NATIONAL ACADEMIES Sciences Engineering Medicine

TRB TRANSPORTATION RESEARCH BOARD

TRB Webinar: Portland Cement Concrete Pavement Joint Sealant Practices

October 12, 2023

12:00 – 1:30 PM

PDH Certification Information

1.5 Professional Development Hours (PDH) – see follow-up email

You must attend the entire webinar.

Questions? Contact Andie Pitchford at TRBwebinar@nas.edu

The Transportation Research Board has met the standards and requirements of the Registered Continuing Education Program. Credit earned on completion of this program will be reported to RCEP at RCEP.net. A certificate of completion will be issued to each participant. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the RCEP.

ENGINEERING
RCEP
REGISTERED CONTINUING EDUCATION PROGRAM

Purpose Statement

This webinar will provide key information and present best practices for developing an effective joint sealing in concrete pavements. Presenters will explore the needs and benefits as well as the circumstances where sealing joints is warranted.

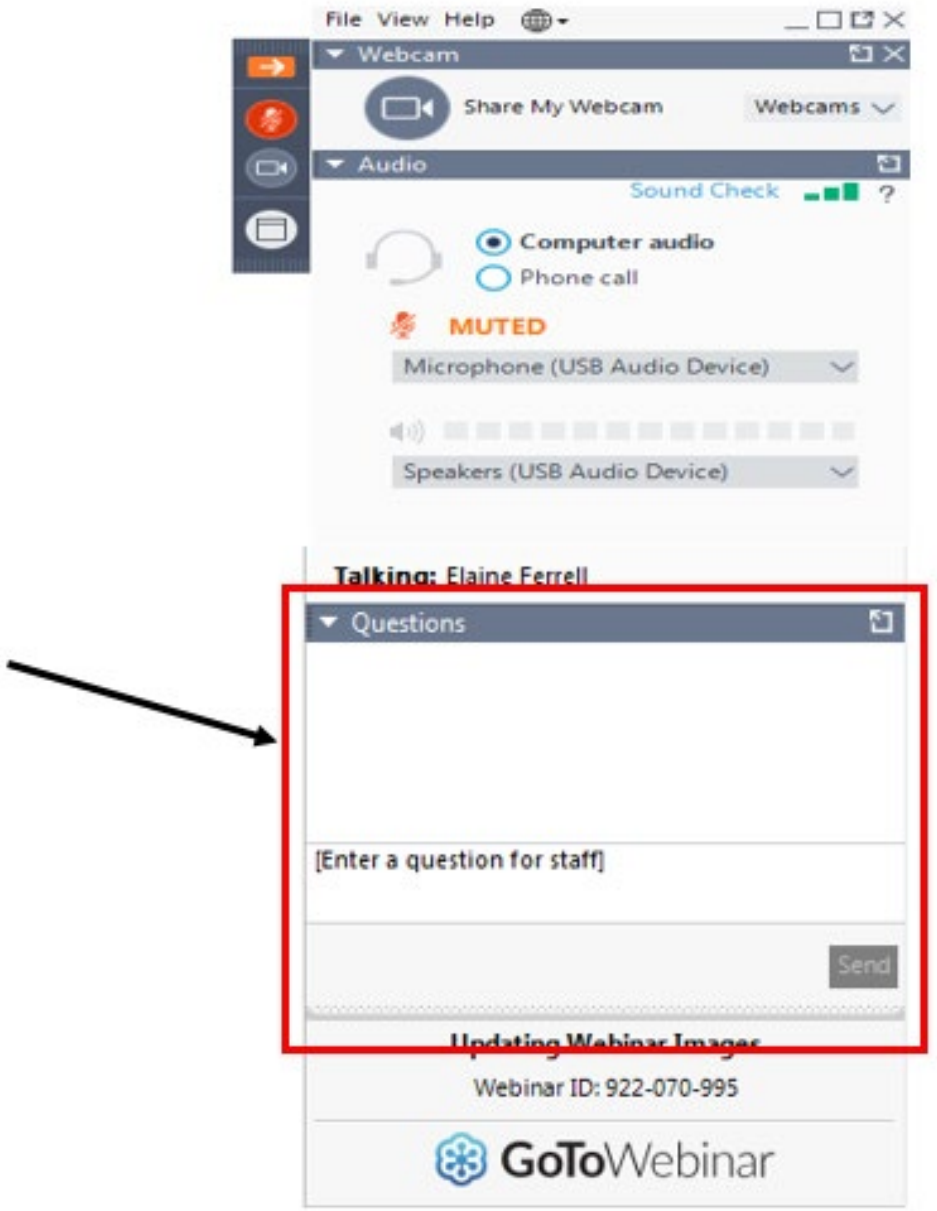
Learning Objectives

At the end of this webinar, you will be able to:

- Recognize conditions that warrant the use of joint sealants
- Understand design implications of not sealing joints

Questions and Answers

- Please type your questions into your webinar control panel
- We will read your questions out loud, and answer as many as time allows



Today's presenters

Hasan Ozer
Hasan.Ozer@asu.edu
Arizona State University

Larry Scofield
lscofield@acpa.org
American Concrete Pavement Association

Dan Zollinger
d-zollinger@tamu.edu
Texas A&M University

Scott Eilken
seilken@qualitysawandseal.com
Quality Saw & Seal Inc.

Zachry Department of
CIVIL ENGINEERING
TEXAS A&M UNIVERSITY

Portland Cement Concrete Pavement Joint Sealant Practices

NCHRP Project 20-05, Synthesis Topic 51-09

Dan Zollinger
Jinho Kim

NCHRP Project 20-05, Synthesis Topic 51-09

NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

NCHRP SYNTHESIS 568

Portland Cement Concrete Pavement Joint Sealant Practices and Performance

A SYNTHESIS OF HIGHWAY PRACTICE

Jinho Kim

AND

Dan G. Zollinger

TEXAS A&M TRANSPORTATION INSTITUTE

College Station, TX

Synthesis Objective

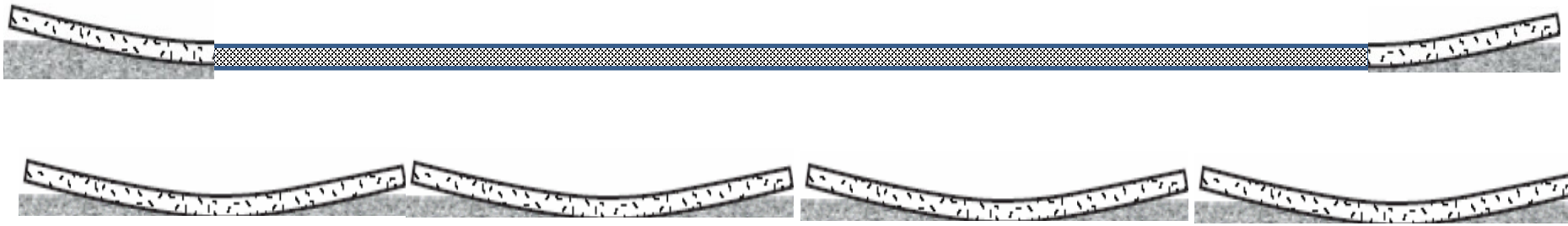
The purpose is to document :

- Current joint sealing practices
  - Types, methods, and tests
  - Develop case studies of successful practices
- New *construction/maintenance* protocols for joint sealants
  - Effect of practices on long term performance
- Clarify future research needs

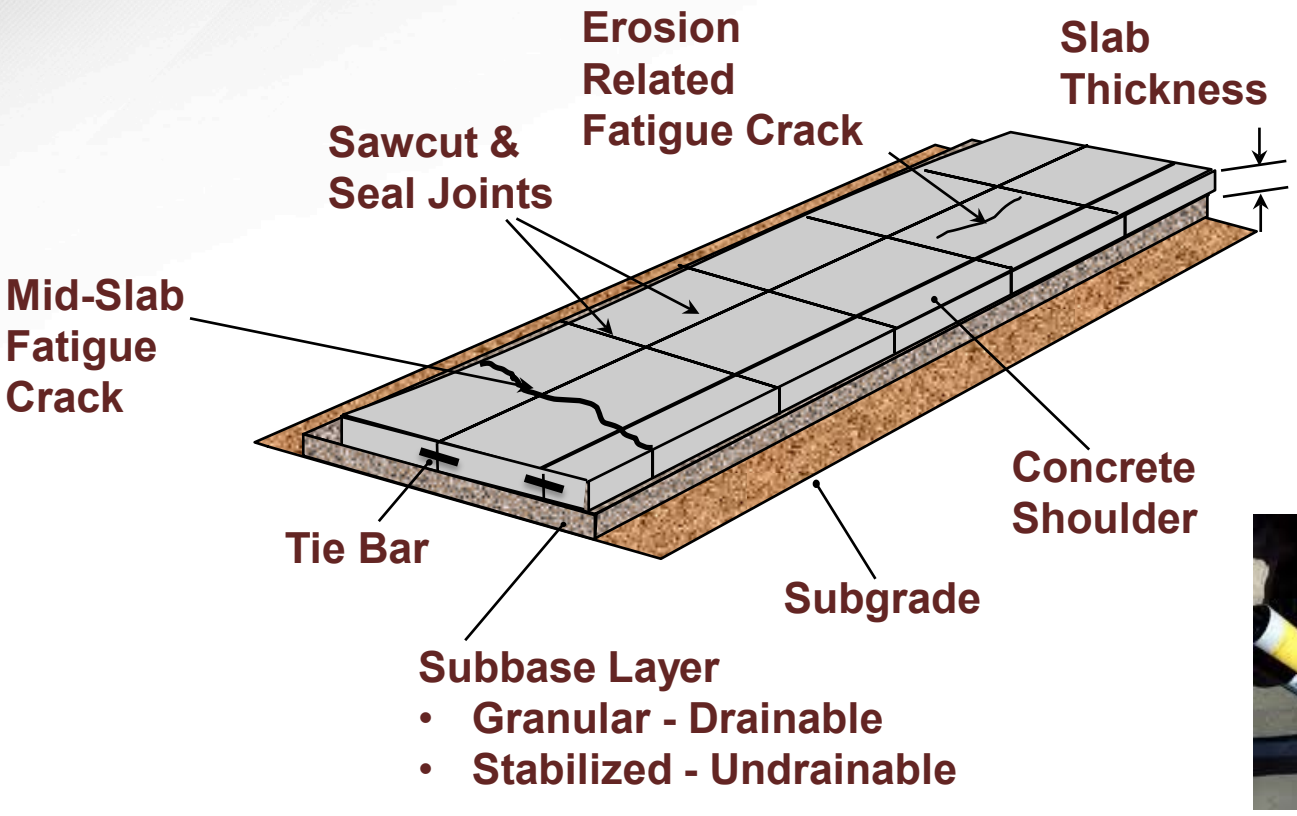
Current Sealant Practice

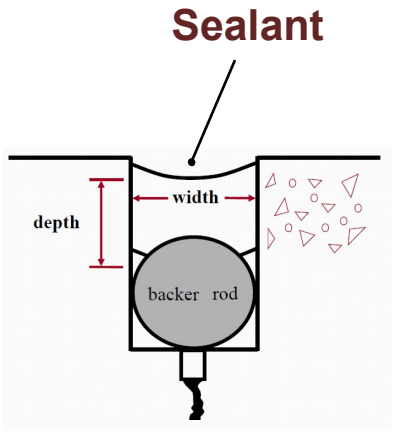
Transverse contraction joints involve the following steps:

- Initial sawcut: control cracking
- Widening: joint sealant reservoir
- Cleaning reservoir faces
- Placing a backer rod
- Placing sealant material



Jointed Concrete Pavement Performance Components





Alternate Methods

9 states - using alternates to joint sealing.

- Using the reduced maximum joint opening w/o sealant.

Examples of responses include:

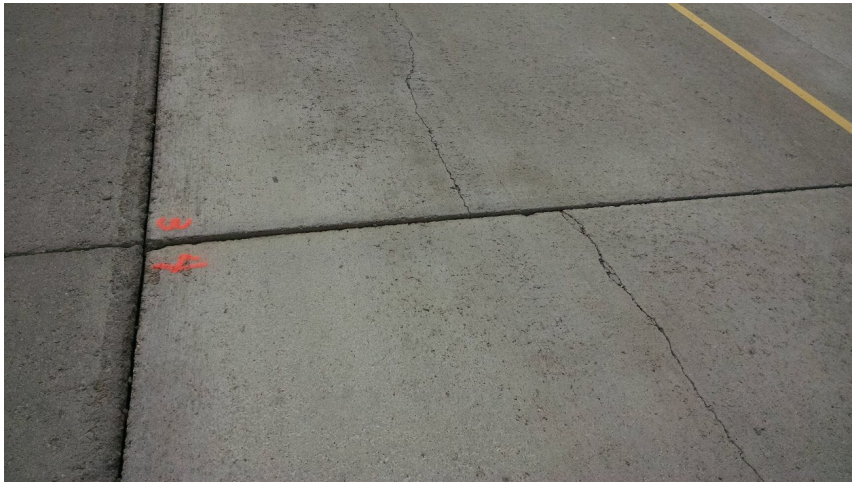
- A very narrow single cut and left open.
- Joint width 1/8 in. at t/3,speed limit >45 mph.
- Single saw cut and a non-erodible cement treated base.
- Filled with a hot-pour sealant.

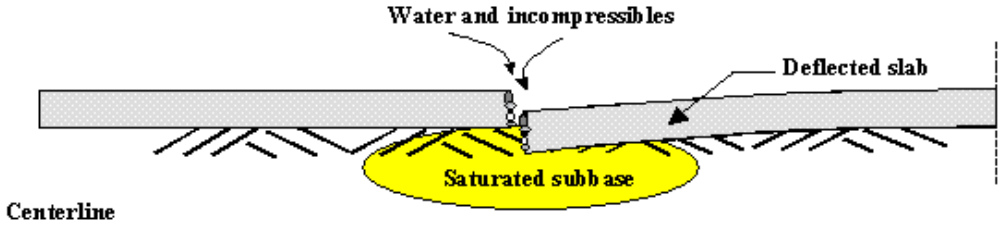
Joint Sealant Failures

Reduce the risk of pumping, erosion, D-cracking or any other moisture intrusion deterioration (Taylor 2012).


Google

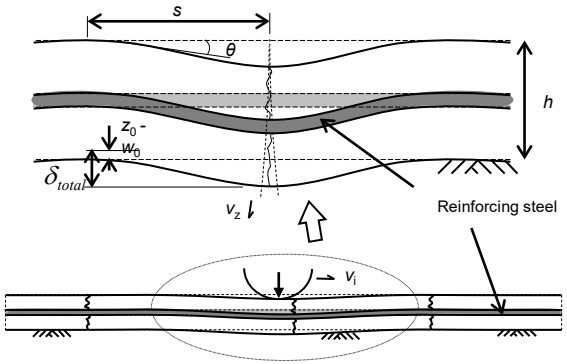
Pumping and Erosion



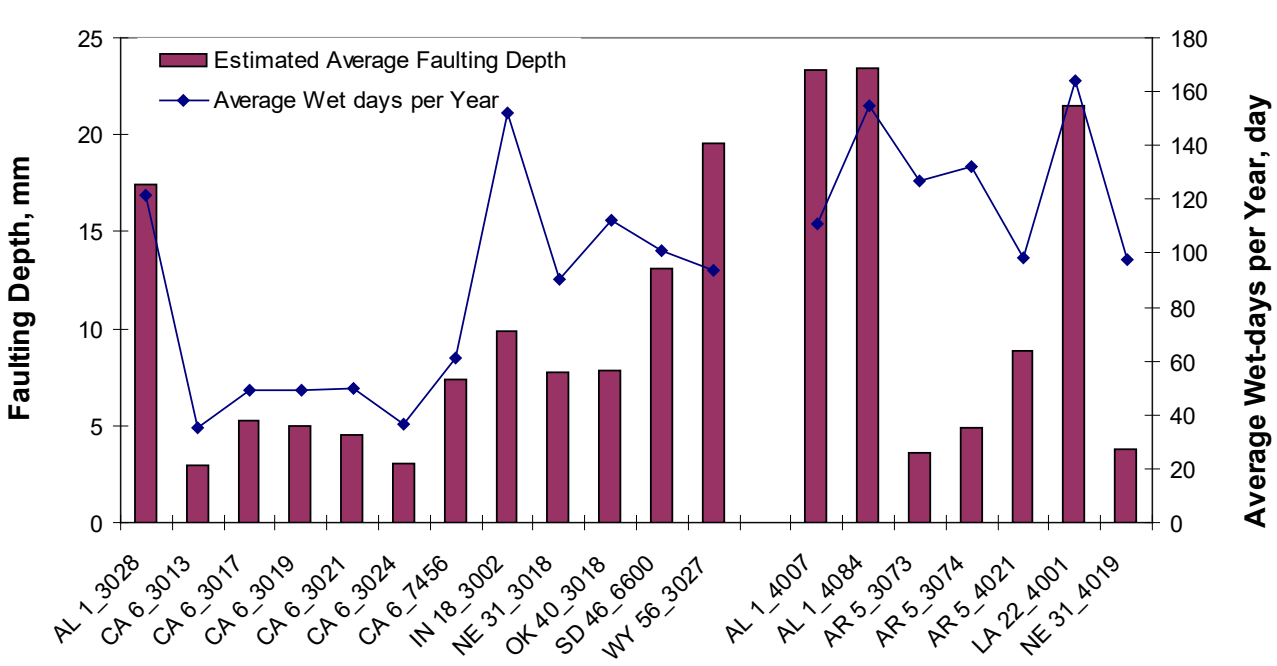


Subbase/Base Layers

- Erosion (between layers)
  - Support
  - Load Transfer



Estimated Average Faulting Depth



Wet days in LTPP database is defined as the number of days for which precipitation was greater than 0.25 mm for year

Joint Sealant Failures

Restrict the entry and lodging of incompressible materials

Blowup/Buckling

General

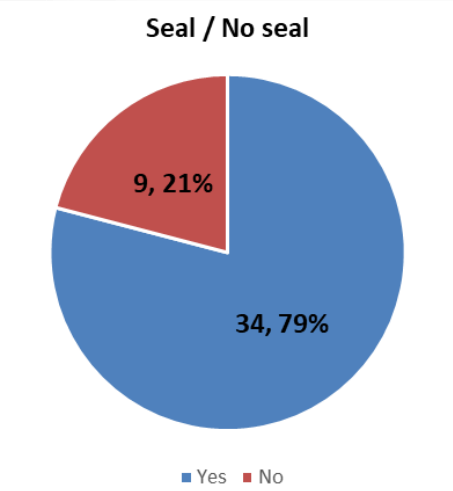


Figure 14. Use of joint sealant in concrete pavement.

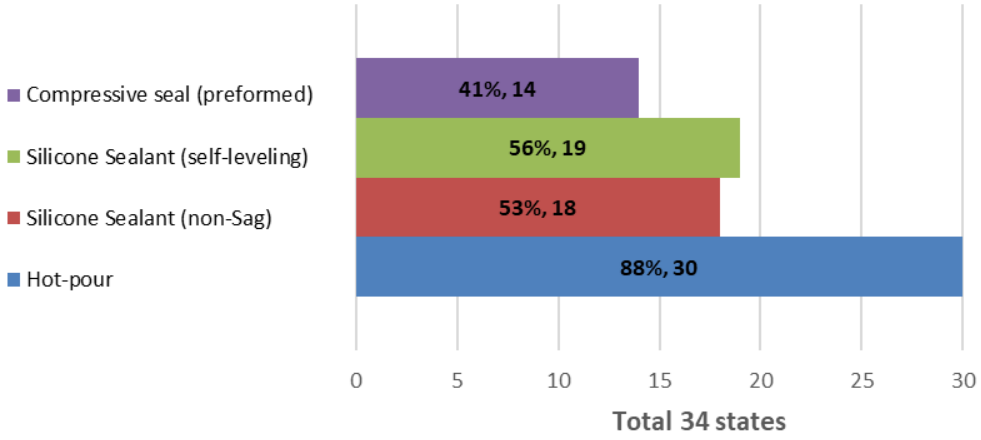
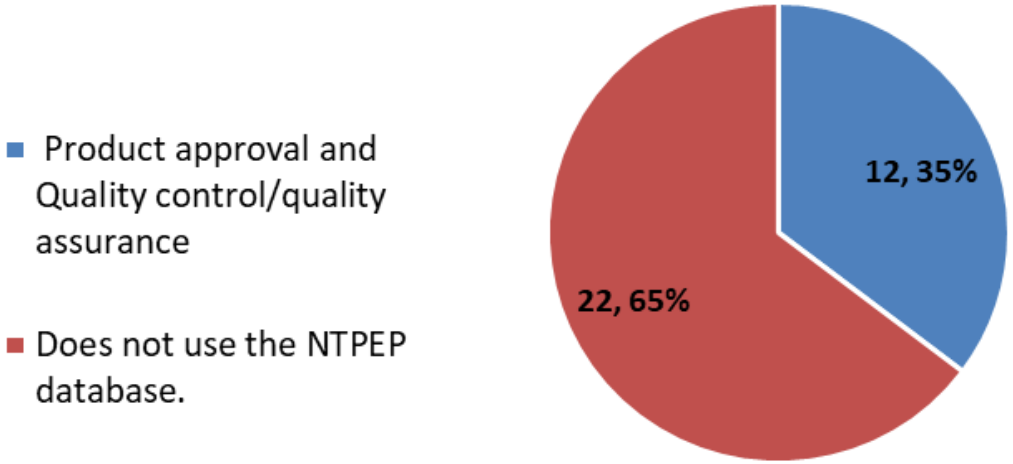


Figure 15. Type of joint sealant used.

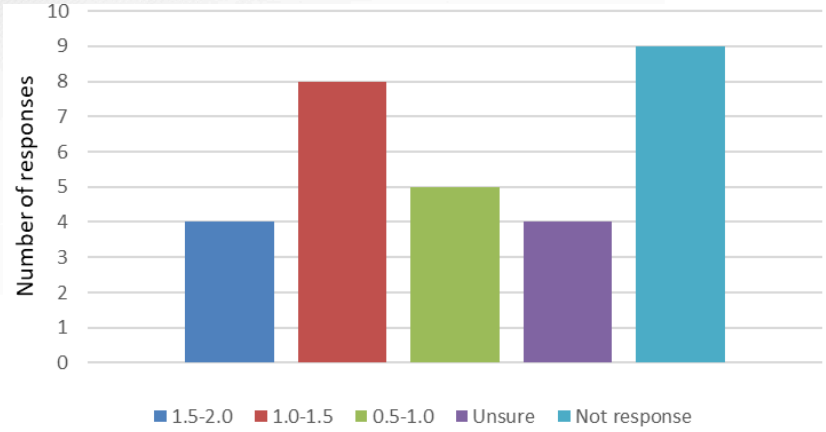
NTPEP DATA

NTPEP data-PCC Joint Seals and HMA Crack Seals (JS-CS)

- Integrated information on joint sealants (product information, placement information, material test information, and performance data of the joint sealant)



Design of the Joint Sealant, SF



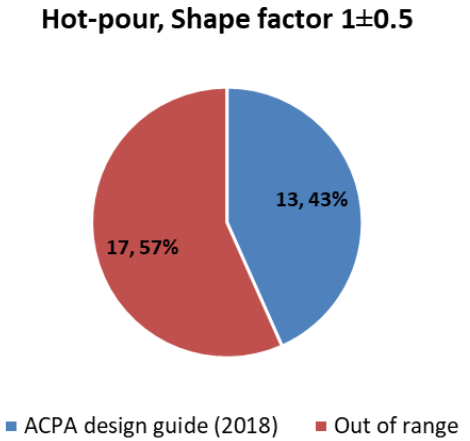
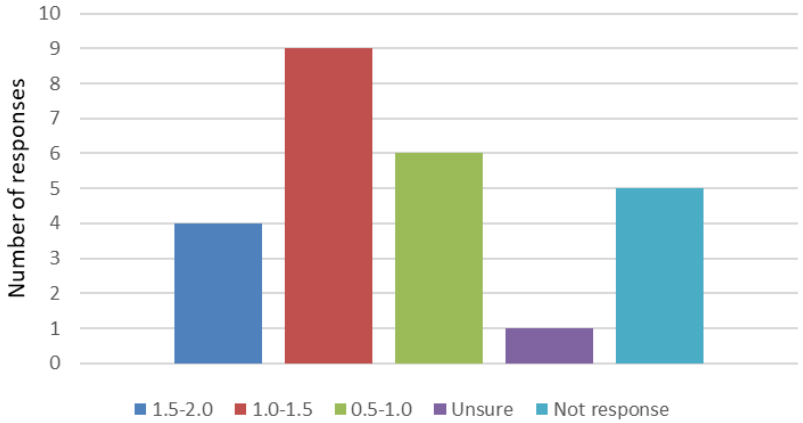


Figure 17. The range of shape factor, hot-pour sealant.



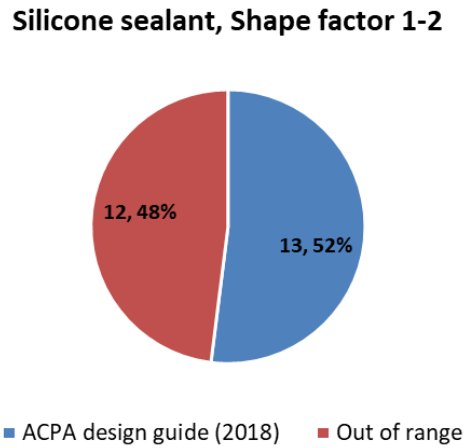


Figure 18. The range of shape factor, silicone sealant.

Design of the Joint Sealant, Joint width and Configuration

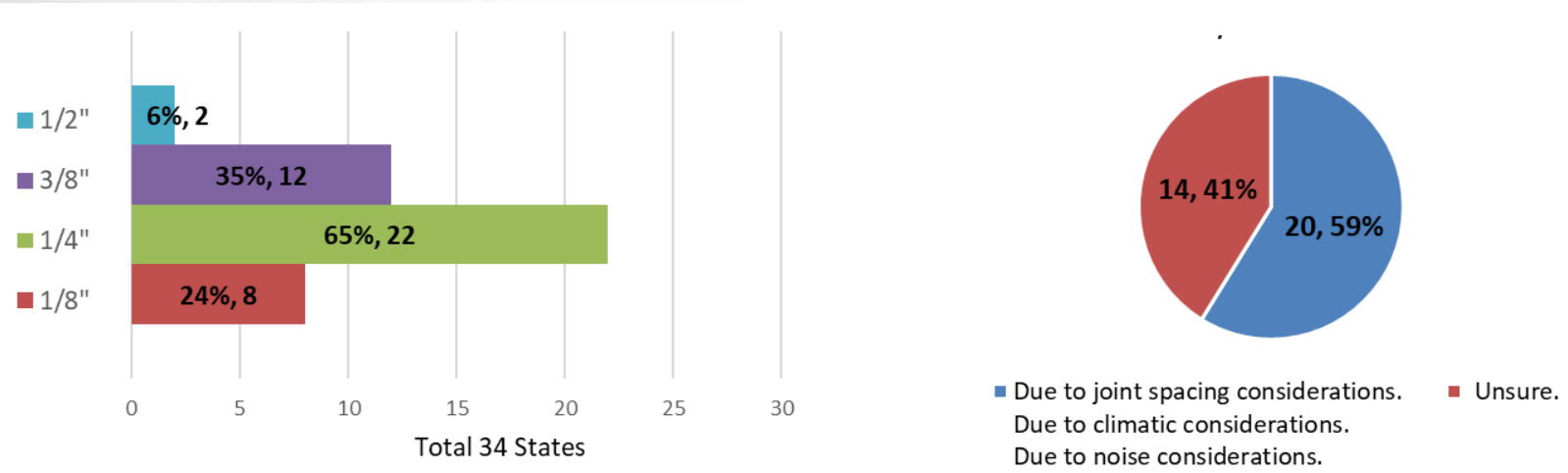
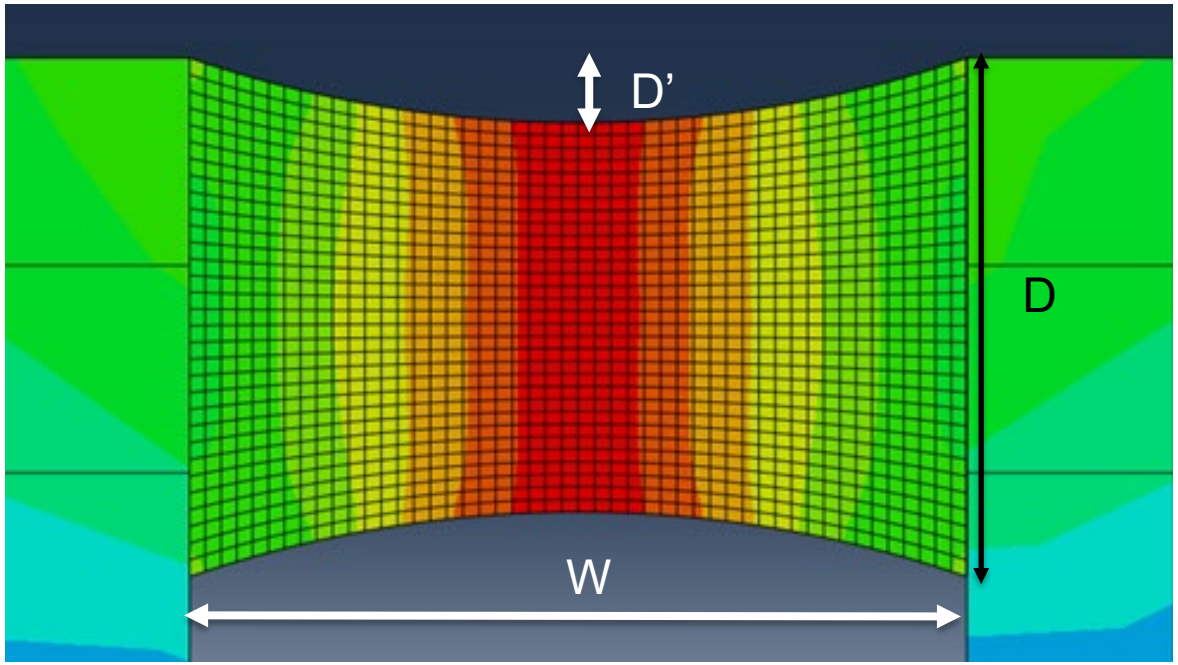


Figure 19. Typical reservoir widths and the reason using the widths.

Figure 20. Sealant configuration.

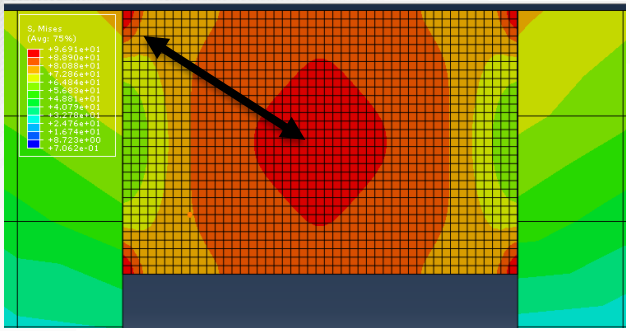
The Degree of Curvature

$$DoC = 2 \times \frac{D'}{D} \times SF = 2\frac{D'}{D}\frac{D}{W} = 2\frac{D'}{W}$$

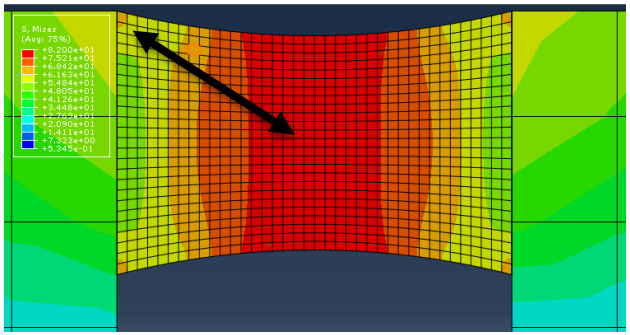


Stress profile @ 25% strain

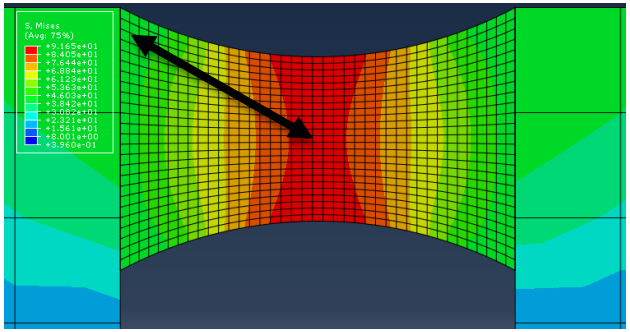
- DoC 0



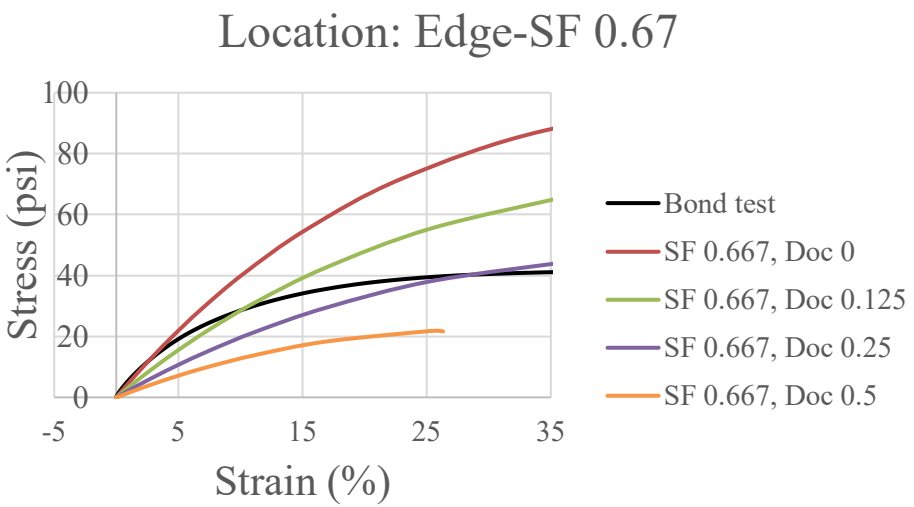
- DoC 0.125



- DoC 0.25



Joint Movement



Joint Preparation, cleaning and inspection

Cleaning

The method of cleaning and preparing the saw cut for sealing used by State Agencies.

- Cleaning multiple times in various ways and orders
- Practices and specification of cleaning practices seem to vary widely from State to State.

Inspection

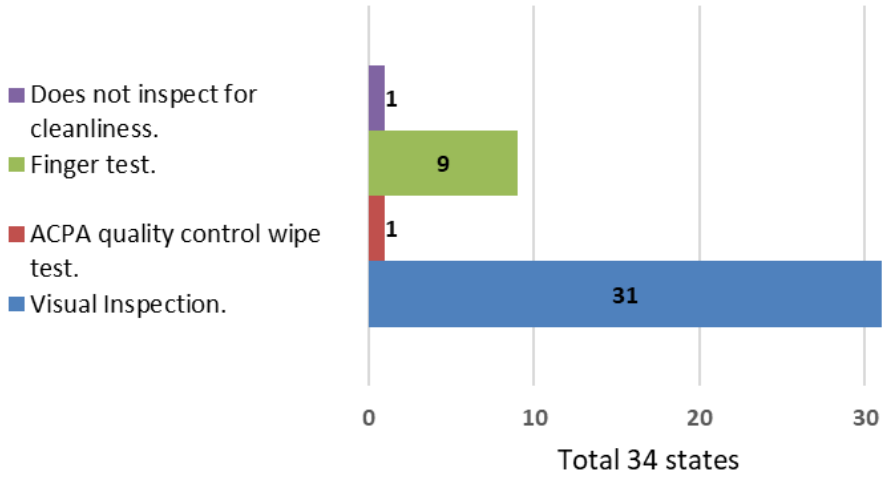
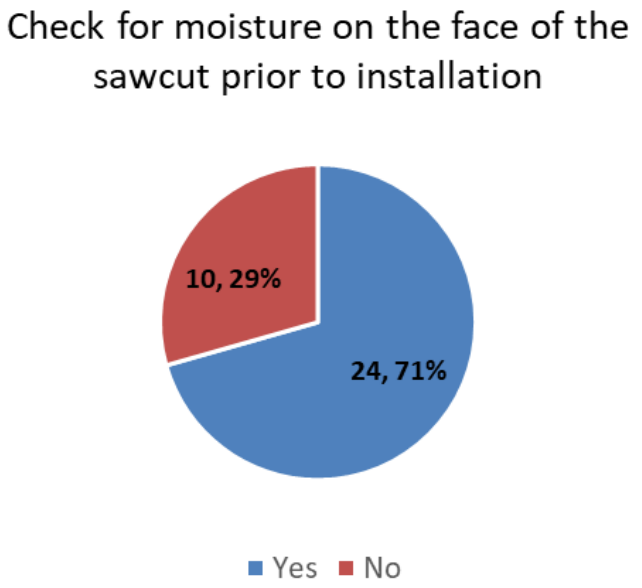


Figure 21. Inspection method for sawcut cleanliness.

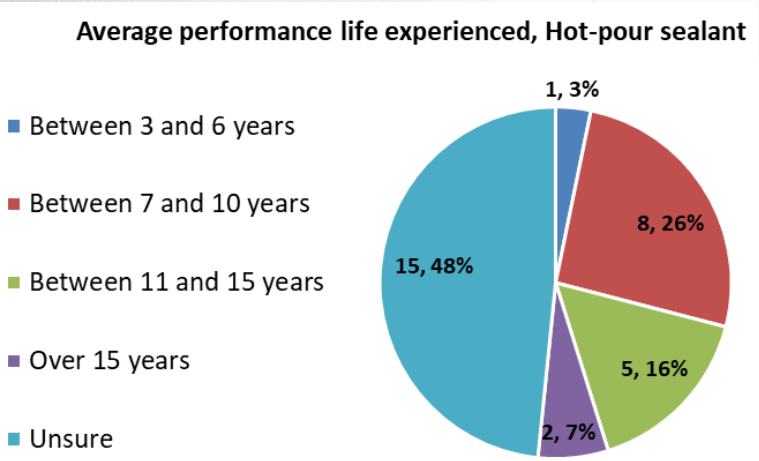
Joint Preparation, Joint Well Drying

Most states delegated the 'when to seal' decision to the contractor, and examples of responses include:

- There is no minimum time..
- Depends upon contractor.
- A wait time is not specified
- As soon as possible after placing backer rods.
- Not specified as long as the joint is thoroughly clean and dry before sealing.
- Wait until clean and dry.
- No required wait period but can be a day or more in advance as long as it hasn't rained and it's still clean.



Performance



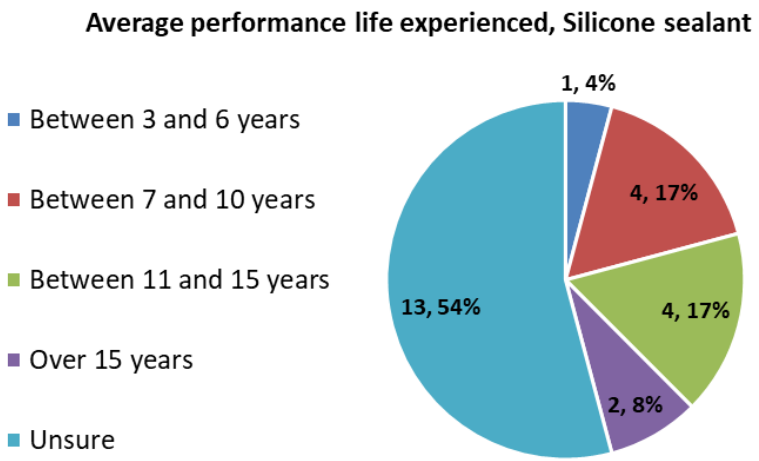
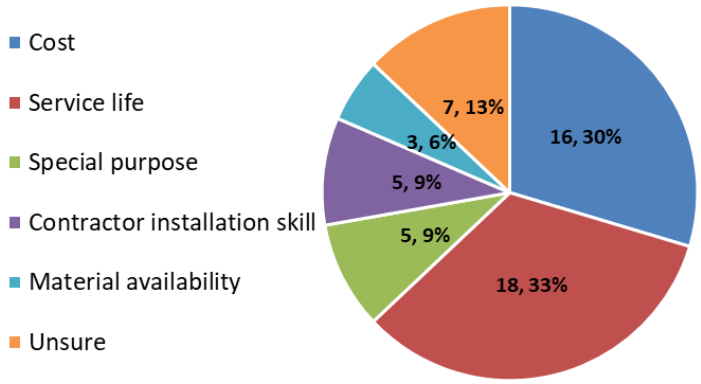


Figure 22. Results of responses to average performance life.



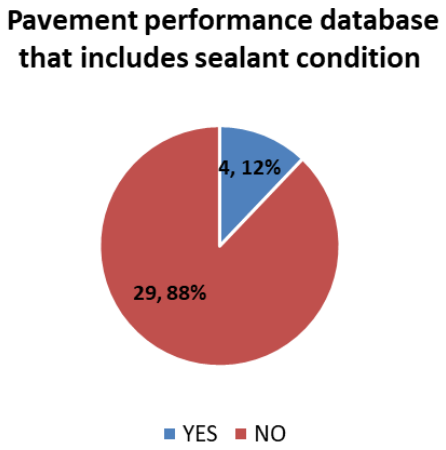
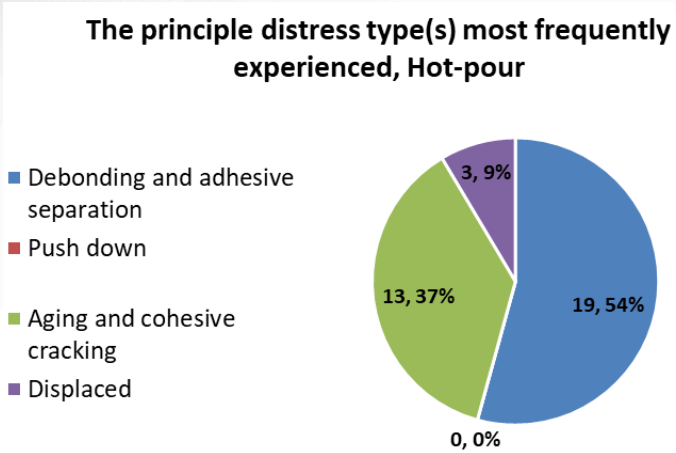
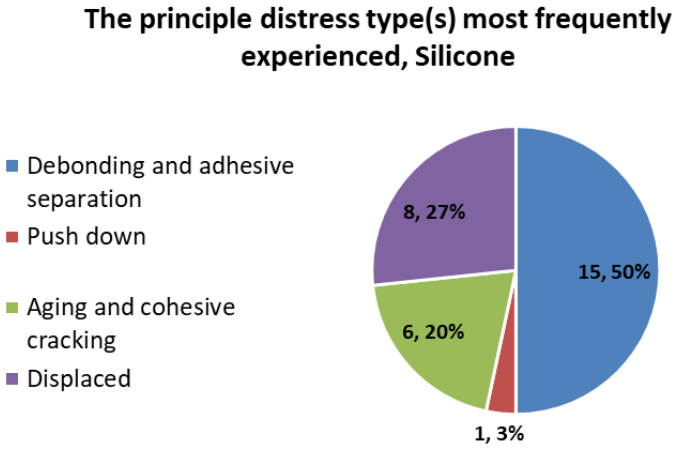


Figure 23. (L) Important factor in sealant type selection and (R) investigation of pavement performance database.

Performance, Distress





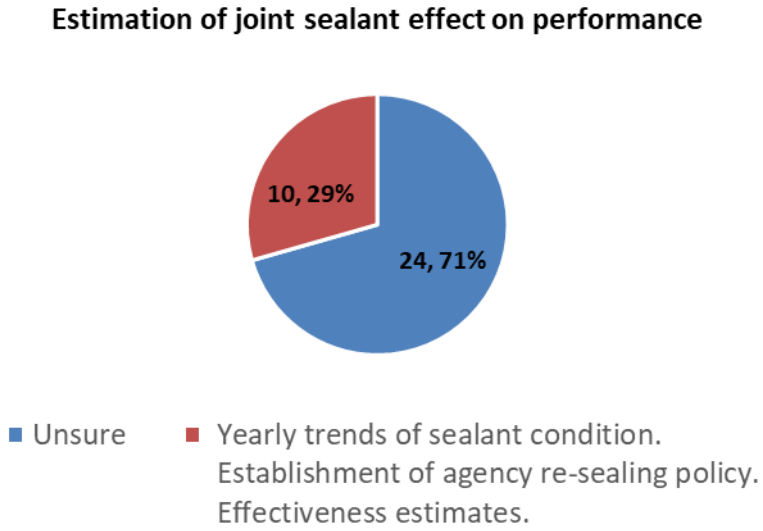


Figure 24. The principle distress type experienced.

Maintenance (Resealing)

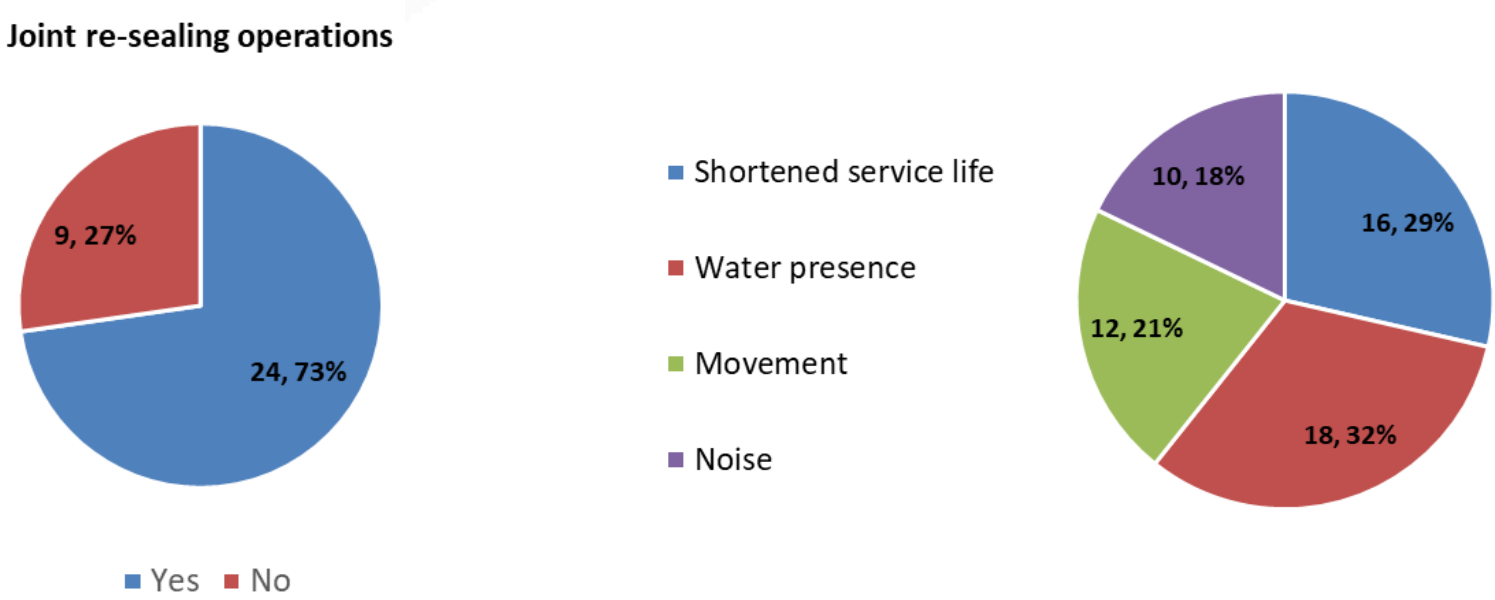
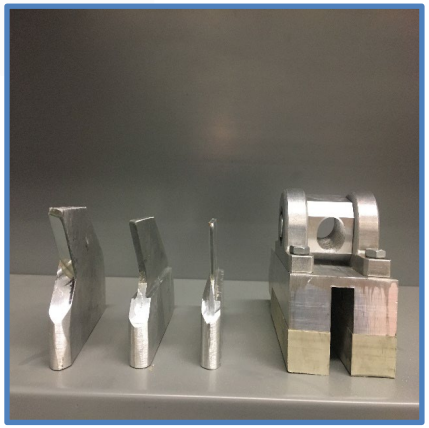
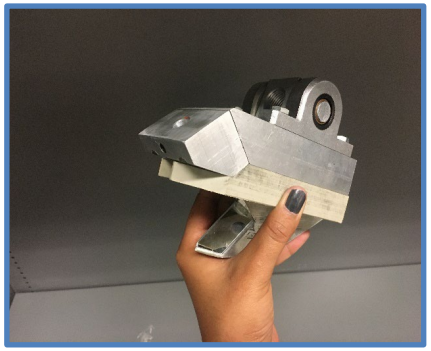


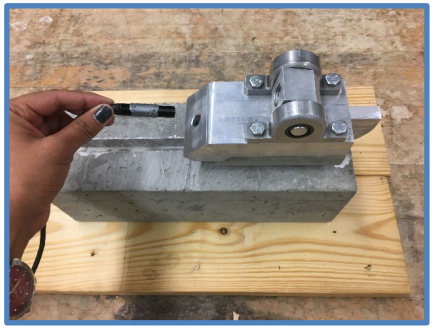
Figure 25. Joint re-sealing operation and the issues with joint seals.

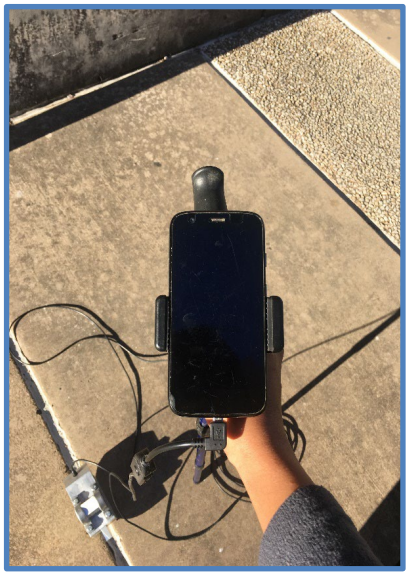
Jointing Cleaning and Sealing Practices: Inspection

- Endoscopic camera
- Android Phone
- Phone Holder
- Blades with mirror
- Blade holder

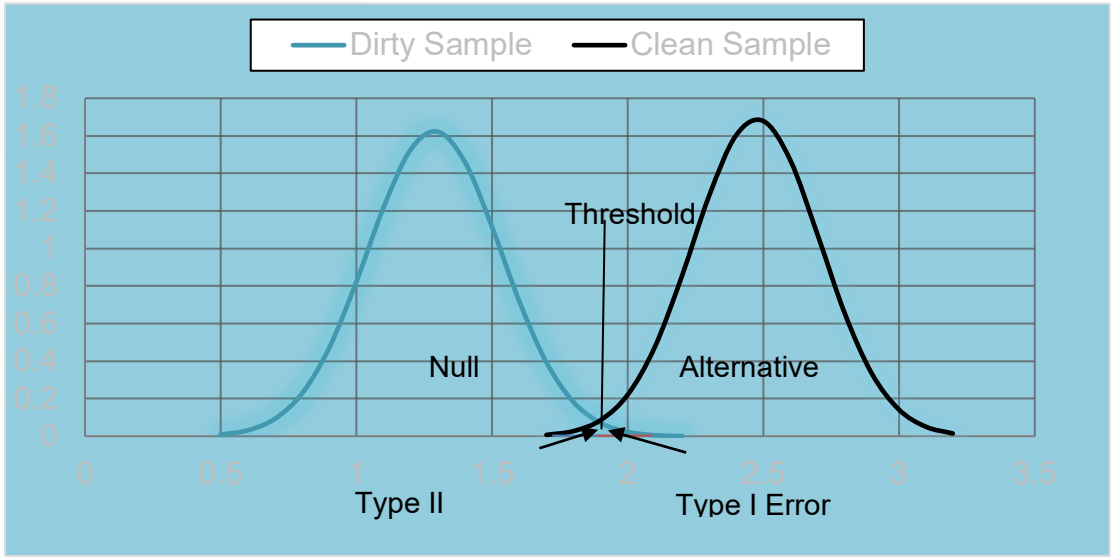


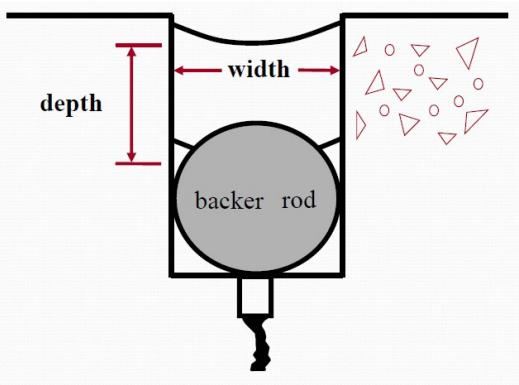






Jointing Cleaning and Sealing Practices: QA/QC



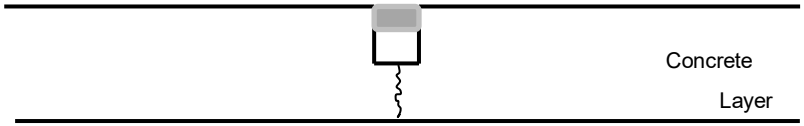


Joint Sealant Design Practice: Estimated Number of Wet days (NwD)

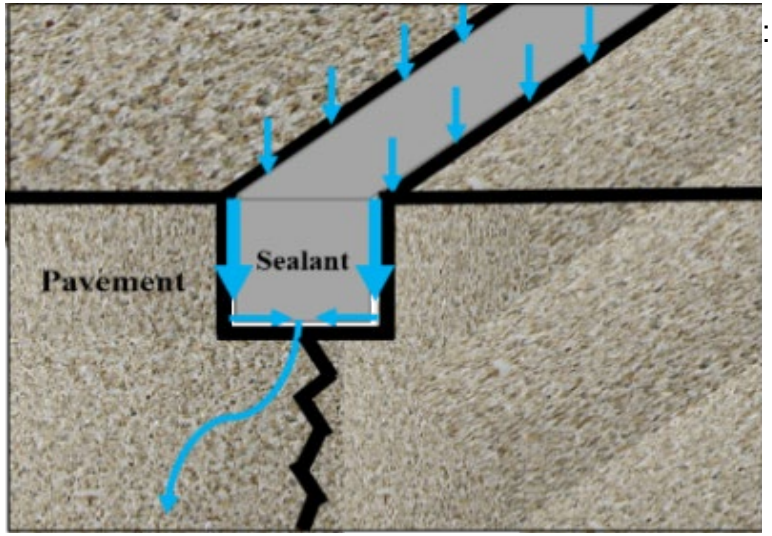
$$P = f(P_1, P_2)$$

1. Rainfall

2. Joint Sealant



3. Sub-base drainage



Conclusions and Recommendations

- Lack of tracking sealant condition and its impact on tracking performance.
- Deviating from established SF recommendations
- Lack of control over inspection of cleaning and joint preparation.
- Lack of assessment tools and criteria for determining the need for joint sealing, joint sealant selection, or timing of re-sealing operations.

Conclusions and Recommendations

- Joint widths tend to be narrower than ACPA's design guidelines.
  - Follow SF guidelines
  - Consider the effect on method of cleaning
- Work towards establishing a performance record for joint filling.
  - Narrow and deep joint sealant configuration tends to increase stress levels
  - Deboning increases potential of erosion.
- Greater uniformity in joint preparation operations.
  - In some states, joint preparation procedures and methods are delegated to the installation contractor.

Conclusions and Recommendations

- Different SF and DoC's may result in different life spans for the same sealant type.
  - Properly formulated databases can be used for analysis of the performance of joint sealants.
  - Use of the NTPEP database is certainly a step in the right direction
- Performance of joint sealant tends to contribute greatly to concrete pavement life
- Recommend performance study to tie sealant condition to its configuraton and behavior to service life of the entire pavement system.

Thank you

Case Studies of Successful Practices

Larry Scofield
IGGA and ACPA

IGGA
International Grooving & Grinding Association
Your Pavement Preservation Resource since 1972

ACPA
AMERICAN CONCRETE PAVEMENT ASSOCIATION

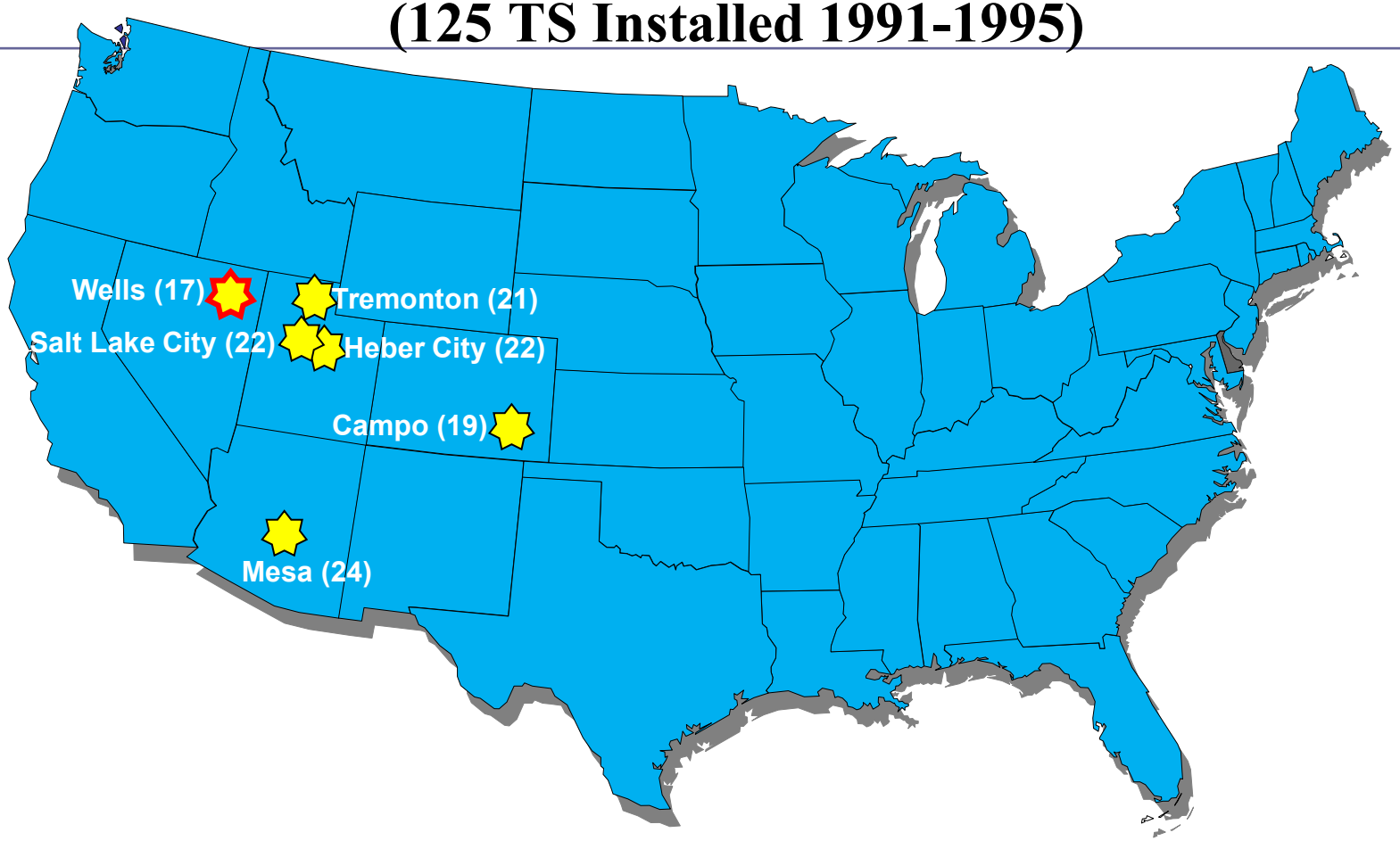
Presentation Outline

- Sealant Performance, Not Pavement Performance -

- LTPP SPS-4 Supplemental Test Sections
- LTPP SPS-2 Transverse Joint Seal Performance
- SHRP Joint Reseal Experiment
- Fairchild Airforce Base Test Sections
- SDDOT Sealant Practices

LTPP SPS-4 Supplemental Test Sections

(125 TS Installed 1991-1995)



21 Sealant Materials Evaluated

Silicone Sealants

- Crafco 902
- Crafco RoadSaver 903-SL
- Dow Corning 888
- Dow Corning 888-SL
- Dow Corning 890-SL
- Mobay Baysilone 960
- Mobay Baysilone 960-SL

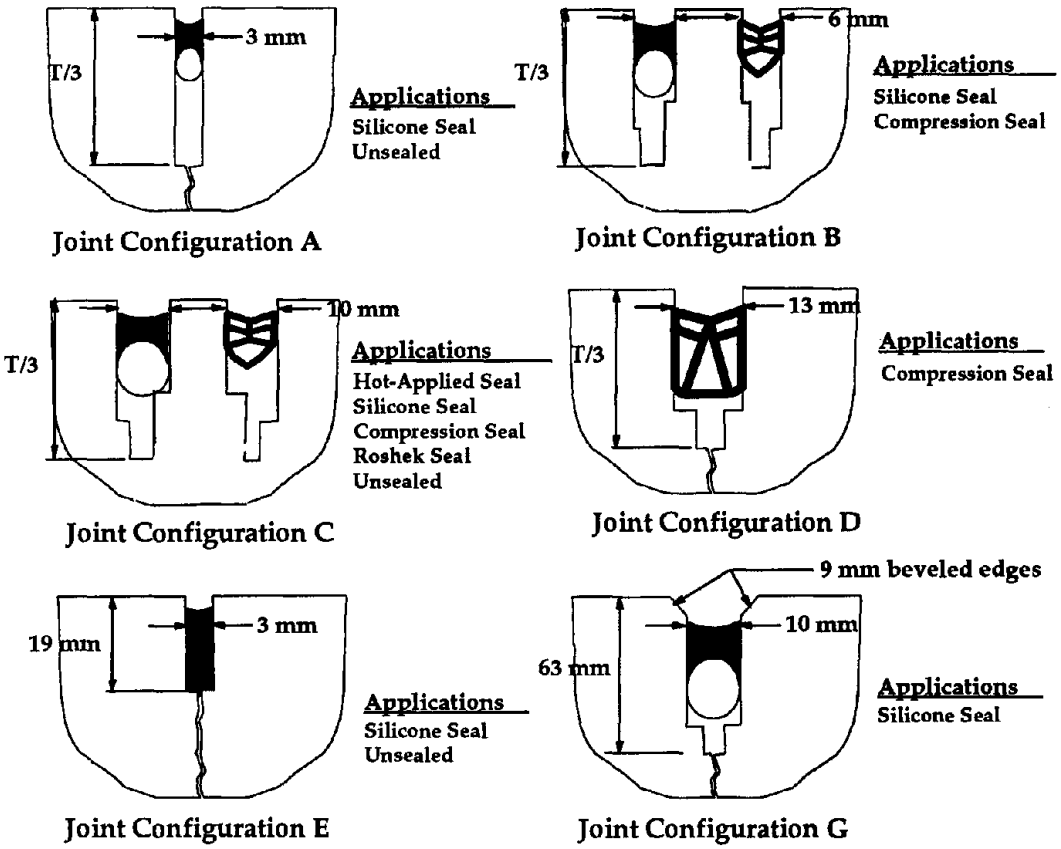
Hot Pour Sealants

- Crafco RS 221
- Crafco SuperSeal 444
- Koch 9005
- Koch 9012

Compression Seals

- D.S. Brown E-437H
- D.S. Brown V-687
- D.S. Brown V-812
- Kold Seal Neo Loop
- Esco PV 687
- Watson Bowman 687
- Watson Bowman 812

7 Joint Configurations Evaluated



Longitudinal Joint Conditions

- AZ and NV sites Longitudinal Joints Sealed with Same Sealant Type
- All Other Locations a Single Longitudinal Joint Seal was Used Throughout the Project

Joint Preparation

- **Mesa Site**: Water Blasted, Abrasive Blasted, Air Blown
- **Wells Site**: Abrasive Blasted, Air Blown
- **Tremonton Site**: Water Blasted and Air blasted
- **Salt Lake City**: Air Blasted Only
- **Campo**?
- **Heber City**?

Evaluation Periods

- **US 60 Mesa, Arizona (Spring 1991 – 2006) (7 - 15 yrs)**
- **US87 Campo, Colorado (Fall 1995 – 1998) (3 yrs)**
- **I-80 Wells, Nevada (Summer 1991- 1998) (7 yrs)**
- **I-15 Tremonton, Utah (Fall 1990 – 1998 (8 yrs)**
- **UT 154 Salt Lake City, Utah (Spring 1992- 1998) (6 yrs)**
- **Heber City, Utah (Fall 1991 – 1998 (7 yrs)**

Sealant Performance by 1998
(2 to 7 yrs)

Sealant Material	Joint Config.	Overall Effectiveness, % joint length					
		Mesa, AZ (US 60)	Campo, CO (US 287)	Wells, NV (I-80)	Tremonton, UT (I-15)	Salt Lake City, UT (UT 154)	Heber City, UT (US 40)
Crafco RS 221	C	10.7				42.4	
Crafco SS 444	C	31.7					
Crafco 902	A		97.5				
	B		97.1				
	C		98.8	84.3			
	G		96.2				
Crafco 903-SL	A		85.4				
	B		97.7				
	C	98.0	99.0	87.0			
Dow 888	C	98.9		94.2[a]		77.7	15.9
Dow 888-SL	C	97.7		90.1	48.1	72.6	19.2
Dow 890-SL	A	96.5			79.1	25.6	32.3
	B	98.4					
	C	98.8		89.3			
	E				80.9[b]	60.2	67.6
DS Brown E-437H	B		65.7[b]			21.3	73.7
DS Brown V-687	C	29.7	82.5[b]			69.9	93.2
DS Brown V-812	D			35.6			
Koch 9005	C				9.2		49.2
Koch 9012	C				0.0	30.1	44.0
Koch 9050-SL	C					18.2	0.1
Kold Seal	C				1.3		
Mobay 960	C			85.6	93.7		
Mobay 960-SL	C	96.3					
Roshek	A				14.8[b]		
Esco PV 687	C				21.0		
Watson Bowman 687	C	87.2[b]					
Watson Bowman 812	C	90.2[b]					
Polyethylene	F			0.0[b]			

Failed Treatment

Sealant Effectiveness

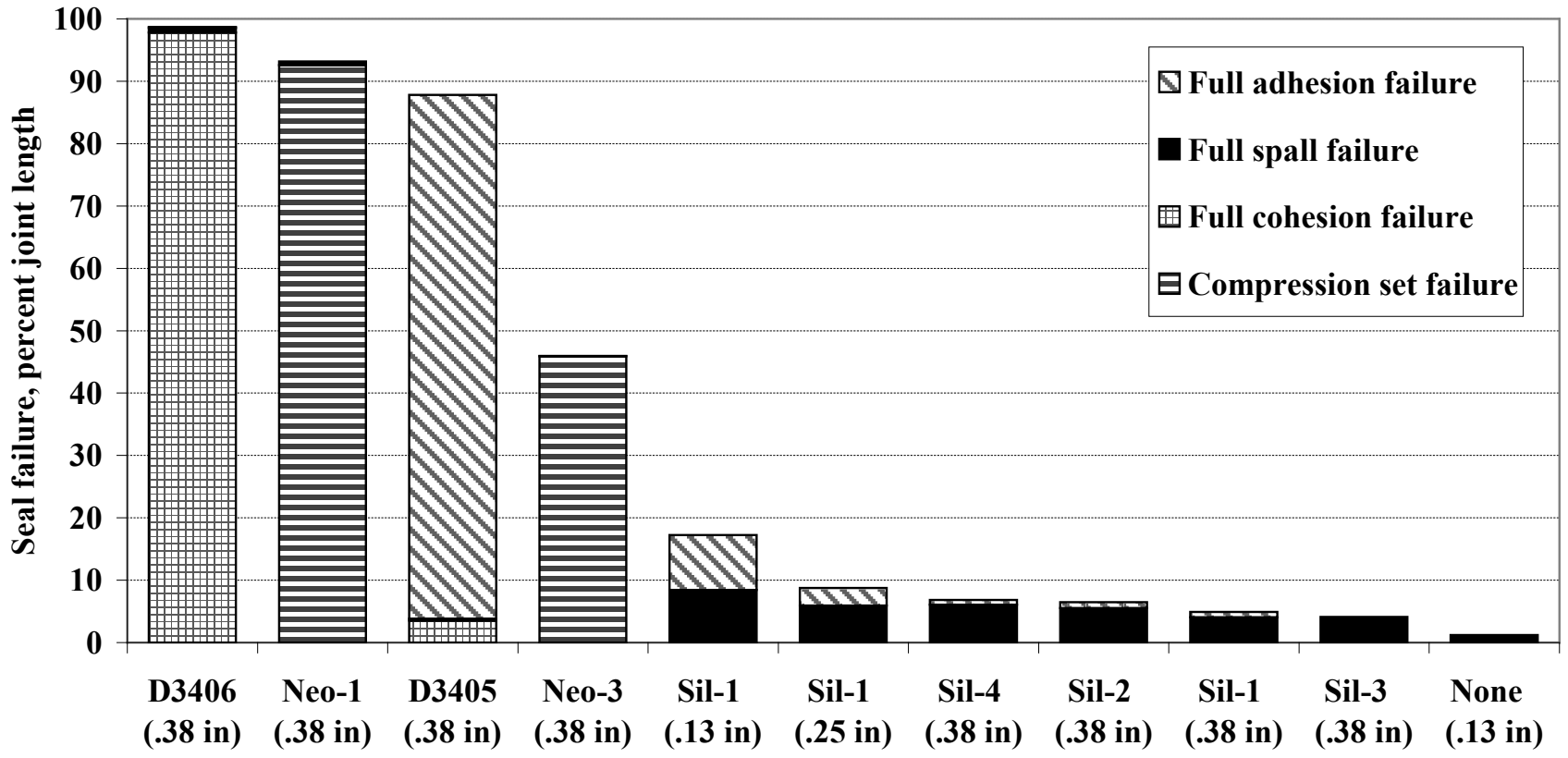
Rating	Effectiveness Level, %	Number of Treatments
Very good	90 to 100	18
Good	80.0 to 89.9	8
Fair	65.0 to 79.9	7
Poor	50.0 to 64.9	1
Very poor (failed)	0 to 49.9	22

Belangie and Anderson Rating- 1985

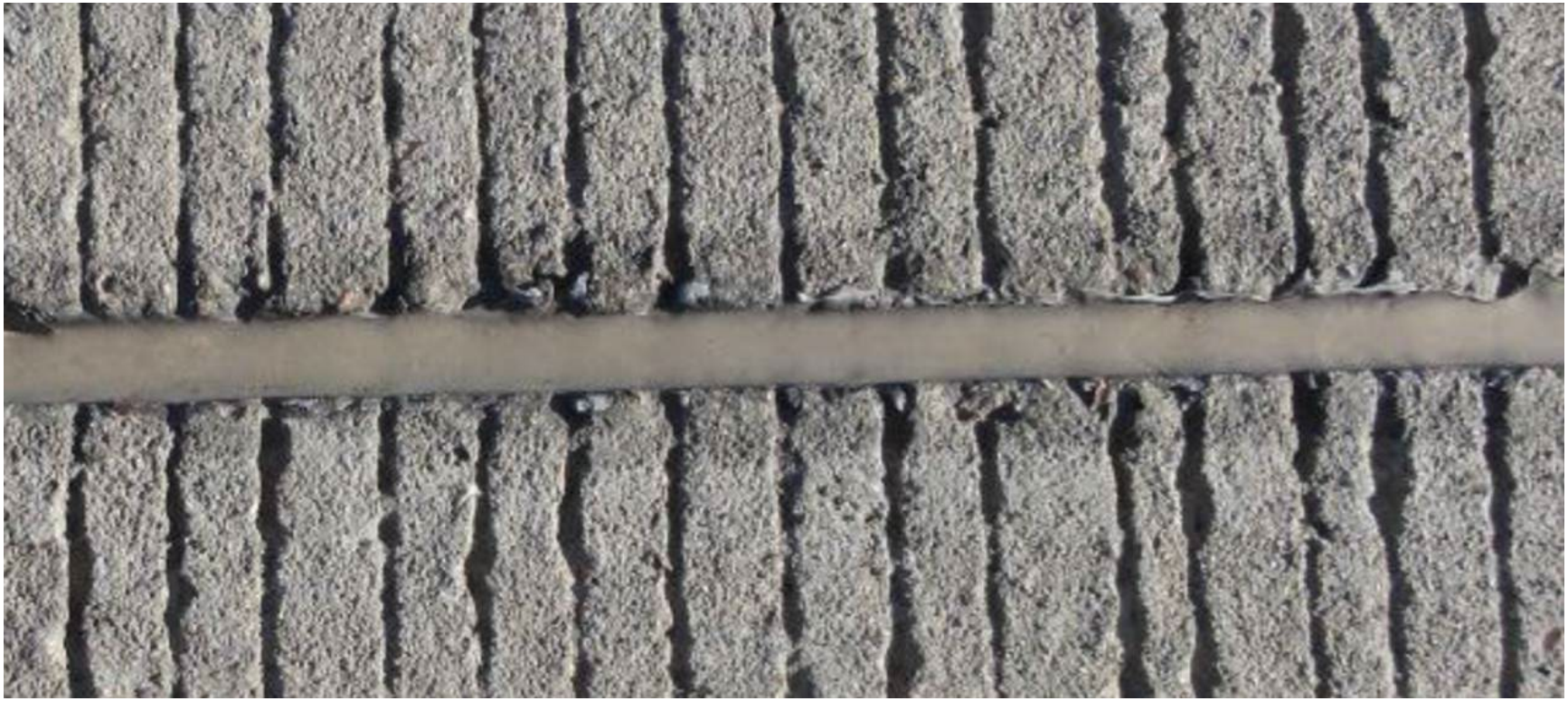
Failure Mode by Sealant Type

- Silicone Sealants
  - Non Sag: Spall Failure and Adhesive Failure
  - Self Leveling: Adhesive Failure
- Hot Pour Sealants
  - Adhesive failure
- Compression Seals
  - Compression Set and Gap failure.

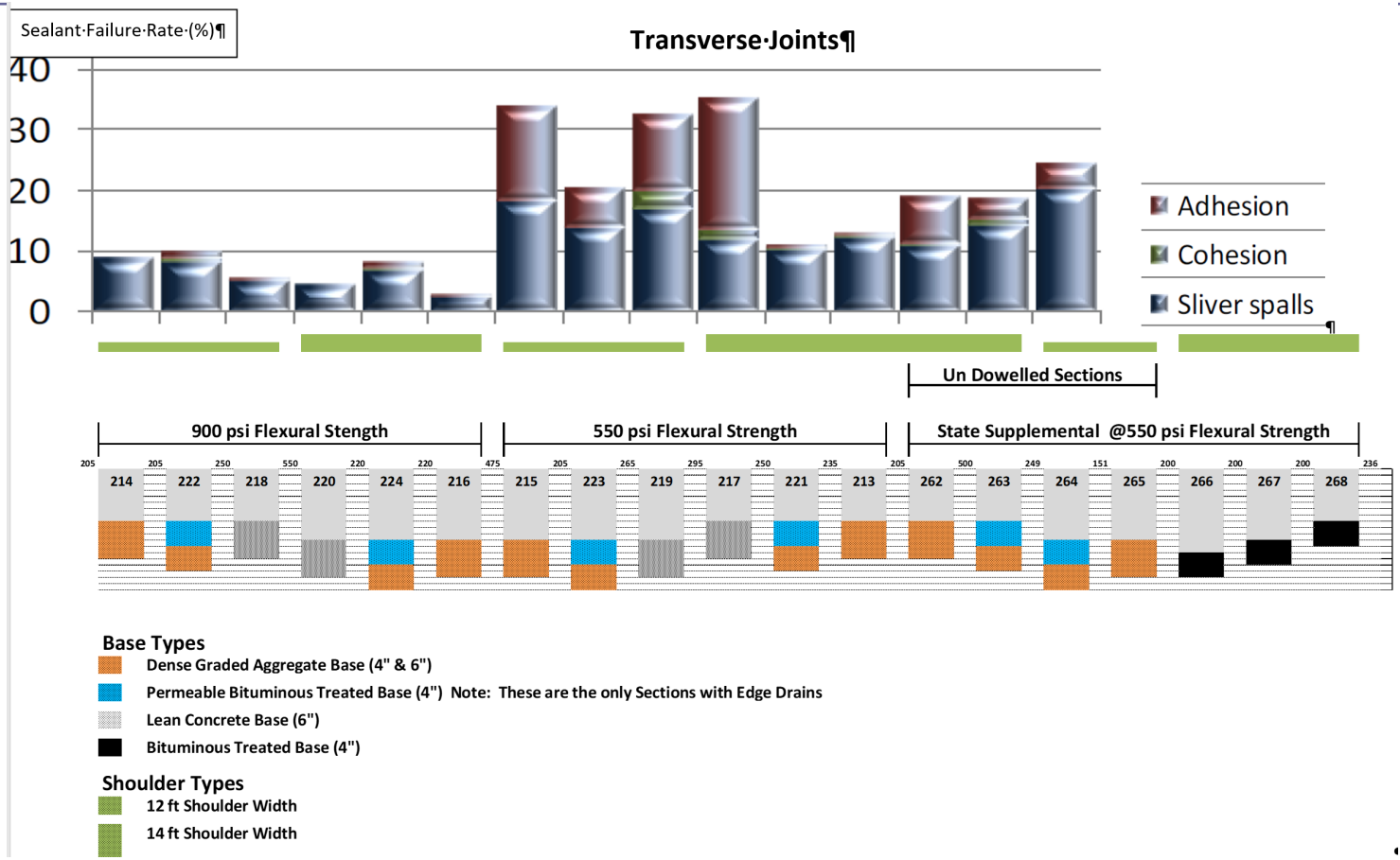
AZ SPS-4: The Rest of the Story- Sealant Failure after 15 Years



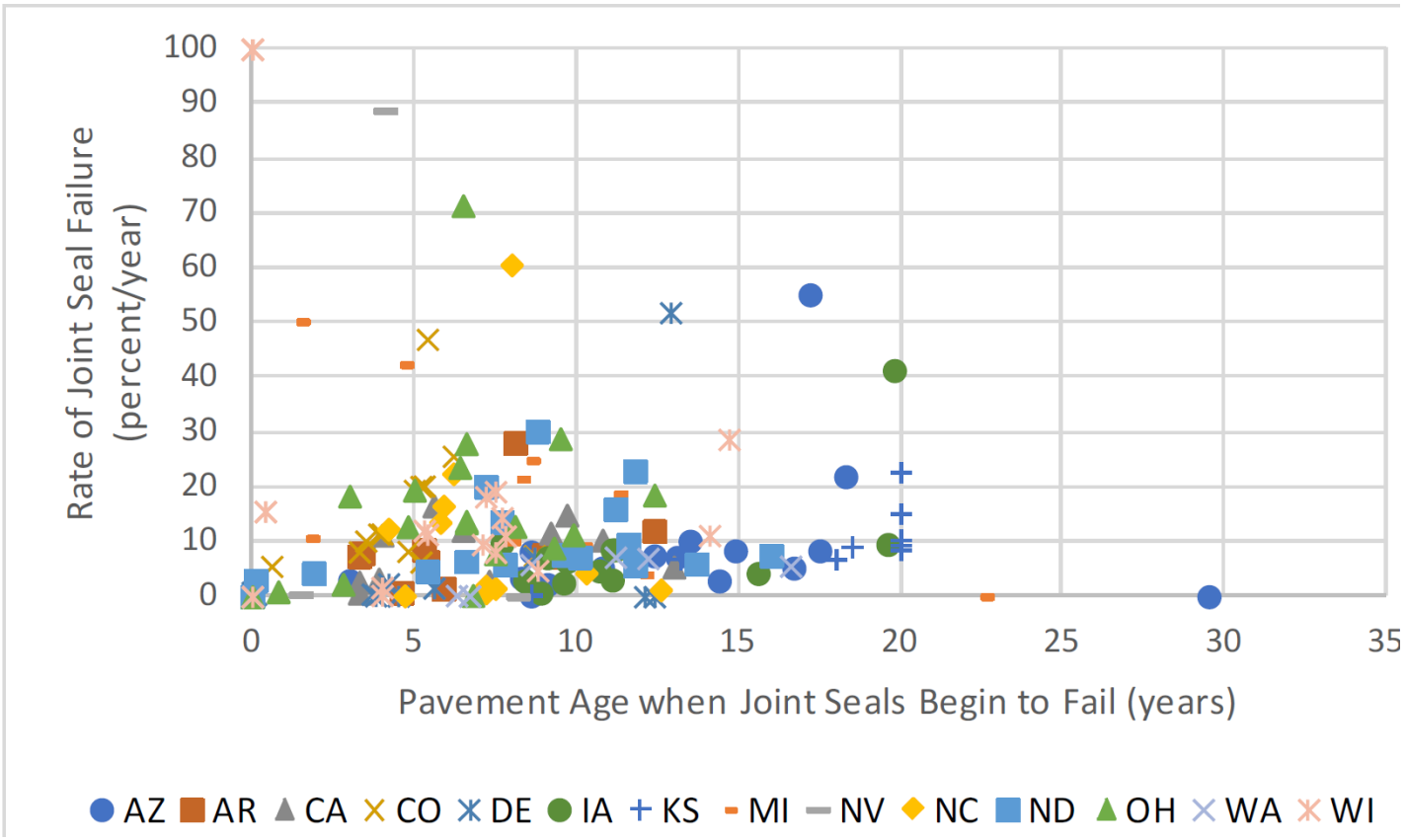
AZ SPS-2 Silicone Sealant after 20 Years and 32 million ESALS



AZ SPS-2 Silicone Sealant after 20 Years and 32 million ESALS



LTPP SPS-2 National Sealant Results

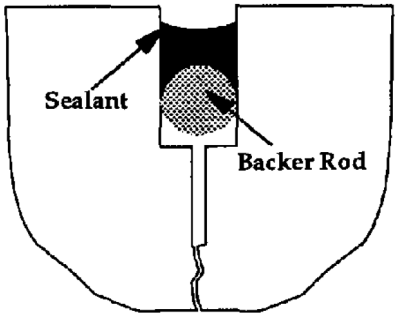


Courtesy of NCE

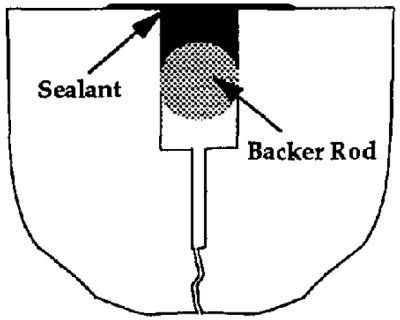
SHRP Joint Reseal Experiment

- Between April and June 1991, 1,600 Joints were Resealed at 5 Test Sites using 12 Sealant Materials and 4 Methods of Installation
- Sealant Types:
  - Hot Pour: Crafco Roadsaver 232, Koch 9005, Koch 9030, Low Modulus Rubberized Asphalt Sealant Rubberized Asphalt Sealant
  - Silicone: Meadows Sof-seal, Dow Corning 888, Dow Corning 888-SL, Mobay Baysilone 960-SL
- Additional State Supplemental Sealants Installed
- 82 Months of Evaluation (almost 7 yrs)

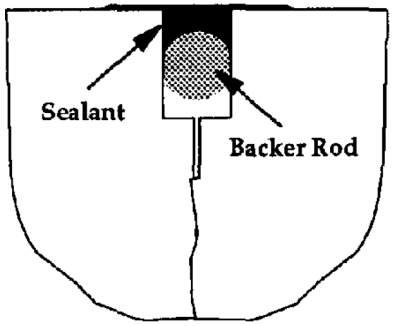
Joint Seal Configurations



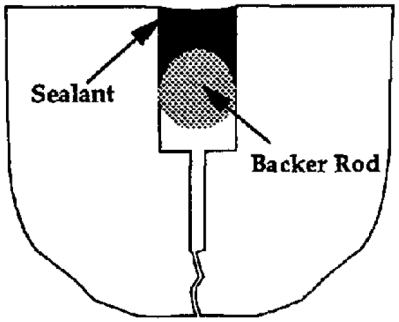
Method 1 Configuration
Saw and Recessed



Method 2 Configuration
Saw and Overband



Method 3 Configuration
Plow and Overband



Method 4 Configuration
Saw and Flush-fill

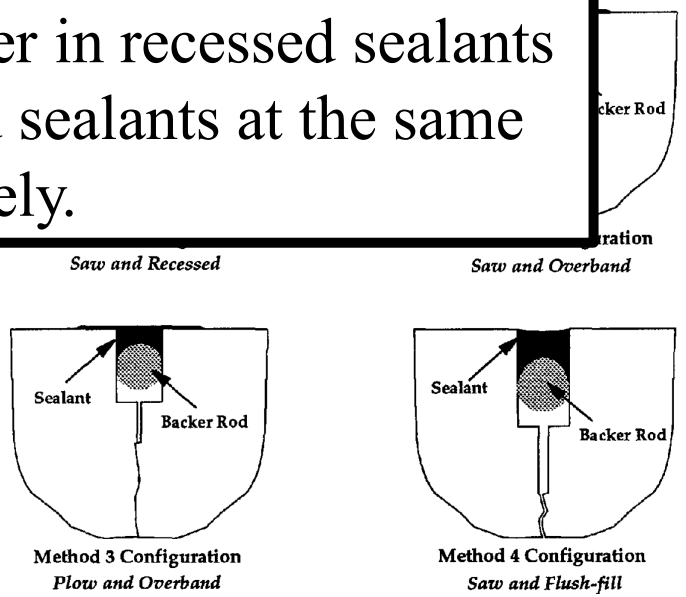
Locations of Resealing Test Sites and Climatic Regions

Overall Sealant Effectiveness after 82 Months

Sealant Material	Config-uration	Total Joints	Overall Effectiveness, percent joint length				
			Arizona	Colorado	Iowa	Kentucky	South Carolina
Koch 9005	1	97	80	55	78	93	58
	2	97	87	47	79	97	86
	3	59			92	98	49
	4	38	50	63			
Crafco RS 221	1	98	40	66	63	78	74
	2	96	92	55	85	85	91
Meadows Hi-Spec	1	19	37				
	2	20	64				
	4	20	61				
Crafco RS 221	1	20	57				
	2	20	86				
	4	20	71				
Dow 888	1	93	99.7	88	86	97	99
Dow 888-SL	1	97	98	83	86	98	99
Mobay 960-SL	1	98	99	77	51	80	97
Mobay 960	1	18			89		
Crafco 903-SL	1	19	98				
Koch 9050	1	29		15		85	
Dow 888 w/ primer	1	10			89		
Dow 888-SL w/ primer	1	9			87		
Koch 9005 w/ primer	1	10				96	

Rating	Effectiveness Level, %	Number of Treatments
Very good	90 to 100	17
Good	80 to 89.9	18
Fair	65 to 79.9	8
Poor	50 to 64.9	19
Very poor (failed)	0 to 49.9	20

Full-depth adhesion loss was greater in recessed sealants than in overbanded and flush-filled sealants at the same site by 2.7 and 1.7 times, respectively.



Twenty-One Year Field Performance of Joint Resealing Project at Fairchild AFB

- US Army Engineer Research and Development Center and Crafco
- 16 Sealant Materials including Silicon and Hot Pour
- Three Installation Configurations
  - Recessed 1/8 to ¼ inch
  - Flush Filled with Overband
  - Primed before Installing Sealant
- Flush fill installation geometry increased life of the hot-applied asphalt sealants by over 50% compared to the standard recessed configuration
- Bubbling of hot-applied sealants did not appear to adversely affect overall sealant performance
- Asphalt based sealants generally failed in adhesion, while silicone sealants generally failed from spalling

Estimated Sealant Life to 75% Effectiveness (250 months)

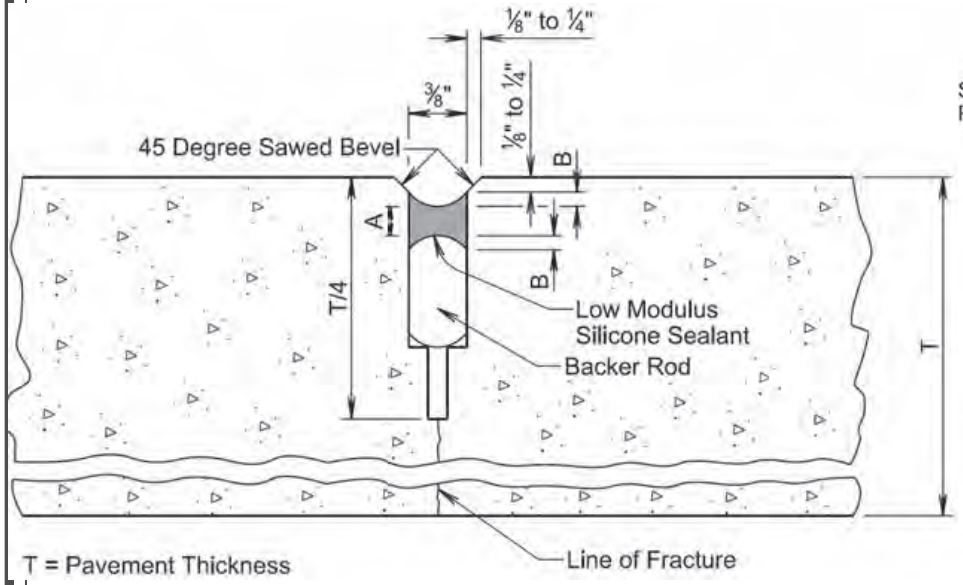
Sealant	Installation	Life, years
Crafco	Recess	11.4

South Dakota DOT Sealant Procedures and Performance

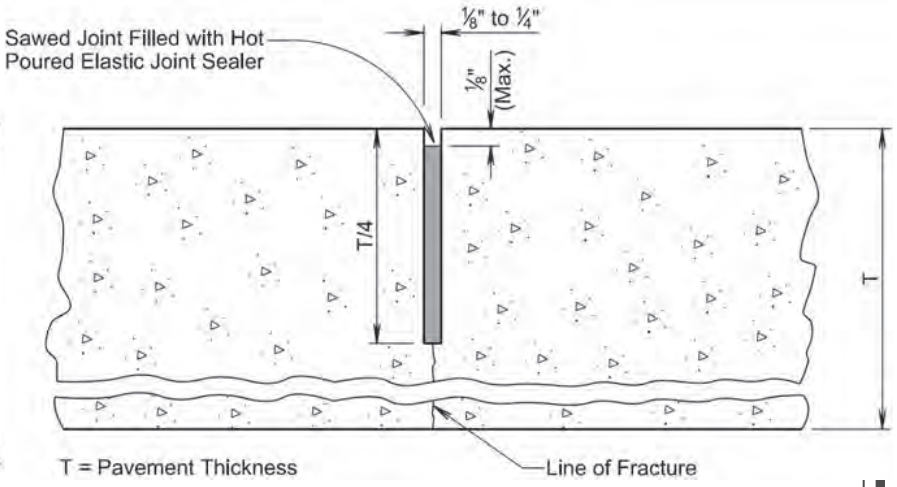
- Joint Sealants Demonstrate Performance Greater than 15 years of Service Life
- SDDOT Uses Silicone Sealants on Rural High-Speed Routes and Hot-pour Sealants on Urban Slower Routes that Typically Include Curb and Gutter
- In Urban Pavements, Dirt, Sand, Snow, and Ice Accumulate in Joints and Then Traffic Packs it Down on Top of the Silicone Sealant, Pushing it Down Causing Adhesion Failure
- Quality Inspection:
  - **Silicone Sealant**: Inspectors Ensure Proper Cleanliness Using Wipe Test, Proper Recess, and Proper Shape Factor
  - Hot Pour Sealant: Inspectors Ensure Proper Cleanliness and Sealant Depth
- Project-level resealing is done by contract and occurs every 12 to 25 years

SDDOT Joint Seal Design Details

Silicone Installation



Hot Pour Installation

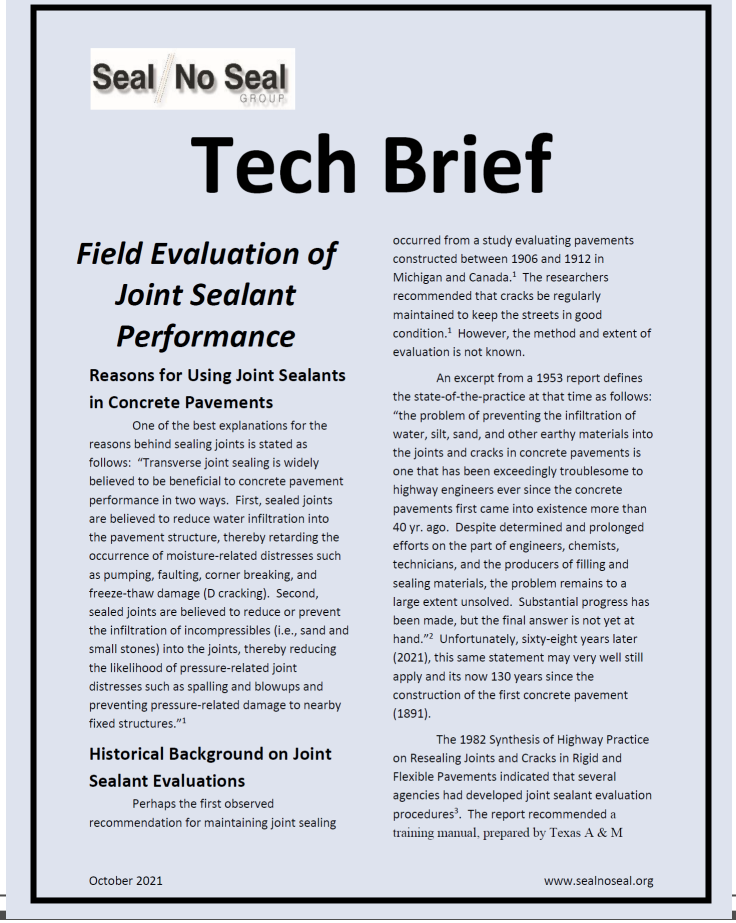


Courtesy Dan Zollinger

References

- LTPP Pavement Maintenance Materials: SPS-4 Supplemental Joint Seal Experiment Final Report: FHWA-RD-99-151
- Pavement and Seal Performance at the Mesa SPS-4 Test Site, ATRC Technical Memorandum, Lynn Evans, 2006
- Arizona SPS-2 PCC Joint Seal Performance, Technical Memorandum, Lynn Evans, 2013
- Evaluating the Impact of Design Features on Pavement Performance, NCE, TPF-5(291) Final Report, 2021
- LTPP Pavement Maintenance Materials: SHRP Joint Reseal Experiment, Final Report, FHWA-RD-99-142, 1999

SNS Tech Brief on History of Joint Sealant Evaluation Criteria



Seal / No Seal GROUP

Tech Brief

Field Evaluation of Joint Sealant Performance

Reasons for Using Joint Sealants in Concrete Pavements

One of the best explanations for the reasons behind sealing joints is stated as follows: "Transverse joint sealing is widely believed to be beneficial to concrete pavement performance in two ways. First, sealed joints are believed to reduce water infiltration into the pavement structure, thereby retarding the occurrence of moisture-related distresses such as pumping, faulting, corner breaking, and freeze-thaw damage (D cracking). Second, sealed joints are believed to reduce or prevent the infiltration of incompressibles (i.e., sand and small stones) into the joints, thereby reducing the likelihood of pressure-related joint distresses such as spalling and blowups and preventing pressure-related damage to nearby fixed structures."[1]

Historical Background on Joint Sealant Evaluations

Perhaps the first observed recommendation for maintaining joint sealing occurred from a study evaluating pavements constructed between 1906 and 1912 in Michigan and Canada.[1] The researchers recommended that cracks be regularly maintained to keep the streets in good condition.[1] However, the method and extent of evaluation is not known.

An excerpt from a 1953 report defines the state-of-the-practice at that time as follows: "the problem of preventing the infiltration of water, silt, sand, and other earthy materials into the joints and cracks in concrete pavements is one that has been exceedingly troublesome to highway engineers ever since the concrete pavements first came into existence more than 40 yr. ago. Despite determined and prolonged efforts on the part of engineers, chemists, technicians, and the producers of filling and sealing materials, the problem remains to a large extent unsolved. Substantial progress has been made, but the final answer is not yet at hand."[2] Unfortunately, sixty-eight years later (2021), this same statement may very well still apply and its now 130 years since the construction of the first concrete pavement (1891).

The 1982 Synthesis of Highway Practice on Resealing Joints and Cracks in Rigid and Flexible Pavements indicated that several agencies had developed joint sealant evaluation procedures[3]. The report recommended a training manual, prepared by Texas A & M

October 2021 www.sealnoseal.org

We Have Been Sealing Joints in Concrete for approximately 150 years!


The End
Thank You!

Seal No Seal GROUP

Sealing and Resealing Basics

Scott Eilken

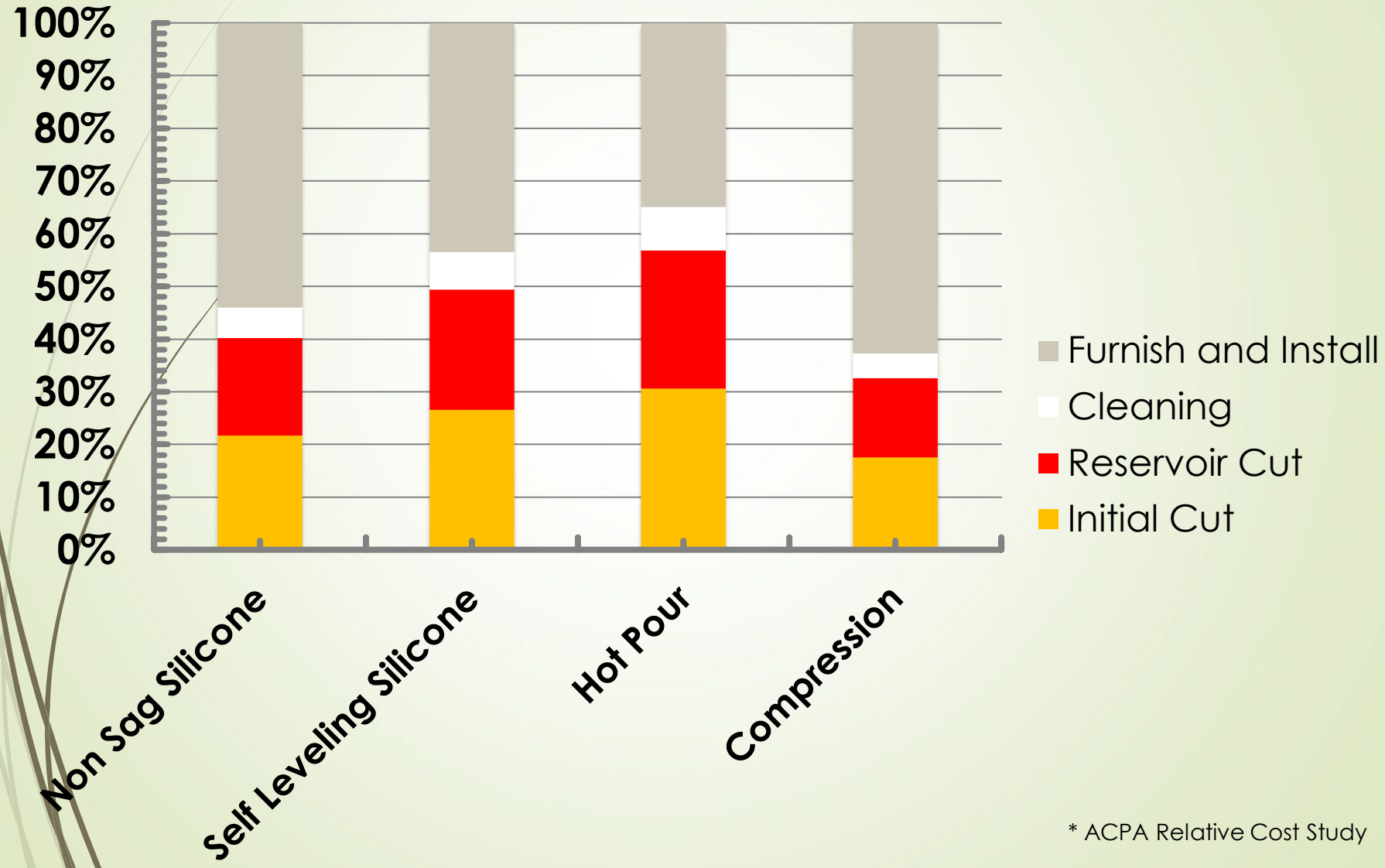
Owner

Quality Saw & Seal

IGGA
International Grooving & Grinding Association
Your Pavement Preservation Resource since 1972

QUALITY SAW & SEAL

Percent of Total Cost For Each Operation of Sealing a Joint*

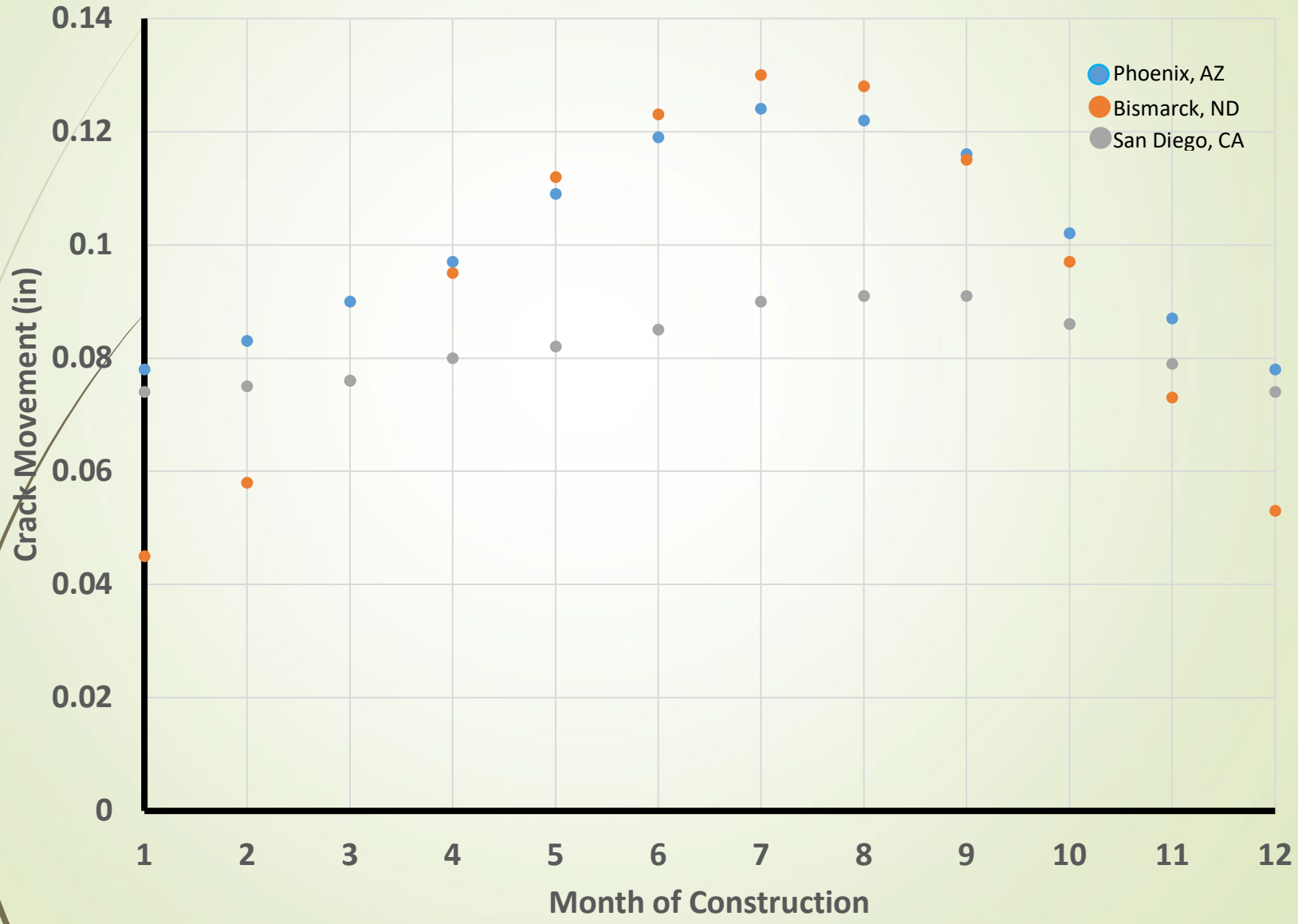


* ACPA Relative Cost Study

Joint Sealing vs Joint Filling

- Joint sealing: Installing sealant to a predetermined thickness and recess with the use of backer rod.
- Joint filling: Filling the entire joint cavity with a sealing material to a level flush with the pavement surface.

Crack Opening Width based on Time of Year of Placement



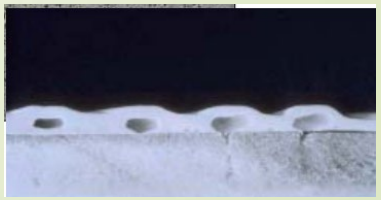
Processes Involved In Sealing

- Material Selection
  - Sealant Type
    - Hot Pour
    - Silicone
    - Compression Seals
  - Backer Rod Type (see SNS Group website)
    - *Open Cell*
    - Closed Cell
    - Hybrid

- Preparation
  - Sawing
  - Cleaning
- Installation
- Inspection

Backer Rod Selection/Use

- Sized to be 25% larger than joint width
- Controls depth of sealant ensuring proper joint design ratio.
- Forces sealant against joint sidewalls/Provides maximum sidewall adhesion.
- Sealants will not adhere to backing rod and this eliminates three-sided joint adhesion failure.
- Closed-cell foam technology/Does not allow air or moisture entrapment.
- Easily compressible, lightweight/Installs quickly, stays in place.
- Do Not Puncture Closed Cell Rod- Outgassing



NON-SAG SILICONE

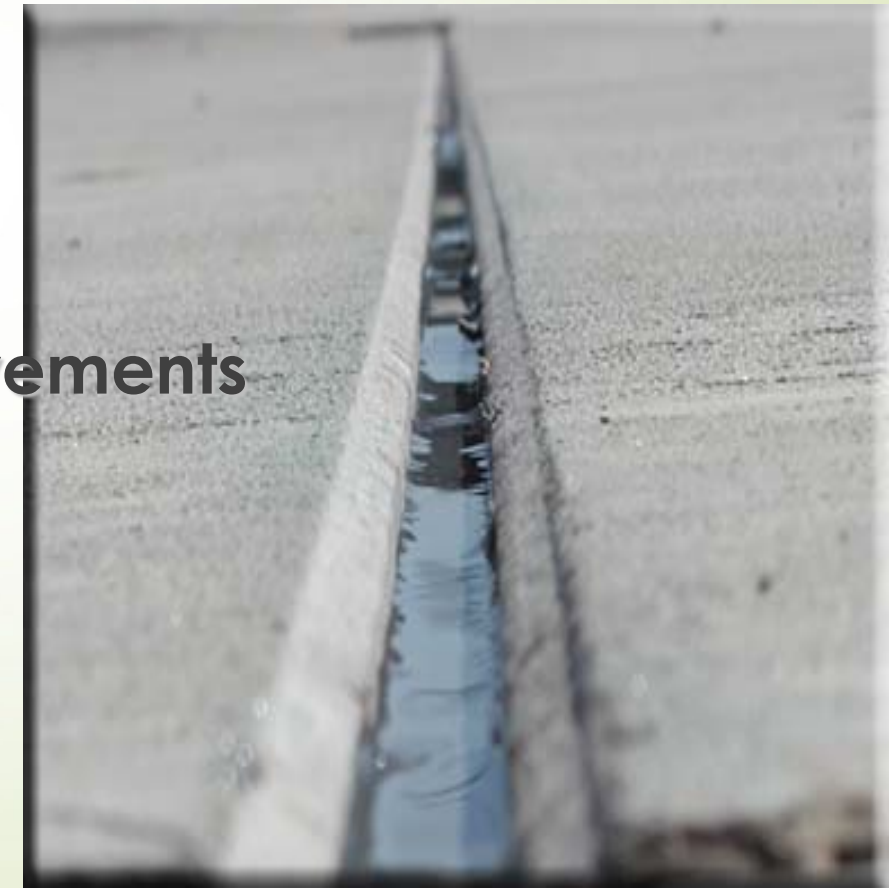
- Light Gray
- Horizontal or Vertical Application
- Low Modulus
- Requires Tooling
- Rehab or New Pavements
- Seals Small Spalled areas in Joint Walls
- Tack Free in 25 to 90 mins.
- Full Cure through in 14 days

SELF-LEVELING SILICONE

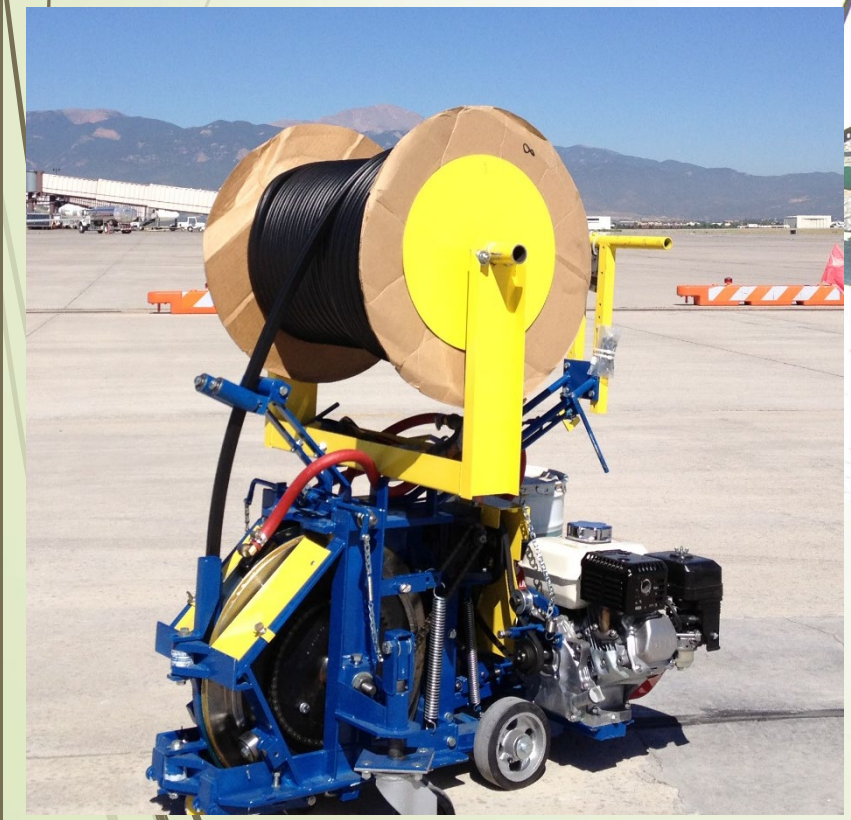
- Dark Grey
- Horizontal Application Only
- Ultra Low Modulus
- Neat Seal-No Tooling
- Rehab or New Pavements
- Tack Free in 3 hours max
- Full Cure through in 21 days
- 6% maximum grade
- AC/PC Joints ???

Asphalt Based Sealants

- Modified Asphalt Based Sealants
- 2 to 15+ Year Life Cycle
- Asphalt and Concrete Pavements
- Different Grades available



Compression Seal



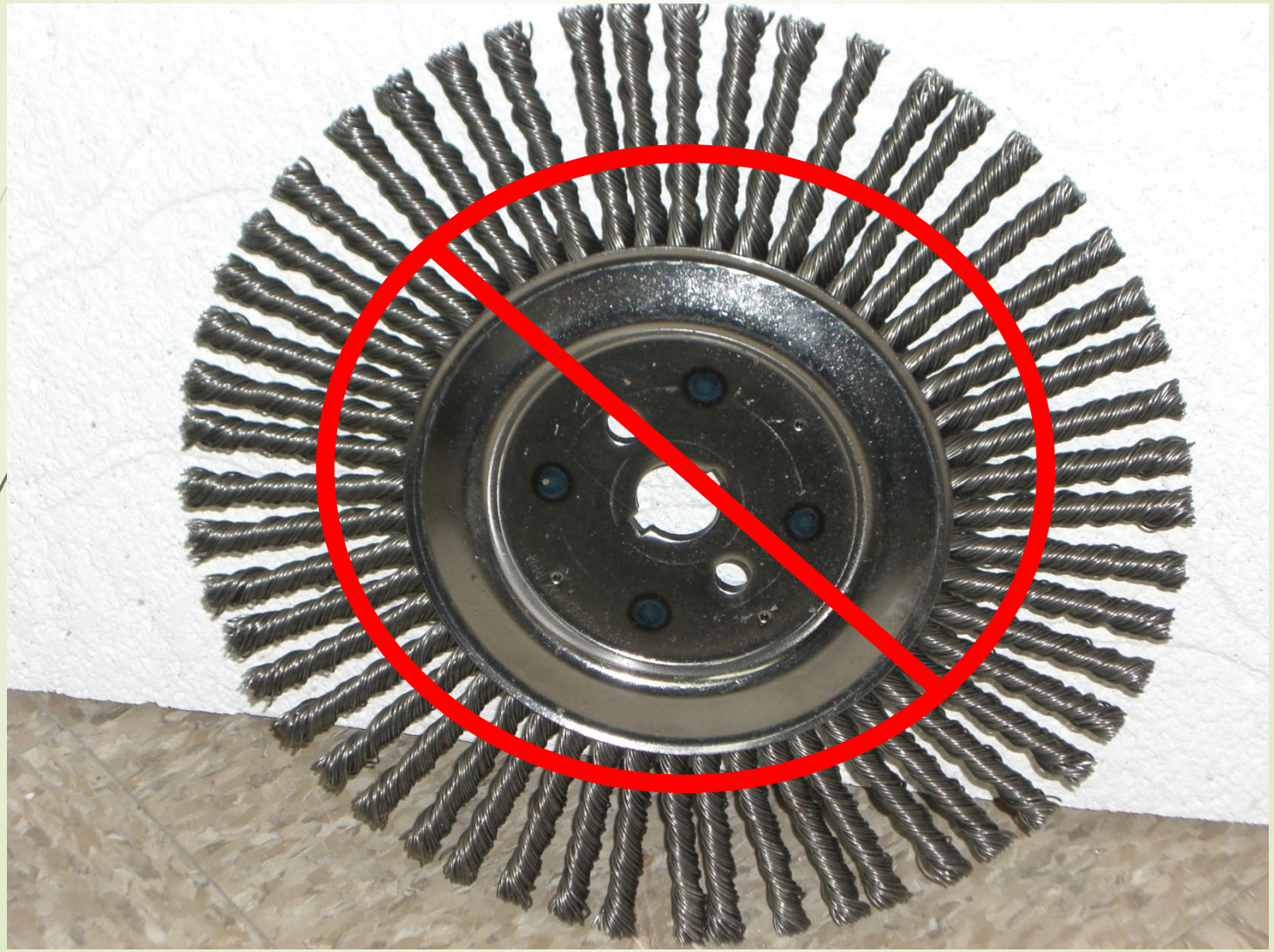
Clean & Dry Isn't an Option!

The pavement MUST be clean and dry

Clean Isn't an Option

- **Finger Test**

Cleaning Brush



Water Blast

Water blasting the joint after the saw cut operation is strongly recommended to remove any slurry from the joint.

Slurry remaining in the joint from sawing will dry on the walls. Silicone will then adhere to the slurry instead of the clean side wall.

Power Washing After Control Joint Sawing

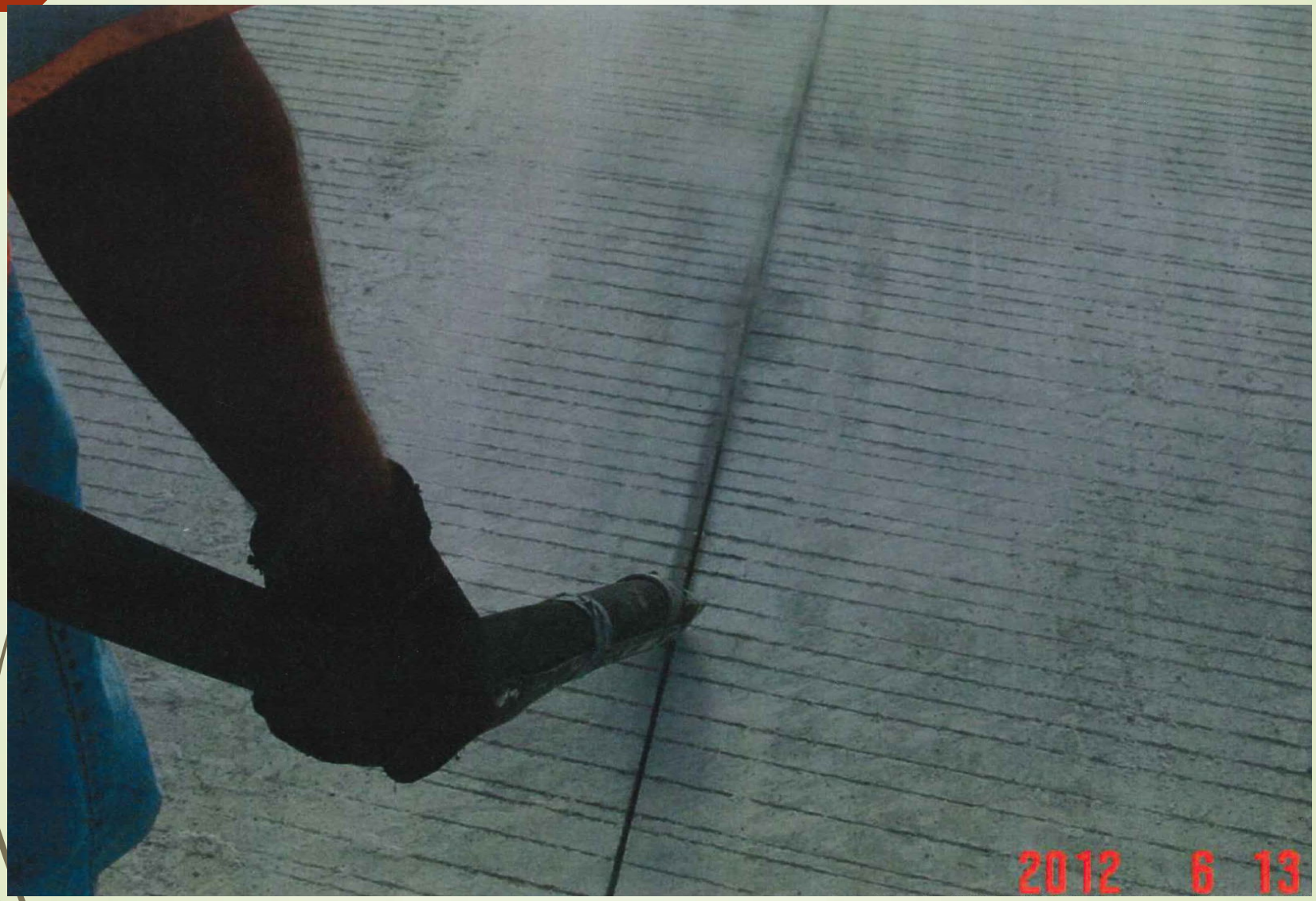
Intersecting Joints After Power Washing

Media Blasting

Media Blasting

Media Blast

Media Blast



Air Blast

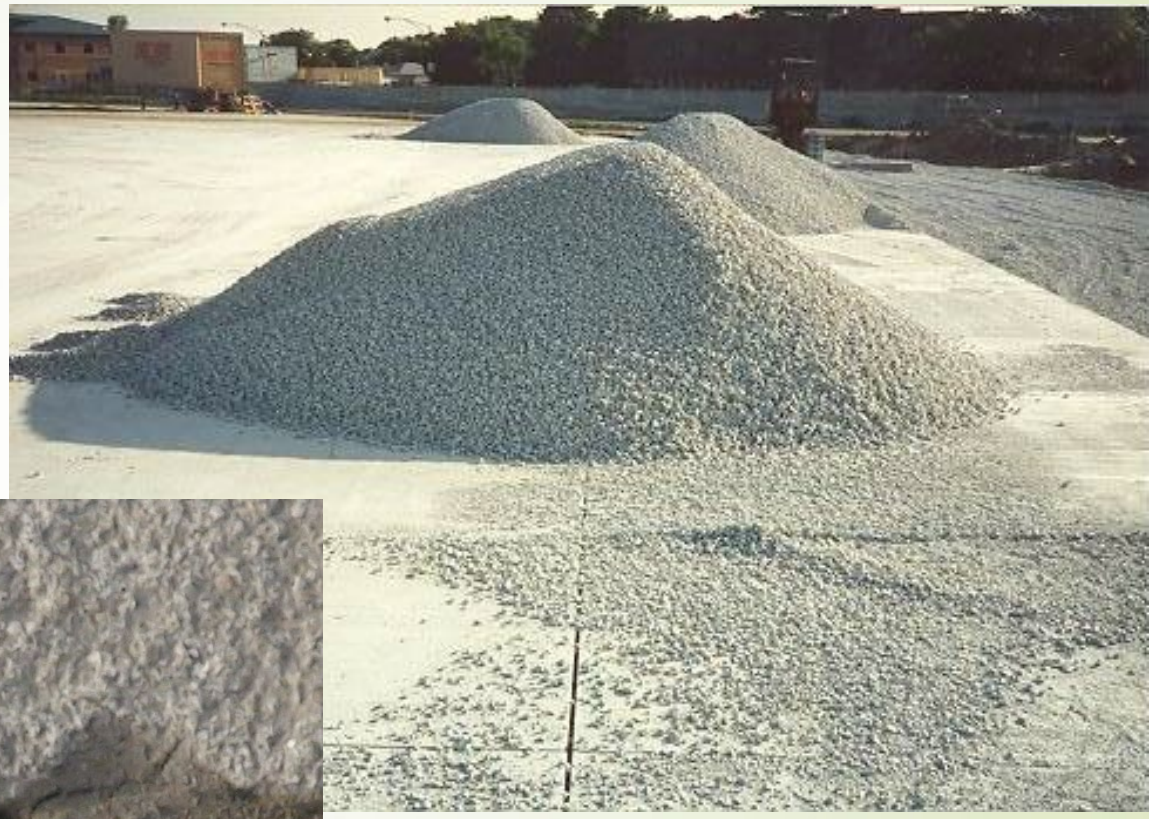
Equipment

- Ensure compressors have an oil/water separators or some means of filtration to provide dry, oil-free air.
- High pressure air should be the primary means to blow out joints.
  - Leaf blowers do not provide sufficient pressure to properly blow out joints.

Keeping Joints Cleaned After You've Cleaned Them.....

Do You Know Where Your Oil is?

Keep the Joints Clean During Construction



Construction Traffic Damage

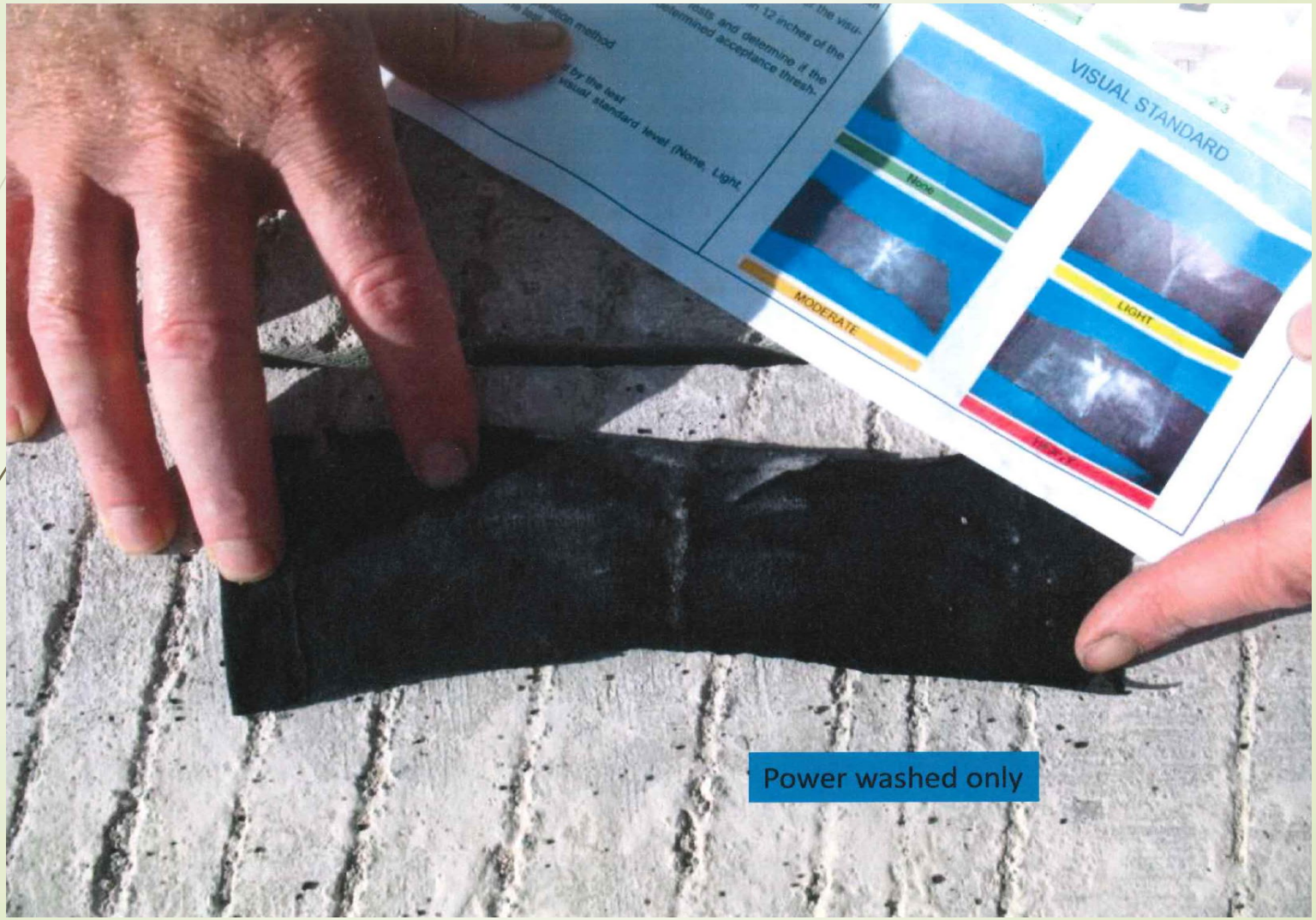
WJE Tools For Inspection

Inspecting Joints—Job 1

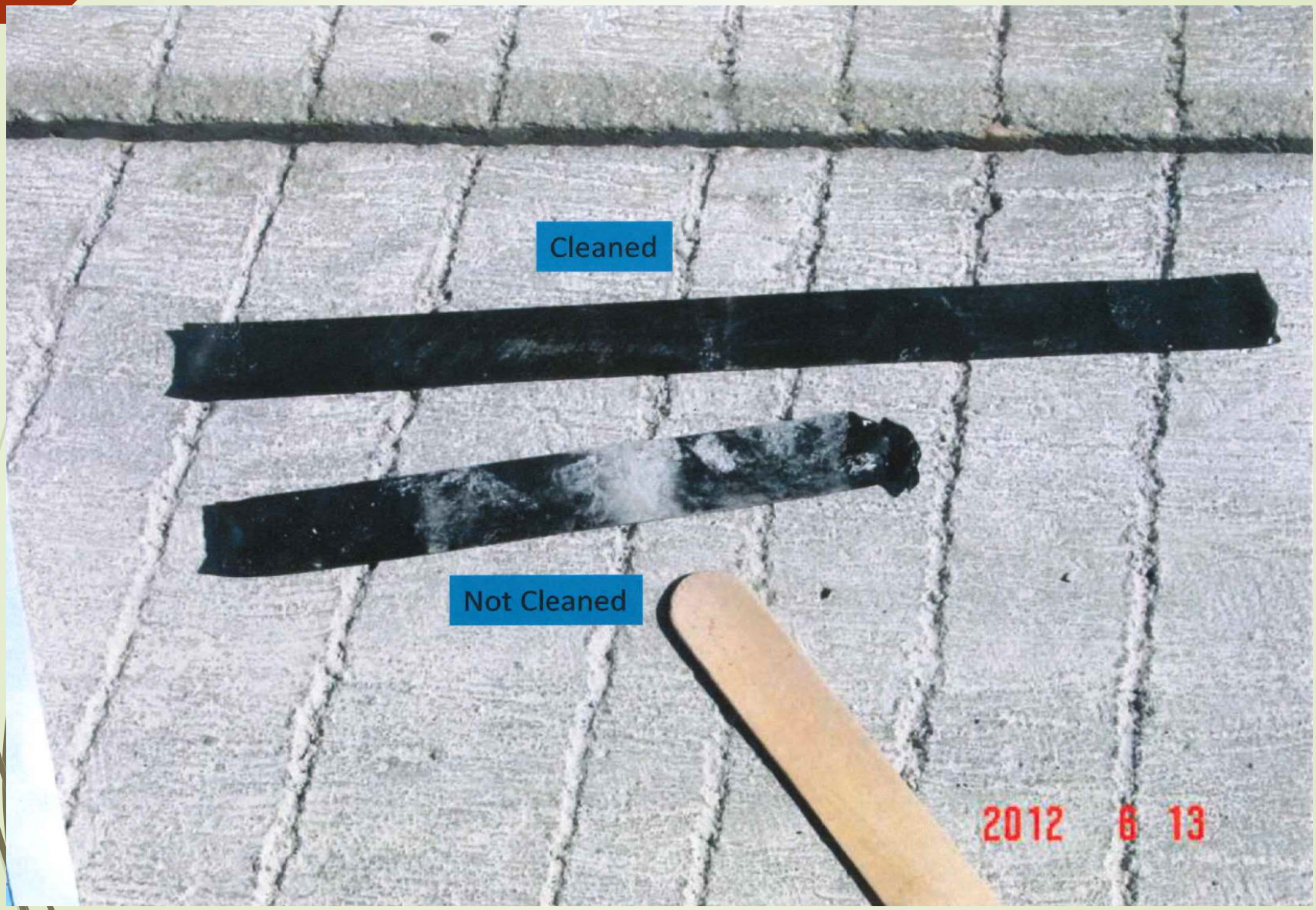
WJE Evaluations

Cleanliness Test

Cleanliness Test



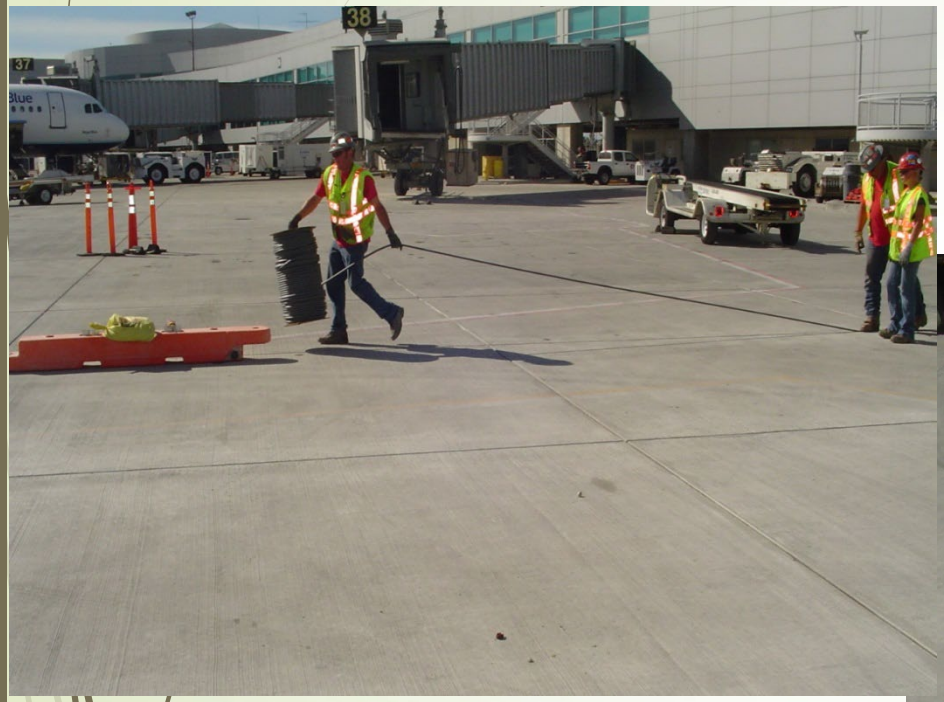
Cleanliness Test



Cleanliness Test

Installing Sealant Systems

Inserting and Rolling Backer Rod



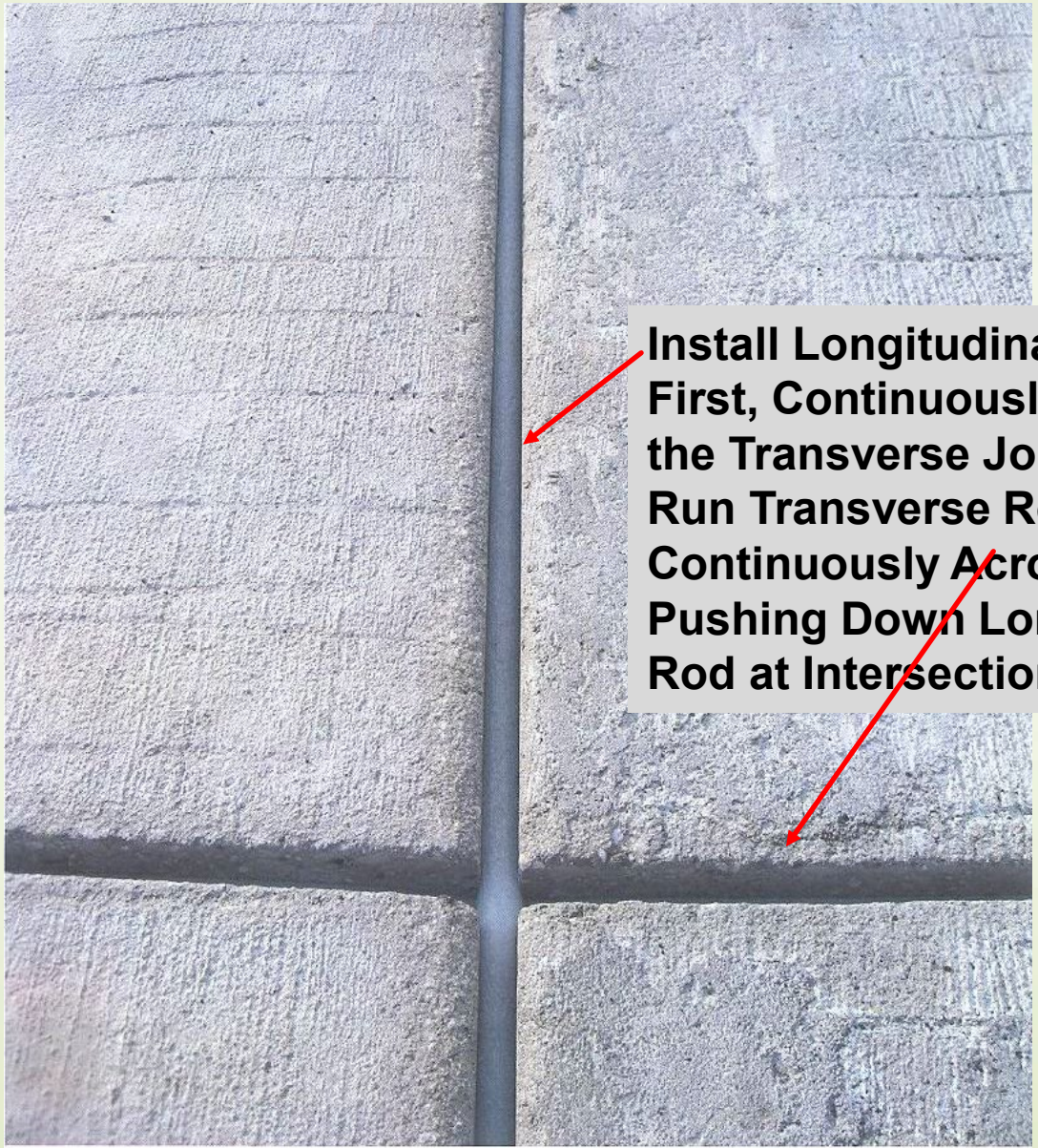
- Cold Rod/Hot Rod

BACKER ROD

- 25% Larger than Joint
- Closed Cell Backer Rod
- Do Not Puncture Backer Rod- bubbling
- Do Not Stretch Backer Rod

Inserting and Rolling Backer Rod

Installing Backer Rod



Installing Hot Pour Sealants

Hot Pour Joint Sealant Configuration

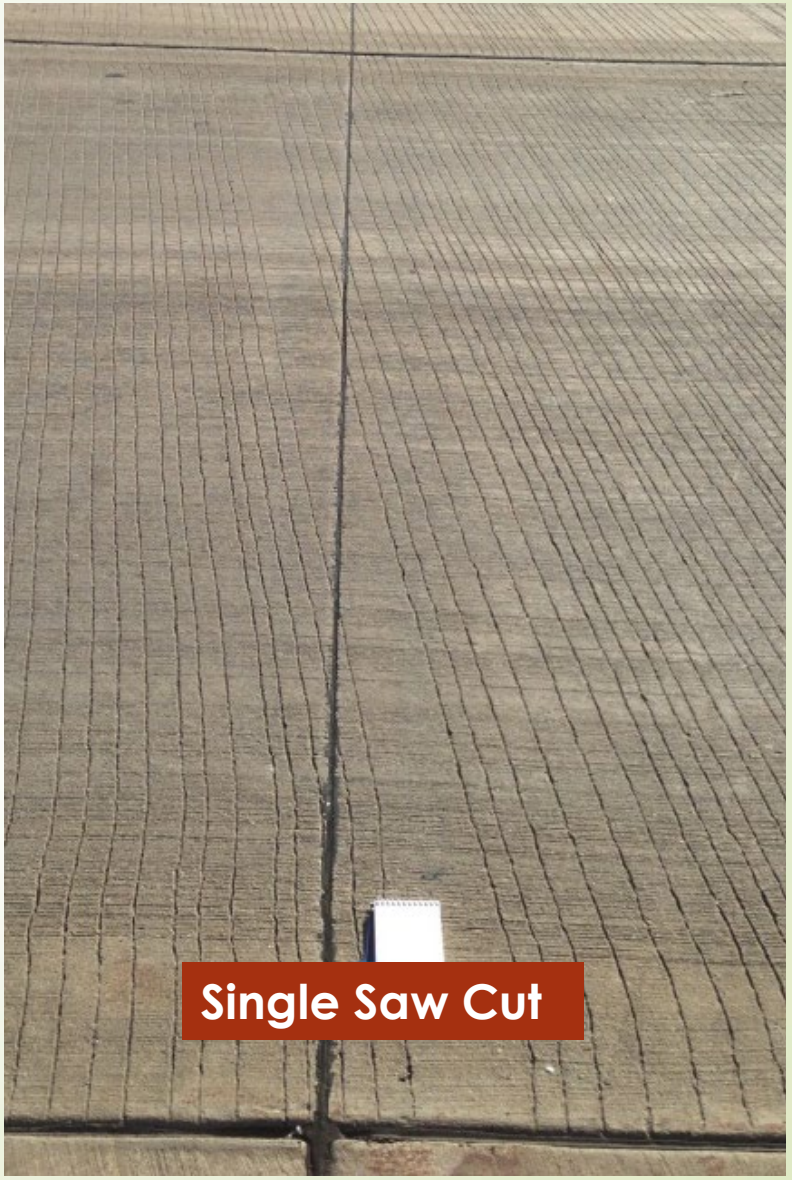
40° F Minimum Pavement Temperatures
Flush Fill, Recessed or Over-band

Flush Filled

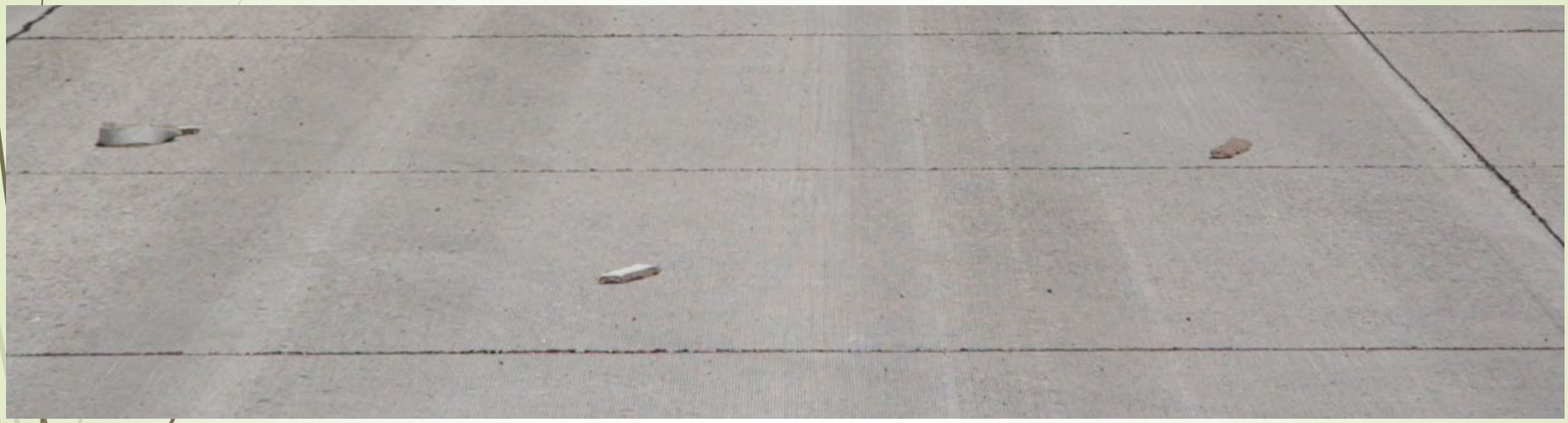
Recessed

Flush Filled

Hot Pour Sealants



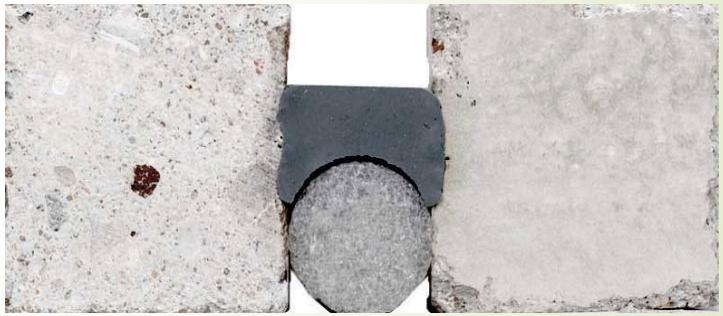
Single Saw Cut Sealant Extrusion



Silicone Joint Sealant Configuration

Non Sag

Self Leveling



Silicone Sealant Recess

- Why is this important.
  - Silicone is a relatively “soft” material.
  - Need to avoid abrasion.
  - Recess helps avoid tire contact.

Silicone Sealing Application

40° F Minimum Pavement Temperatures
1/8” Minimum Recess
Requires Tooling

Silicone Sealant Installed at Joint Intersection

Best Time to Seal Joints

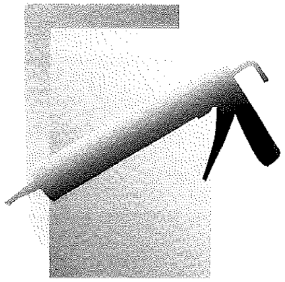
- As the job progresses or at the end?
- Depends on the job.
- Important considerations.
  - Concrete must have sufficient time to cure and dry.
  - Joint preparation and sealing operations need to be spaced appropriately to avoid contaminating previous work.
  - Ensure construction traffic does not damage freshly installed sealant with dirt and debris.

Silicone Adhesion Test

1. Make a knife cut horizontally across the silicone

2. Make a vertical cut approximately 3 inches long on each side of the joint

3. Hold the piece of silicone firmly and slowly pull at a 90° angle. If adhesion is proper, the silicone will not pull out of the joint, but will eventually tear cohesively



Field Adhesion Test For Use With *Dow Corning*® Brand Silicone Pavement Joint Sealants

As a check for adhesion, a simple hand pull test may be performed on the job site after the sealant is fully cured (usually within 14 to 21 days). The hand pull test procedure is as follows:

1. Make a knife cut perpendicular to the joint from one side of the joint to the other.
2. Make two parallel cuts approximately 2" long, along each side of the joint.
3. Place a 1" mark on the sealant tab as shown in Figure 1.
4. Grasp the 2" piece of sealant firmly just beyond the 1" mark and pull at a 90° angle. Hold a ruler along side the sealant.
5. If the 1" mark on the sealant can be pulled to the 5 1/2" mark on the ruler (total pull of 4 1/2" or 450% elongation) and held with no failure of sealant, the sealant should perform in a joint designed for +100/-50% movement.

DOW CORNING

Significance and Use

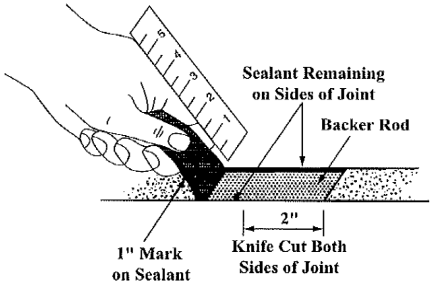
This is not a precise, scientific test, but a simple screening procedure that may help detect such problems as improper cleaning, improper installation or other problems that may affect adhesion.

Repair of Sealant in Adhesion Test Area

Sealant may be replaced in test area easily by merely applying more sealant in the same manner it was originally installed (assuming good adhesion was obtained). Care should be taken to ensure that the new sealant is in contact with the original and the original sealant surfaces are clean so that good bond between the new and old sealant will be obtained.

Precision and Accuracy

These are not precise, scientific tests, but simple screening procedures. The precision and accuracy of these tests have not been determined.



Printed in USA FPH30642 Form No.62-119B-01

General Silicone Tips

- All silicone sealants are not the same. Don't allow different products or brands to contact one another wet to wet unless approved by the manufacturer.
- Don't wet tool sealants with soap or solvents.
- When installing SL silicone, and approved NS silicone may be used to fill small gaps between the backer rod and joint wall.
- Silicone bonds to silicone making minor repairs relatively simple.

Proper Equipment for Silicone

value added systems inc

Value Added Systems
Incorporated

Highway Star
Joint Sealant Pump
Manufactured Exclusively for Value Added Systems, Inc.

- ✓ 48:1 Air-To-Fluid Power Ratio
- ✓ Chopping Check Pump
- ✓ 3" Post Double Elevator / Ram
- ✓ 55 Gallon Drum Wiper / Follower Plate
- ✓ Stainless Steel Elevator Shafts
- ✓ Stainless Steel Pump & Air Motor Support Rods
- ✓ 30' Application Hose
- ✓ Applicator Valve & Wand
- ✓ Operating and Service Manual
- ✓ 10" Diameter Air Motor
- ✓ Air Motor Muffler
- ✓ Air Line Filter / Lubricator / Regulator
- ✓ Two Auto Drain Water Separators
- ✓ 360° Drum Locator / Clamp
- ✓ Electroless Nickel Plated Pump Housing
- ✓ Hose Support
- ✓ 5 Gallon Pail Conversion Kit Available
- ✓ Tool Kit

Also Available:
38:1 Power Ratio *Road Star* Joint Sealant Pump for most self leveling joint sealants.

Experience Counts – Count On Us℠

Value Added Systems, Inc. • PO Box 2335 • Denton, Texas 76202 • 940.566.2508 • Fax 940.382.1164
Technical Support 800.825.2379 • Fax Orders 800.736.4119
URL http://www.dispense.com • e-mail: info@dispense.com

Example of a typical pump used to disperse silicone into joint.

Silicone Project Review

CRAFCO INC
AN ERGON COMPANY
420 N. ROOSEVELT AVE. ● CHANDLER, AZ 85226 ● WWW.CRAFCO.COM
(602) 276-0406 ● (800) 528-8242 ● FAX (480) 961-0513

SILICONE PROJECT START UP & INSPECTION VISITS GUIDLINES

DISCUSS PROJECT WITH CONTRACTOR AND OWNER/PROJECT ENGINEER – Supply a copy of the application instructions for Roadsaver Silicone. Review them section by section. (Available at www.crafco.com and packaged with each pallet of silicone)

VISIT JOB SITE AND VERIFY THE FOLLOWING

JOINT PREPARATION

- All old sealant must be removed 100%
- All saw slurry has been removed.
- Joint Face has been abrasively cleaned (Both Sides)
- Joint faces must be blown with compressed air (No oil or moisture should be emitted by the compressor. Oil & Water traps are recommended on all compressors.)
- Test for cleanliness using the finger test-rub finger along joint walls to observe for dust. If there is no dust present on finger joint has been properly cleaned.
- Backer rod has been installed properly
  - Correct Depth (see Joint Design Chart in the installation instructions)
  - Proper Size (see Joint Design Chart in the installation instructions)
  - All dirt and dust must be blown out prior to sealing

SILICONE APPLICATION

Pavement must be dry and all dirt and dust must be blown out prior to sealing. No oil or moisture should be emitted by the compressor. Oil & water traps are recommended on all compressors.

- Non Sag (34902)
  - Tooling is required
  - Installed leaving a 1/4" to ½" recesses after tooling (see Joint Design Chart in the installation instructions)
  - Sealant thickness should be ¼" to ½" (2:1 ratio) (see Joint Design Chart in the installation instructions)
- Self Leveling (34903)
  - Tooling is NOT required
  - Installed leaving an 1/4" to ½" recesses (see Joint Design Chart)
  - Sealant thickness should be ½ to ¼" (2:1 ratio) (see Joint Design Chart)

Never install silicone without a recess. Contact with tires after cured will affect the bond of the silicone to the concrete.

Supply Center & Sealant Manufacturing
1680 E. Race St.
Allentown, PA 18109
(610) 264-7541

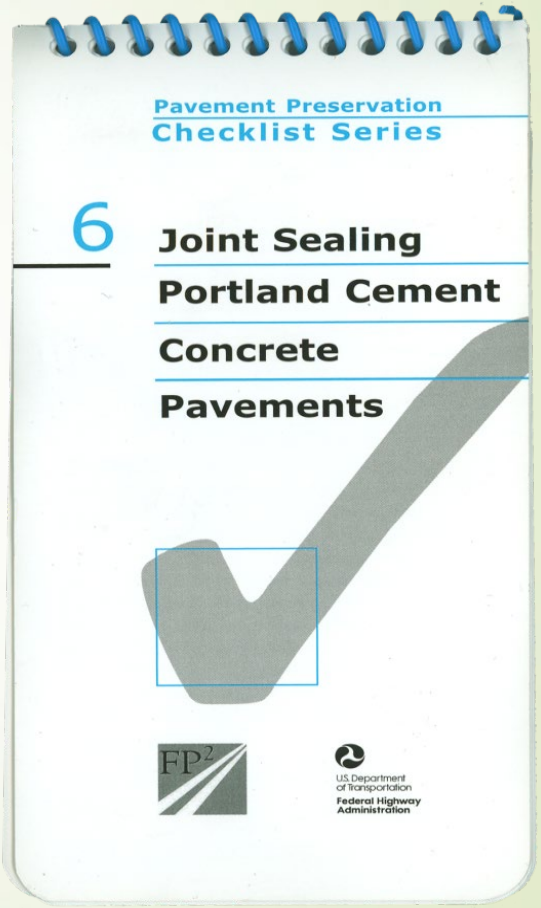
Sealant Manufacturing
6975 W. Crafco Way
Chandler, AZ 85226
(602) 276-0476

Supply Center
14142 Whittram Ave.
Fontana, CA 92335
(909) 822-6822

Sealant Manufacturing
121 Industrial Park Rd.
Halls, TN 38040
(731) 836-5002

Supply Center & Equipment Manufacturing
25527 S. Arizona Ave.
Chandler, AZ 85248
(480) 655-8333

Sealant Manufacturing
PO Box 191
4th & Duke, Penn Central
Railroad Yard
Northumberland, PA 17857-0191
(570) 473-8038



Silicone Project Review

Materials and Procedures for Repair of Joint Seals in Portland Cement Concrete Pavements

Manual of Practice

Federal Highway Administration
U.S. Department of Transportation

shrp

Strategic Highway Research Program
National Research Council

CRAFCO INC
AN ERGON S COMPANY

- Silicone Adhesion Field Test should be preformed to verify proper adhesion. This test can not be preformed until the silicone has cured for 14-21 days.
- If bubbling is observed in the silicone, refer to the installation instructions for guidance.

FOLLOW UP LETTER

All sight visits should be followed up with a letter to the contractor & the owner/project engineer. This letter should include:

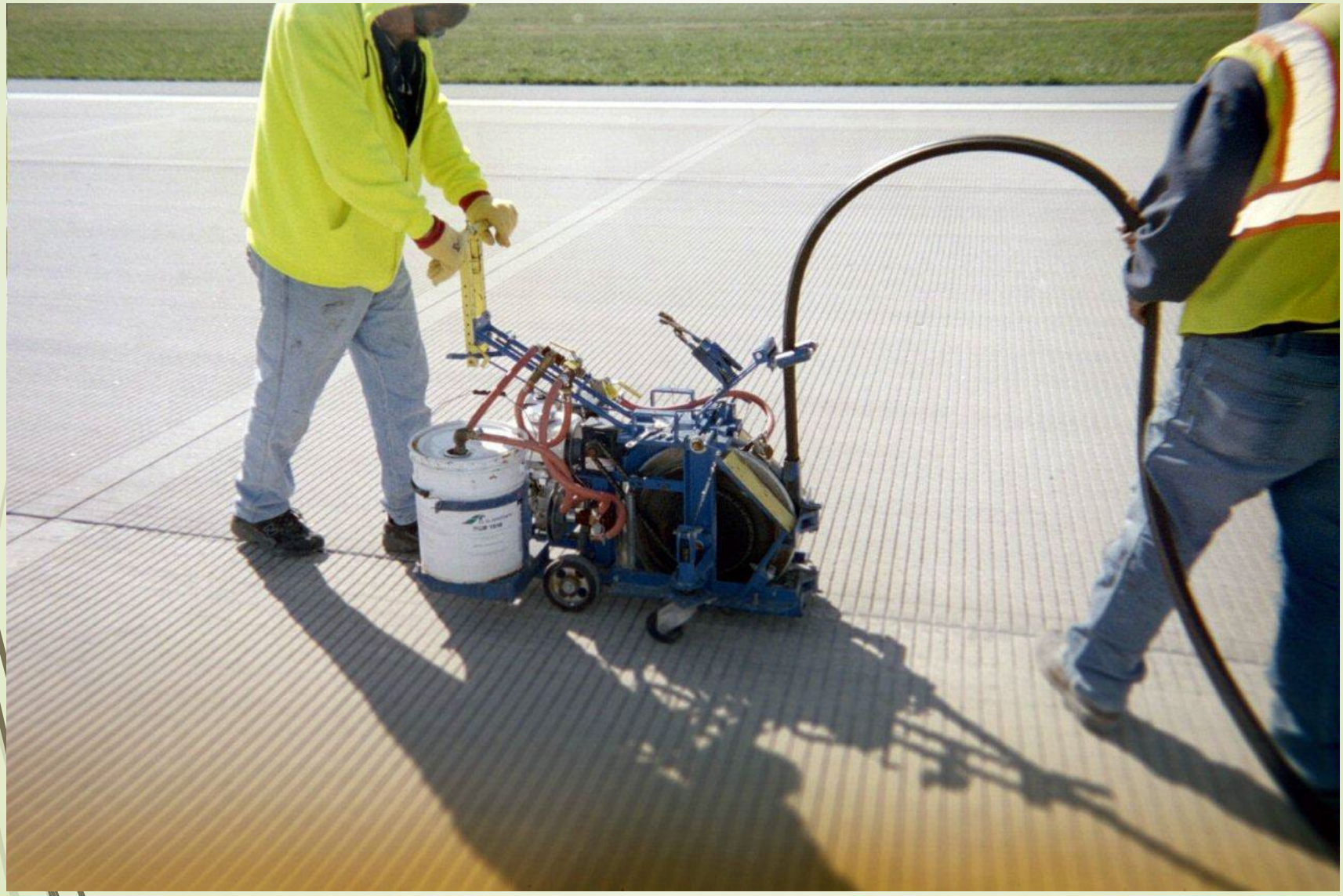
- Date & Time of the Visit
- Contact Names at the project
- Weather Conditions including temperature
- Detail of any observation made at the project. (Good & Bad)
- Any recommendations on changes or corrections that are needed.

At any time should you be unsure or have any questions always contact Crafco, Inc. at 800-528-8242.

Compression Seal Installation

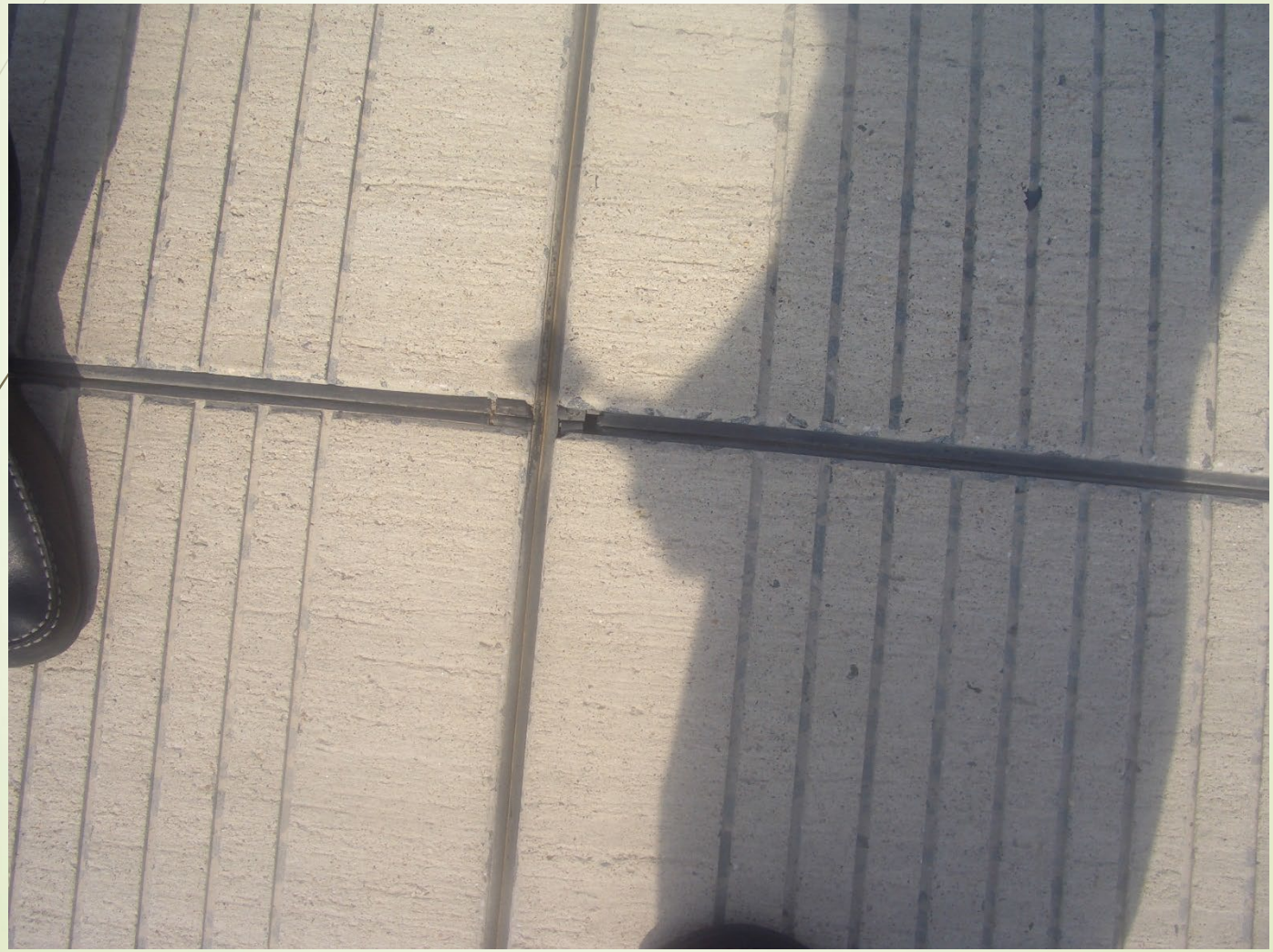
- Lubricant-Adhesive shall meet ASTM D2835
- Installation Above 32 F
- Install Sealant in Longitudinal Joint First
- Cut Longitudinal Joint in Center of Each Transverse Joint
- Install Transverse Joint Continuously Across
- Sealant Stretch Should be $\leq$ 4 %
- Recess Sealant 3/16”

Proper Sealant Installation



Compression Seal at Joint Intersection

Stretched and Broken Compression Seal



What Not to Do

Overband Hot Pour Sealant

Seal Joint Without Cleaning

Place Sealant That Only Covers Joint

Today's presenters

Hasan Ozer
Hasan.Ozer@asu.edu
Arizona State University

Larry Scofield
lscofield@acpa.org
American Concrete Pavement Association

Dan Zollinger
d-zollinger@tamu.edu
Texas A&M University

Scott Eilken
seilken@qualitysawandseal.com
Quality Saw & Seal Inc.

Upcoming events for you

October 18, 2023

TRB Webinar: TRB Webinar: Using Ultra-High Performance Concrete for Bridges

October 30, 2023

TRB Webinar: Superpave Volumetric Mix Design—Beyond the Basics

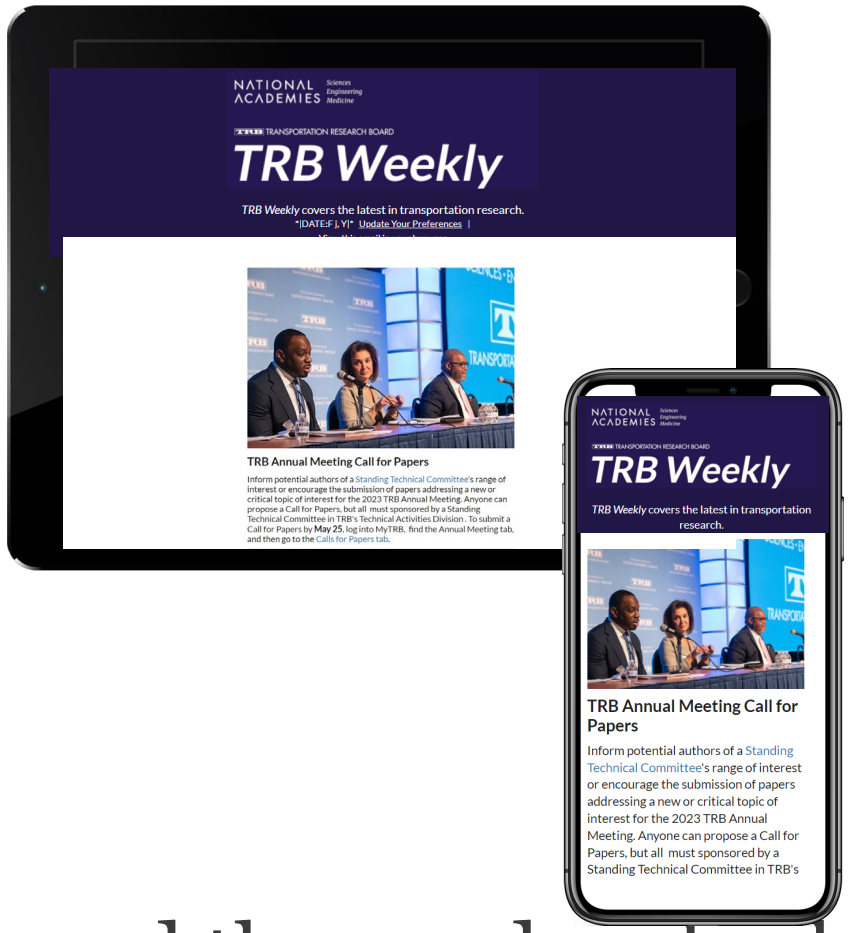
https://www.nationalacademies.org/trb/events

Subscribe to *TRB Weekly*

If your agency, university, or organization perform transportation research, you and your colleagues need the *TRB Weekly* newsletter in your inboxes!

Each Tuesday, we announce the latest:

- RFPs
- TRB's many industry-focused webinars and events
- 3-5 new TRB reports each week
- Top research across the industry



Spread the word and subscribe!
https://bit.ly/ResubscribeTRBWeekly

Discover new TRB Webinars weekly

Set your preferred topics to get the latest listed webinars and those coming up soon every Wednesday, curated especially for you!

https://mailchi.mp/nas.edu/trbwebinars

And follow #TRBwebinar on social media

NATIONAL ACADEMIES Sciences Engineering Medicine

TRB TRANSPORTATION RESEARCH BOARD

TRB 103rd

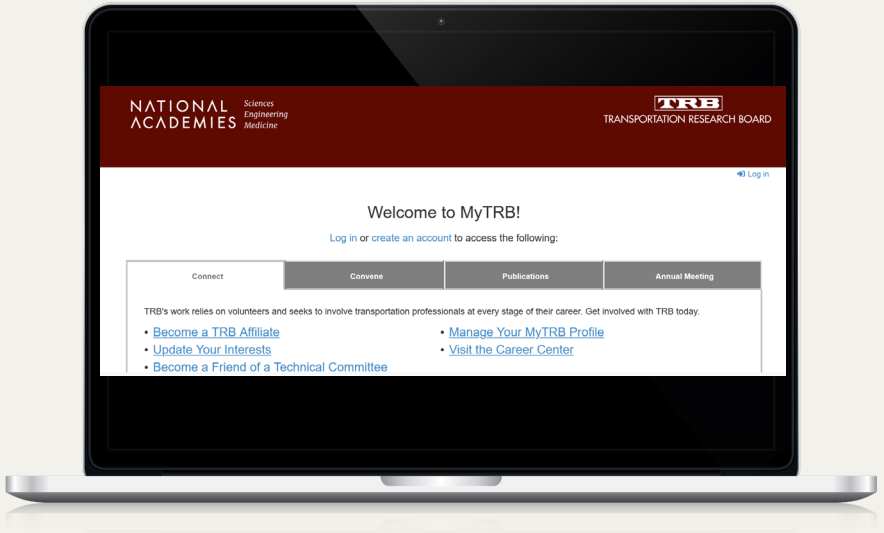
ANNUAL MEETING

On January 8–12, 2024, join the single largest gathering of transportation practitioners and researchers in the world. *Register today!*

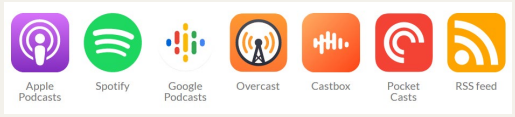
www.trb.org/AnnualMeeting

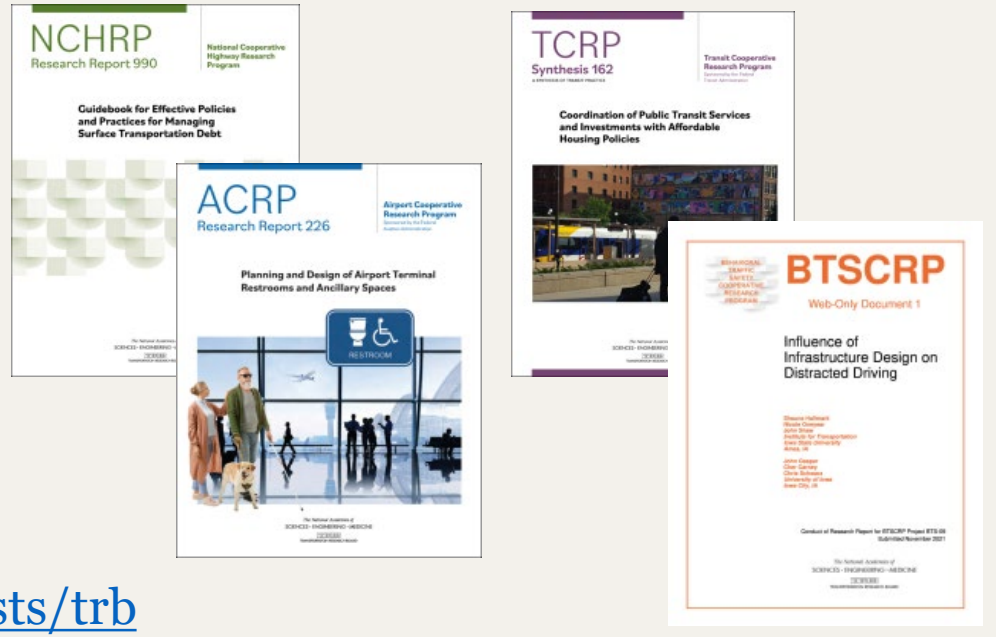
Get involved

https://www.nationalacademies.org/trb/get-involved



- **Become a Friend of a Standing Technical Committee**
  Network and pursue a path to Standing Committee membership
- **Work with a CRP**
- **Listen to our podcast**





https://www.nationalacademies.org/podcasts/trb

We want to hear from you

- **Take our survey**
- **Tell us how you use TRB Webinars in your work at trbwebinar@nas.edu**

NATIONAL ACADEMIES Sciences Engineering Medicine