

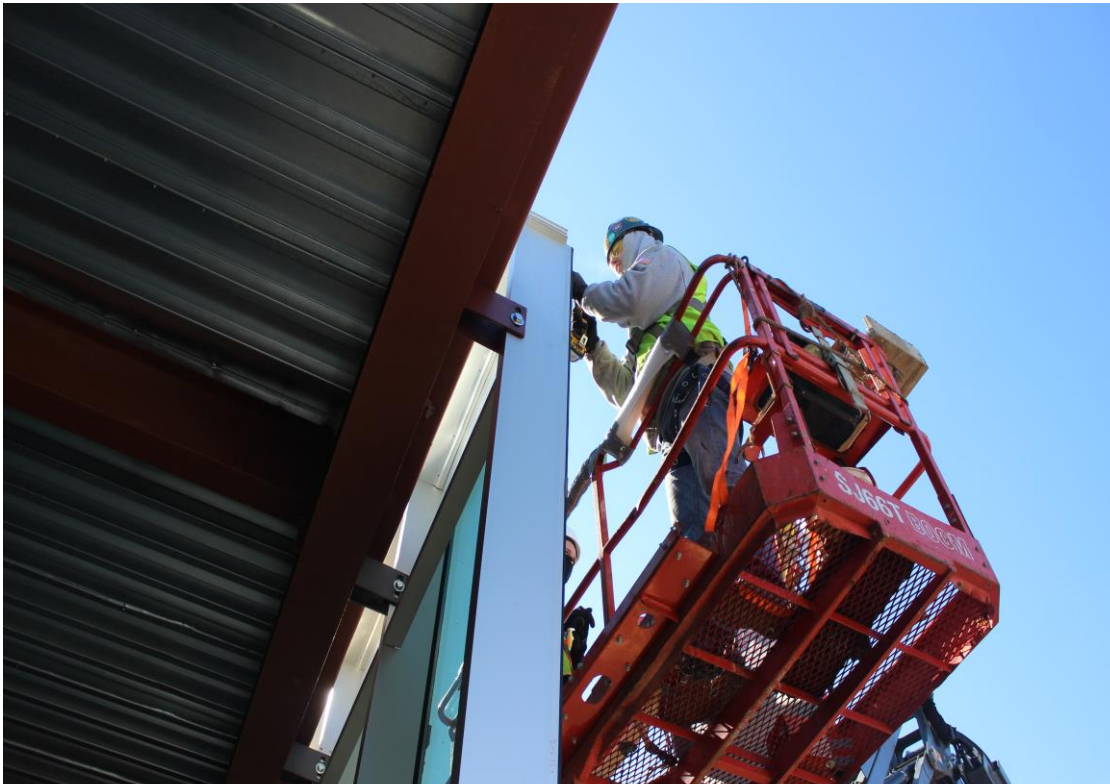
Pecora Sealant Installation Manual

Materials, New Construction, Restoration

ABSTRACT

A detailed summary of common and recommended techniques for the application of architectural sealants manufactured by Pecora Corporation.

Pecora Technical Service
01/11/2021



PECORA CORPORATION

Sealant Installation Manual

Materials, New Construction, Restoration



Pecora Technical Service

01/11/2021



165 Wambold Road, Harleysville, PA 19438 • 1-800-523-6688 • 215-723-6051 • FAX 215-799-2518

SEALANT INSTALLATION MANUAL

Table of Contents

Section 1	Sealant Chemistries	3
	1. Acrylic (solvent)	3
	2. Butyl	3
	3. Latex (water based)	4
	4. Polysulfide	4
	5. Polyuréthane	4-5
	6. Silicones	5
	7. Silyl Terminated Polyurethane - (Silicone / Urethane Hybrid)	6
Section 2	New Construction	7
	1. Sealant Application Classification	8
	2. Joint Location and Condition	9
	3. Design for Sealant Movement Sealant Selection	9-10
	4. Sealant Selection	11
	5. Temperature Considerations	12
	6. Substrate Surface Preparation	12
	7. Priming	13
	8. Placing the Sealant	14
	9. Joint Filler and Sealant Backing Materials	15-16
	10. Waterproofing Applications	16
	11. Acoustical Applications	17
	12. Fire stopping	18
	13. Glazing	18-19
	14. Security Applications	20-21
	15. Pre-Formed Joint Sealants	21
Section 3	Restoration	22
	1. Sealant Failure – Identifying Causes	23-24
	a. Aging	
	b. Incorrect Sealant for Application	
	c. Inadequate Surface Preparation	
	d. Excessive Joint Movement	
	e. Early Joint Movement During Sealant Cure Cycle	
	f. Improper Sealant Application	
	g. Incompatibility	
	2. Choosing the Correct Sealant	25-26
	a. Identify Failed Sealant Type	
	b. Avoid Recurring Failures	
	c. Interior or Exterior	
	d. Movement Capabilities	
	e. Color and Paint-ability	
	f. Joint Preparation	
	g. Sealant and Residue Removal	
	h. Surface Preparation	
	i. Priming	
	3. Sealant Application	28-31
	a. Sealant Backings	
	b. Sealant Mixing (if applicable)	
	c. sealant Dimensions (width / depth)	
	d. Tooling of Sealant	
	e. In Process / Post Application Clean Up	
	f. Adjacent Substrates (porous / non-porous)	
	g. Tools and Equipment	
	h. Photos (reference)	
	i. Website Tech Bulletin Links (referenced)	



SEALANT CHEMISTRIES

Following is a list of the seven major elastomeric sealant types or chemistries.

1. Acrylic (solvent)
2. Butyl
3. Latex (water based)
4. Polysulfide
5. Polyuréthane
6. Silicones
7. Silyl Terminated Polyurethane
(Silicone / Urethane Hybrid)



1. ACRYLICS (SOLVENT-BASED)

- a. Used in residential and light commercial construction, mainly for exterior applications
- b. In general, meet $\pm 12.5\%$ movement (ASTM C 920, Class 12-1/2)
- c. May need special handling for flammability and regulatory compliance relative to VOC levels.
- d. Paintable
- e. Short open time; some challenges in tooling
- f. Exhibit some shrinkage upon cure
- g. Often used for perimeter sealing and low movement joints

2. BUTYLS (SOLVENT-BASED)

- a. Excellent adhesion to most substrates
- b. Excellent water vapour transmission resistance, low water vapour permeability
- c. Limited movement capabilities, generally up to $\pm 10\%$
- d. Excellent weathering
- e. Sometimes used in curtain wall applications where adhesion to rubber compounds is needed
- f. Most are stringy and difficult to apply neatly
- g. May show some shrinkage after cure; may harden and crack over time on exposed surfaces
- h. Some are not suitable for application where exposed to UV
- i. Some are non-hardening and are suitable for concealed application where sealant needs to remain pliable.

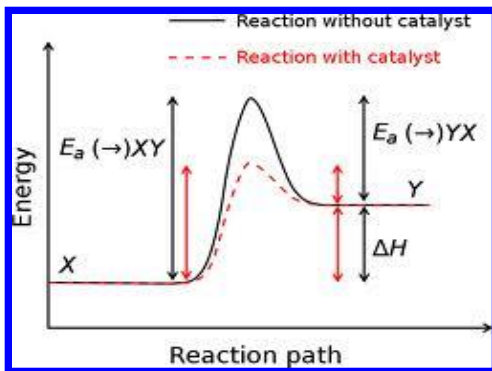


3. ACRYLIC LATEX (EMULSION OR WATER BASED)

- a. Used mainly in residential and light commercial construction applications
- b. Interior and exterior use
- c. Premium products meet $\pm 25\%$ movement (ASTM C 920, Class 25)
- d. Excellent paint-ability (with latex paints)
- e. Very good exterior durability
- f. Exhibit some shrinkage after cure
- g. Not used for exterior applications, particularly on high rise construction, for applications undergoing significant cyclic movement.

4. POLYSULFIDES

- a. First “high performance” sealant; mainly used in industrial applications (ASTM C920, Class 12-1/2 or 25)
- b. Poor recovery limits their use in joints with high cyclic movements
- c. Can be formulated for excellent chemical resistance (especially for aviation fuel)
- d. Good performance in water submerged applications
- e. Require a primer on almost all substrates

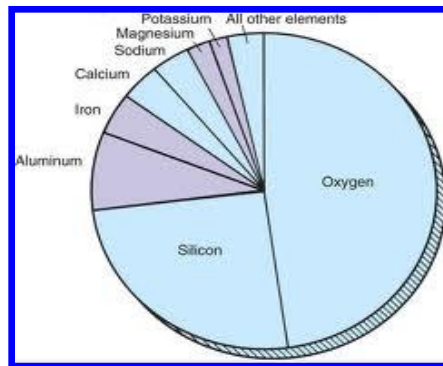
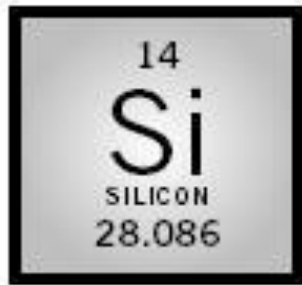


5. POLYURETHANES (PU)

- a. Used in industrial and commercial applications
- b. Very good movement capabilities, up to $\pm 50\%$ (ASTM C 920, Class 25 and 50)
- c. Not used in SSG applications (avoid direct contact to glass)
- d. Excellent bonding, generally without a primer for many surfaces
- e. Can be formulated for good UV resistance, which may be compromised by select colors



- f. Paintable
- g. Some formulations may contain low levels of solvent and isocyanate.



Abundance of Elements in the Earth's Crust

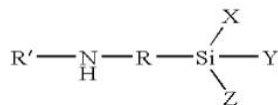
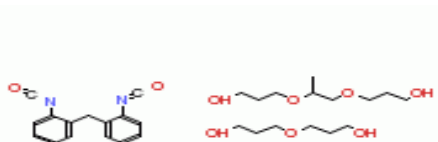
6. SILICONES

- a. Structural bonding and structural sealant glazing (SSG) of glass to structural frames
- b. Excellent joint movement capabilities; can exceed $\pm 50\%$ (ASTM C 920, Class 50 and Class 100/50)
- c. Excellent low temperature movement capability
- d. Excellent UV and heat stability
- e. Good adhesion for many substrates especially glass; a primer is recommended on certain substrates, particularly porous substrates
- f. Not paintable
- g. Used in protective glazing systems and insulating glass units to improve thermal performance (reduce heat loss). Also used for missile impact and bomb blast applications.
- h. Acetoxy chemistry-based silicone sealants have strong odour and are not compatible with materials reactive to acetic acid.
- i. Neutral curing, non-acetoxy silicone sealants are available and have become the standard for architectural use. "Neutral" refers to the Ph of the reaction product during cure. A reaction product with a neutral Ph will not adversely affect construction materials.
- j. Adhesion, as for all sealant types, is adversely affected by less than perfect application conditions.
- k. High, medium and low modulus sealants available
- l. May cause staining of some types of natural stone and "residue" run down on non-porous panel facades
- m. Low and non-staining potential formulations are available
- n. Available in Field tintable versions with a wide range of standard colors.





7. SILICONE / URETHANE HYBRIDS
Silyl Terminated Polyurethanes (STPU)



- a. Latest development in sealant technology
- b. No CO₂ evolution associated with single component urethane
- c. No isocyanate contents
- d. Enable broad use in construction, institutional, industrial, DIY, automotive, marine and transportation markets (not recommended for structural sealant glazing applications)
- e. Excellent adhesion and movement capabilities; good UV and heat stability
- f. Paintable
- g. Provide exceptional bonding to most construction substrates including plastics, metals, wood and stone
- h. Can exceed ± 50% joint movement capability (ASTM C 920) even in low temperatures
- i. Contain little to no solvent, contribute less VOC, and yield very low to no odors compared to other chemistries

Environmental Effects on Sealant Cure Chemistry

Conditions ► Cure Type ▼	Higher Temperature	Lower Temperature	Higher Humidity	Lower Humidity
Chemical Cure- Two components	<i>Reduces cure time</i>	<i>Increases cure time</i>	<i>Little effect</i>	<i>Little effect</i>
Moisture Cure- One component	<i>Reduces cure time</i>	<i>Increases cure time</i>	<i>Reduces cure time</i>	<i>Increases cure time</i>
Drying - Solvent evaporation	<i>Reduces cure time</i>	<i>Increases cure time</i>	<i>Little effect</i>	<i>Little effect</i>
Drying- Moisture evaporation	<i>Reduces cure time</i>	<i>Increases cure time</i>	<i>Increases cure time</i>	<i>Reduces cure time</i>





NEW CONSTRUCTION



- A. Sealant Application Classification
- B. Joint Location and Condition
- C. Design for Sealant Movement
- D. Sealant Selection
- E. Temperature Considerations
- F. Substrate Surface Preparation
- G. Priming
- H. Placing the Sealant
- I. Joint Filler and Sealant Backing Materials
- J. Waterproofing Applications
- K. Acoustical Applications
- L. Firestopping
- M. Glazing
- N. Security Applications
- O. Pre-Formed Joint Sealants





A) SEALANT APPLICATION CLASSIFICATION – TERMINOLOGY

- 1) Waterproofing
 - Expansion joints in Building Facades
 - Lap Joints – Flashing/Coping
 - Door/Window/Curtain wall perimeters
 - Traffic Joints – Vehicular/Pedestrian
 - Glazing – Structural/Backbedding

- 2) Acoustical
 - Interior wall joints
 - Base and top plate
 - Thresholds
 - Exterior wall joints and window perimeters

- 3) Firestopping
 - Wall to Wall Joints
 - Floor to Floor Joints
 - Floor to Wall Joints
 - Head of Wall Joints
 - Wall Penetrations

- 4) Glazing
 - Structural – 2-sided / 4-sided
 - Back Bedding Adhesive
 - Wet Glazing exterior
 - IGU seals
 - Security / Bomb Blast
 - High Impact

- 5) Security
 - Pick Proof
 - Pick Resistant
 - Eliminate Contraband
 - Reduce maintenance
 - Institutional Use – Prisons/Schools/Hospitals/Animal Enclosures

- 6) Pre-Formed Joint Sealants
 - Silicone extrusions
 - Adhered to substrate with silicone adhesive caulk
 - Restoration value
 - Available in custom colors and textures





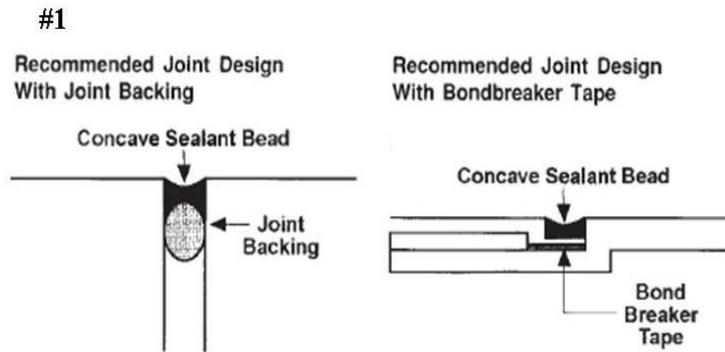
B) JOINT LOCATION AND CONDITION

- 1) The location of joint openings must permit applicator access to install joint components and to properly tool the sealant
- 2) The spacing of joints contributes to establishing the correct joint width
- 3) Wider spacing between joints requires wider joints
- 4) At every termination detail there must be adequate access and sufficient bonding area for sealant application
- 5) The joint opening must allow for sufficient placement of sealant and other joint components, i.e., backer rod, primer
- 6) The substrate(s) must be sound and free of materials that would compromise adhesion i.e. dirt, debris, oils, curing compounds, etc.
- 7) Perimeter seals must provide a minimum .25” wide surface for an adequate sealant bond interface
- 8) A minimum depth of 1/4 inch for the sealant to substrate bond. A minimum width of 1/4 inch opening is necessary to ensure that sealant applied from a caulking gun will flow into the sealant joint properly

C) DESIGN FOR SEALANT MOVEMENT

- 1) Joint movement capability of a sealant is determined by the percentage of movement between the substrates to be sealed-narrower joints provide less movement
- 2) Good architectural practice calls for joint design of four times the anticipated movement due to construction tolerances and material variations
- 3) Use joints greater than the minimum of .25”, since wider joints can accommodate more movement than narrow joints and can also result in a greater joint spacing
- 4) Use a sealant backing or bond breaker tape to eliminate "three-sided adhesion." The sealant should bond only to the substrates that will be moving (**Picture #1**)



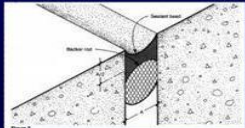


Picture #1: Recommended Joint Design


- 5) In joints up to 0.5” use a 1:1 width to depth ratio and joints wider than .5” use a 2:1 width to depth ratio to accommodate movement (**Photo #2**)

#2

Joint Configuration



- Width to depth ratios guidelines
 - Purpose: Maximize sealant performance
 - Vertical Joints
 - Joints up to 1/2 ” 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 1/2 “ 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



Picture #2: Joint Configuration

- 6) For a joint size larger than 1 inch, the depth should be kept to between .375” to 0.5”
- 7) Excessive sealant depth will result in compromised sealant movement capability
- 8) A sealant joint should not be greater in width than 2 inches without consulting Pecora Technical Service department
- 9) Performance is determined based on the number and spacing of joints





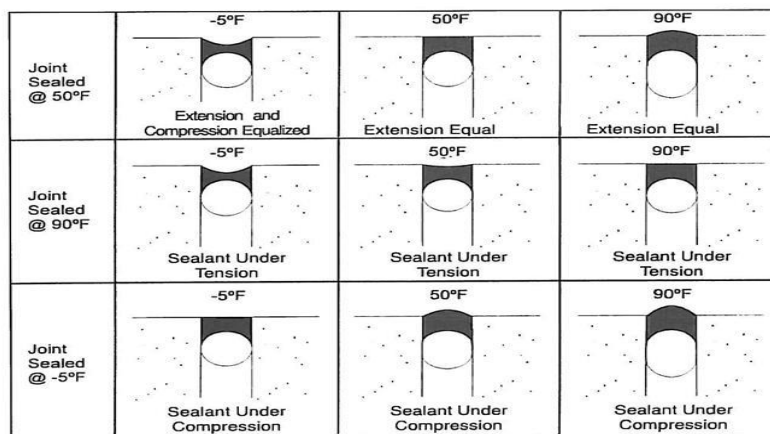
D) SEALANT SELECTION

- 1) The sealant must accommodate the anticipated joint movement requirements
- 2) The sealant must have the requisite durability for environmental exposure (i.e. UV stability, chemical resistance, submersed applications, etc.)
- 3) Sealant adhesion to the substrates to be sealed must be verified prior to application either through laboratory and/or field adhesion testing in accordance to → [Pecora Technical Bulletin #55](#).
- 4) Verification may be performed by laboratory testing that the selected sealant is compatible with adjacent substrates ([ASTM C1087](#)), has been tested for adequate adhesion to those substrates [ASTM C794](#), and if aesthetics is a concern that it will not stain adjacent porous surfaces ([ASTM C1248](#))
- 5) Submit representative samples for laboratory testing for adhesion, compatibility, and stain testing by completing and returning this → [Request Form](#) to the Pecora Technical Service Department.



E) TEMPERATURE CONSIDERATIONS

- 1) Sealant applications should be done when temperatures are above 40°F, whenever possible
- 2) When applying sealants below 40°F see → [Pecora Technical Bulletin #65](#) for cold weather application guidelines.
- 3) Installing sealants above or below a median temperature may cause unsatisfactory outcomes such as the sealant joint exhibiting a raised center (“breadloafing”) or an excessive concave profile (**Photo #3**)



Picture #3: Installment of Sealants at Various Temperatures

F) SUBSTRATE SURFACE PREPARATION

- 1) Clean out joints immediately before installing joint sealants
- 2) Remove laitance and form-release agents from concrete
- 3) It is advantageous for joints of exposed aggregate in precast concrete panels to be removed or minimized to provide enhanced sealant adhesion
- 4) Adhesion surfaces must be clean, dry, and free of dew or frost
 - (i) For porous substrates: oil-free compressed air, abrasive blasting, high pressure water (allow to dry), grinding, or wire brushing
 - (ii) For non-porous substrates: use the two-cloth method—wipe with solvent on the first cloth immediately followed by a dry rag wipe. See → [Pecora Technical Bulletin # 74- Two Cloth Cleaning Method](#).





G) PRIMING

- 1) Improves the sealant's adhesion in many situations
- 2) Many sealants perform well without the use of primers
- 3) Priming is not a substitute for good joint design and sealant application
- 4) Laboratory and/or field adhesion testing is required for verification of whether a primer is necessary for proper sealant adhesion
- 5) Primers should always be used for horizontal and submerged joint applications
- 6) Care must be taken to apply primer only to the surface to be sealed. Most primers stain and are difficult or impossible to remove
- 7) Almost all sealants, to achieve adequate adhesion for moving joints, require cement based substrates to be primed
- 8) Primers must be installed properly (e.g. use the correct primer, do not apply to thick or to thin, and requires drying or curing time before sealant application)
- 9) Whenever possible prime substrates before insertion of the sealant backing
- 10) The most current Pecora adhesion and primer guidelines may be found online with a wide variety of building substrates located here:
 - i. **Silicones:**
 1. [TB 109 Pecora Silicone Construction Sealants Adhesion and Primer Guidelines](#)
 - ii. **Urethanes:**
 1. [TB 110 Pecora Urethane Construction Sealants Adhesion and Primer Guidelines](#)



H) PLACING THE SEALANT

- 1) Use sealants that have not reached the end of their package shelf-life
- 2) Mix multi-component sealants properly. Do not entrain air or over or under mix components **(Photo #4)**

#4



Picture #4: Multi-component sealant mixing procedure

- 3) Tape the outside edge of joints if necessary to prevent overlapping sealant application
- 4) Gun the sealant into the joint at constant pressure and flow
- 5) Tool the sealant surface to completely fill the joint opening with sealant thereby wetting the entire substrate adhesion area
- 6) Check the quality of the work frequently and keep samples
- 7) Maintain a project log (e.g. sealant lot #, weather conditions, application procedure): i.e.

[TB 55A Field Adhesion Test Log](#)





D) JOINT FILLER AND SEALANT BACKING MATERIALS

- 1) Sealant backing and bond breakers establish sealant depth and prevent detrimental three-sided adhesion. Properly installed sealant backing prevents sealant leakage and creates a proper sealant profile. Sealant backing function ceases once sealant is applied, tooled, and cured
- 2) A joint filler is inserted into joints that are deeper than required for the sealant backing and sealant installation
- 3) For moving joints the joint filler and sealant backing must be compressible
- 4) Sealant backing provides resistance to sealant tooling pressure and helps to attain proper wetting of the substrate when sealant is tooled

J) RECOMMENDED BACKING MATERIALS

- 1) Closed cell sealant backing: primarily a polyethylene foam with a surface skin
 - a. Vertical and horizontal joints with one or two component sealants. Approved for use in EIFS applications
 - b. Closed cell sealant backing must be no more than 25 to 33% larger than joint width so it remains in compression and in place during sealant installation
 - c. Do not rupture the skin of closed cell sealant backing material during installation, this can cause air bubbles in the sealant compromising its ability to perform
- 2) Open cell sealant backing: primarily a urethane foam without a skin
 - a. Vertical joints utilizing one-component sealants when cure speed is critical.
 - b. Double caulk beads in vertical joints for curing of initial (internal) caulk bead
 - c. Must be at least 25% larger than joint width so it remains in compression and in place during sealant installation
 - d. Not for use in horizontal traffic joints or EIFS applications
- 3) Bicellular sealant backing: composed of both open and closed cell polyethylene or polyolefin foam with a surface skin
 - a. Recommended for all sealant applications with the exception of applications requiring rapid curing from backside
- 4) Bond breaker tape: Self-adhesive polyethylene or teflon material
- 5) Backing materials to avoid





- a. A rigid joint filler or sealant backing in joints that will experience movement
- b. Using braided sealant backing to compensate for a joint opening that is too large for the backing material

K) WEATHERPROOFING APPLICATIONS

Weatherproofing is intended to keep rain and other environmental elements from entering a building. To achieve successful weatherproofing sealant joints the following parameters must be considered and where applicable designed for:

- 1) "Joint Movement"—Occurs as a result of: changes in material temperature, seismic movement, elastic frame shortening, creep, live load, concrete shrinkage, moisture-induced material movement, and inadequate joint design. Joint movements must be evaluated, designed for, and accommodated
- 2) "Movement Capability"—The \pm percent value that indicates the amount of movement the sealant can take in extension (+) and compression (-) from its original cured joint width. Movement capability and expected joint movement must be coordinated.
- 3) "Installation Tolerances"—Depending on the substrate materials the joint opening will have a \pm tolerance for its designed width which must be considered when establishing width (e.g. for a joint width of 1/2 inch in a brick masonry wall the tolerance for its width could be $\pm 1/8$ inch or more
- 4) "Sealant Selection"—Select the appropriate polymeric type for the application; however, within a polymeric type there can be a wide range in performance capabilities and properties. All sealants in that type may not perform similarly; therefore, it is important to research product capabilities prior to use





L) ACOUSTICAL APPLICATIONS

Acoustically rated sealants reduce sound transmission in partition systems and maintain specific STC values for sealant spaces around cut-outs and at partition perimeters (**Photo #5**)

All installations of acoustical sealants shall be applied in accordance with ASTM C-919 for proper acoustical performance.

- i. Pecora offers sealants of differing chemistries which are acoustically rated:
 - b. Acrylic
 - c. Urethane
 - d. Butyl

- Pecora acoustically rated products: → [Acoustic Sealants](#)



Picture #5: Sealants should be designed to maintain the STC rating of the existing wall by sealing penetrations.





M) FIRESTOPPING

Firestopping systems for expansion joints and through penetrations will effectively contain fire, smoke, toxic fumes and water for a one, two, three or four hour period depending on the design specifications.

- Pecora/UL approved joint designs are comprised of a sealant (smoke seal) as well as a fire safing material (heat and flame protection) such as mineral wool: → [Fire-Rated Sealants](#)

In joint designs not completely meeting the pre-approved UL designs listed a → [Firestopping Engineering Judgment Application](#) may be completed to attain a Pecora approved project specific firestop system or Engineering Judgement.

Pecora offers sealants of differing chemistries for firestopping applications:

- Acrylic
- Urethane
- Silicone

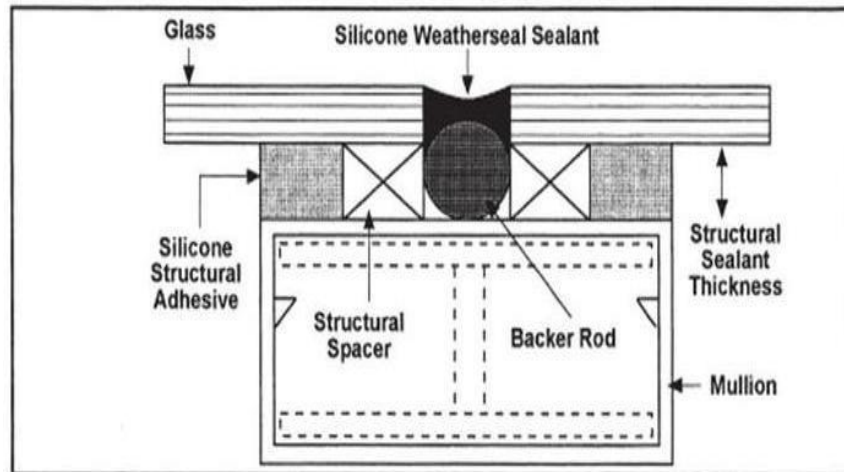
N) GLAZING

Structural sealant glazing involves attaching glass, metal, or other panel materials to a building's window or curtain wall metal framing system in place of using gaskets and other mechanical attachments. Only structural quality silicone sealants are used since they must be able to withstand ultraviolet radiation, weathering affects, and wind load and other stresses and transfer these affects to the metal framing system. **(Photo #6)**



#6

TYPICAL STRUCTURAL GLAZING DESIGN



Picture #6: Structural Glazing Design

A. For effective structural sealant glazing joint design, at least the following structural joint parameters must be considered:

- 1) "Bite"—defined as the effective structural contact dimension of a structural sealant required on both the panel and frame faces to accommodate the required transfer of loads.
- 2) "Thickness"—defined as the minimum structural sealant dimension between structurally bonded substrates (the panel and frame) to facilitate the installation of a sealant and to reduce stress on the structural sealant joint that results from differential thermal movement.
- 3) "Deadload"—the weight that a panel places on a structural sealant joint when, for certain applications, no setting blocks are used to support a panel's weight

Pecora offers a complimentary → [Structural Glazing Appraisal Program](#), which is intended to reduce the risks for all team members. Compliance with the program is a requirement of all projects using Pecora structural silicone sealants. More information regarding this program may be found online.

[Pecora Fenestration and Structural Glazing Products:](#)





O) SECURITY APPLICATIONS

Security sealants contain the properties to prevent idle tampering and vandalism that can endanger children, patients and citizens (Photo #7)

#7 **Critical Properties of Security Sealants**

CRITICAL PROPERTIES	TYPE ¹	CHEMISTRY	MIXING REQUIRED	STANDARD COLORS	TENSILE STRENGTH ASTM D-412
Dynaflex	TR	Urethane	YES ²	50 ³	375
Dynaflex SC	TR	STPU Hybrid	NO	3 ⁴	350
Dynapoxy EP-1200	TP	Epoxy	YES ²	50 ³	3530 ⁵
Dynatrol II	A	Urethane	YES ²	50 ³	110

CRITICAL PROPERTIES	MODULUS 100%	SHORE A HARDNESS	PRIMER REQUIRED ³	MOVEMENT CLASS	STANDARD PACKAGING
Dynaflex	175	55 ± 5	YES	12.5	1.5 Gal.
Dynaflex SC	170	55 ± 5	YES	12.5	Cartridge
Dynapoxy EP-1200	N/A	>90	NO	0	1.5 Gal.
Dynatrol II	20	20	NO	50	1.5 Gal.

- 1 TR = Tamper Resistant, TP = Tamper Proof, A = Architectural.
- 2 Two component field tintable materials require mixing in the field before application with bulk caulking guns.
- 3 Use Pecora Universal Color Pack.
- 4 Available in Tru-white, Limestone and Bronze.
- 5 ASTM C-882, Bond Strength.

Picture#7:Critical Properties of Security Sealants

(1) The use of security sealants also provides benefits from an economic perspective:

1. Decreased risk of lawsuits
2. Decreased maintenance costs
3. Increased service periods of sealants
4. Decreased replacement costs
5. A “tamper proof” or “tamper resistant” sealant requires a Shore A hardness of up to 80+ and 50, respectively, to prevent them from being easily removed from a joint
6. Standard architectural joint configuration guidelines must be followed in moving joints to ensure movement capabilities of the sealant (**Photo #2**)
7. Security sealants used in non-moving joints do not have a requirement related to width to depth configurations. When





installing security sealants in non-moving joints, tamper resistance and tamper proof properties are improved when a greater volume of sealant is installed in the joint

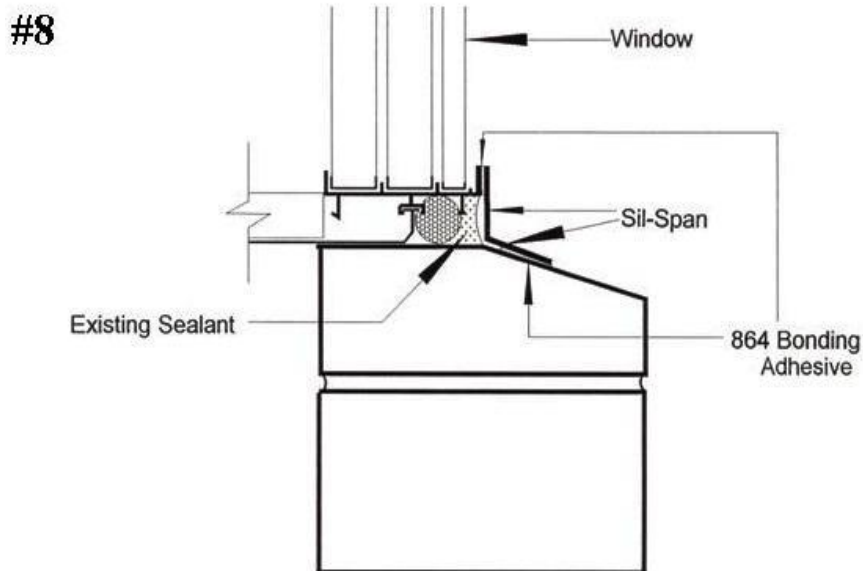
[Pecora Security Systems Application Manual:](#)

[Pecora Security Sealants:](#)

P) PRE-FORMED JOINT SEALANTS

- 1) Preformed joint profiles may be utilized in:
 - a. Architectural applications (Pecora Silspan):
 - i. For the repair of construction joints and/or glazing details by “bridging over existing sealants and/or gaskets
 - ii. For new construction applications where conventional sealants and weathersealing techniques are not adequate
 - b. Traffic applications (Pecora Dynaspan):
 - i. Designed for use on parking decks, bridges, plazas, malls, stadiums, waste
 - c. Water treatment facilities, concrete roof decks, or wherever you need to build joints which can take extreme joint movement.

- [Pecora SilSpan Specification Data:](#)
- [Pecora Dynaspan Specification Data:](#)



Picture#8:Pre-formed Joint Sealant



RESTORATION



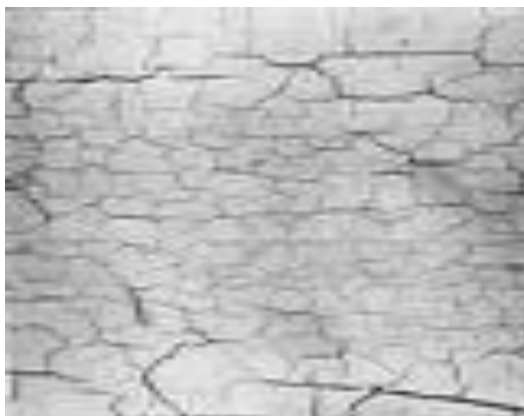
- 1) Sealant Failure – Identifying Cause/s**
 - a. Aging
 - b. Incorrect Sealant for Application
 - c. Inadequate Surface Preparation
 - d. Excessive Joint Movement
 - e. Early Joint Movement During Sealant Cure Cycle
 - f. Improper Sealant Application
 - g. Incompatibility
- 2) Choosing the Correct Sealant**
 - a. Identify Failed Sealant Type
 - b. Avoid Recurring Failures
 - c. Interior or Exterior
 - d. Movement Capabilities
- 3) Joint Preparation**
 - a. Sealant and Residue Removal
 - b. Surface Preparation
 - c. Priming
- 4) Sealant Application**
 - a. Sealant Backings
 - b. Sealant Mixing (if applicable)
 - c. Sealant Dimensions (width / depth)
 - d. Tooling of Sealant
- 5) In Process / Post Application Clean Up**
 - a. Adjacent Substrates (porous / non-porous)
 - b. Tools and Equipment
- 6) Photos & (reference)**
- 7) Website Tech Bulletin Links (reference)**



A. SEALANT FAILURE – IDENTIFYING CAUSE/S

1. Aging

- Sealant has reached its maximum service life and has become dry, brittle, cracked and/or crazed and shows sign of significant aging. **(Picture #9)**



Picture #9: Sealant aging with cracks

2. Incorrect Sealant for Application

- Sealant installed was not appropriate for application due to inadequate performance characteristics. The correct sealant should be identified based on the nature of the sealant failures observed.

3. Inadequate Surface Preparation

- Sealant is exhibiting adhesive failure due to dirt, dust, debris, and/or other contaminants present on joint face at time of sealant application.
- Omission of manufacturer's required sealant primer.

4. Excessive Joint Movement **(Picture #10)**

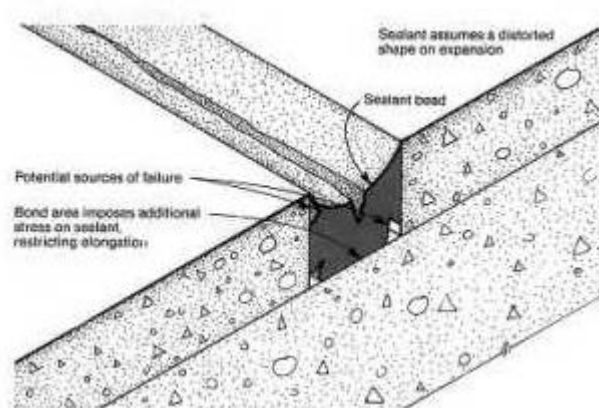
- Actual thermal joint movement has exceeded the designed movement capabilities of the installed joint sealant causing cohesive sealant failures.



Picture #10: Cohesive Failure



5. Early Joint Movement During Sealant Cure Cycle
 - Early joint movement caused by extreme temperature swings has occurred during the initial sealant cure cycle and has caused surface wrinkling and/or cracking leading to cohesive sealant failures.
6. Improper Sealant Application (**Photo #11**)
 - Improper sealant dimensions (width to depth ratio) leading to excessive or insufficient sealant depth.
 - Sealant was not properly mixed leading to insufficient cure and poor sealant performance (applicable to multi-component sealants only).
 - Three-sided adhesion due to inappropriate or non-existent sealant backing.
 - Inadequate sealant tooling causing lack of contact at sealant / substrate interface resulting in adhesive failures or insufficient cure.



Picture #11: Three-sided adhesion

7. Incompatibility
 - Sealant and substrate incompatible causing an adverse reaction at the sealant / substrate interface.

Note: All of the above sealant failures will most likely lead to air and/or water infiltration into occupied space and should be repaired immediately.



B. CHOOSING THE CORRECT SEALANT

1. Identify Failed Sealant Type

- Properly identify the failed sealant type in order to accurately assess the causes of failure and appropriate restoration sealant.
- The sealant manufacturer (if known) can assist in identifying the failed sealant type i.e. silicone, polyurethane, polysulfide, etc. through laboratory analysis of sealant samples.
- If the incorrect sealant type was originally installed, ensure the appropriate replacement sealant type is identified prior to reapplication.

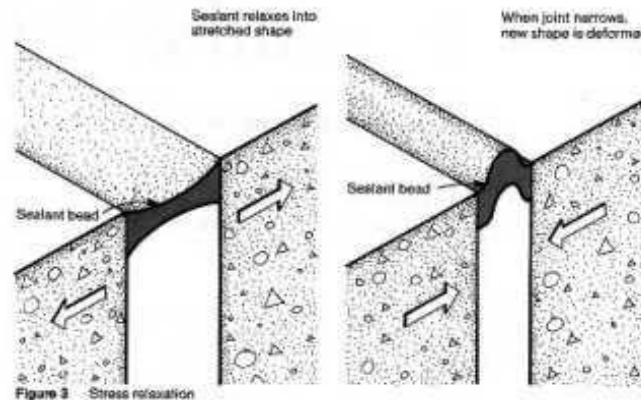
2. Avoid Recurring Failures

- Choosing the correct replacement sealant is critical when restoring a failed sealant joint in order to avoid recurring sealant failures.
- Sealant selection will be determined by the type of failure/s experienced on the project i.e. excessive joint movement, incompatibilities, etc. Existing sealants can also have influence over choice of restoration sealant.
 - Sealants that have failed due to excessive joint movement must be replaced with a sealant that can accommodate the actual joint movement occurring at the project. A sealant upgrade, with respect to movement class, will be required in these situations.
 - Sealants that have failed due to early joint movement during sealant cure cycle must be replaced. The repair process involves either selection of a sealant that will perform under adverse conditions of early movement or waiting for extreme conditions to subside before undertaking repairs.
 - Any sealant / substrate incompatibilities must be clearly identified and the appropriate testing must be conducted in order to determine the correct restoration sealant.
 - If poor surface preparation or omission of sealant primer has caused the sealant failures, the sealant should be reinstalled per the manufacturer's surface preparation and priming guidelines.
 - If the failed sealant has significantly aged and has reached its maximum service life, all affected sealant should be replaced.
 - If an improper sealant application was identified, the identical or appropriate alternate sealant may be reinstalled provided that the manufacturer's published installation procedures are strictly followed.





3. Interior or Exterior
 - Careful consideration and review of manufacturer's data sheets should be carried out in order to determine proper sealant for application.
4. Movement Capabilities (**Photo #12**)
 - A sealant's designed movement capabilities (extension/compression) are typically published in the manufacturer's product literature.
 - Be sure to choose a sealant that will accommodate the anticipated joint movement occurring at the project.



Picture #12: Joint Movement Extension/Compression

5. Color and Paintability
 - Sealant color may or may not be vital to the project owner. Be sure to select a sealant that is available in the color choice required for the project.
 - Most sealants are paintable with the exception of silicone-based sealants. If the sealant is to be painted, be sure to choose the correct sealant and compatible paint finish. Consult the manufacturer for required sealant cure times prior to painting.



C. JOINT PREPARATION

1. Sealant and Residue Removal

- Cut away failed sealant as close as possible to the joint edge and remove all existing sealant and backing materials.
- Clean all joints of contaminants and impurities to the depth at which the new sealant and sealant backing are to be installed. This may be accomplished by the following methods:
 - Porous Substrates: Diamond grinding for concrete, masonry, brick, and similar porous substrates to expose virgin substrate. **(Photo #13)**



Picture #13: Diamond Grinding

- Non-Porous Substrates: Razor knife for non-porous substrates such as metal and glass followed by a solvent wipe to remove most if not all residual sealant.
- EIFS Substrates: Extreme caution must be taken when restoring EIFS joints. Sealant must be removed by razor knife only in order to maintain an undamaged EIFS substrate surface. Grinding is prohibited.
 - The Pecora Silspan EIFS restoration system may be utilized in order to prevent any substrate damage possibly caused by attempting to remove existing failed sealant.





2. Surface Preparation
 - Blow dust, loose particles and other debris with oil-free compressed air. Make as many passes with cleaning tools and compressed air as required to ensure that joints are clean and free of existing sealing materials and/or other dirt and debris.
3. Priming
 - Sealant primer may be required and should be determined by the manufacturer or applicator through field and/or laboratory adhesion testing.
 - If primer is required, primer must be installed per the manufacturer's application procedures in regard to appropriate primer selection, coverage rate, and dry time.

D. SEALANT APPLICATION ([LINK #4](#))

1. Sealant Backing (**Photo #14**)
 - 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 rod, a polyethylene bond breaker tape should be installed.



Picture #14: Backer Rods



2. Sealant Mixing (multi-component sealants only)
 - If a sealant requires mixing in the field, ensure that the manufacturer's 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. **(photos #15 & 16)**



Picture #15: Sealant Mixing in Process

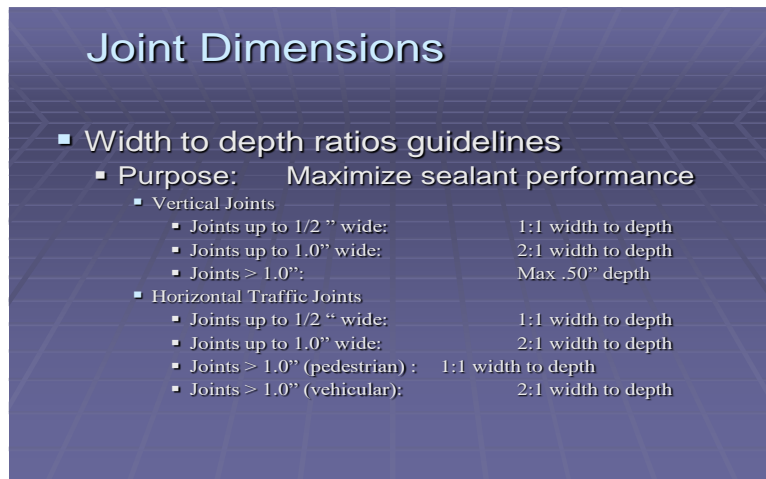


Picture #16: Fully mixed sealant



3. 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". **(Photo #17)**



Picture #17: Joint Dimensions Photo

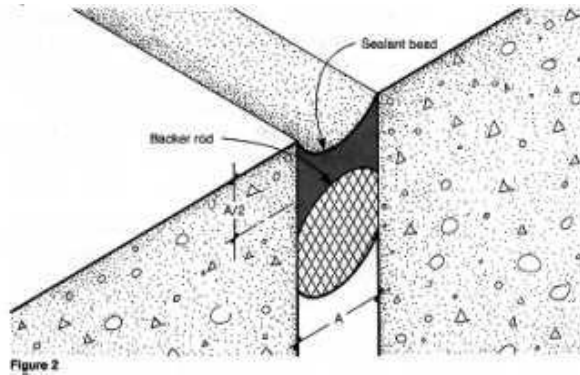
4. Sealant Installation

- 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. Sealants may be recessed if required by manufacturer.

5. Tooling of Sealant

- 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. **(Photo #18)**





Picture #18: Hourglass Sealant Configuration

- The sealant should be dry tooled unless the sealant manufacturer specifically approves otherwise. If approved, the tool may be dampened with a sealant manufacturer approved tooling agent (typically mineral spirits).
- Do not use water or soapy water as a tooling agent. Avoid over tooling.
- Tool the sealant at window sills 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).

Note: All remedial sealant installations should be verified for proper performance through field adhesion testing. (Link #6)

E. IN PROCESS / POST APPLICATION CLEAN UP

1. 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 xylene, toluene, methyl-ethyl ketone, or isopropyl alcohol. Ensure all cleaning agents are compatible with installed substrates or other building façade materials.
 - Porous Substrates: Allow sealant to develop initial cure, then remove by abrasion or other mechanical means. Exercise extreme caution in order to maintain an undamaged original sealant surface texture. Compatible solvents, cleaners, and poultices may be utilized to remove any remaining residue.

2. Tools and Equipment





- Tools and equipment may be cleaned with solvents such as 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 sealant applications.

Provided that the afore-mentioned sealant removal and installation procedures are followed, the remedial sealant installation will maintain a watertight weather seal for the full-service life of the installed joint sealant.



F. PHOTOS & LINKS



Photo #9 - Sealant aging w/ cracks



Photo #10 - cohesive failure

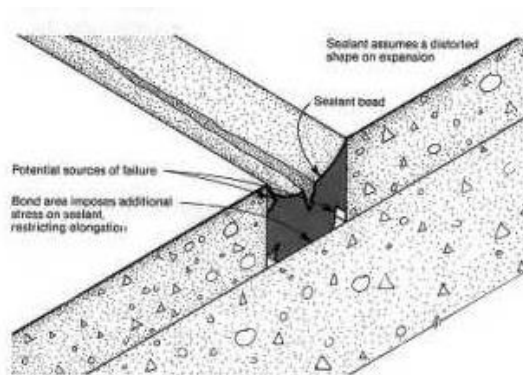


Photo #11 - three-sided adhesion

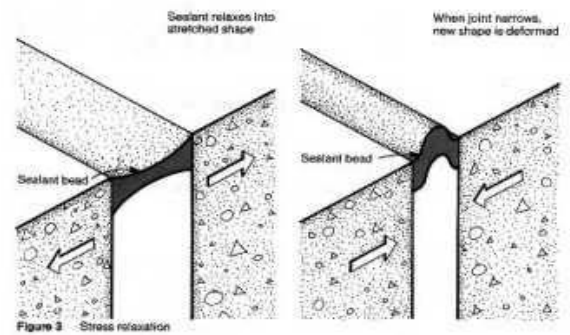


Photo #12 - Joint Movement Extension/Compression



Photo #13 - Diamond Grinding



Photo #14 - Backer Rods





Photo #15 – Sealant Mixing in Process

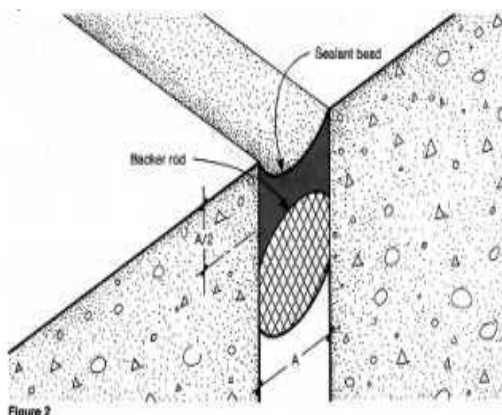


Photo #16 – Fully mixed sealant

Joint Dimensions

- Width to depth ratios guidelines
 - Purpose: Maximize sealant performance
 - Vertical Joints
 - Joints up to 1/2" 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 1/2" 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

Photo #17 – Joint Dimensions Photo



#18 - Hourglass Sealant Config.

G. WEBSITE TECH BULLETIN LINKS

1. **TB# 103 Sealant Joint Inspection**
 - a. http://www.pecora.com/pdfs/Tech_Bulletin_103_Joint_Inspection.pdf
2. **TB# 31 Painting Over Sealants**
 - a. http://www.pecora.com/pdfs/Tech_Bulletin_Painting_Over_Sealants.pdf
3. **Two links – TB# 109 & 110 Surface Prep Guidelines (Silicone & P.U., respectively)**
 - a. http://www.pecora.com/pdfs/Tech_Bulletin_109_Silicone_Primer_Guidelines.pdf
 - b. http://www.pecora.com/pdfs/Tech_Bulletin_110_Urethane_Primer_Guidelines.pdf
4. **TB# 108 Sealant Application Guide**
 - a. http://www.pecora.com/pdfs/Sealant_Application_Guide_6-21-2011.pdf
5. **TB# 65 Caulking at Low Temperatures**
 - a. http://www.pecora.com/pdfs/Tech_Bulletin_65_Low_Temperature_Application.pdf
6. **TB#55 Field Adhesion Test Methods and Test Log**
 - a. http://www.pecora.com/pdfs/Tech_Bulletin_55_Field_Adhesion_Test.pdf

