Alterm National Pty Ltd

"No More Solder" Termite Proof Silicone

Termite Proofing Construction Joints

Introduction

The successful performance of a building exterior is frequently defined by its ability to keep termites and the elements outside, away from the building's occupants. One of the critical links to ensuring a termite proof building is the joint sealant. Building joints can be sealed effectively by following a few simple guidelines for design in workable joints, selecting the correct termite proof sealant, performing appropriate surface preparation, and performing quality checks to ensure proper performance. This section of the guide addresses design, sealant selection, surface preparation.

Joint Movement

Regardless of the size and height of structures, joint movement inevitably occurs by various factors such as changes in temperature, seismic movement, elastic frame shortening, creep, live loads, concrete shrinkage, moisture induced movements and design errors. Therefore, each joint should be designed to absorb these movements, using the correct sealant.

When movement is caused by temperature change, the degree of joint movement for each material should be considered since all materials have their own coefficient of linear thermal expansion (CTE). Joint movement caused by thermal expansion can be calculated by the following equation:

Movement (Mt) = CTE x Temp. Change x Length of Material

Examples are below

Max Temp (Deg F)	Min Temp (Deg F)	Material Length (inch)	Material	Thermal Coefficient In/in/F	Movement (inch)
160	-20	96	Glass	0.0000051	0.088
100	50	180	Aluminium	0.0000132	0.119

Max Temp (Deg C)	Min Temp (Deg C)	Material Length (mm)	Material	Thermal Coefficient Mm/mm/C	Movement (mm)
60	-20	4000	Glass	0.0000090	2.880
70	-20	3500	Aluminium	0.0000238	7.497

Average Coefficients of Linear Thermal Expansion for Building Materials - Reference ASTM C-1193

Material	**mm/mm/°C x 10-6**	**in/in/°F x 10-6**
Glass	9.0	5.0
Aluminum	23.2-23.8	12.9-13.2
Granite	5.0-11.0	2.8-6.1
Marble	6.7-22.1	3.7-12.3
Concrete	9.0-12.6	5.0-6.0
Stainless Steel	10.4-17.3	5.8-9.6
Acrylic	74.0	41.0
Polycarbonate	68.4	38.0

Note: The coefficient of expansion for natural materials (brick, stone, wood, etc.) or fabrications of natural materials can be highly variable. If a specific material is contemplated then the coefficient for that material should be established and used rather than an average value. Moisture induced movement of brick masonry will cause the brick to swell and reduce joint sizes over the life of the project.

Joint Types

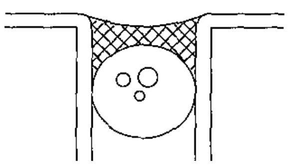
From a functional point of view, joints for construction can be put into two classes depending on the degree of movement.

Working Joint

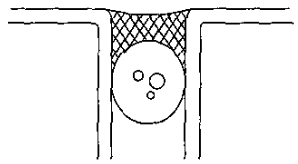
Working joint are joints in which the shape and size of the sealant joint changes dramatically when movement occurs. Usually, a working joint occurs on the building envelope when different materials abut each other or joints are designed to allow thermal expansion of materials. Typical examples or working joints include:

- Control Joint
- Expansion Joint
- Lap Joint
- Butt Joint
- Stack Joint

WORKING JOINT



EXTENSION



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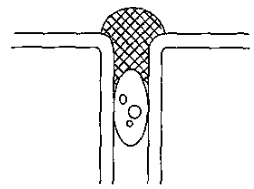
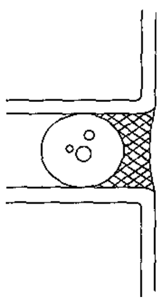


COMPRESSION



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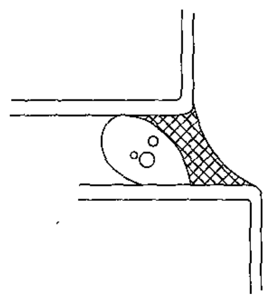


SHEAR

Fixed Joint

Joints which are mechanically fixed to prohibit movement. Movements are generally less than 10% of joint width. These joints are typically designed as air and/or water seals in curtain walls.

Joint Design

Alterm National (No More Solder) Termite Proof Silicone has been designed to perform when installed in compliance with accepted termite sealing procedures. Some good examples are included in the reference section of this document.

Alterm National has found that a few underlying principles are critical to consider in virtually all joint designs using termite proof silicone sealants. This section is intended as a review of these underlying design principles. When considering the design of termite-proof joints, the following basic points must be addressed:

- In all cases, a minimum depth of 6mm (1/4") sealant/ substrate bond is necessary to ensure adequate adhesion.

* In most cases, a minimum width of 6mm (1/4") opening is necessary to ensure that sealant applied from a caulking gun will flow into the sealant joints. Note: In some cases where the sealant is used simply as a non-moving bedding compound and is applied to one substrate before both substrates are pressed together, thinner joint dimensions are acceptable.
* One-part silicone sealants require atmospheric moisture to fully cure. Therefore, the sealant joint must be designed to ensure that the sealant is not isolated from air.

Moving Joint Considerations.

When designing moving joints, the following points also need consideration:

* A minimum 6 mm (1/4") joint width is recommended. Wider joints accommodate more movement than narrow joints.
* Three-sided adhesion limits the amount of movement that a joint can accept without inducing a tear. Three-sided adhesion can be eliminated by the addition of a bond breaker tape or backer rod. With three-sided adhesion, no more than +/-15 percent movement can be accommodated.
* A thin sealant joint (6 mm +/- 3 mm) will accommodate more movement than a thick joint. Alterm National Sealants are designed to deliver optimum performance when the joints are shaped like an hourglass.
* As a practical matter, as the sealant joint width becomes larger than 25 mm (1"), the depth should be held at approximately 9 to 12 mm (3/8 to ½"). There is no need for greater sealant depth with a silicone sealant.

Minimum Joint Width = 100/X (Mt+Ml)+T

X = Sealant Movement Capacity (%)
Mt = Movement due to thermal expansion
M1 = Movement due to Live loading
T = Construction Tolerance

For example:

A horizontal joint between an aluminum curtain wall and a concrete panel with a thermal movement of 8 mm (5/16"), a live load movement of 6 mm (1/4"), a construction tolerance of 6 mm (1/4") and 25 % movement capacity sealant would be

Width = 100/25*(8+6)+6
Width = 62mm

Width = 100/25*(5/16 + ¼) + ¼
Width = 2.5inches

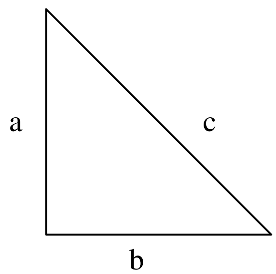
Joint movement in Shear

When joints move in shear, greater joint movement can be accommodated since actual movement on the sealant is less. The joint width required (a) for joint movement (b), as calculated below, or the allowable movement (b) for a particular joint width dimension (a), can be calculated using Pythagoras' Theorem. The new joint width after movement (c) is limited by the movement capability of the sealant in shear in a termite proof joint configuration. The calculation is as follows:

$a^2 + b^2 = c^2$ where a = original joint width

b = joint movement

c = new joint width after joint movement



Original Joint Width (inch)	Sealant Movement Capability Expansion	Max. Shear Joint Movement (inch)
0.25	50	.280

Original Joint Width (mm)	Sealant Movement Capability Expansion	Max. Shear Joint Movement (mm)
10	50	11.18

Movement During Cure

Dow Coming's one-part sealants cure by reacting with atmospheric moisture. Joint movement during cure can cause unsightly aesthetics due to joint deformation e.g. wrinkling. Premature adhesion loss can also occur because the adhesive characteristics of the sealant are obtained after the sealant has cured. Adhesion loss due to movement during cure can be minimized by the use of a primer. Primers can decrease the adhesion cure time lag. Wrinkling can be minimized following these suggestions:

* Use open cell polyurethane backer rod
* Seal when the joint surface is cool and will experience minimum temperature changes, typically in the late afternoon or early evening.
* Place no more than 6 mm (1/4") of sealant over the backer rod at the center.

These suggestions should help minimize wrinkling, but may not eliminate it, as all sealants are prone to this aesthetic issue.

Backer Materials

A backer rod is the typical backer material for most termite proof joints. The role of a backer rod is to allow a sealant to be installed and tooled to a proper joint profile. Once the sealant cures, the backer material must not restrict the movement of the sealant or cause “3-sided adhesion.” To provide sufficient backpressure during sealant installation, the backer rod should be sized -25 % larger than the joint opening. Sizing differs among backer rod types; refer to manufacturer’s recommendations. Generally, three common backer rod types can be used with Alterm National (No More Solder) Sealants:

* Open cell polyurethane
* Closed cell polyethylene
* Non-gassing polyolefin

Each backer rod type has demonstrated successful performance with Alterm National® Sealants. When selecting a backer rod, consider the following:

* Open cell polyurethane backer rod allows the sealant to cure through the backer rod, which is beneficial when fast sealant cure is desired. Open cell polyurethane backer rod can absorb water, which may have a detrimental effect in certain joint types.
* Closed cell polyethylene backer rod may outgas if punctured during installation, requiring it to be left for 20 minutes before application of the sealant.
* Other back-up materials such as expanding foam tapes or glazing gaskets should be reviewed or tested for compatibility prior to use.
* When a backer rod cannot be positioned in a joint opening, Teflon or polyethylene tape should be -used to prevent 3-sided adhesion.

Alterm National makes the following exceptions when selecting backer rod types:

* For double termite proof joints, open-cell polyurethane backer rod must be used unless the interior seal is allowed 7 days cure before installing the exterior seal.
* Open cell polyurethane backer rod is recommended for use with Alterm National (No More Solder) Termite Proof Silicone Building Sealant against painted or metal surfaces to promote cure from both sides of the joint.
* Because EIFS manufacturers do not permit the use of open-cell polyurethane backer rod with their systems, use either Alterm National (No More Solder) Silicone Sealant or Alterm National (No More Solder) Silicone Sealant when EIFS is adjacent to non-porous or metal surfaces. Open cell polyurethane backer rod should not be used adjacent to EIFS.
* In some horizontal joints where water can collect, open cell polyurethane backer rod should not be used.

EIFS Consideration

Exterior Insulation and Finish Systems (EIFS) is a new and growing segment of the exterior cladding market. EIFS offers unique challenges due to its composition. Alterm National (No More Solder) silicone sealants have a demonstrated history of success when used with Exterior Insulation and Finish Systems. Silicone sealants offer unique benefits over organic sealants when used with EIFS.

Consider the following benefits offered by Alterm National (No more Solder) Sealants:

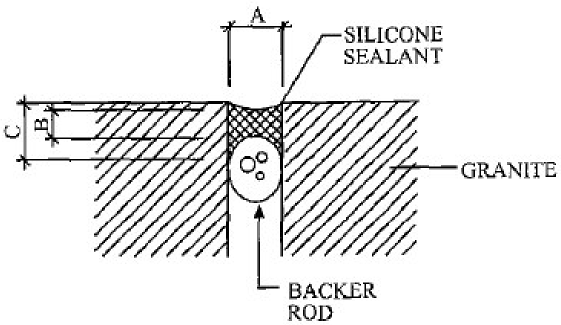
- Alterm National (No More Solder) One-component silicone sealants do not require special mixing.
- Alterm National (No More Solder) silicone sealants are UV stable and are virtually unaffected by outdoor weathering. Silicone sealants have a life expectancy of greater than 50 years.
- Alterm National (No More Solder) Sealant, the preferred sealant for EIFS expansion joints, has unparalleled ultra-low modulus properties, movement capability of+1001-50% and a proven 50+ year performance on buildings.
- An inorganic silicone sealant maintains its low modulus when cold whereas an organic polyurethane sealant can get 2 to 3 times stiffer in cold temperatures. Low modulus silicone sealants put less stress on softer EIFS coatings when a joint opens up during cold temperatures. Alterm National sealants are tested and approved for use by the major EIFS manufacturers. Refer to the Building Sealant Recommendation and Surface Preparation Guide for current recommendations.

Termite proof Design Examples

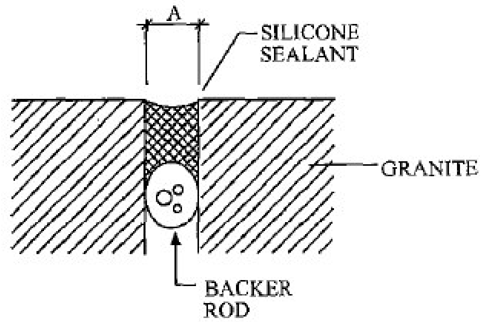
Examples of a variety of termite proof joints follow with a review of joint type for key points and concerns.

Conventional Moving Termite Seal

GOOD JOINT DESIGN



POOR JOINT DESIGN



Good Joint Design

Key Points:

1. Dimension A must be at least 6 mm (1/4")
2. Dimension B must be at least 3 mm (1/8")
3. Dimension C must be at least 6 mm (1/4")
4. Ratio of A:B should be 2:1 minimum.
5. Joint surface tooled
6. Dimension B suggested Maximum = 12 mm (1/2")
7. Dimension A Maximum = 100 mm (4"). Joints wider than 50 mm (1/2") may slump slightly; therefore double application techniques of the sealant may be required.

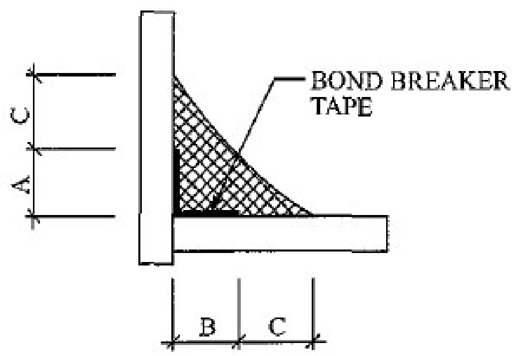
Poor Joint Design

Concerns:

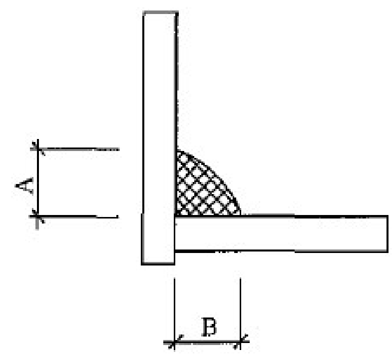
1. A deep sealant joint will not have the same movement capability as a properly designed joint
2. Slow cure due to excessive sealant depth

Moving Corner Joints

GOOD JOINT DESIGN



POOR JOINT DESIGN



Good Joint Design

Key Points:

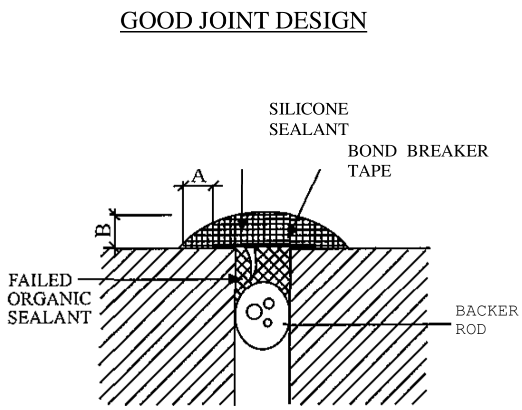
1. Dimension A and B must be at least 6mm (1/4”).
2. A bond breaker tape or backer rod must be present if joint movement is anticipated
3. Joint must be tooled flat or slightly concave.
4. Dimension C must be at least 6 mm (1/4”).

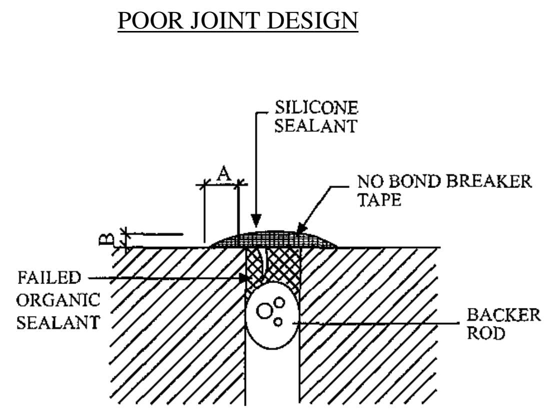
Poor Joint Design

Concerns:

1. Dimension A or B less than 6 mm (1/4”)
2. Joint not properly tooled
3. No bond breaker material; therefore the joint will not accept movement

Remedial Joints





Good Joint Design

Key Points:

1. Dimension A must be at least 6mm (1/4”)
2. Dimension B must be at least 3 mm (1/8”)
3. Bond breaker tape must be used to isolate fresh sealant from failed organic weatherseal and to allow joint movement.

Poor Joint Design

Concerns:

1. Dimension A less than 6 mm (1/4”) increases difficulty in obtaining adhesion and increases the likelihood for voids.
2. Dimension B less than 3 mm (1/8”) increases the likelihood of pinholes or voids in tooling; poor cohesive integrity.
3. No bond breaker material; therefore the joint will not accept movement.

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