ARIZONA
TRANSPORTATION
RESEARCH
CENTER

DOW CORNING 888

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PRODUCT EVALUATION

84-20

DOW CORNING 888

JULY 10, 1986

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None

16. ABSTRACT

This report contains a product evaluation of Dow Corning 888 joint sealant. Dow Corning 888 is a one-part silicone material that cures to a low modulus silicone rubber upon exposure to atmospheric moisture. It uses include transverse and longitudinal highway joints, bridge joints and runways.

Two different test sections of Dow Corning 888 were placed in Phoenix. One section was placed to evaluate the sealant capabilities in concrete joints. The other test section was asphalt cracks and asphalt to concrete joints. Both sections were placed using tubes of sealant and caulking gun.

The Dow Corning 888 joint sealant performed well. The sealant was pliable and adhered well to the joints.

Based on field performance, the Arizona Transportation Research Center recommends allowing the use of Dow Corning 888 on Arizona projects. The Research Center will be placing a larger test section of joint sealants in northern Arizona. Dow Corning 888 will be placed in this test section.

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I. INTRODUCTION

Joint breakouts are becoming an ever increasing problem along Arizona's Black Canyon Freeway (I-17). Spalling, cracking and deflection at the joints has become the main form of pavement damage. A number of companies have produced joint sealants in an attempt to inhibit joint failures. Some of these sealants are performing very well, while others have failed within a short period of time. Currently there is a large amount of research being done throughout the country in the area of joint failures. Arizona is in the process of evaluating a number of test sections utilizing different products.

Dow Corning Corporation produces a silicone-sealant called Dow Corning 888. It is a one-part silicone material that cures to a low-modulus silicone rubber upon exposure to atmospheric moisture. The cured silicone rubber is supposed to remain flexible over a wide temperature range. It's uses include, transverse and longitudinal highway joints, bridge joints, runways, parking lots and decks, sidewalks, random cracks, curbs and gutters.[1]

II. CONSTRUCTION REPORT

Dow Corning demonstrated their product on April 20, 1984, at two locations in the Phoenix area. The first location is in the southbound passing lane of I-17, just south of the Bell Road underpass.

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1. Dow Corning Corporation - Guide specifications

The 9th, 11th, and 14th joints south of the structure were sealed with Dow Corning 888. The other test section is at the on-ramp of I-17 S.B. from Bell Road. The locations of both sections are shown in Figure 1.

District I maintenance provided traffic control and prepared the joints for sealing. Crack preparation consisted of blowing out the crack with air, sand blasting the sides of the joints (Figure 2) and blowing the remainder of the debris out of

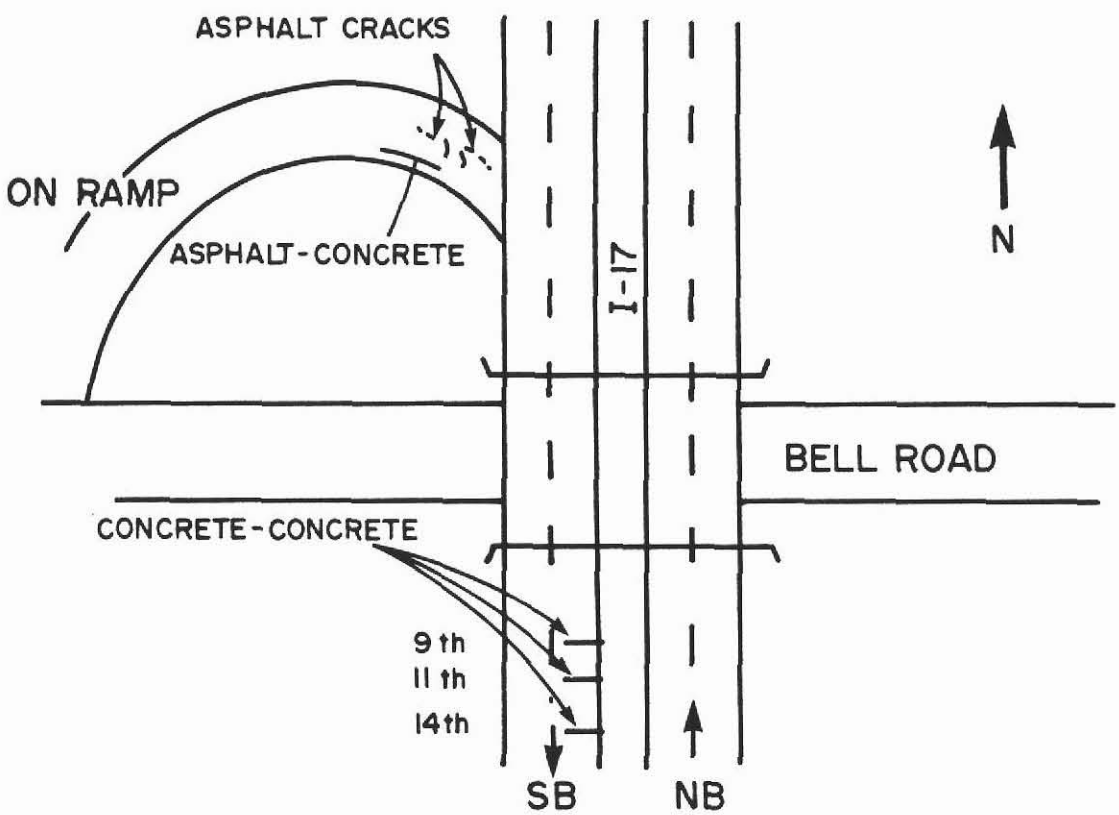


FIGURE 1 - LOCATION OF TEST SITE

FIGURE 2

SAND BLASTING JOINT

FIGURE 3

INSTALLING BACKER ROD

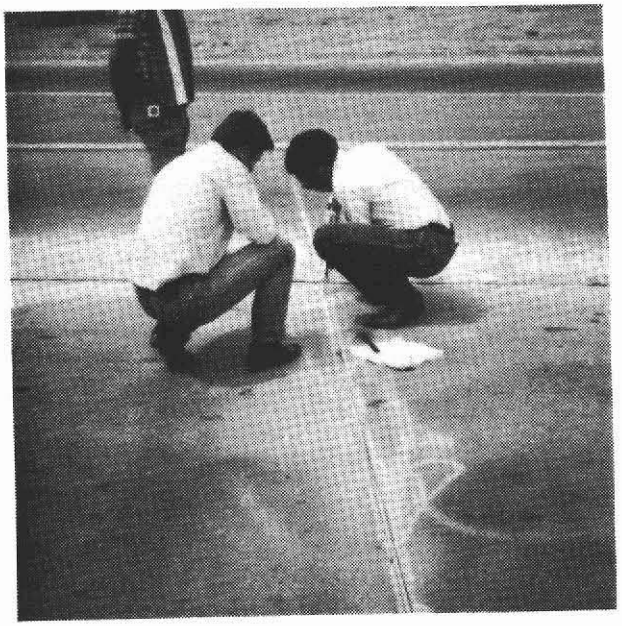


FIGURE 4

APPLYING JOINT SEALER

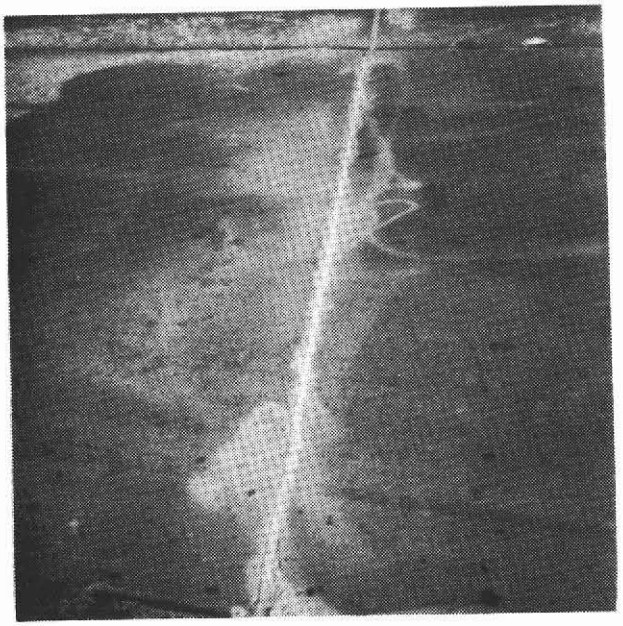


FIGURE 5

FINISHED JOINT

the joint.

The installation of the joint material was performed by the Dow Corning representatives. A 3/4 inch backer rod was installed (Figure 3) and the joint was filled with gray Dow Corning 888 (Figure 4). Using a caulking gun, the installation took an average of 6 pints of silicone sealant for each joint. The finished joint is shown in Figure 5.

The asphalt joints on the on-ramp were sealed using the same silicone joint material. Transverse cracks were partially filled with a 1/2" backer rod and the longitudinal asphalt to concrete joint at the shoulder was filled with a 3/4" backer rod before applying the sealant.

III. EVALUATIONS

The first evaluation of the test sections was made on February 12, 1985 by Research. All of the joints were intact and performing well. The sealant was still pliable and adhering very well.

A second evaluation was made in June, 1985. The product was performing satisfactory. The joints were pliable and adhering well to the edges. There were no incompressables embedded in the sealant and the surface of the joint was in good condition.

On April 7, 1986 a final evaluation of Dow Corning 888 was performed. The joints were still performing well. The sealant was pliable and adhering well (Figure 6). The sealant in the asphalt joints was also performing well.

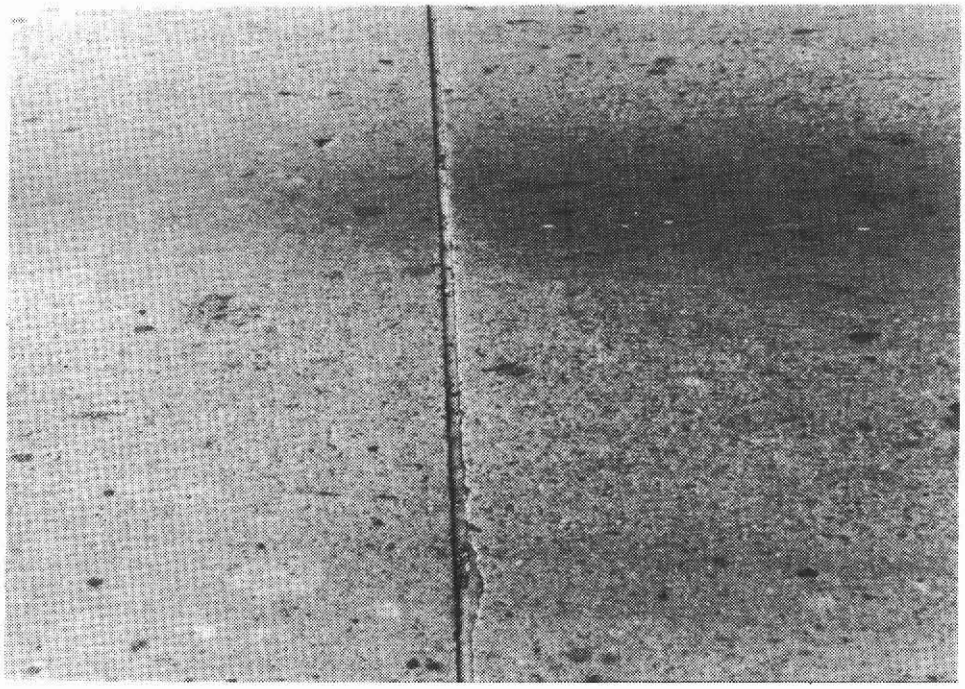


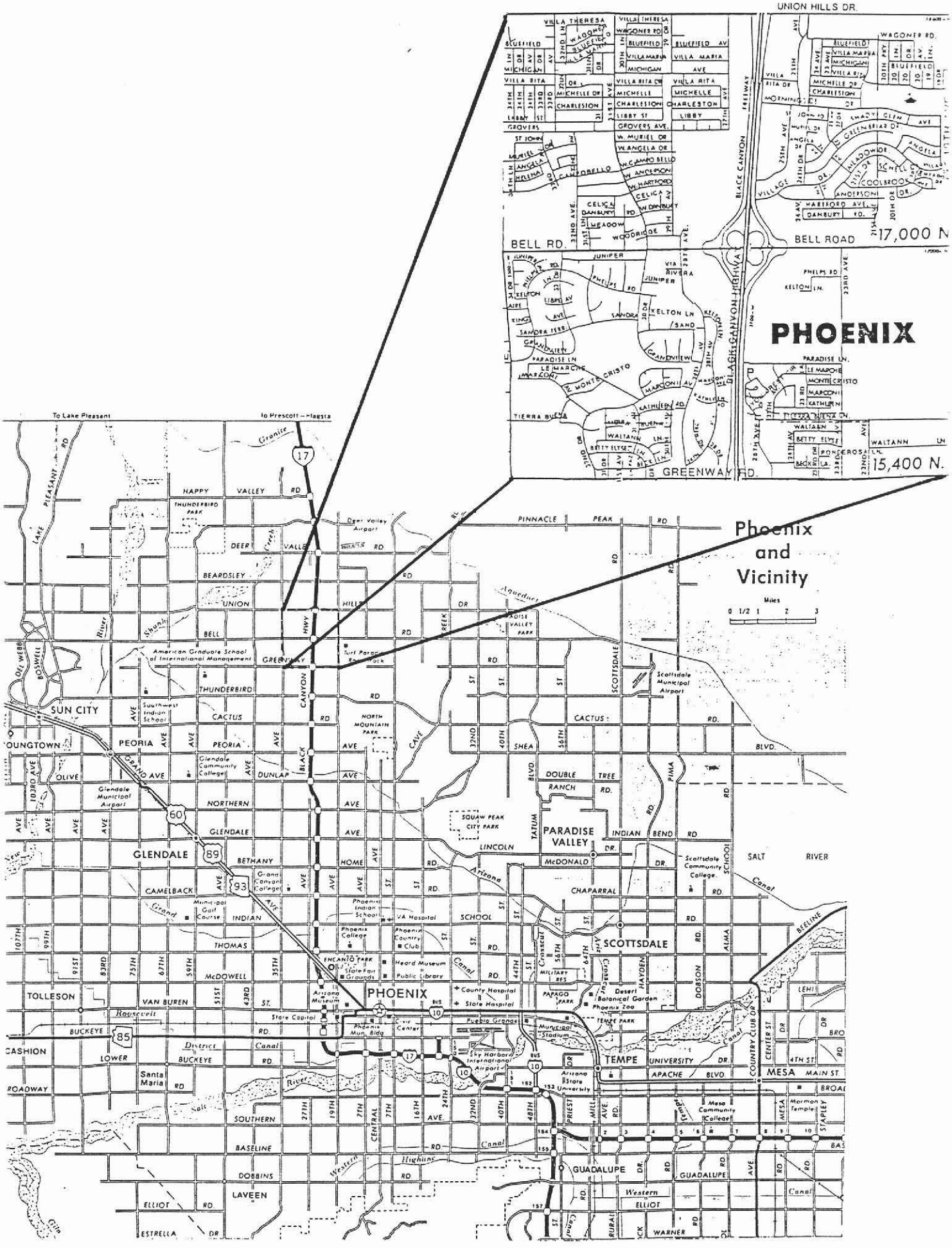
FIGURE 6 - JOINT AT TIME OF FINAL EVALUATION

IV. CONCLUSIONS AND RECOMMENDATIONS

The Arizona Department of Transportation is in the process of reevaluating joint sealants. A committee has been formed to evaluate different types of sealants. Included in that evaluation will be laboratory testing methods and material specifications. Silicone joint sealants, including Dow Corning 888, will be considered in this evaluation.

Based on the performance in limited field applications it is recommended that Dow Corning 888 be included as an approved material for use on Arizona highways. If the joint is properly prepared before installation, the sealant will prevent water from entering the base materials and will not allow fines to infiltrate into the joint. Existing joints should be sandblasted and cleaned before the joint sealer is installed.

APPENDIX


Phoenix and Vicinity
PHOENIX
SCOTTSDALE
TEMPE
MESA
GLENDALE
PARADISE VALLEY
SUN CITY
TOLLESON
LAVEEN
GUADALUPE
CASHION
BELL ROAD
17,000 N
15,400 N.
UNION HILLS DR.
BELL RD.
GREENWAY RD.
To Lake Pleasant
To Prescott—Flagsta
Miles
0 1/2 1 2 3

Information about Silicone Sealants

DOW CORNING

DESCRIPTION

Dow Corning® 888 silicone highway joint sealant is a one-part silicone material that readily extrudes over a wide temperature range and cures to produce a durable, flexible, low-modulus silicone rubber highway joint seal.

Because of its low modulus characteristics and good extension/compression recovery (+100 percent/-50 percent of original joint width), Dow Corning 888 silicone highway joint sealant gives outstanding performance in highway joints in which extreme movement occurs.

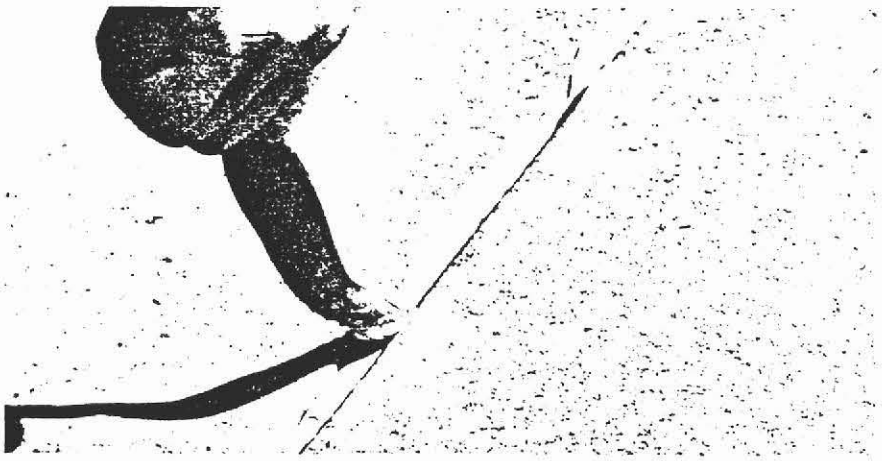
Highway concrete contraction/expansion joints are generally sealed to prevent concrete "slab growth" and/or "blow-up," erosion of sub-base, or corrosion of metal tie bars embedded in the concrete, resulting from incompressibles (dirt and stones), water and deicing chemicals entering the joints at the joint surface.

Dow Corning 888 silicone highway joint sealant features:

- *Ease of application* — one-part, ready to use as supplied; no mixing required; dispensed directly from bulk container into joint with air-powered pump.
- *All-temperature gunnability* — consistency is relatively unchanged over normal installation temperature range.
- *Unprimed adhesion* — primer is not required for bonding to concrete; surface must be clean, dry, and frost-free.
- *Seals irregular surfaces* — can be used to seal joints where spalls have occurred, provided adequate

DOW CORNING® 888 SILICONE HIGHWAY JOINT SEALANT

Type	Low-modulus silicone
Cure	One part; cures at room temperature by reaction with moisture in air
Special Properties	Easy to use; bonds to concrete without use of primer; good recovery from extension/compression
Primary Use	Sealing highway concrete contraction joints, especially those exposed to extreme movement



TYPICAL PROPERTIES

These values are not intended for use in preparing specifications or joint designs, but for comparison of rubber properties.

As Supplied

Color	Gray
Flow, Sag or Slump	Nil
Working Time, minutes	10
Tack-Free Time, at 77 F (25 C), hours	1
Cure Time, at 77 F (25 C), days	7-14
Full Adhesion, days	14-21

As Cured — after 7 days at 77 F (25 C) and 50% RH

Elongation, percent minimum	1200
Durometer Hardness, Shore A, points	15
Joint Movement Capability, percent	+100/-50
Tensile Strength, maximum elongation, psi	100
Peel Strength, ppi	25

Specification Writers: Please contact Dow Corning Corporation, Midland, Michigan, before writing specifications on this product.

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TABLE I: RECOMMENDED BACKER ROD INSTALLATION (SHALLOW CUT)*

Joint Width	*1/4"*	*3/8"*	*1/2"*	*3/4"*	*1"*
Recessed Below Surface	1/4"	1/4"	1/4"	1/4"	1/2"
Sealant Thickness	1/4"	1/4"	1/4"	3/8"	1/2"
Backer Rod Diameter	3/8"	1/2"	5/8"	7/8"	1-1/4"
Total Joint Depth	7/8 - 1"	1 - 1/8"	1-1/8 - 1-1/4"	1-1/2 - 1-5/8"	2-1/4 - 2-3/8"

*On road surfaces where grinding is planned at a later date, the sealant and backer should be installed so that it is approximately 1/4 inch below the road surface after grinding is complete.

contact is made between sealant and substrate.

• *High movement capability* — the sealant will perform in a continuous joint movement of +100 percent and -50 percent. In new construction, it will take the 25-percent movement of each of 2 or 3 slab lengths working in unison before all the "shrink" or contraction cracks occur.

• *Low modulus* — the sealant stretches 100 percent in the joint with very little force. This places very little strain on the bond line or joint walls. This, in turn, maximizes the probability of a successful seal with continuous joint movement. Movement of highway joints caused by temperature, traffic and faulting requires a sealant that does not strongly resist stress and/or shear.

• *Fully elastic* — the sealant can be stretched to 100 percent or compressed 50 percent of the bond width and held there. When released, it will recover 95 percent or greater of the original dimension. This extension and/or compression can be repeated many times and the sealant will resume its original shape without splits or cracks. Thus, when properly installed in a highway contraction joint, it does not "pump" out of the joint during compression or split or crack during extension.

• *Resilient* — once cured, the sealant rejects or prevents stones and other noncompressibles from entering the joint by "squeezing" them out as soon as force pushing these noncompressibles into the sealant is removed.

• *Good weatherability* — a 100-percent silicone rubber that is virtually unaffected by sunlight, rain, snow, ozone, or temperature extremes.

• *Fast cure* — typically, the sealant will have a tack-free surface in one hour or less. With this fast cure and recessed joint design, the road can be opened almost immediately after sealing in most applications.

• *Long-life reliability* — under normal conditions, cured sealant stays rubbery from -80 to 300 F (-56 to 149 C) without tearing, cracking, or becoming brittle.

• *Compliance with performance requirements* — meets and exceeds both Federal Specifications TT-S-001543A Class A (one-part silicone sealants) and TT-S-00230C Class A (one-component sealants). Also meets Canadian Specification 19GP9 Type I.

USES

Dow Corning 888 silicone highway joint sealant is especially effective for sealing transverse contraction and expansion joints, longitudal, center line and shoulder joints. These concrete expansion/ contraction joints can be on a roadway or a bridge. It can be used as the original sealant in new concrete construction or as a remedial or repair sealant in old construction.

In new construction, Dow Corning 888 silicone highway joint sealant provides the *extra* insurance needed if all the "shrink" or contraction cracks do not occur during the initial "weakening" step. Thus, two or three concrete lengths will act in unison, stressing a sealant two or three times the design dimensions or movement.

For use in repair or remedial applications where other joint sealing materials have failed because of excessive movement or poor weatherability, Dow Corning 888 silicone highway joint sealant can be used to seal irregularly shaped and/or spalled joints.

Thus, the joints do not need reforming before sealing. These joints should be dry and free of all old sealing compounds.

Limitations

Dow Corning 888 silicone highway joint sealant is not recommended for continuous water immersion. It should not be applied in totally confined spaces where the sealant is not exposed to atmospheric moisture. The sealant bead should be recessed below the highway surface to minimize abrasion from traffic and snow removal equipment. The sealant should never be applied to wet or damp concrete or installed during inclement weather.

The adhesion to joints that are formed with noncement-based products should be checked before performing full-scale sealing.

HOW TO USE

Low-modulus Dow Corning 888 silicone highway joint sealant easily withstands extreme joint movement when properly applied. The sealant will withstand 100-percent

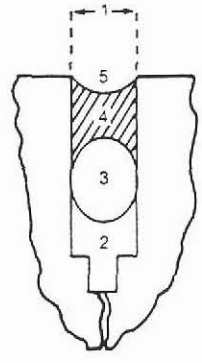
TABLE II: ESTIMATING REQUIREMENTS*

Linear feet per gallon of Dow Corning 888 silicone highway joint sealant for various joint widths.

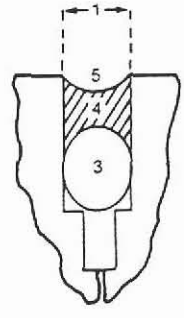
Joint Width, Inches	Sealant Bead Thickness, Inches	Backer Rod Diameter, Inches	Minimum Joint Depth, Inches	Backer Rod Placement Depth, Inches	Estimated Linear Feet/Gallon
1/4	1/4	3/8	1	1/2	246
3/8	1/4	1/2	1-1/4	1/2	149
1/2	1/4	5/8	1-1/4	1/2	103
5/8	5/16	3/4	1-1/2	9/16	66
3/4	3/8	7/8	1-3/4	7/8	46
7/8	7/16	1	1-3/4	11/16	33
1	1/2	1-1/8	2	3/4	26
>1	1/2	1-1/4+	2+	3/4	—

*Volumes will vary depending on joint design, tooling, backer rod placement and waste.

FIGURE 1: GOOD JOINT DESIGNS



STANDARD JOINT



SHALLOW CUT JOINT
FOR NEW CONSTRUCTION

1. Joint width wide enough to accommodate movement.
2. Joint sawed deep enough to allow backer rod/sealant placement and space for pumping of old sealing compounds. *NOTE:* This applies to standard joints only; void space beneath backer rod in new construction is not needed.
3. Proper backer rod placement.
4. Sealant installed to proper depth and width.
5. Sealant tooled 1/4" to 1/2" below pavement surface.

extension and 50-percent compression of the original joint width. But the recommended joint movement design is for ±25 percent (50 percent total) and not at the sealant limits. This difference provides the insurance for successful seal when job site joint widths are different than designed widths. Therefore, the joint design dimensions should be less than the ultimate sealant capability.

A thin bead of silicone sealant will accommodate more movement than a thick bead. Dow Corning 888 silicone highway joint sealant should be no thicker than 1/2 inch (12.7mm) and no thinner than 1/4 inch (6.4mm). Within these limits, the sealant width-to-depth ratio should be 2:1. In all cases, it is recommended that the sealant be recessed below the road surface at least 1/4 inch with 1/2-inch recess being acceptable in wider joints (see Table I).

Dow Corning 888 silicone highway joint sealant is a nonsag sealant, which allows its use in vertical curb joints as well as horizontal joints. Being a nonself-leveling sealant, it must be "tooled" to insure good contact and adhesion. An expanded closed cell polyethylene foam aids in sealant tooling, controlling sealant depth and providing a recessed nonbonding tooling surface. In new construction where the joint is a new cut, a shallow cut is recommended where the backer rod is placed on the "shelf" or bottom of the joint (see Figure 1). The recommended depths are shown in Table I. This design provides a firm support for sealant tooling, making the sealant easier to install, and provides more insurance of good sealant/concrete contact. The shallow cut also saves blades and time and is recommended when the roadway will see foot traffic, as in urban areas.

In repair work where previous sealing materials have been of a joint filling sealing type or the joint is not broadened by sawing, the standard joint design is advocated where the backer rod is slightly above the shelf. Enough space between the bottom of the backer rod and the shelf should be provided for possible "pumping" of old joint sealing — filling from the bottom of the joint. It is recommended that care be given to selection of the proper oversized backer, so that a firm tooling support is obtained (generally 1/4 inch larger than the joint works quite well).

The Dow Corning 888 silicone highway joint sealant is part of a system which must include the proper backer rod and proper installation procedures. The backer rod must be expanded closed cell polyethylene foam. Several other back-up materials (paper rope and open cell foam) are available, but have proven to be unacceptable. There are several manufacturers of closed cell polyethylene foam and any may be used.

INSTALLATION

When using Dow Corning 888 silicone highway joint sealant, the

following procedure is recommended:

1. Clean all joints of contaminants and impurities to the depth at which the sealant and backer rod are to be installed, by grinding, saw cutting, blast cleaning (sand or water), mechanical abrading or a combination of these methods. This will provide a sound, clean, and frost-free surface for sealant application.

2. Blow out dust, loose particles and other debris from joints with oil-free compressed air.* Surfaces must be *clean, dry, frost-free and dust-free.*

3. Install expanded closed cell polyethylene foam rod back-up material in joints. This material permits application of a thin bead and acts as a bond breaker, which allows the silicone sealant to stretch freely with the joint movement (refer to Table I).

4. Apply Dow Corning 888 silicone highway joint sealant in a continuous operation to properly fill and seal the joint width. For maximum performance, the sealant should be applied above 40 F (4.4 C).

5. Using a blunt instrument, tool the joint so that it is slightly concave and approximately 1/4 inch below the roadway surface. Tooling should be done before a "skin" forms, usually within 10 minutes of application. Do not use a soap or oil as a tooling aid (see Figure 1).

*OSHA Regulation. General Rules. Part 1, R-408.10036 Paragraph 1.

6. Excess sealant may be cleaned off tools and equipment while in uncured state with a commercial solvent such as xylol.

7. Keep traffic off sealed lane for 30 minutes.

NOTE: For complete installation instructions see Installation Guide for Dow Corning 888 silicone highway joint sealant, Form No. 61-507-79.

CAUTION

On direct contact, uncured Dow Corning 888 silicone highway joint sealant may cause skin irritation. Avoid prolonged or repeated skin contact.

SHIPPING LIMITATIONS

None.

STORAGE AND SHELF LIFE

When stored in original, unopened containers at or below 90 F (32 C), Dow Corning 888 silicone highway joint sealant has a shelf life of 6 months from date of shipment. Keep containers tightly closed.

PACKAGING

Dow Corning 888 silicone highway joint sealant is supplied in 10.3-fl. oz. (305-ml) disposable plastic cartridges, 29 fl. oz. (857-ml) disposable cartridges, 4.5-gal. (17-l) bulk pails, and 40-gal (151.4-l) bulk drums. All weights, net.

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