

MINNESOTA'S EXPERIENCE WITH LOW W/C RATIO PAVEMENTS

SEALANTS AND FILLERS FOR JOINTS AND
CRACKS COMMITTEE, AHD25
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Your Destination...Our Priority



A Very Long-Life Pavement –TH61- Built 1954





LONG LIFE PAVEMENTS IN MINNESOTA

- In 1995, MnDOT decided to move away from strength to a low w/c ratio specification for acceptance to achieve more durable and longer lasting pavements
- Pilot projects with different variables tried
 - Bought Water Reducer for Contractor
 - Statistically based aggregate quality spec
 - Well-Graded Aggregate Variations
 - Use of incentives
 - Use of 1 ½” coarse aggregate





MNDOT JOINT SEALING HISTORY

- Pre-2008
 - Hot Pour – 1/2” wide sawcut with either backer rod or paper
 - 3723 Hot-Poured Elastic Type
 - 3725 Hot-Poured, Extra Low Modulus, Elastic Type
 - Silicone – 3/8” wide sawcut with backer rod
 - Preformed Compression Seal – 3/8” wide sawcut
- Many unsealed and single sawcut test sections
- Awaiting the report “Cost-Effectiveness of Sealing Transverse Contraction Joints in Concrete Pavements”
- Neighboring state of Wisconsin - unsealed





ALL ROADWAYS: SPEED LIMIT 45 MPH OR LESS

Base Materials	Contraction Joint Sealant Type	Longitudinal Joint Sealant Type
All	3725 Hot Pour	3725 Hot Pour or None





NEW CONSTRUCTION: SPEED LIMIT GREATER THAN 45 MPH

Type of Construction	Base Materials	Contraction Joint Sealant Type	Longitudinal Joint Sealant Type
New Construction: Speed limit greater than 45 mph	Open Graded Aggregate Base (OGAB) Drainable Stable Base (DSB)	None	None
New Construction: Speed limit greater than 45 mph	Class 5	3725 Hot Pour	3725 Hot Pour or None





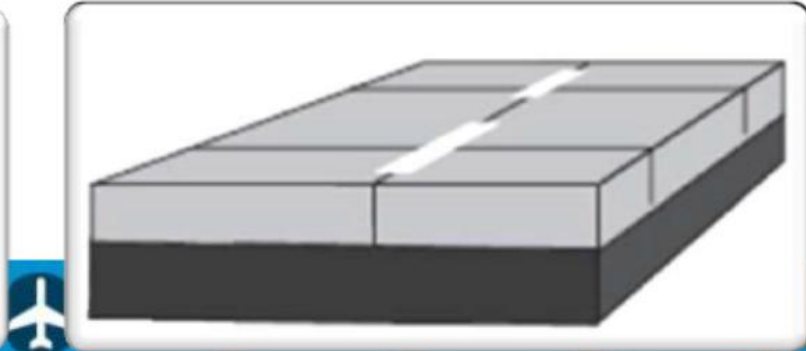
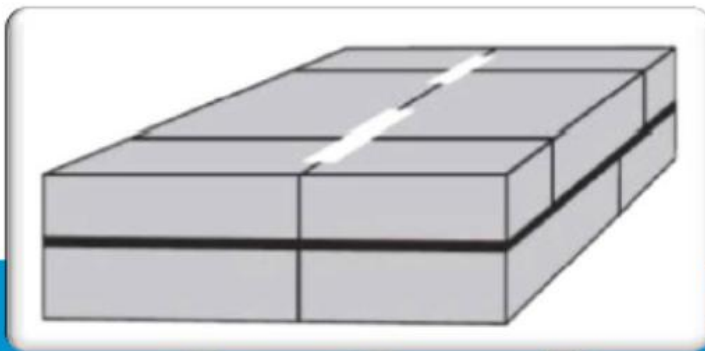
HIGH PERFORMANCE CONCRETE

Type of Construction	Base Materials	Contraction Joint Sealant Type	Longitudinal Joint Sealant Type
High Performance Concrete	N/A	3721 Preformed Elastomeric	3725 Hot Pour or None



CONCRETE OVERLAYS

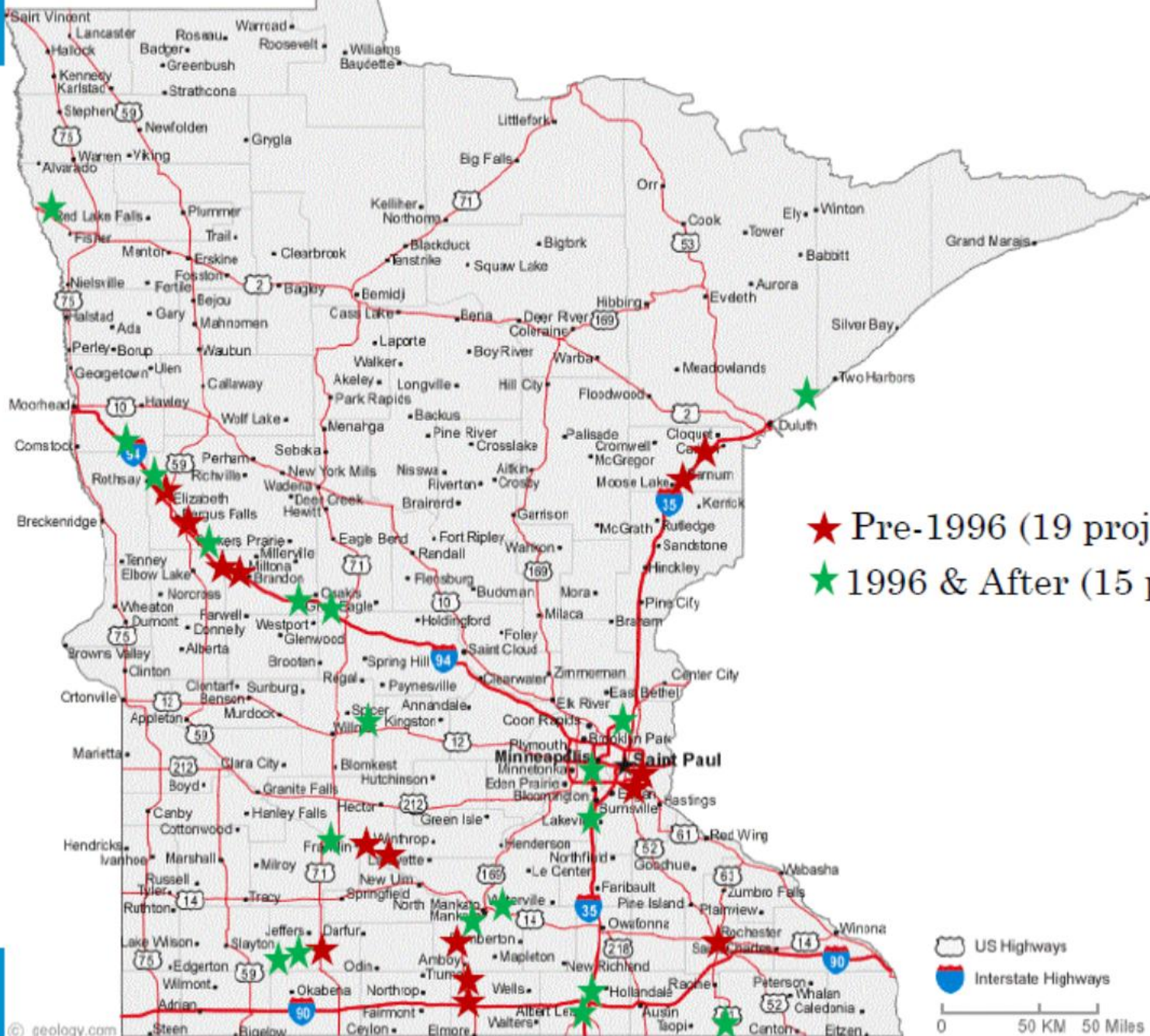
Type of Construction	Base Materials	Contraction Joint Sealant Type	Longitudinal Joint Sealant Type
Overlay: Concrete over Concrete	PASSRC Geotextile	None	None
Overlay: Concrete over Bituminous	Full Depth Bituminous	3725 Hot Pour	3725 Hot Pour or None
Overlay: Concrete over Concrete	Bituminous Bond Breaker		



CONCRETE PAVEMENT REHAB

Type of Construction	Base Materials	Contraction Joint Sealant Type	Longitudinal Joint Sealant Type
CPR	N/A	3725 Hot Pour or None	3725 Hot Pour or None





★ Pre-1996 (19 projects)

★ 1996 & After (15 projects)

US Highways

Interstate Highways

0 50 KM 50 Miles

D1 0980-127

**Silicone sealant completely de-
bonded. Severe joint distress.**



1992



Silicone sealant mostly de-bonded from both sides. Dev. distress and mass loss along depth of joint crack



TH12 © RT 5-11-11
STA. 191+800 MP. 112.99
ON JOINT # 4
ONE FOOT OFF JOINT # 5
THREE FEET OFF JOINT # 6

4705-30, US12 (D8)

**Neoprene sealant missing.
Developed tunneling and
vertical spalling full depth.**



mool
⊗
TH
62

2313-13 (D6)



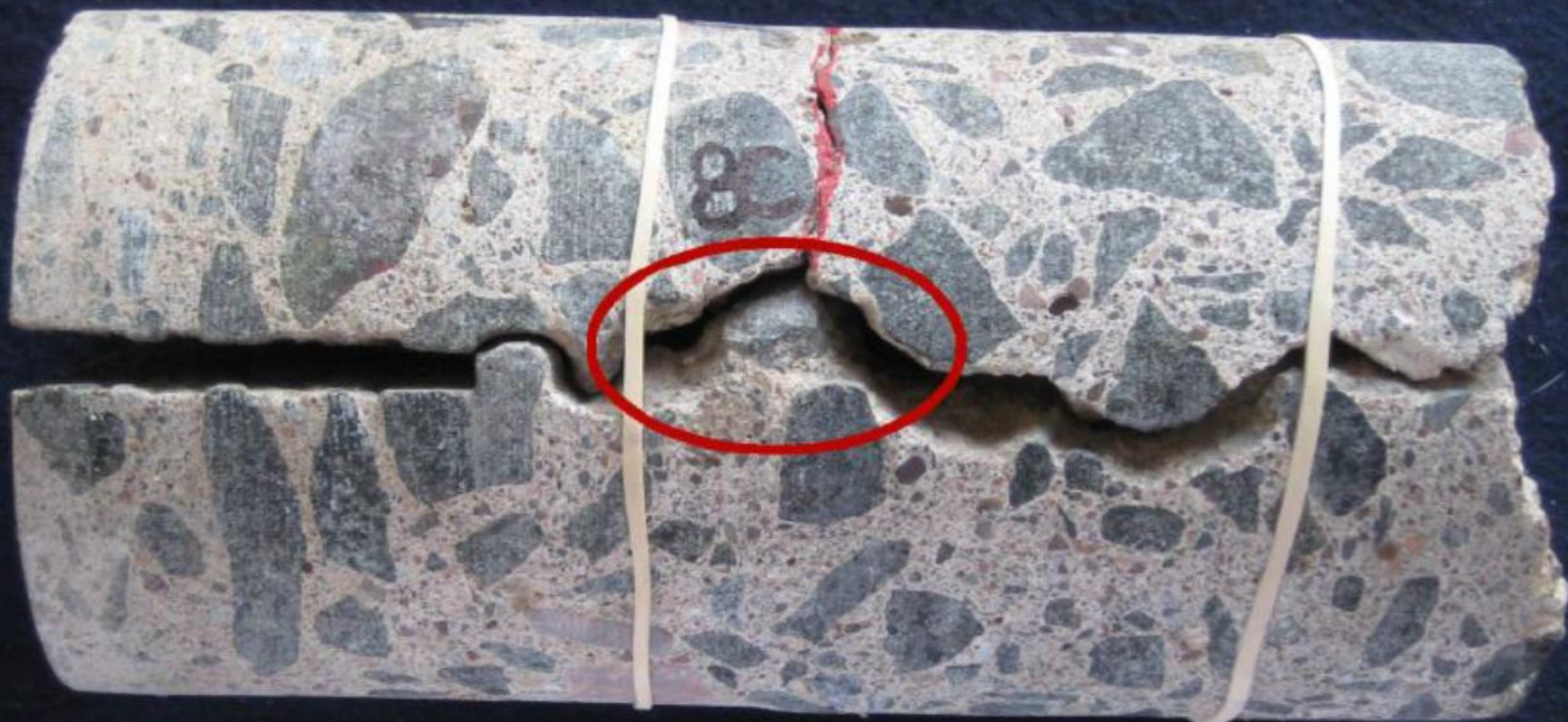
D1 3805-67 (TH61)

Sealant bonded both sides,
pristine joint crack



D1 3805-67 (TH61)

**Purposefully Unsealed
Joint, Developing tunneling**



Degenerated Hot Pour Sealant developing tunneling and vertical spalling full depth.



D6 2480-88 (I-35)

D3 7380-199

Silicone sealant mostly de-bonded from one side of joint. Developing tunneling



D3 7380-199

Silicone sealant well bonded both sides. LATE, pristine crack



Silicone sealant well bonded both sides. LATE, pristine crack.

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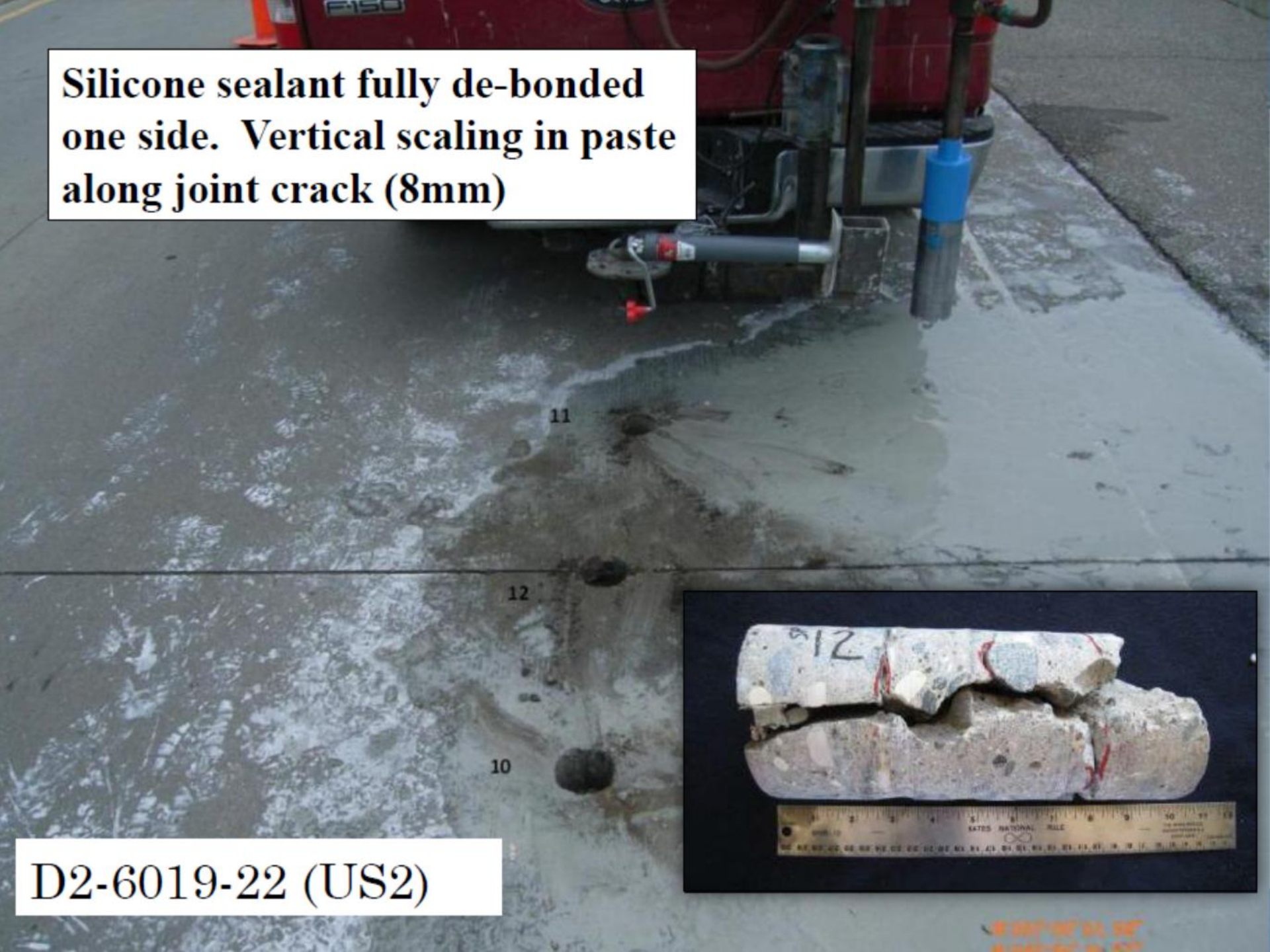
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D2-6019-22 (US2)



N: 047-56° 18.87"

**Silicone sealant fully de-bonded
one side. Vertical scaling in paste
along joint crack (8mm)**



D2-6019-22 (US2)

PRELIMINARY CONCLUSIONS

- Intact Joint Sealant = No distress ~ joint sealant preparation is critical
- Post w/cm cores exhibit less distress and thinner zones of ettringite-filled entrained-sized air voids ~ benefit of reduced permeability





FUTURE WORK

- Core the remaining projects in the Metro and SW Minnesota and test
- Research and conclude on the effects of deicer types.
- Further research and conclude on joint sealant use/condition vs. concrete joint condition.





FUTURE WORK – JOINT SEALANT TEST SECTIONS

- Install DS Brown Delastic Preformed Pavement Compression Sealant
 - TH 23 in Rock County
 - E-347 3/8” wide sealant – 1/4” wide joint
 - Manufacturer recommends doing an initial sawcut and then widening
 - MnROAD
 - E-347 ~ 3/8” wide sealants – 1/4” joint opening
 - E-313 ~ 1/4” wide sealant – 3/16” joint opening
 - Possibly seal unsealed joint with a silane type material as Wisconsin DOT is currently doing

