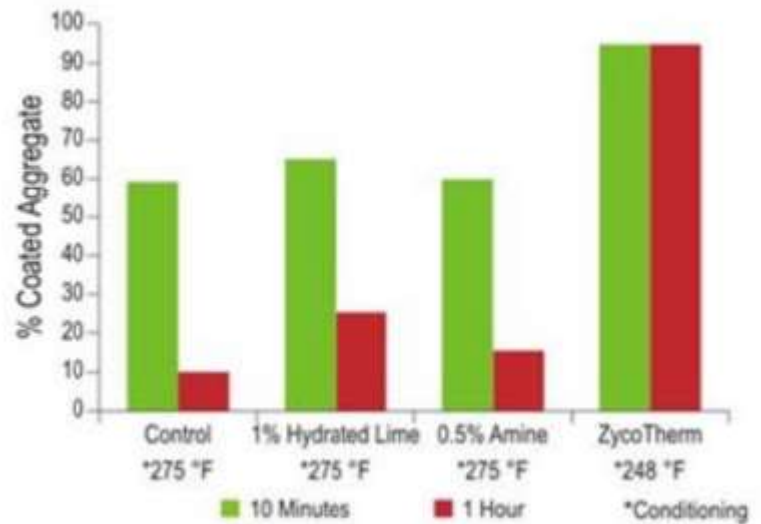
**Higher Tensile Strength Ratios**

## Improved Rut Resistance



Rut depth, less than 5 mm as per AASHTO T340-10

## Highly Resistant to Salt Action



ASTM D3625 4% Salt Water Boil Test

**ZycoTherm****Zydex**<sup>®</sup>**COATING AID. COMPACTION AID. BLACKER MIXES**

**ZycoTherm** nanotechnology substantially improves coating of asphalt binder on aggregates, ensures consistent and higher compaction and eliminates stripping for making durable asphalt pavements over the service life.

**ZYCOTHERM BENEFITS****• Improves coating upto 120 °C**

Wets & spreads better even at lower bitumen content to give blacker looking mix

**• Reduces stickiness on trucks and compaction roller upto 90 °C**

Captures sticky asphaltenes in nano cages of ZycoTherm for improved free flow and reduced stickiness to trucks or paver and compaction roller

**• Improves field compaction upto 90 °C**

Uniform flow ensures consistent densities at same number of passes

**• Eliminates stripping**

Residual water in aggregate at lower mix temperature helps to promote reactivity with aggregate to withstand six hours boil test with 95% retained coating

**• Eliminates odor**

Captures all odorous compounds in nano cages of ZycoTherm

**• Reduces fuel consumption**

Lowers mixing temperature by 35 °C, saves fuel by 20-25% OR Helps in longer hauls OR Allows paving in cold conditions 0 – 5 °C

**• Stable to storage**

Stable for 15 days and more, suitable for terminal blending

**ZycoTherm****Zydex**<sup>®</sup>**• Improves TSR values 80 – 90 °C****• Melts and mixes hardened asphalt**

Improves melting and mixing of hardened asphalt from RAP / RAS to reduce / eliminate raveling

**• Marinates aggregates as alternative to lime**

ZycoTherm dissolved in water (ZycoTherm 1 kg : Water 400 liters) is sprayed on aggregates (5% by weight of aggregates) and left to dry before processing for asphalt mixes

**DOSAGE**

• Unmodified asphalt binders at 0.1% by weight of asphalt binder

• Modified binders PMB / CRMB, RAP / RAS mixes at 0.125 - 0.15 % by weight of asphalt binder

**STORAGE AND SHELF LIFE**

ZycoTherm should be stored between 5 – 45 °C (41 – 113 °F) in a shaded, dry area away from sunlight, heat, ignition, source of sparks, rain and standing water. The container lid should be securely fastened every time it is used. Its shelf life is 24 months.

**Wyoming, USA****ZYDEX : SUSTAINABILITY THROUGH INNOVATION****ZycoTherm / Zycosoil**  
Warm / Hot Mix**Nanotac**  
Tack Coat**Terraprime**  
Prime Coat**Terrasil**  
Soil Waterproofing**Zydex Industries**

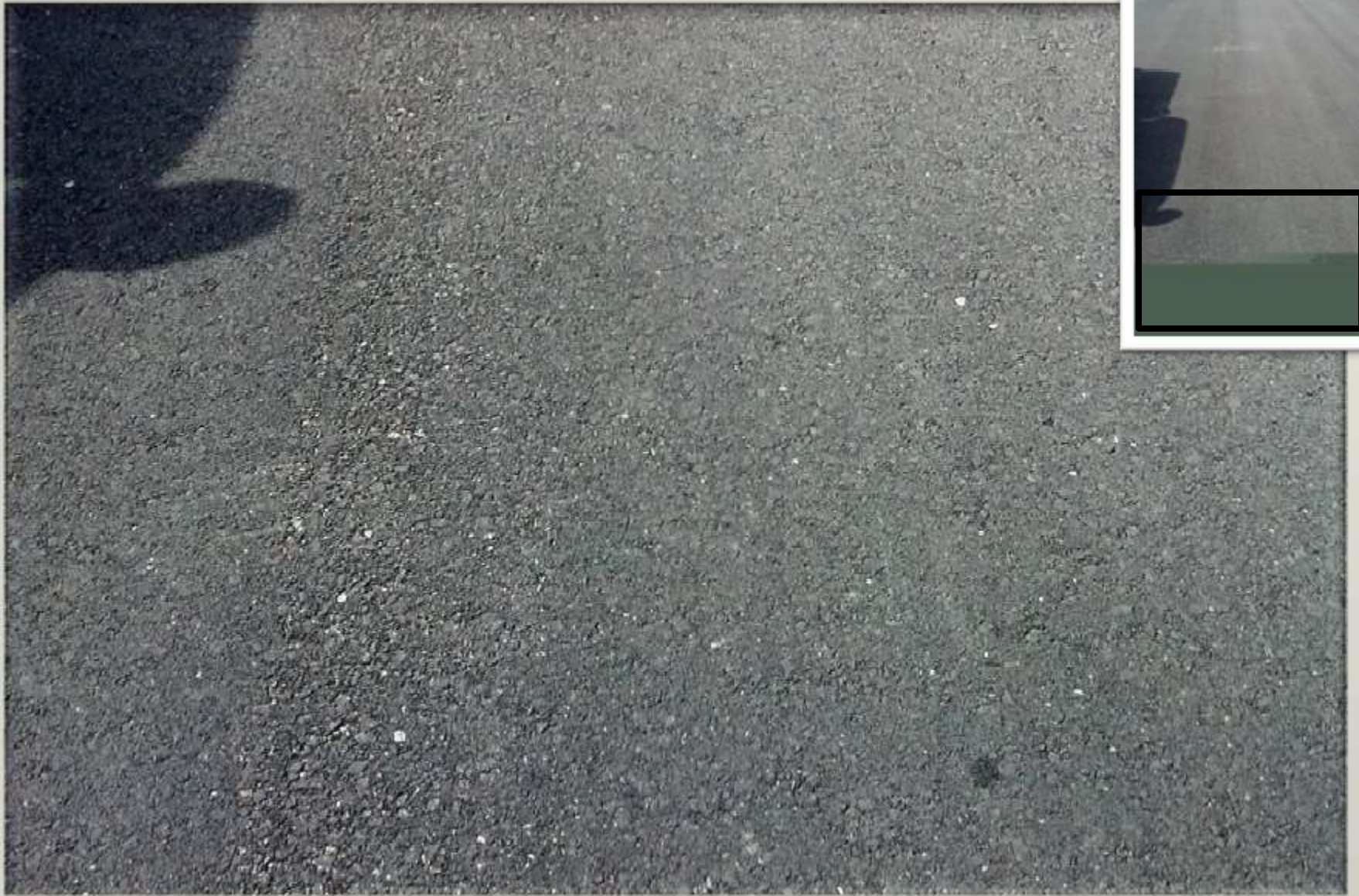
25 - A, Gandhi GI Mill Compound, Gorea, Vadodra - 390 016, Gujarat, INDIA.

Tel. : +91 365 2280866 / 2283386 • Fax : +91 265 2280872 • Email : zycosoil@zydexindustries.com • www.zydexindustries.com



# Paving Considerations

- Pace / Speed
  - Knockdown roller on the pavers xxx
  - Knockdown by  $235^{\circ}$
- Timing
  - Space the trucks for continuous paver operation
    - 1.5 – 2 MPH
  - When the paver did stop, noticeable segregation



# Results

- Deterrents
  - Still needs to be 35°
  - Only 3 to 4 hours of paving time per day
  - Unable to flush
    - Will complete this spring
  - Need to tack the day before paving
    - Traffic control

# Results

- Overall, Successful
- Density range from 93<sup>0</sup>% to 95<sup>0</sup>%
- Air voids from 3<sup>0</sup>% to 5<sup>0</sup>%
- Completed projects for the Owner

# Questions?

