TuffTex Materials, Inc.
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RepSil Silicone Joint Sealants Installation Guide

Concrete moves and requires specialized materials to withstand the extreme wear and tear of its service life. Highways, airports, and parking garage joints call for high quality sealants that can withstand horizontal and vertical movement, have the following requirements: excellent weather ability, easy to install, fast turnaround time, and long service life. **RepSil Silicone Joint Sealants** are designed with these criteria.

RepSil Silicone Joint Sealants are one-part and two-part silicone formulations that can be extruded from -20°F to 120°F. In addition, **RepSil Silicone Joint Sealants** can be used on asphalt. These sealants cure upon exposure to moisture in the air to form a flexible, low- to ultra-low-modulus, high-elongation silicone rubber seal.

RepSil Silicone Joint Sealants are capable of withstanding extension of 100 percent and compression of 50 percent of the original joint width. They have excellent recovery, which makes them ideal for use in joints that experience a high degree of movement. **RepSil Silicone Joint Sealant**s are ultra-low-modulus sealant that can also be used to seal joints in asphalt pavements because it places extraordinarily little stress on the asphalt joint face. Asphalt paving materials have low tensile strengths and require a sealant that places extraordinarily little stress on the asphalt itself while keeping the joint sealed. To fully utilize these capabilities, the sealant must be properly installed in professionally designed joints. This guide provides the correct installation procedures, which begin with good joint design and preparation. The guide also covers backer rod installation, installation equipment and a list of manufacturers and recommended equipment, as well as the most frequently asked questions and answers.

Applications

Please contact your **TTM** representative for more information or other applications not listed below:

- Airports
- Fast Track Pavements
- Bridge Joints
- Pavements on Grades
- Steel/Armor Joints
- Short-term Exposure Fuel Resistance

Important Considerations

Joint faces must be clean, dry, and frost-free when the sealant is installed. Joints must be free of standing water, and under no circumstances should sealing take place during inclement weather.

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Joint Cleanliness – A clean joint should have no visible signs of residual sealant or debris on the joint face and leave no residual cement powder or dust on your fingers after rubbing the joint face.

Pavement Drainage – **RepSil** silicone pavement sealants are not recommended for conditions where continuous water or moisture exposure is expected. Sources of subsurface water infiltration include a high-water table, shallow or poor drainage ditches or improperly designed or maintained subsurface drainage systems. All potential applications should be reviewed to ensure the pavement has positive drainage. The correct application of a primer has been shown to enhance performance of the sealant in these situations; contact your **TTM** representative for more details.

Dew Point – This is the temperature at which the air is saturated with moisture vapor and liquid water (dew) begins to form. Do not install sealant when the temperature is at or below the dew point. Additionally, conditions should be closely monitored if temperatures are approaching the dew point.

Inclement Weather – If rain or other inclement weather occurs during joint preparation or sealing, all operations should cease, and sufficient time must be allowed so the joints are dry prior to starting or continuing the sealing operation. Joints that were cleaned but left open during inclement weather may need to be cleaned again prior to sealing due to the potential for contamination from run-off water.

Confined Spaces – **RepSil** silicone pavement sealants are not recommended for use in totally confined joints where the sealant is not exposed to atmospheric moisture during cure.

Joint Preparation

Obtaining the desired performance depends on using correct installation procedures. All contaminants, especially dried laitance from saw-cutting and previous sealants, must be removed with a high-pressure water wash followed by a sandblast after the joint dries. Leaving materials of this type on the surface of the joint face will prevent development of a good adhesive bond.

A clean joint will have no visible signs of residual sealant or debris on the joint wall and will leave no residual cement powder or dust on your fingers after rubbing the joint face.

RepSil Silicone Joint Sealants will not bond to wet asphalt or concrete. Moisture in and on the pavement is difficult to detect. The pavement must be allowed to dry. When in doubt, it is wiser to allow additional drying time than to risk sealant adhesion failure. After drying, it is especially important to sandblast the top portion of the joint the sealant will contact. When sandblasting, follow all federal, state, and local laws and regulations regarding the proper use and handling of equipment. The primary purpose is to remove traces of residual laitance. The sandblasting nozzle must be held at an angle to the joint face and within 1 or 2 inches of the pavement. Pointing it toward the bottom of the joint or at too great a distance from the face allows the force of the blast to dissipate resulting in ineffective cleaning. These points and others regarding surface preparation of new and old concrete pavement are expanded upon in following sections.

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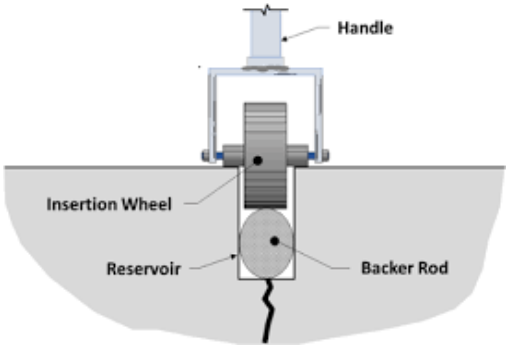
Backer Rod Selection

Sealant Backing

- Choose the appropriate sealant backing based on the available joint depth. Sealant backing will prevent three-sided adhesion, control sealant depth, and allow for tooling to ensure proper sealant / substrate contact.
- Foam cylindrical backer rod is typically installed and should be approximately 25% larger than the width of the joint to ensure a tight compressed fit. Three types are currently available: open cell, closed cell, and hybrid. Consult the sealant manufacturer for the recommended backer rod type.
- In joints where depth is not adequate to accept a backer road, a polyethylene bond breaker tape should be installed.



Size		
1/4"	Spool	3200
3/8"	Spool	1800
1/2"	Spool	2500
5/8"	Spool	1550
3/4"	Spool	1100
1"	Spool	550
1 1/4"	Spool	400

		BOX
1 1/2"	6'Lengths	552 LF/ 92 Box
2"	6'Lengths	360 LF/ 60 Box
2 1/2"	6'Lengths	240 LF/ 40 Box
3"	6'Lengths	144 LF/24 Box
4"	6'Lengths	90 LF/ 15 Box
6"	'9'Lengths	72 LF/ 8 Box

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Joint Sealant Coverage Chart (linear feet per gallon)

		Width of Joint (in.)										
		1/4	3/8	1/2	5/8	3/4	7/8	1	1.25	1.5	1.75	2
Depth of Joint (in.)	3/16	411	275	205	164							
	1/4	307	205	154	123	103	88	77	62	51	44	38
	3/8			103	82	68	59	51	41	34	29	26
	1/2			77	62	51	44	39	31	26	22	19
	5/8								25	21	18	15
	3/4								21	17	15	13

Failure to utilize a backer rod will allow the sealant to bond to the bottom of the joint, which may result in excessive stress on the sealant.
Another function of the backer rod is to control the thickness of the sealant bead. The backer rod should be approximately 25 percent oversized so that it fits tightly the joint. A loose backer rod will be pushed deeper into the joint when the sealant is installed and will not provide adequate support for proper tooling of the sealant. Thus, the thickness of the sealant bead cannot be controlled as required. With proper tooling, the joint sealant is pushed down onto the backer rod and firmly against the joint walls, resulting in excellent contact, proper wetting, and good adhesion with the joint walls. The sealant requires a tight-fitting backer rod to control thickness of the sealant bead and to prevent the sealant from bypassing the backer rod to the bottom of the joint.

Sealant and Backer Rod Placement Depths
The sealant bead must be recessed a minimum of 3/8 inch (9.53 mm) below the pavement surface. The sealant bead should be a minimum of 1/4 inch (6.35 mm) thick but not greater than 1/2 inch. A width-to-depth ratio of **2:1** is suggested for joints less than one inch wide and should be maintained throughout the bead whenever possible. This ratio is not applicable for joints 1/4 inch wide or joints over 1 inch wide. If other operations, such as diamond grinding, are to be performed after sealant installation, the sealant recess and the resulting joint depth and backer rod placement may need to be increased. Preferably, the sealant should be installed after surface grinding to avoid damage to the sealant.

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VERIFYING SEALANT ADHESION

The field adhesion test is a valuable tool for verifying the installed quality of the joint seal. Performing this test prior to the application allows for early detection of problems, which can help to minimize the cost associated with sealant restoration projects. Potential problems that could be detected using this field adhesion test include:

- Contaminated or expired shelf-life sealant or primer
- Improper substrate cleaning
- Incorrect primer selection
- Improper joint configuration
- Poor priming techniques
- Three-sided adhesion (i.e., absence of or improper installation of backing material)
- Excessive substrate movement
- Presence of bond breaking material(s) (i.e., moisture, frost, incompatible coatings, etc.)

The field adhesion test is simply a hand pull test of a cut area of joint sealant (Figure 1.1). The testing procedure can be found in **Appendix X.I of ASTM C1193, Standard Guide for Use of Joint Sealants.** It is a particularly useful tool for evaluating the effects of various cleaning methods and primers. It is also a good indicator of the fundamental adhesive properties of a sealant on a particular substrate. It is most important to verify adhesion and joint configuration at the start of the project for the various construction materials that may come in contact with the sealant(s) used. We recommend that one adhesion test be performed every 100' of joint over the first 1,000' of install sealant as soon as the sealant has fully cured. If good results are obtained from the tests of the first 1,000', future field adhesion testing should proceed at a lesser rate of:

1) One test per 1,000' (305 m)
2) One test per floor per elevation
3) One test per week per installation crew

If poor results are obtained in a field adhesion test, work should be stopped to verify the root cause and magnitude of the problem. Once the cause of the problem is identified, corrective measures can be implemented. The area yielding the poor results should be identified by additional, more frequent field adhesion tests in the affected area(s). The daily log should be analyzed to see if there is anything unique about the poor results area. Good results are defined as meeting the standards for adhesion and joint configuration established in the mock-up application. Conversely, poor results are not meeting these established standards.

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REPAIR OF THE FIELD ADHESION TEST AREA

The field adhesion test is a destructive test that should be repaired immediately. This will help to maintain the weatherproofing integrity of the repaired area. In most cases, it is simply a matter of gunning in new sealant to replace the cut area. Ensure that the original sealant surfaces are clean, and that the new sealant fully wets out all contact areas. Refer to the sealant data sheet or contact your local **TTM Representative** for correct tie-in procedures.

Sealing New Concrete Pavement

Before attempting to seal joints in new concrete, the concrete must be given adequate time to cure, dry and develop strength so the joint reservoir can be sawed without concrete damage (e.g., raveling, spalling, etc.). The time between sawing of the initial cut (contraction cut to control cracking) and the joint sealant reservoir will depend on such factors as mix design (e.g. conventional, Fast Track, High Early Concrete mixes), cement type, time of year concrete is placed, temperature, etc. Only clean and dry joints should be sealed. For conventional concrete mixes, it is recommended that the concrete be allowed to cure and dry a minimum of seven days in good drying weather before installing **RepSil Silicone Pavement Sealants**. Cold, wet, inclement weather will require a longer drying time. An additional day of good drying weather should be allowed for each day of poor drying weather.

Joint sealant reservoirs are prepared by saw-cutting the concrete to the specified width and depth. It is recommended that freshly sawed joints be washed with high-pressure water immediately after sawing to remove most of the saw slurry from the joint faces. Joint washing should be in one direction (working forward) to minimize recontamination.

After the joints have dried, they should be sandblasted to remove residual laitance from the joint walls. Sandblasting should be done in two passes, one pass for each face, with the nozzle held at an angle to the joint face and within 1 or 2 inches (25.4 or 50.8 mm) of the pavement. Sandblasting should be done to the depth at which the sealant and backer rod are to be installed. Experience has shown that the best method for removing contaminants is by sandblasting the dry joint that was previously flushed with water after the saw-cutting process. Other techniques, such as grinding or wire-brushing, are not recommended. They have been found to be less effective due to possible operator error and/or equipment problems. If conditions are such that sandblasting is not permitted, high-pressure water blasting may be used as an alternative. After sandblasting, the blasting media, as well as any dust and dirt deposited by wind and traffic, must be blown out of the joint and away from the area around it using a high-pressure air blast. As with the water wash, the air blast should move in only one direction (forward) to prevent recontamination of the joint. Compressed air, ata pressure of at least 90 psi (620 kPa), should be used to blow out the joint just before installation of the backer rod. Air compressors used for this purpose must be equipped with traps capable of providing moisture-free and oil-free air.

Just before the backer rod is installed into the joint, rub your finger across the dry joint face to determine that residual dust or dirt has been removed. If joints still contain dust or dirt, contaminants must be removed before backer rod and sealant installation. Solvents should not

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be used to remove oils, because they generally only carry the materials further into the concrete pores or spread them over the surface. Solvents that have not completely flashed may also affect the sealant cure process.

Note: Many new concrete additives are being sold to the highway industry that allow concrete to be placed and opened to traffic in less time. These materials may be additives to or substitutions for Portland Cement Concrete. When using any of these new materials, adhesion testing of RepSil Silicone Pavement Sealants is suggested and TTM be contacted.

Resealing Old Concrete Pavement

The installation techniques required for resealing can be summarized as removal of old sealant/seal, proper cleaning of the joint and installation of the bond breaker and sealant. The tools and techniques used to remove the existing sealant or joint filler will be determined by the material in the joint and by available equipment. The old sealant can be removed by cutting or saw-cutting, which slightly widens the joint, to produce a new surface for sealing. Some materials, compression seals for example, are simply pulled out of the joint and then sandblasted to remove the lubricant/adhesive.

After removing previous materials, immediately high-pressure water wash the joint to remove sawing residue. Wash in one direction (forward) to prevent recontamination. When the joint has dried, it should be sandblasted to remove any residual dust using techniques described previously. After sandblasting, the joint should be blown out with compressed air at a pressure of at least 90 psi (620 kPa) to remove blasting media and dust. Air should be free of oil and water.

As a final check before bond breaker and sealant installation, the joints should be inspected for residual dust and/or old sealing material. If dust or old sealing materials remain, contaminants should be removed using techniques described previously.

Installation Equipment

Equipment needed to install **RepSil Silicone Pavement Sealants** can be operated manually or with power. Powered equipment is recommended because of the speed and ease of application. Manually operated equipment can be successfully used for small applications. Cartridges (29 ounce [858mL]) are available for activities of this type. Air-powered versions of the small, hand-held caulking guns are also available. The major pieces of power equipment required to install **RepSil Silicone Pavement Sealants** are an extrusion pump to transfer the material from the container to the joint and an air compressor capable of delivering air at 60 CFM (28.3 L/s) and 100 psi (690 kPa). Complete units including air-powered pump, follower plate and hose are required for both pails and drums. For versatility, the same unit can be used for both drums and pails, provided the system offers interchangeable follower plates.

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Sealant Mixing (multi-component sealants only)

- If a sealant requires mixing in the field, ensure that the **RepSil Silicone Pavement Sealants** published mixing procedures are strictly followed.
- Thorough and uniform mixing is vital when installing multi-component sealants. Be sure to utilize the correct mixing equipment as recommended by the sealant manufacturer.

Sealant Dimensions

- The correct sealant dimensions are critical when installing joint sealants and will ensure the sealant maintains its designed performance characteristics.
- Width of joint to depth of sealant should be two to one (2:1) with no joint depth being less than ¼".

Width to depth ratios guidelines

Vertical Joints	
• Joints up to ½" wide:	1:1 width to depth
• Joints up to 1.0" wide:	2:1 width to depth
• Joints > 1.0":	Max. 50" depth
Horizontal Traffic Joints	
• Joints up to ½" wide:	1:1 width to depth
• Joints up to 1.0" wide:	2:1 width to depth
• Joints > 1.0" (pedestrian):	1:1 width to depth
• Joints > 1.0" (vehicular):	2:1 width to depth

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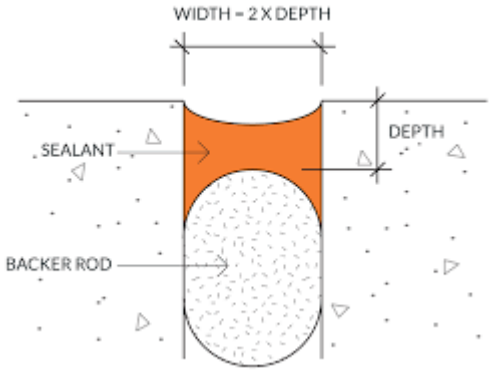
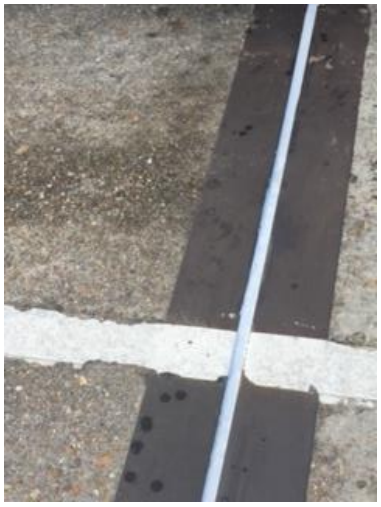
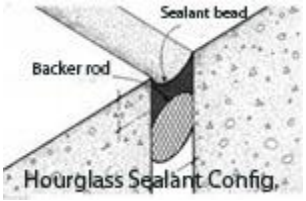


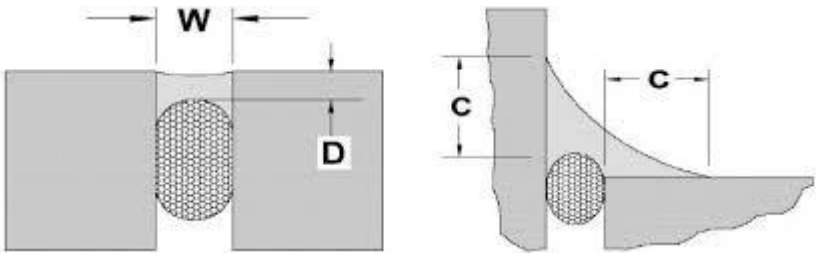


Sealant Installation

- All sealing should be done when temperatures are above 40°F. Preferably, sealants should be installed at a median temperature and not at temperature extremes (low and high).
- All surfaces receiving sealant should be DRY and CLEAN.
- Sealant should be applied in a continuous operation using a professional grade cartridge-type caulking gun or bulk loading gun.
- Joints should be filled uniformly to the required sealant depth. .

5. Tooling of Sealant





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- Tool the sealant with light pressure to spread the material against the sealant backing and joint surfaces. Use a tool with a rounded tip to keep a concave sealant profile in the joint and maintain the industry standard “hourglass” configuration.
- The sealant should be dry tooled unless **TTM** specifically approves otherwise. If approved, the tool may be dampened with a **TTM** approved tooling agent (typically mineral spirits).
- Do not use water or soapy water as a tooling agent. Avoid over tooling.
- Tool the sealant at windowsills and similar places so that precipitation, cleaning solutions, etc. will not pond.
- Any masking materials used are to be removed immediately after tooling while the sealant is still in its uncured state (wet).

Clean Up

Adjacent Substrates

- Uncured sealant must not come into contact with surfaces adjacent to the sealant joint. If uncured sealants are introduced to prohibited areas, the sealants should be removed as follows:
- Non- Porous Substrates: Immediately remove all excess uncured sealant by using **RepSolv X**, xylene, toluene, methyl-ethel ketone, or isopropyl alcohol. Ensure all cleaning agents are compatible with installed substrates or other building facade materials.
- Porous Substrates: Allow sealant to develop initial cure, then remove by abrasion or other mechanical means. Exercise extreme caution to maintain an undamaged original sealant surface texture. Compatible solvents, cleaners, and poultices may be utilized to remove any remaining residue.

Tools and Equipment Clean Up

- Tools and equipment may be cleaned with solvents such as **RepSolv X** xylene, toluene, methyl-ethyl ketone, or isopropyl alcohol while sealant is uncured.
- Note: Maintaining clean application tools and work areas will result in higher quality project performances & sealant applications.

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TMI OFFERS A COMPLETE LINE OF JOINT SEALANTS FOR EVERY APPLICATION

HOT-APPLIED JOINT SEALANTS

Our line of high quality, time-proven, hot-applied sealants includes:

- **RepJoint 3405**- Hot-Applied, Single Component Polymeric Joint Sealant
- ASTM D3405
- ASTM D1190
- ASTM D6690, Type I, II and III
- AASHTO M 173
- AASHTO M 324
- Corps. of Engineers, CRD C 530
- FAA P-605
- Federal Specification SS-S-1401

The quality of this hot pour sealant makes it the only one needed for ALMOST ALL concrete and asphalt applications. You can buy cheaper, BUT not better!

RepJoint HCS Crack Filler

- D 5078 Hot-Applied, Single Component Polymeric Crack Filler

COLD-APPLIED JOINT SEALANTS

Our complete line of cold-applied sealants includes:

- **RepSeal AC**- Cold-Applied Rubberized for Concrete or Asphalt Sealant
- **RepSeal SL-** 1 & 2 Part, Self-leveling, Hybrid polyurethane Joint Sealant
- **RepSeal NS**- 1 & 2 Part, Non-Sag, Hybrid polyurethane Joint Sealants
- **RepSeal LD**- Loop Detector Sealant Roads, Toll Booths, & Weigh Stations
- **RepSil FS**- 1 Part, Type 7 compliant, fast setting bridge sealant
- **RepSeal AP-** Polyurea Joint Sealant 50-60 Durometer
- **RepSeal RS 80-** Polyurea Joint Sealant 80 Durometer
- **RepSil SL-1** Part Self Leveling Silicone Highway and Airport Joint Sealant
- **RepSil NS-1** Part Non-Sag Silicone Highway & Airport Joint Sealant
- **RepSeal WJS-** Wide Joint Self Leveling Hybrid (600% Elongation) Joint Sealant
- **RepSil FS**- Fast Setting 1 Part Silicone Joint Sealant

FOAMS

- **RepJoint PF-UV-** Low-density, closed-cell, cross-linked, Ethylene Vinyl Acetate, polyethylene with a **Hindered Amine Light Stabilizer (HALS)** for added UV resistance
- **RepJoint EVA-** Low-density, closed-cell, cross-linked, Ethylene Vinyl Acetate, polyethylene
- **RepJoint LDP-** Preformed low density, cross linked, nitrogen blown, polyethylene
- **RepJoint HM**- low-density, closed cell, cross-linked, polyethylene material with EVA for added memory

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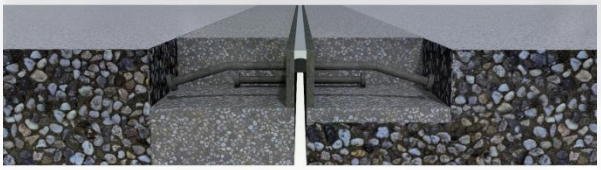
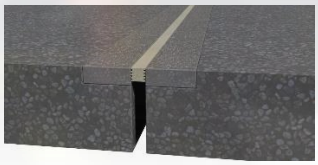
RepPoxy PA is a two component, low odor, low viscosity, fast setting, epoxy primer with unique penetrating characteristics. It is designed to enhance the adhesion between substrates, sealants, and topcoats. **RepPoxy PA** seals porous surfaces to prevent pinholes and also performs as a lubricating adhesive for foam and rubber joints. This primer can be used on concrete, steel, plywood and in heavy traffic areas. Use for indoor or outdoor applications.





Fiber Reinforced Polymer (FRP) Systems, Cementitious Mortars & Repair Products, Epoxies,

Sealers, Cleaners, Polyurethane & Epoxy Header Systems, Biodegradable Etching Products

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