



# Sealing & Bonding Technical Handbook

**BOSTIK ASIA PACIFIC**



EXTERNAL USE ONLY

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HEALTH  
& SAFETY  
RECOMMENDATIONS



## Product Safety

The Construction Sealants Industry is one of the fastest-growing parts of the construction sector with modern technology and innovations. The development pattern is also getting stronger because of the behaviour and importance of health and safety standards.

Bostik is the leading Sealant manufacturer implementing its Hazard Control Action Plan and committing to fulfilment of Standardized Safety regulations. Bostik believes “Everyone goes home safe” which is the top-most priority in keeping worker’s life safe.

We believes to fulfil Safety Standards, our plant operations, product and application methodologies are designed in such a smarter way that directly and progressively enhances the achievement and success of the health and safety added value efforts.

Bostik is not only limited to the standardised safety operation and production but our focus is also the product safety. Succeeding pages are some safety considerations and precautions for using a construction sealant (applicable as well in adhesive & PU foam) product:

## Does the Sealant Product Emit Little to No VOCs?

Volatile Organic Compounds (VOCs) have the ability to evaporate and mix into the air at room temperature. Many sealants have provisions to emit VOCs which are very harmful and can lead to long as well as short-term adverse health effects. Consequently, it is important to use sealants with little to no VOC emission factor. According to the U.S. Environmental Protection Agency, VOCs can cause the following symptoms:

- Nausea/vomiting/motion sickness
- Irritation of the ears, nose and throat
- Loss of coordination/dizziness
- Headache
- Allergic skin reaction

## Does the Sealant Product Decrease Exposure to Solvents?

The Sealant products with little to no VOCs also decrease applicators' exposure to solvents due to their chemical compositions. The following are the health hazards list down by the U.S. Department of Labour cites health hazards associated with solvent exposure:

- Toxicity to the nervous system
- Reproductive, liver and kidney damage
- Damage to the Respiratory system

## Does the Sealant Product Contain TDI?

Toluene Di-Isocyanate (TDI) is commonly used as a chemical ingredient in polyurethane sealants. The long-term exposure to the TDI is responsible for the extreme toxicity to workers. The following are side effects that workers/labour can encounter due to the continuous application of Sealants:

- Skin, eyes and nose irritation
- Nausea
- Decreased lung function
- Bronchial Constriction



Accordingly, the product formulation should consider prior to its use as toxic health hazards are associated with VOCs, TDI and solvent exposure. Some installers/applicators may be sensitive to handling isocyanates and sealant products. It is highly recommended to use Personal protective equipment to avoid any harmful effects and toxicity.

Further to ensure high safety standards, the Safety Data Sheet should be consulted prior to the product handling.



Sealants come in different forms. They can pose safety risks to workers in the form of fires and explosions, or health risks due to their chemical properties.

## ► Hygiene

Do not eat or consume any food or drink in chemical storage areas. The designated area where sealants are handled or used may cause health hazards due to the emission of toxic vapour from certain sealants.

It is highly recommended to refer to the Safety Data Sheet for the requirements of Personal Protective Equipment (PPE) such as hand gloves, safety masks, respirators, protective clothing, eye protection and/or adequate ventilation. Care should be adopted to minimize skin contact. Follow manufacturer's recommendations or instructions on barriers and cleansing agents appropriate for their products.

## ► Spillage and waste disposal

Spillage should be addressed immediately. Follow the appropriate procedure as available in Safety Data Sheet regarding spillage. Generally, inert material can be used to soak up the spillage which further can be accommodated in a suitably closed container for safer disposal.

To avoid any latent explosion and/or fire hazard, the solvent-based sealants (it can be adhesives or PU foams) must be disposed-off carefully. Keep empty container open or either carefully punctured to maximize the elimination of solvent vapour-air expansion and development of internal pressure when subject to the ambient temperature.

*Warning: Precautionary measures should be adopted for Aerosol Packages as they are pressurized and must not be punctured unless all internal pressure has been relieved.*

## ► Usage

Protect skin from sealant while its application there should not be any skin contact. Wear approved goggles or face shields to protect eyes from splashes and gloves all time while handling and applying sealants specifically low-viscosity sealants. To remove sealant from the skin, suitable antiseptic cleaning agents should be used in lieu of straight solvents.

Avoid inhaling the sealant vapours. It is recommended to have appropriate ventilation while application of sealants and adhesives. By ensuring adequate ventilation, the buildup of solvent vapours also known as hot spots can be avoided in the work atmosphere.

It is recommended to make possible the use of flameproof exhaust fans where necessary. In case of non-availability, then suitable breathing apparatus, such as respirators, should be worn.

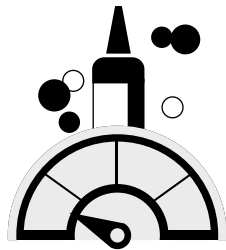


# Proper Storage/Transport of Sealant

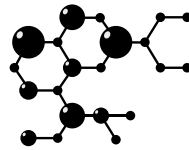




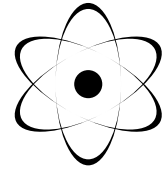
- Storage temperature - between +5°C and +25°C.
- Above +35°C, problems might occur.



**Foam canister  
build-up  
pressure inside**



**Neutral silicone  
sealant changed its  
chemical reaction**



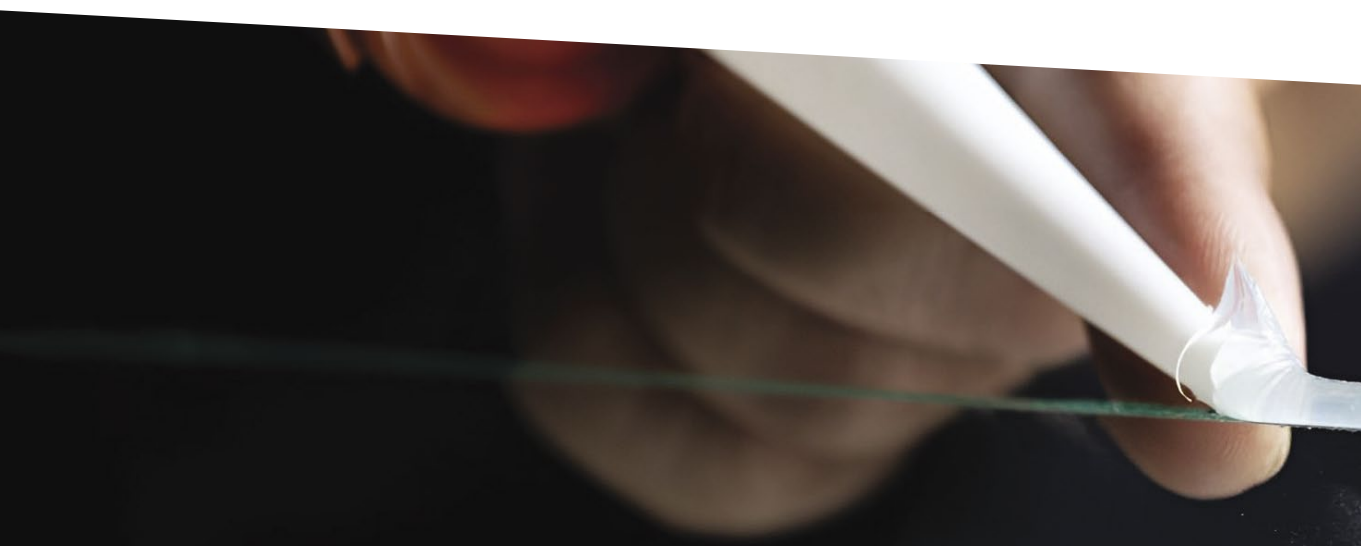
**PU will accelerate its  
shelf-life being highly  
reactive etc.**

- Temperatures below +5°C until ca. -5°C do not directly cause problems. Below -5°C dispersion (Acrylic-based) products can freeze.
- In silicone sealants that contain acid, the crosslinker can crystallize at temperatures below -5°C. By warming the sealant to above +5°C, this crystallization can be reversed.

# Application Guidelines for Sealant

## ► **During Sealant Installation:**

- All sealants can be applied from ambient temperature of +5°C. Lower temperatures resulting condensation or ice can occur on the surfaces. This could make the bonding of the sealant fail.
- Ambient temperature more than +40°C will cause problems with application. When the joints expand later on when temperatures drop, constant pressure will be placed on the sealant, increasing the chance for de-bonding.
- For this reason it is not recommended to seal highly operating joints during hot weather, or in full direct sunlight, as this can cause blistering of the sealed joint.



## ► After Sealant Installation:

- During curing, in extreme situations the sealant can become deformed, showing cracks or surfaces pressed together in the sealant joint.
- Temperatures as low as  $-10^{\circ}\text{C}$  will make the sealant more rigid. Due to the cold and shrinkage, the joints are at their widest. Maximum pressure is now exerted on the sealed joint.
- Silicone based products being an exception, indifferent to temperature and being as elastic at  $-10^{\circ}\text{C}$  as at  $+20^{\circ}\text{C}$ . Mostly neutral silicone sealants with low modulus are used for dilatation joints in facades. Products based on hybrid technology maintain elasticity over a wide range of temperatures.
- Service temperature may vary for sealant to sealant. e.g. PU has  $-40^{\circ}\text{C}$  to  $80^{\circ}\text{C}$ . Kindly check the respective TDS for this information.

# General Safety Guidelines



- No applicator is expected to undertake a job until that person has received adequate training.
- All applicators shall be trained on every potential hazard that they could be exposed to and how to protect themselves.
- No applicator is required to work under conditions that are unsanitary, dangerous or hazardous to their health.
- Only qualified trained personnel are permitted to operate machinery or equipment.
- All injuries must be reported to supervision or foreman. The manufacturer's specifications or limitations or instructions shall be followed.
- For employees working in areas where there is a possible danger of head injury, Personal Protection Equipment (PPE) shall protect against excessive noise exposure, or potential eye and face injury.
- All hand and power tools and similar equipment shall be used according to its manual observing safety & maintained in a safe condition.

- All materials stored in tiers shall be stacked, racked, blocked, interlocked, or otherwise secured to prevent sliding, falling or collapse.
- The site engineer shall ensure that electrical equipment is free from recognized hazards that are likely to cause death or serious physical harm to applicators.
- All places in the construction site shall be kept clean, and the floor of every workroom shall be maintained, so far as practicable, in a dry condition; standing water shall be removed. Where wet processes are used, drainage shall be maintained and false floors, platforms, mats or other dry standing places or appropriate waterproof footwear shall be provided.
- To facilitate cleaning, every floor, working place, and passageway shall be kept free from protruding nails, splinters, loose boards, holes and openings.
- All floor openings, open-sided floor and wall openings shall be guarded by standard railings and toe boards or cover.
- Proper use of a railing, full-body harness, safety lanyard, scaffolding, lift, & ladder must be observed when working at heights in accordance with local standards and regulation.

# PREFACE

# What is a sealant?

A sealant is a soft, pliable material that is used to seal cracks or joints where structural strength is not required. In technical terms a sealant does have roughly a shore A hardness below 40 and comes with an E-modulus of maximum 0.7 N/mm,

The main function of a sealant is to prevent the penetration of water or moisture, air, dust, sound, & heat/fire between the elements, components and assemblies made of the same or dissimilar materials.

Furthermore, this soft material can accommodate buildings and civil engineering structures movements and assure a durable, sustainable and above all a functional tightness throughout their whole lifespan.



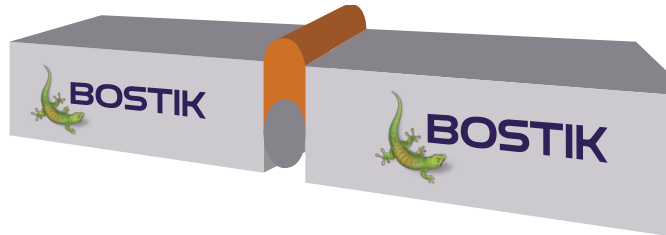


**Example 1:**



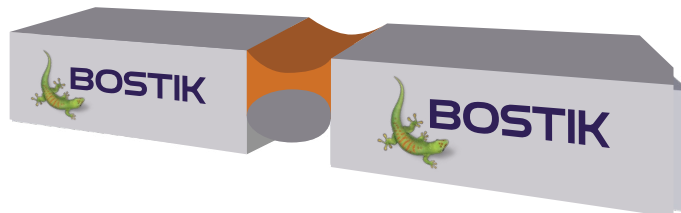
A proper applied sealant on a backer rod with the correct joint width and joint depth.

**Example 2:**



Expansion of the building materials due to temperature absorption. The result is that the joint in between the adjacent building materials will be 'smaller'.

**Example 3:**



Contraction of the building materials due to temperature heat remittance. The result is that the joint in between the adjacent building materials will be 'wider'.

GENERAL  
CONSIDERATIONS  
BEFORE APPLYING  
SEALANT

# Substrate Requirement

## ► **CONCRETE**

### **Pull-off and compressive strength**

The Concrete substrate should have a minimum compressive strength of 25 MPa and Pull-Off strength of 1.5 MPa for 28 days. The Concrete must have adequate mechanical properties and sound enough to produce the required level of performance. Preliminary tests are required to obtain confirmation of concrete strength if necessary.

### **Moisture Content**

Before application of sealant, the moisture content is needed to determine. The concrete surface should be completely dry or there should be no more than 5% presence of moisture content. Primarily, hybrid Sealant and new generation PU have moisture content accommodation ranges 5% to 10%. Therefore, applicators need to consider relative humidity and concrete age as the prime factor that can affect the moisture activity of the sealant like silicone.

### **Ambient, Surface Temperature and % Relative Humidity**

The ambient temperature should be between 5°C to 40°C. Concrete's surface temperature is preferably between 2°C to 50°C. Do not apply sealant at rising temperatures. A temperature beyond 50°C can exhibit harmful reactions while applied.

The application of sealant can be performed when the Relative Humidity must be at least 3°C above from dew point and a maximum of 95% RH.

## ► GLASS

The Glass substrate is subject to the structural moments in horizontal as well as the vertical directions. Therefore, the parameters such as dead load, wind load, and thermal variations should keep into consideration while designing the building glass elements such as curtain walls, galls walls, and glass façades to address these movements. Furthermore, the other related factors should also be considered as far as building movements are concerned:

- Movements due to occurrence of concrete shrinkage, regular and irregular settlements and creep
- Horizontal movement soft storey drift and consecutive floors drift due to stiffness of building
- Vertical movement due to possible relative deflections of the moment frame system of the building

Therefore, proper selection of sealant such as compatibility, movement accommodation, UV resistance, weather resistance, water & air tightness etc. should take into account for glass requirement.



## ► NATURAL STONE

Natural stones are widely used as façades of the building elevation. The stone mainly granite, marble and sandstone are widely used to build the aesthetic of the façade. But these stones are highly sensitive when subject to environmental and weathering actions. If the sealant has no appropriate compatibility with stone and is used in joints then there will be staining or streaking of the joint edges which can provide a high impact on the beautification of the building façade.

Bostik, therefore, recommends special silicone and hybrid sealants which have system compatibility and suitability to use those with highly sensitive nature stones. Bostik also recommends these special sealants for the substrate such as metal facades or Glass curtain walls which have their joint connectivity with the natural stones.

These sealants are formulated in such a way that they are free from the staining compounds that could harm the natural stone. Accordingly, there is no migration of staining compounds through the pores of the stone therefore Bostik described them as non-staining silicone sealants. They are also highly recommended for Glass façades to avoid streaking on glass panels and metal panels to have a clean façade appearance.



## ► **METAL (UNPAINTED), LEAD, ALUMINUM, COPPER, STAINLESS STEEL, GALVANIZED IRON**

Metals are widely used in form of pipes, HVAC ducts, etc., and most are subject to environmental effects such as oxidation, rusting and corrosion. Therefore, the prior quality assurance performance tests are required for sealant application.

Sealant for metals is basically formulated with a blend of rubber, resins and polymers. These are mostly known as Polyurethane sealants, hybrid sealants and neutrally curing silicone sealants.

The metal sealant is mostly air drying, highly viscous, and good adhesive in nature which possess excellent vapour barrier, water/oil & airtight properties. Some sealants such as acetic curing silicone sealants are immediately subject to the corrosion effect on metal when in contact with the moisture. Therefore, these are less effective to use

## ► ALUMINUM COMPOSITE PANEL

Aluminium Composite Panel (ACP) is composed of thin coated aluminium sheets and a non-aluminium core. Basically, it is a three-layered sandwich panel comprised of a polythene or thermoplastic base core and two pre-coated aluminium sheets on either side of the core. ACP mostly use the external side of the building structures because of the uniform dimensional stability, easy handling, strength and durability. There is also the excellent performance of ACP when used as indoor building elements.

The suitability of the sealant formulation is needed to require prior application on ACP as the faces of the ACP are coated with protective wax. Therefore, a prior compatibility check is advisable for the ACP cladding panels.

The sealants formulated with plasticizers can harm the ACP as they tend to penetrate in and damage the protective coating. Moreover, the presence of the plasticizer can also become the reason for the stains on the ACP surfaces which is unacceptable as far as aesthetics is concerned. Therefore, is advisable to select compatible and non-staining sealants for joints between ACP panels

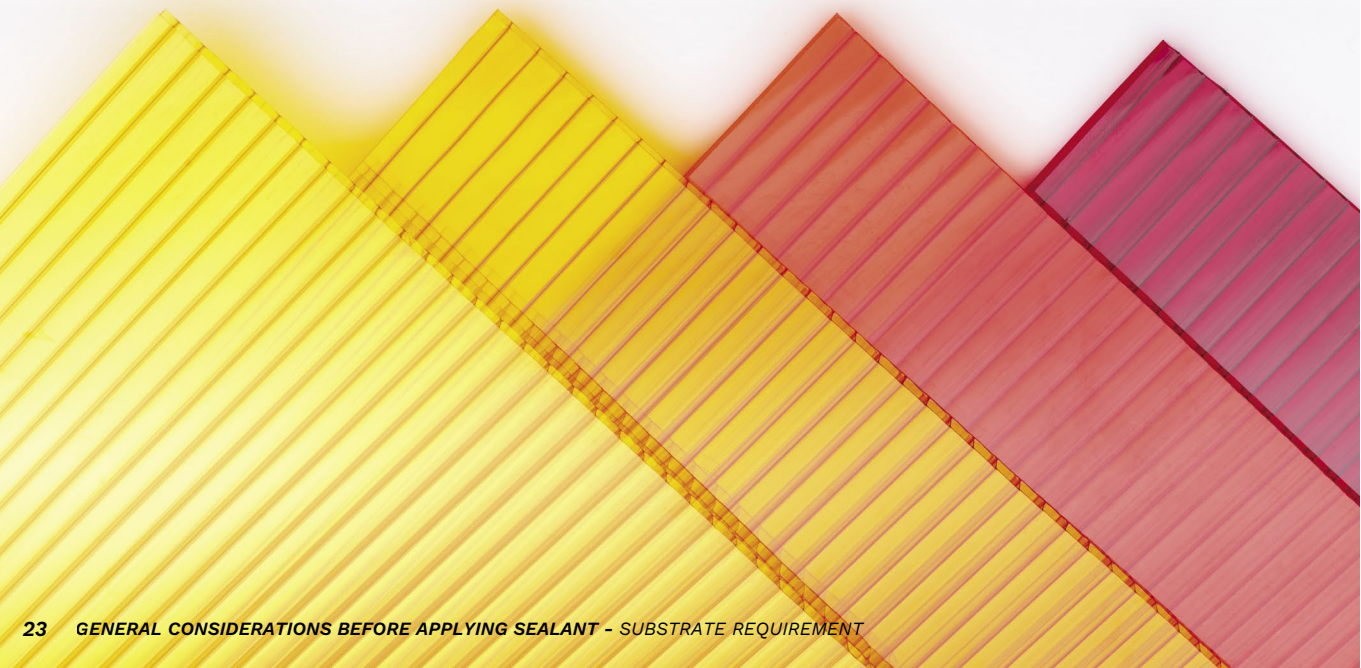


## ► PLASTICS

Plastics are primarily composed of polymers as the main ingredient and are available in a wide range of synthetic or semi-synthetic materials. It can be moulded in various shapes. Plastics are comprised of more than seven types. Accordingly, the composition of plastics highly influences the bonding of sealants. Bostik recommended the thumb rule that can be stated as follows

**As a rule of thumb the following can be stated:**

<b>Bostik Hybrid Sealants:</b>	<b>No primer required</b>
<b>Bostik S765 SILICONE PREMIUM:</b>	<b>Usually no primer required</b>
<b>Bostik S300 Series:</b>	<b>A primer is necessary</b>





**The bonding test is always recommended for satisfactory performance.**

- Polyethylene / Polypropylene / PTFE - For this type of plastic there is no possibility of bonding. Moreover, the primers are also not applicable.
- Soft PVC - This plastic composition comprises the weakening agents which can easily travel causing a sticking layer between the PVC and Sealants within a few weeks. For PVC, the Bostik S765 SILICONE PREMIUM provides the best and most satisfactory results
- Polystyrene - These are extremely sensitive to solvent-based sealants. It is recommended to clean with alcohol.
- Horizontal movement due to inter-storey drift.
- Vertical movement due to possible relative deflections between consecutive floors.

**Polyacrylate, PMMA and Polycarbonate**

Due to an inappropriate selection of sealants, the plastic can receive stress cracking. Further, most sealants are not able to create bonds with these plastics. The use of Bostik S765 does not affect the plastics and usually bonds well.

Plastics are also very highly sensitive to the temperature difference, with relatively high expansion rates. It is very important to decide the correct dimension and location of the joint.

# Substrate Preparation

## ► CONCRETE

- The concrete substrate must be sound and have a minimum compressive strength of 25 N/mm<sup>2</sup> and a pull-off strength of 1.5 N/mm<sup>2</sup>.
- The substrate must be clear of all loose materials, old coatings, curing ingredients, release agents, laitance, oil grease, and other contaminants. It must be in a saturated surface dry (SSD) state.
- Manual sanding or grinding is required to remove structurally unsafe layers or surface impurities. Substrates heavily impregnated with oil must be thoroughly clean by approved & safe methods in accordance with local and construction standards.

### Procedure to correct uneven concrete joint profile:

- 1.** Used sand paper or grinder to eliminate minute debris
- 2.** Allow saw cutting to make it straight profile
- 3.** Clean it manually or with the aid of industrial vacuum

*Cleaning concrete surfaces are done using steel brush or paint brush. Too dusty surfaces are cleaned with wet rags. For maximum adhesion, use primer such as Bostik N49 Primer or Bostik T300 Universal Primer .*

## ► **GLASS & OTHER NON-POROUS SUBSTRATES**

- Grease, oil, and dust must not be present on any of the surfaces. Surface treatment is critical for a long-lasting connection and depends on the nature of the substrates.
- A clean lint-free cloth should be used to wipe all sealant-receiving components thoroughly. Use the specified cleanser (Bostik Cleaner) and a dry wipe thereafter for the best results (2-rag method).
- Apply the dry wipe with a clean towel. In cold weather, extra care must be taken to avoid frost and/or condensation on the surfaces.
- All surfaces should be handled with care once they have been cleaned and/or primed to avoid contamination.
- If sanding is not mandatory for cleaning, then do not sand as this creates scratches in the surface.



# Application Of Primer\*

Substrate such as Concrete, Stone, and Wood are porous in nature so when these substrates are subject to routine water requires the bonding primer. The application of primer is also essential for the surfaces which are too porous or joints that experience high stresses and remain subject to the extreme weather exposure.

The sealant can directly be applied on surfaces for the materials such as glass, ceramics, metal and plastic as these materials are non-porous in nature and do not require application of primer. For more details, read the supplied product information sheet. The prior bonding test is recommended for the materials which have several compositions such as plastic, painted surfaces, coatings, powder coating, etc.

The bonding test can easily be performed by application of sealant bead to the surface and judge the bonding after curing. Follow the complete material instruction provided by the manufacturer while applying bonding primer specifically when minimum and maximum drying times of the primer is concerned.

*\* For specific Bostik product for primers, cleaners and wipes, consult Bostik representative or technical department.*

# Primer Suitability Guide

## ► GUIDE FOR PRIMING

APPLICATION SURFACE	BOSTIK PRODUCT	B535 B735	A325 A585 A750 A975 A980 A990	P360 P590 P790 P795 P985	H560 H565 H725 H775 H950 H985	S300 S320 S520 S570 S730	S340 S545 S735 S740 S765 S960
	<b>POROUS</b>						
Pine wood untreated	-	x	P	P	P	P	
Hard Wood	-	x	P	P	P	XP	
Stone	X	x	XP	XP	P	XP	
Concrete	X	x	XP	XP	O(1)	XP	
Concrete blocks	X	x	XP	XP	O(1)	XP	
Aerated concrete	X	x	P	P	O(1)	P	
Limestone	-	x	P	P	O(1)	P	
Gypsum	-	x	P	P	O(1)	P	
Natural stone	-	x	-	X	-	O(4)	
Marble	-	x	-	X	-	O(4)	

The following indications are used:

**X = Suitable application, mostly without primer**

**XP = Suitable applications, mostly with primer mandatory.**

**O = Application with limited suitability (footnotes do explain limitations)**

**P = Primer mandatory.**

**- = Not Suitable.**

1. On fresh concrete the acids from the sealant can react with the alkalis in the concrete.
2. With water the loss of bonding power can occur.
3. With exposure to U.V. light the bonding can release.
4. Use only special types not causing discoloration. (for example Bostik S955 SEAL'N'FLEX NON-STAINING)
5. The acids released during the curing of the sealant can have a corrosive effect on the metal.
6. Discoloration can occur when elements of the rubber migrate through the sealant.
7. Bostik S955 SEAL'N'FLEX NON-STAINING is preferred due to possible stress-cracking.

APPLICATION SURFACE	BOSTIK PRODUCT					
	B535 B735	A325 A585 A750 A975 A980 A990	P360 P590 P790 P795 P985	H560 H565 H725 H775 H950 H985	S300 S320 S520 S570 S730	S340 S545 S735 S740 S765 S960
<b>NON-POROUS</b>						
Glass	X	0(2)	0(3)	X	X	X
Ceramic	X	0(2)	X	X	X	X
Emanel	X	0(2)	X	X	X	X
Porcelain	X	0(2)	X	X	X	X
Iron	X	0(2)	XP	X	-(5)	XP
Sink	X	0(2)	XP	X	-(5)	X
Lead	X	0(2)	XP	XP	-(5)	XP
Copper	X	0(2)	XP	XP	0(5)	XP
Inox	X	0(2)	X	X	XP	X
Aluminium	X	0(2)	X	X	0(5)	X
Aluminium coated	X	0(2)	XP	XP	XP	XP
Polyethylene	-	-	-	-	-	-
Polypropylene	-	-	-	-	-	-
PTFE	-	-	-	-	-	-
Polyester	X	X	X	X	XP	X
PVC	X	X	X	X	XP	X
Polystyrene	X	X	X	X	XP	X
Polystyrene foam	-	X	X	X	X	X
Polyacrylate	-	-	-	-	-	X(7)
Polycarbonate	-	-	-	-	-	X(7)
Wood + alkyd paint	X	X	X	X	X	X
Wood + dispersion paint	X	X	X	X	X	X
Neoprene rubber	X	-	0(6)	0(6)	-	0(6)
Bitumen/tar	X	-	-	-	-	-



## Backer Rod Selection

Backer rod is primarily made up of a foam which is widely used in joints to control the amount of sealant and provide the backing in joints as this rod is able to create the back stop. The material used for backer rod is weaker in nature as compared with sealant so that there will be no obstruction in movement of the sealant in compression as well as in expansion. Following are the types of backer rod that mostly used in joints:

**A** PU Backer rod (open cells)

**B** PE Backer rod (closed cells)



The round shape backer rod exhibits the best performance due to its perfect dimension. It provides a large bonding surface which can't be achieved with the thinner layer backer rod used in the middle of the sealant joint.

**PU Backer Rod** which is open cell foam that can easily be compressed and return to its original shape due to non-obstruction to air movement. It is widely used for non-mechanical joints or joints which are not subject to contact with the water. The joints in the façade are one example.

**PE Backer Rod** is used when the joint is in contact with the water or has mechanical pressures. The foam used for PE Backer Rod is known as closed-cell foam. Great care is required while placing PE Backer rods as these are more critical than PU Backer rods.

Blistering is one the most critical issues that can occur due to the damage of PE Backer Rod as it releases propellant such as gas or air which causes blistering in the sealant joint. This happens because the air is locked between the rod and the sealant further exposure to direct sunlight causes blisters.

The other materials such as wooden battens, rubber hoses, and 1-component polyurethane foam which is not suitable to use as backer rod as these are not effective in expansion of joints. The use of Polystyrene foam as backer rod is less suitable as this can dissolve by primer when applied for the bonding with the sealant.

When it becomes difficult to accommodate a backer rod due to less depth of the joint, the self-adhesive PE form or PE foil can be effectively used in lieu of backer rod. The Polyethylene backer rod allows the cured sealant to move freely in the joint as there will be no bonding between polyethylene and sealant which prevent bonding to respective three surfaces.

# Backer Rod Insertion Tool

In order to maintain proper joint depth, backer rod insertion tool can be used to have consistent joint depth profile. Alternatively, improvised wooden insertion tool can be also used as long as it won't damage backer rod.

## Joint Design & Backer Rod Placement

The joint design ratio should be:

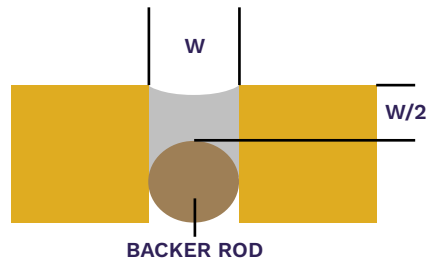
**Depth of joint : Width of joint**

**1 : 2** for >12mm width gap

**1 : 1** for < 12mm width gap

Or use this formula:

$$\text{Joint Depth} = \frac{\text{Width Joint}}{3} + 6$$



# Table of Backer Rod Sizes

Correct Backer Rod Sizing		
Joint Width in Inches and (Millimeters)	Closed-Cell Backer Rod Recommended Diameter in Inches and (Millimeters)	Open-Cell Backer Rod Recommended Diameter in Inches and (Millimeters)
3/16 inch (5 mm)	1/4 inch (8 mm)	1/4 inch (6 mm)
1/4 (6)	3/8 (9)	3/8 (8)
3/8 (10)	1/2 (13)	1/2 (13)
1/2 (13)	5/8 (16)	5/8 (16)
9/16 (14)	3/4 (17)	3/4 (17)
5/8 (16)	3/4 (19)	3/4 (20)
11/16 (17)	7/8 (20)	7/8 (21)
3/4 (19)	1 (25)	1 (24)
7/8 (22)	1-1/8 (29)	1-1/8 (28)
1 inch (25 mm)	1-3/8 inch (33 mm)	1-1/4 inch (31 mm)
1-1/8 (29)	1-1/2 (39)	1-3/8 (36)
1-1/4 (32)	1-5/8 (43)	1-5/8 (40)
1-3/8 (35)	1-7/8 (47)	1-3/4 (44)
1-1/2 (38)	2 (51)	1-7/8 (48)
1-5/8 (41)	2-1/8 (55)	2 (51)
1-3/4 (44)	2-3/8 (59)	2-1/4 (55)
1-7/8 (48)	2-1/2 (64)	2-3/8 (60)
2 inch (51 mm)	2-5/8 inch (68 mm)	2-1/2 inch (64 mm)
2-1/4 (57)	2-7/8 (74)	2-3/4 (71)
2-1/2 (64)	3-1/4 (83)	3-1/8 (80)
2-3/4 (70)	3-5/8 (91)	3-3/8 (87)
3 (76)	3-7/8 (98)	3-3/4 (95)
3-1/2 (89)	4-1/2 (115)	4-3/8 (111)
4 (102)	5-1/8 (132)	5 (128)

# Masking Tape Installation

Place the masking tape at edge of the linear joint to avoid excessive scattering or contamination of sealant.

## Sealant Gun Selection

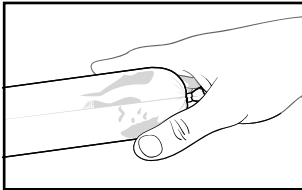
Manual (closed barrel) gun is preferred in dispensing sealant. There are two reasons. First, available packaging is in 600mL sausage mostly for project sites (long linear joints) which are majority in Asia Pacific. Secondly, applicator can detach the stopper from manual gun to make it suitable for 300mL cartridge sealant.



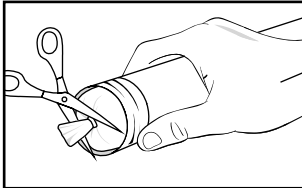
In Bostik, there are battery operated guns that fit to sausage & cartridge/tube sizes for faster and efficient extrusion of sealant.

On the other hand, for cartridge or tube size (~300mL) sealant, manual caulking gun is commonly used.

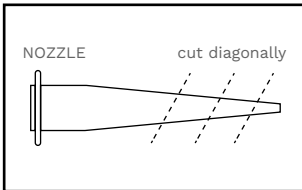
# Sealant Gun Preparation



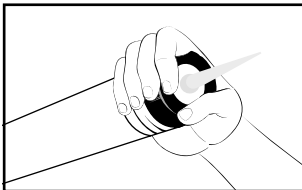
Inspect the sausage whether there are lumps, hardened or poor quality of seam/weld.



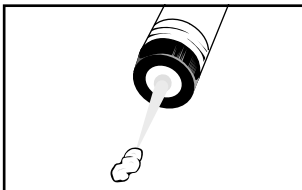
Cut the tip of nozzle and insert the sausage inside the manual gun



Cut the nozzle diagonally according to joint width dimension



Close the lid of sealant gun



Extrude an ample amount of sealant before applying it into large linear joint to inspect lumps or hardened sealant. Remove it afterwards

PRACTICAL  
LAB TEST  
FOR SEALANT

# Slump Test

Determine the sag of a sealant when vertically applied

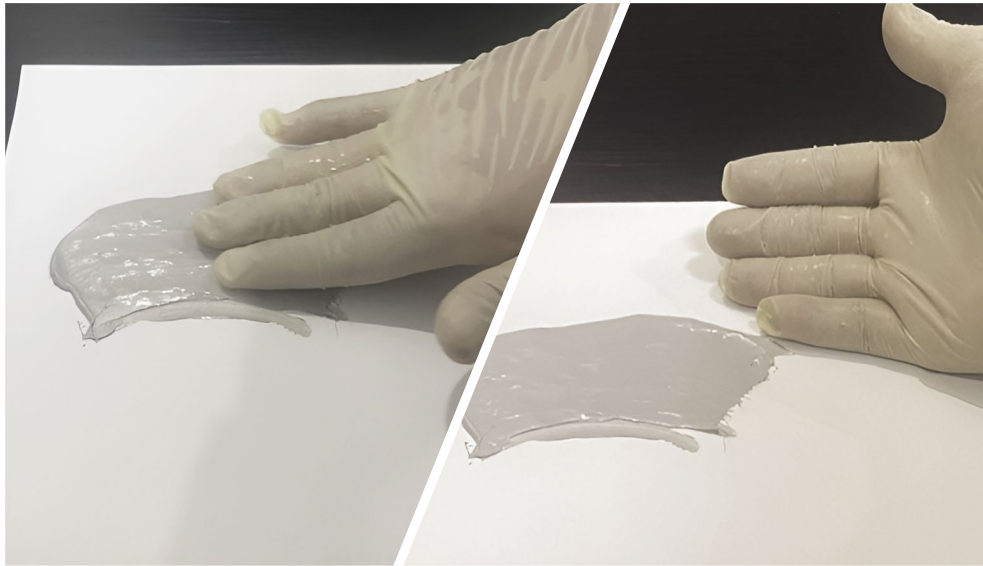


- 1.** Get a sturdy illustration board 15" x 20" (1/4) on which sealants are to be applied. Draw two circles with diameter of 30-50mm as reference
- 2.** Place this illustration board on the wall and make it stable preferably using Bostik Blu Tack as adhesive.
- 3.** Extrude the sealant on a 1st circle creating a descending pattern as shown above. Do the same pattern for another sealant.
- 4.** Observe sealant holding form and not sliding from the board or drooping over.

# Toolability Test

## Determine how easy to tool & finish sealant

1. On top of flat and stable surface, extrude the sealant
2. Spread the sealant on the given surface using spatula
3. Using finishing soap e.g. Bostik T500 sprayed on top of sealant, tool it using hand with glove
4. Observe whether transfer of sealant to applicator's hand is visible. Without transfer signifies that sealant is readily tool-able





# Smoothness Test

**Determine the whether un-dissolved materials present in sealant**

- 1.** Apply an ample amount of sealant.
- 2.** Spread the sealant using flat card into thin and smooth finish.
- 3.** Observe the consistency of the sealant.
- 4.** Poor quality sealant will often look grainy, lumpy, rough etc.



# String Test

**Minimal stringing assists with application ease and cleanliness of the finished seal making the product more workable.**

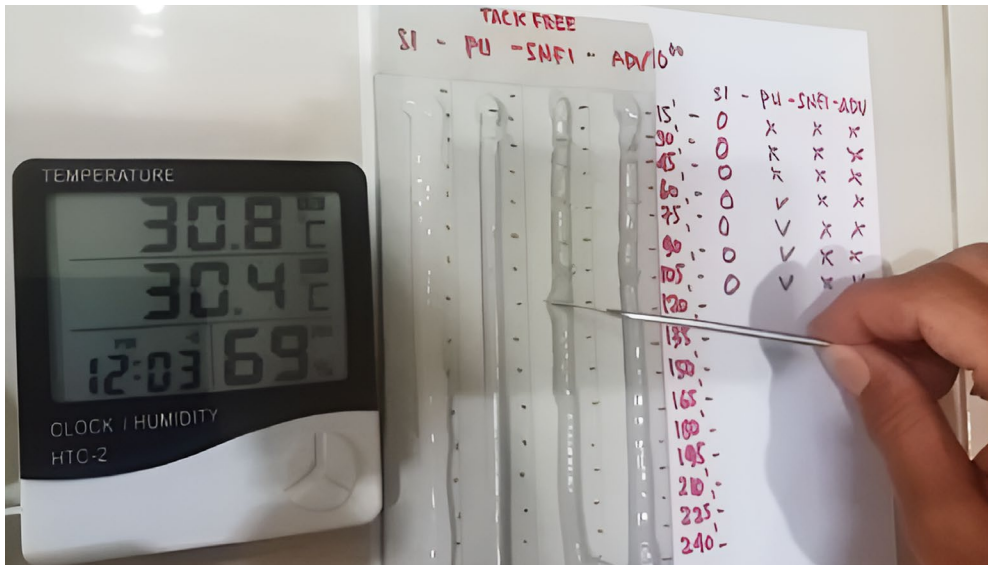
- 1.** Gun a thick bead of sealant along a card or paper.
- 2.** After approx. 60mm release the pressure catch.
- 3.** Slowly drag away the nozzle, observing the stringiness of the sealant.
- 4.** Repeat with competitor product to show advantage.



# Tack-Free Time Test

**It measures of the time interval before the sealant resists damage by touch or light surface contact**

- 1.** Get illustration board and apply 10-12mm beads of sealants(right). Alternatively, spread the sealant on card board(left).
- 2.** Record the temperature & relative humidity using thermo-hygrometer device. Test the surface of sealant by touching it using metal or plastic rod for different time intervals.
- 3.** Determine the final time until no sealant will transfer to the rod.
- 4.** Significance of this test are sealant can resists job-site airborne dirt pick-up & resists impinging rainfall.



SEALING  
PRE-CAST  
PANEL

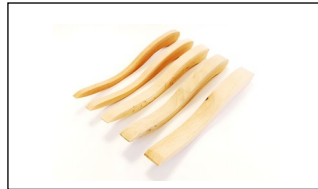
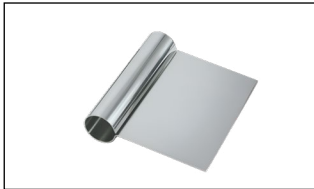


The precast is referred to as the prefabricated construction which includes the fabrication of major structural elements following the standardised procedure at the fabrication plant which is located away from the site and then transported and erected after assembling the structural elements on the site. The prefabricated structural elements are manufactured at the plant by following the industrial procedures in a bulk quantity to complete the demand for a large number of buildings within a short time at a low cost. Keeping in view the successful building performance, the exterior of the building must be able to keep rain and other weathering actions away from the building's occupants. Accordingly, the precast concrete panels are relatively impermeable to water. Concrete panels do not allow moisture to penetrate through them. It is the basic requirement of the joint between the precast concrete panels and other building materials that they do not allow water and air to penetrate through the building envelope. Therefore, it is necessary to make the right selection while selecting the sealant for making joints that should give the best performance when subject to the different types of stress. For this purpose, the right joint dimensions, proper surface cleaning and right application technique are required.

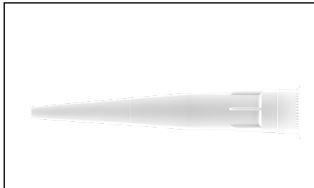
# Materials Needed For Sealing Pre-Cast Panels



Tooling spatula can be used are putty knife with different sizes, scrapper or wooden spatula



Nozzle cutter can be used to cut the tip of sealant's nozzle



Plastic nozzle provided by sealant manufacturer



Masking tape is used to avoid contamination of sealant during tooling



For optimum adhesion and in areas of critical, high performance applications such as high stress joints, extreme weather exposure or surfaces that are too porous, the use of substrate primer is required.



It is highly recommended to use Bostik T500 Finishing Soap as tooling solution because it will not make sealant' surface sticky after cured & it is biodegradable.

# Other Tools & Equipment Might Needed



## **Pull-off Tester**

Portable machine used to measure adhesion strength of concrete



## **Moisture Meter**

Used to measure the percentage of water in concrete by means of electrical impedance



## **Thermo-hygrometer**

Useful measuring device for determination of both air temperature and relative humidity



## **Infrared Thermometer**

Use to measure substrate &/or product's temperature



## **Industrial Vacuum**

Wet and dry industrial grade vacuum cleaner use for collecting dust and minute loose particles during substrate preparation along concrete joint



## **Concrete Grinder**

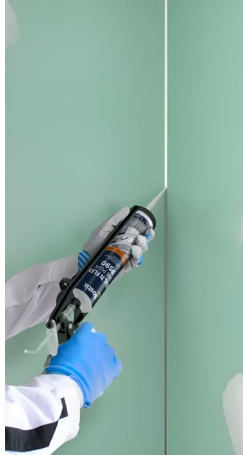
Use some sort of abrasive to grind or cut & polish the surface using diamond grinding cup wheels. Uneven concrete profile should treat this machine in order to have uniform linear joint



# Sealant Extrusion, Tooling & Finishing



Place the masking tape at edge of the linear joint to avoid excessive scattering or contamination of sealant.



Extrude the sealant at angle of 45 degrees filling the joint correctly.



Apply the sealant with care. It is important to fill the entire joint. This can be done by applying sufficient sealant to the back of the joint or the backer rod. This causes the sealant to be pressed to both sides of the joint, creating a good surface for bonding between sealant and joint.

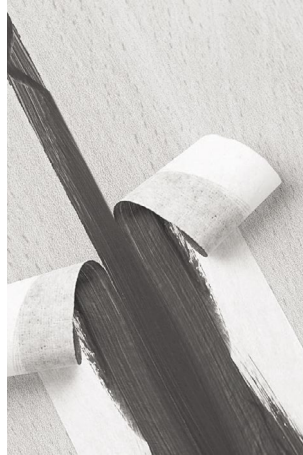


Push the lever at the back of sealant gun after use to avoid continuous dispensing of sealant.





Using putty knife or scrapper or metal/ wooden spatula, tool the sealant downward to achieve uniform surface profile.




Remove the masking tape slowly preventing any contamination at sealant's surface.



For any uneven or non-contact sealant to concrete, spray Bostik T500 Finishing Soap on sealant's surface, then tool properly to have perfectly smooth surface.



GLAZING



With recent development in the construction industry and modernization in building envelope, the curtain walls which are also known as structural glazing systems are becoming trending for high-rise as well as low-rise buildings, specifically commercial projects. Along with the beautiful visualisation, the glazing elements are also energy efficient for houses and buildings. Due to up-gradation and improvement in standards, insulating Glazing including second and triple glazing with warm edge spacers, are becoming a part of the standard.

The most important part of the glazing curtain walls and other glazing elements is the arrangement and accommodation of connection joints. The requirement of the connection joints are that it should be waterproof, airtight and if possible contribute to the lambda-value of the adjacent elements. It is, therefore, efficient and/or high-performance building element, also requires a high performance and suitable sealant and adhesive. Therefore Bostik's aim is to continuously focusing on the development of high-end products keeping in view quality, durability and sustainability as priorities.

# Bostik Scope in Glazing Application

## ► **INSULATING GLASS (TOP SEAL)**

Insulating glass units are widely used in structurally glazed facades to improve the thermal performance of a facade. With the help of the insulating glass units, the Architects and designers are now using the larger areas of glass that can be used as façades while having the best thermal performance of the building. This allows the designers to increase the suitability of materials while designing the façade system using modern technology and developments.

## ► **LAMINATED (SAFETY) GLASS**

It is made by pasting PVB (polyvinyl butyral) resin glue film between two or more pieces of glass sheet, then heating, pressing and bonding them together to create a flat or curved compound glass product. The glass sheet for making laminated glass can be ordinary glass, float glass, tempered glass, coloured glass, heat-absorbing glass or heat-reflecting glass etc.

## ► **SINGLE SHEET GLASS**

is made using a series of rollers that draws the molten glass vertically up out of the mixing tank (where the glass is still a liquid). This includes further rolling up vertically and then as it is cooling, turned horizontally, for further cooling and processing.

## ► **MONUMENTAL GLASS**

A semi-transparent with a distinctive pattern offers privacy and natural light. The door glass, by law, will have a safety-logo on each panel of glass in the door.

## ► **FIRE RETARDANT GLASS**

It is specialized glass that has been proven to provide a period of protection against fire during a fire test. The degree of protection offered depends on the type of fire-rated glass used but generally speaking, all fire-rated glass acts as a barrier to help prevent the spread of flames and smoke in the event of a fire.

## ► **WEATHER SEALING GLASS**

Glass facade must be absolutely waterproof and fulfil the highest expectations of quality and aesthetics. This requires high-performance weather sealing.

The individual elements are ultimately subject to extreme movements due to temperature changes, UV exposure, shrinkage of construction materials, sound, wind and vibrations, which may affect the joints and adjacent elements.

## ► PAINTABLE GLASS

Glass that has been coloured, esp. by having pigments baked onto its surface or by having various metallic oxides fused into it.

## ► WET AND DRY GLAZING SYSTEMS

Since glass itself is impervious to water penetration, the waterproofing performance is determined by the glazing method and the way of installation. Waterproofing glazing systems can be executed by so-called wet glazing and dry glazing solutions.

Wet glazing means applying a wet sealant out of a cartridge or aluminum sausages with a professional caulking gun as a waterproofing seal.

Dry glazing systems use pre-formed solid rubber glazing seals. These pre-formed solid rubber glazing seals are extruded in a factory and packed on rolls.

On some occasions, wet and dry systems can be used in combination. Both systems do come with advantages and disadvantages. In the table below, we will explain them.



Glazing system	Advantages	Disadvantages
<p><b>Wet glazing:</b> Applying a sealant over backer rod or glazing tape</p>	High resistance to water and air penetration, Adheres perfectly to glass and adjacent materials and it generates an uninterrupted seal	Requires exterior access for installation, maintenance and glass removal
	Protects the unit edges and laminated glass from water and premature deterioration	Workmanship dependent (surface preparation, weather, etc.)
	Reduces glass movement, “walk”, as the sealant acts	Can costs more than dry glazing
	UV resistant	
<p><b>Dry glazing:</b> Installing a pre-formed solid rubber glazing seals backer rod or glazing tape</p>	Can be installed from the interior	Not as water and airtight
	Less dependent workmanship and weather	Can be affected by UV over a longer period of time
		Pre-formed solid rubber glazing seals can shrink, creating openings for water and air penetration
	Generally less costly than wet glazing	Pre-formed solid rubber glazing seals can roll into pocket and place uneven stress on glass
	Glass can “walk”	

# Sealant Types for Glazing

## ► **SILICONE SEALANTS**

Silicone sealants are construction sealants with excellent resistance to weathering and ageing. They are used to seal all types of construction joints. Silicone sealants cure by absorbing moisture from the air to form a silicone rubber seal capable of extreme movement ( $\pm 25\%$  for CE Marking and 50% for ASTM).

## ► **SILICONE ADVANTAGES**

- Excellent extensibility
- Excellent recovery
- Extreme resistance to weathering (including UV) and ageing
- Easily applied at all temperatures
- Good to excellent adhesion

## ► **HYBRIDS**

Hybrid is the fast growing elastic sealant and adhesive technology. It combines a wide adhesion spectrum, paintability, bubble-free curing and applicability to damp substrates. In addition, hybrids products contain no isocyanates.

## ► HYBRID ADVANTAGES

- Excellent recovery
- Extreme resistance to weathering (including UV) and ageing
- Good adhesion to most substrates
- Hydrophilic; even adhesion to damp surfaces
- High mechanical resistance
- Human friendly to use
- Paintable



## ► **CE CLASSIFICATION (EUROPE)**

In today's world, globalization and harmonization become commonly used and familiar terms. This is also true at building standards and regulations. Within Bostik we embrace this movement and strive for a globalized standard which provide transparency and simplicity in sealing and bonding.

## ► **'CLASS' ABBREVIATIONS MEAN:**

- LM refers to a 'softer' sealant and stand for low modulus. Low modulus performing sealants can withstand a movement capability of 20 and 25%.
- HM refers to a 'harder' sealants and stand for high modulus. High modulus performing sealants can withstand a movement capability of 20 and 25%.
- CC for cold(er) climate applications.

One of the most familiar, and for Europe mandatory standards in the sealant industry is the CE Classification, or also known as the standard EN 15651.

## ► EN 15651-2 SEALANTS FOR GLAZING

EN 15651-2 sets out definitions and requirements for non-structural, elastic joint sealants for sealing glazing in buildings. Included are glazing joints at an angle of 7° to the horizontal. The areas in which these joint sealants are used are:

- Glass to glass
- Glass to frames
- Glass to porous carrier materials

Application	Movement capability	Class	Elastic recovery	Loss of volume
<b>Type G</b>	± 25%	25LM	≥70%	≤10%
		25HM	≥70%	≤10%
	± 20%	20LM	≥60%	≤10%
		20HM	≥60%	≤10%

## ► **ASTM INTERNATIONAL**

The ASTM C920-18 ‘Standard Specification for Elastomeric Joint Sealants’ covers the properties of a cured single or multicomponent cold-applied elastomeric joint sealant for sealing, caulking, or glazing operations on buildings, plazas, and decks for vehicular or pedestrian use, and types of construction other than highway and airfield pavements and bridges. A sealant qualifying under this specification shall be classified as to type, grade and class.

## ► **USE**

Uses M, G, and A refer to sealants that remain adhered, within given parameters, to various standard specimens including, respectively, mortar (M), glass (G), and aluminum (A) when tested for cyclic movement and adhesion-in-peel. It is important to understand that the specimens related to these designations are not those specified for the Project but those that comply with restrictive material specifications in the ASTM test methods.

## ► **TYPE**

Type S products are those supplied in pre-packaged cartridges or other forms in which no jobsite mixing is required.

## ► GRADE

Grade NS products are suitable for installation in joints in vertical surfaces without sagging at temperatures between 40 and 122 deg. F (5 and 50°C).

Application	Use	Class	Movement Capability
<b>Type S</b> Single Comp.	<b>G</b> Glass	100/50	100% expansion / 50% compression
		50	50% expansion / 50% compression
<b>Type NS</b> Single Comp.	<b>A</b> Aluminium	35	35% expansion / 35% compression
		25	25% expansion / 25% compression
		12.5	12,5% expansion / 12,5% compression





# Method of Application

## ► **GLAZING SEALANT**

### **Pre-Installation Meeting**

All material shall be used complying with Bostik's printed instructions. During the bid stage, a joint meeting should be held to review material technical specifications, performance tests, and procedure of sealant application prior to the commencement of work on the project. A Bostik representative should be present at the start of each job to review procedures and instruct in sealant application.

### **Adhesion Testing**

Prior to the movement of the units to storage, the sealant needs to properly adhere to the substrate. When the adhesion test shows cohesive separation of the sealant, proper adhesion has been achieved.

## ► SEALANT APPLICATION

- The glazing sealant shall be installed according to Bostik’s method of application stipulated in TDS. All surfaces must be properly cleaned using Bostik T100 Universal Cleaner or other approved solution.
- The surfaces to which the glazing sealant will adhere should be designed smooth: free of nubs, serrations, grooves or other features, so as to not impede the flow of the glazing sealant or wetting of the sealant to the substrates on its entire surface contact depth.
- Prime surfaces (if necessary) using Bostik Primer, taking care to protect the surfaces that do not require primer. Consult Bostik representative for specific primer selection. See page [28](#).
- Refer to page [35](#) for masking tape & pages [31-34](#) for backer rod selection & installation.



*Cleaning the glass joint using clean “nano-fibre” rag or with the aid of Bostik T100 Universal Cleaner*

- Apply the sealant with care. It is important to fill the entire joint. This can be done by applying sufficient sealant to the back of the joint or the backer rod. This causes the sealant to be pressed to both sides of the joint, creating a good surface for bonding between sealant and joint.
- All sealant beads must be tooled immediately after application, forcing the sealant into contact with the sides of the joint, promoting a full and continuous contact of the sealant with both substrates. This reduces the risk of air entrapment.



## ► **BOSTIK T500 FINISHING SOAP**

### **Joint sealant finishing additive**

BOSTIK T500 FINISHING SOAP is a ready mixed neutral universal additive for the wet tooling of sealants in joints. BOSTIK T500 FINISHING SOAP is more than 99% Biodegradable

### **Bostik PE Glazing Tape**

BOSTIK PE GLAZING TAPE is a self-adhesive reinforced tape that can be used in timber and steel frames.

### **Bostik Spatula**

A set of three professional wooden spatula for easy tooling and finishing of sealant joints.



# OTHER FACADE SEALING

# Consideration About Staining

## ▶ **WHAT IS STAINING?**

Staining can occur when applying a sealant or adhesive on a natural and/or artificial stone surface. The migration of oils or other liquids creates a darker “wet-looking” stain on both sides of the natural stone where the sealant is applied. This effect can be seen after the curing phase of the sealant or adhesive. This can occur after several weeks, months, or even years. This staining effect on the natural and artificial stone does have a negative visual aspect. Technically, both the substrate as well as the sealant or adhesive aren’t affected negatively in performance and durability.

## ▶ **WHAT CAUSES STAINING?**

Staining or edge soiling is most often caused by non-reacted plasticizers, solvents or fluids in the sealant and adhesive that can leach out of the sealant after it cures. Every sealant and adhesive formulation, whether inorganic or organic, is different. Any standard sealant or adhesive can cause or initiate staining. Therefore, if you need to apply a sealant or adhesive to these so-called sensitive building and construction materials, we highly recommend you select products that don’t contain plasticizers and aren’t diluted.

## ► **ASTM C-1248**

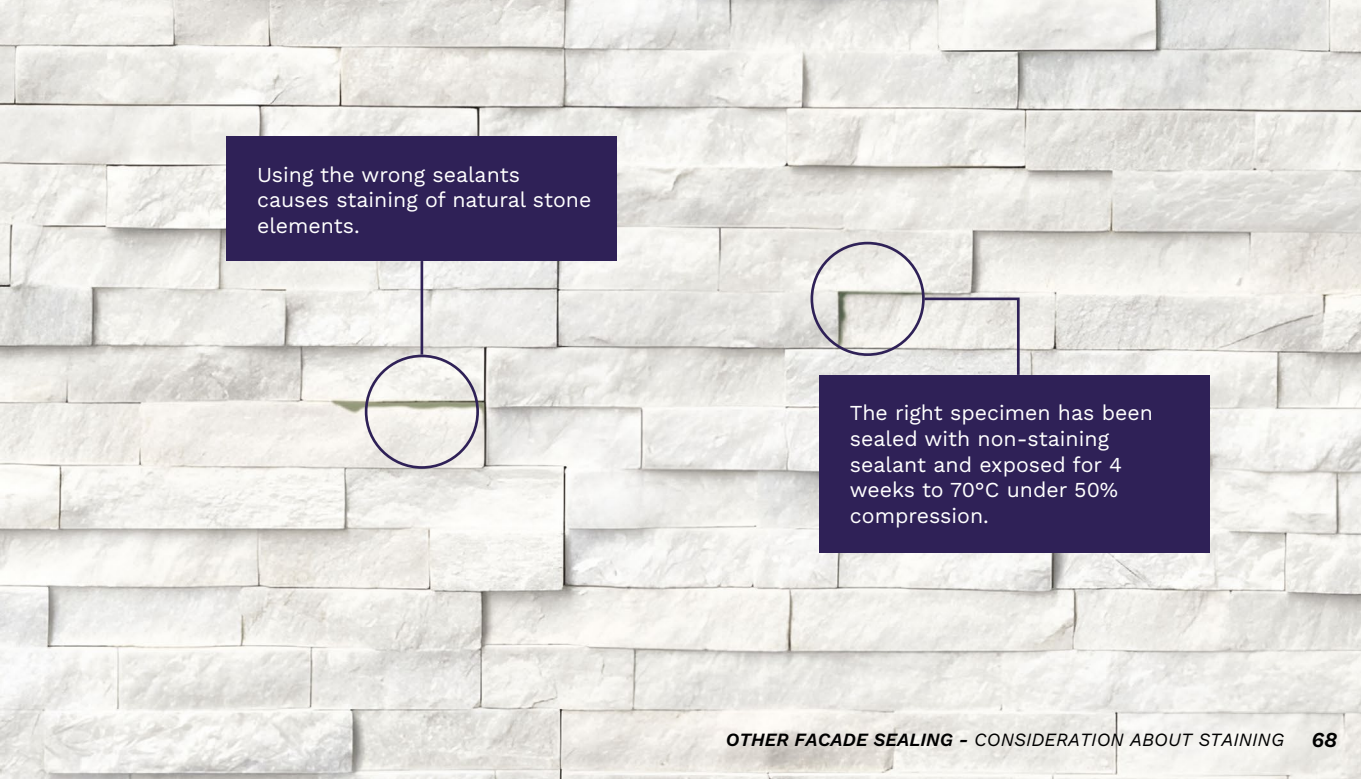
ASTM International, formerly known as American Society for Testing and Materials, is an international standards organization that develops and publishes voluntary consensus technical standards for a wide range of materials, products, systems, and services. Bostik is using for sealants and adhesives relevant ASTM standards, amongst others the ASTM C-1248. The ASTM C-1248 is a standard test method for 'Staining of Porous Substrate by Joint Sealant. The ASTM C-1248 is a test method that covers an accelerated laboratory procedure to determine if a joint sealant has a probability of staining a porous substrate.

The ASTM C-1248 will make out of 24 substrates, and 12 test specimens (25x25x75mm), between which the sealant or adhesive is applied in the dimension of 49x25x13mm. The test specimens are compressed and clamped out the joint movement capability we've mentioned in our technical datasheets. 4 Test specimens are stored at standard conditions, while under compression for up to 28 days. 4 Test specimens are exposed in an oven (@70 ± 2°C), while under compression for up to 28 days. The last 4 test specimens will be exposed under compression for up to 28 days in an ultraviolet (UV) fluorescent test chamber.

The full test procedure can be read in the ASTM C-1248 document and can be purchased at <https://www.astm.org>

# Natural Stone Façade

Natural stone is used in kitchens, floors, walls, bathrooms, dining rooms, around swimming pools, building foyers, public areas and facades. Since ancient times, stone has been popular for building and decorative purposes. It has been valued for its strength and durable properties. It can be cut, cleft, or sculpted to shape as required, and the variety of natural stone types, textures, and colours provide an exceptionally versatile range of building materials. The porosity and makeup of most stone does, however, leave it prone to certain types of damage if unsealed.



Using the wrong sealants causes staining of natural stone elements.

The right specimen has been sealed with non-staining sealant and exposed for 4 weeks to 70°C under 50% compression.



## ► BOSTIK NON-STAINING PRODUCTS

- BOSTIK H985 SEAL'N'FLEX WEATHER SHIELD
- BOSTIK H980 HIGH TACK PREMIUM
- BOSTIK S960 SILICONE NON-STAINING
- BOSTIK S955 SEAL'N'FLEX NON-STAINING
- BOSTIK P795 SEAL'N'FLEX PREMIUM
- BOSTIK H750 SEAL'N'BOND PREMIUM
- BOSTIK H505 SEAL'N'BOND CRYSTAL



## ▶ OTHER BOSTIK PRODUCTS PASSED ON ASTM C1248

- BOSTIK H725 SEAL'N'FLEX FAÇADE
- BOSTIK P795 SEAL'N'FLEX PREMIUM
- BOSTIK P590 SEAL'N'FLEX ONE PLUS



### LIABILITY:

All supplied information is the result of our tests and experience and is of general nature. However they do not imply any liability. It is the responsibility of the user to verify by his own tests if the product is suitable for the application.

# Aluminum Composite Panel (ACP)

ACP materials are laminated products. These products come in an extremely wide variety of color finishes thus they offer larger quantities of fabrication for building facade.

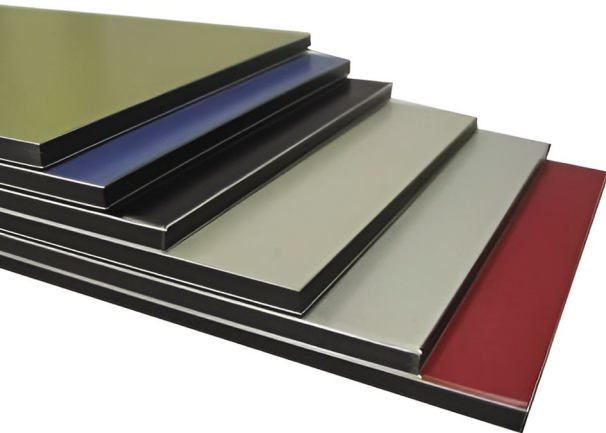
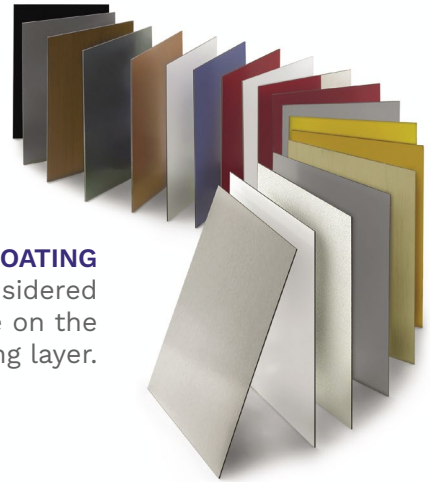
## ► COMMON TOP PROTECTIVE LAYER USED FOR ACP

### POLYESTER COATING

The polyester paint itself is considered a protector and is placed alone on the coating layer.

### PVDF COATING

Is a fluoropolymer resin that is highly inert and stable, providing excellent resistance from metal weathering over time.



# Metal Cladding Panel

Metal Cladding Panel involves covering building materials e.g. Aluminum, steel, zinc, copper etc. with another 'layer' to provide protection against changes in temperature, wind, water absorption, and pollution, all of which can damage the structural integrity of a building and its aesthetics.

It has protective layer, commonly powder (e.g. polyester or epoxy) coating that is applied as a free-flowing & dry powder. It adds extra strength and thickness, making them increasingly resistance to damage.

# Things to Consider in Sealing ACP/ Metal Cladding Panel

## ► **COMPATIBILITY OF SEALANT**

Conduct an adhesion test on mock-up sample of ACP/metal cladding panel to sealant. Adhesion issue might arise on protective coating used such as PVDF, polyester or powder coating.



*Protective coating (paint) or powder coated surfaces*

Layers of paint must bond well to the surface. Remove loose layers of paint. All painted or powder coated layers are seen as plastics, with a wide variety of compositions. The composition of paints between brands can be very different.

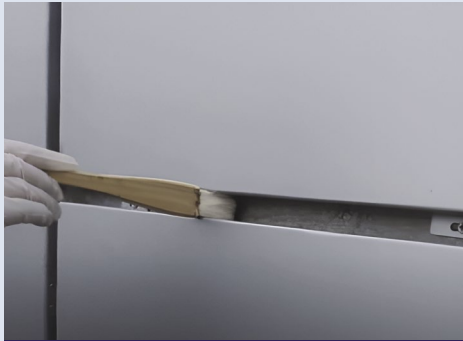
Bonding of these surfaces can show very different results. Powder coatings can contain elements which make bonding impossible. The bonding of sealants to paints/plastics can only be assured by testing on the material itself prior to use. When sealants containing solvents or plasticizers are used, the material must be able to withstand to these.

## ► CLEANING THE JOINT

During installation of panels, protective film shall remove to expose ACP. There is waxy component present on ACP's surface & edge. It is highly recommended to use Bostik T100 Universal Cleaner. Consult Bostik representative or updated TDS regarding the application of this product.



**Bostik T100 Universal Cleaner**  
*Powerful cleaner for  
non-porous substrates*



*Using **Bostik T100 Universal Cleaner**  
to promote better wetting of sealant*



*Using **Bostik Primer** (if necessary)  
by two way cloth method*



## ► STAINING OF SEALANT

As migration of plasticizer is detrimental aesthetically to ACP's surface, it is highly recommended to use Bostik non-staining sealant with compliance to ASTM C1248 standard.



Sealing of ACP & metal cladding using **Bostik H725 Seal N Flex Façade**





INSPECTION,  
MAINTENANCE & REPAIR  
OF JOINT SEALANTS



# Inspection, maintenance and joint repair

A properly applied and well-maintained sealant will last for many years, sometimes up to or even longer than 30 years. However early repairs or replacements of sealants might happen and most likely are caused by:

- Detachment of sealant from surface
- Growth of fungus on sealant joints
- Damage by construction, mistakes or over pressure
- Degradation by chemicals
- Damage by animals like mice and birds

As the sealant mostly keeps moisture out of the building construction it is of great importance to flag and repair joints in time to prevent further damage. Although these leakages become visible during rainy periods, it is recommended to have regular inspections to prevent damage.





## ► INSPECTION

First inspection of joints must be carried out 1 year after application, followed by a biannual inspection. This inspection should be combined with the inspection of the paint work. The most effective way is to judge the joints during the colder season as building materials shrink the most in low temperatures, resulting in the widest joints. This period is best to judge if the sealants are still able to cope with the pressure, and if detachments appear.

During inspection pay specific attention to:

- Detachment/adhesion-loss or cracks in sealant (cohesion-detachment)
- Damages
- Afflictions/fungi
- Weathering
- General state of maintenance of surrounding materials
- Tackiness

Where the sealant is not functioning as it should, (local) repair must take place.

## ► DETACHMENTS

Detachments in facades of buildings can result in leakage. When leakage is noticed but the exact cause and location is unclear, the exact spot should be found by testing. We have two methods for this test:

- Visual (most common)
- Test with a (garden) hose
- Test with a smoke test

## ► PROBLEM SOLVING

With a hose, the façade of the building can be sprayed with water from the lowest point upwards. The interior check is conducted for the water entering the building. It is possible that no signs are found of the leakage. But, it is possible that the leakage will only appear when there is a combined effect of the rain and wind pressure on the façade. Wind Pressure causes overpressure on the outside whereas under pressure appears inside of the building. For this reason, the water can get stuck inside through the small openings. The mechanism becomes more critical in tall buildings when the water can be pushed up and find its way inside..

However, a smoke test is performed to check the leak points easily especially when wind pressure occurs. It is necessary to review available building plans and consult to determine the possible causes of the leakage.

For Drainage System, the drain holes must be kept open as water will accumulate in the construction when these are closed, effectively causing leakage and degradation. However, when the loss of adhesion appears and repaired is needed, further investigation is required to find the cause of the detachment.

## ► THERE ARE SEVERAL POSSIBLE REASONS

- When detachment appears in the joint everywhere, it is clear on first inspection that the applied sealant probably does not bond with the surface of the joint. Accordingly, the repair should take place with a sealant that is specified for the substrate for which the joint is prepared in order to get proper bonding (Pre-Test).
- There is also the possibility that the surface of the substrate and sealant do not tolerate each other. In such a scenario, repair with a sealant which does tolerate is considered for the joint surface.
- Detachment of joints can also be appeared by overloading the sealant. It can be verified by measuring the gap between the surface and sealant. If the gap is more than 25% of the original sealant joint, this means the joint has been overloaded and an adjustment of the construction is required by grinding the joints.
- When the sealant is securely bonded to the other parts which indicates a local cause, e.g. damp spots while applying the sealant. This may also cause when insufficient primer was applied.
- Insufficient use of the sealant to fill the gaps is another cause. Partially filled joints resulting in local detachments that can be filled with touch-up of the same sealant which was applied originally.

When detachments are cohesive, in case of cracks in the sealant joint itself, this indicates over-pressured joints. Before any repairs, the cause of the cohesive cracks must be determined. The cause can be too large a deformation of the joint or too low elasticity of the sealant used. In case of too-large deformations, the joint can be widened to accept more activity. When the elasticity of the sealant used is the cause, the problem can be solved by using a more elastic type of sealant or a sealant which still has a high elasticity at low temperatures.

## ► DAMAGE

Damage can have several causes. In horizontal joints like floors, corridors etc. this can be caused by mechanical stress. Also, by “picking out“ damages can arise that need to be touched up. Animals like birds and mice, also snails, are known to eat sealants. Generally, these are defects which can be repaired locally. It is best to execute these repairs with the same sealant that was originally used.

## ► DEGRADATIONS/FUNGI

The contact of Fungi, bacteria and chemicals with sealant can degrade the joints. Moreover, the visual appearance also changes for which repair of joints becomes mandatory. It is required to ensure that the previously used sealant is correct or need to apply other sealants which can overcome degradation and perform best. Specifically, for antifungal sealant, the fungi may appear due to the following major causes:

- Continued water exposure causes the leach out of the anti-fungal protection due to which antifungal operation is suspended.
- The anti-fungal operation of sealant can also be terminated due to the use of detergent and chemicals which cause degradation of the sealant. For the above reasons, the joint should be considered the maintenance joint which requires regular repairs.





## ► WEATHERING

Weathering is the outdoors natural process which occurs when the joint is subject to ultraviolet light and water. However, this completely depends on the type of sealant used for the preparation of the joint. Some sealant degrades from their surface as time passes, e.g PU sealant becomes hard when its surface is exposed to UV light resulting in cracks in the sealant where the joint can deform. Further, these cracks travel in-depth causing the joint sealant to tears. In this case, the repairing of joints becomes mandatory. With Polysulfide sealants, the degradation also happens and the surface is visible as “Elephant Skin”. This is only restricted to the surface not moving in depth of the joint. MS polymer sealants and silicone sealants are highly UV and water-resistant showing minimum weathering effects on the sealant. With silicone sealants, contamination on the joint and sometimes adjacent surfaces can appear as a result of the static type of the sealant.



## ► **TOTAL STATUS OF MAINTENANCE OF SURROUNDING CONSTRUCTION PARTS/ ELEMENTS**

Perfection in the construction of the substrate structure is causing the sealant joint to be heavily stressed such as paint on wood, quality of concrete and brickwork, warped construction etc. If there is any imperfection in the construction observed that must be repaired. The appropriate methodology should be adopted.

It is recommended to repair with the same sealant as used before, if you are repairing with other sealants the suitability is required to check prior to its application. To use another sealant, the old sealant should be completely removed and the bonding surface needs to be cleaned with degreasing and grinding etc.

If you are repairing with the same sealant then the cleaning of the joint is less critical. Accordingly, for alternate sealants, the complete removal of the old sealants is necessary.

## ► REMARKS

- Bituminous products cause yellow/brown discolouration in sealants which are in contact with bitumen. This can also change the properties of the sealants. Therefore, repairs to bitumen joints are executed with bitumen products.
- Butylene sealant is not easy to remove in plastic form. The use of solvents is usually not sufficient to remove all polybutylene from the surface. A sticky layer can remain on the surface. If repairs are done with polybutylene sealant this layer will not cause problems. If repair is done with another type of sealant, then bonding can be negatively affected.
- Another possibility is intolerance to the new sealant with the old residue of polybutylene sealant, possibly even causing moisture to run from the joint. A bonding test is recommended.

Butyl-mastics are stuck to the surface like chewing gum and it is very difficult to remove. Residual butyl with the presence of plasticizers often causes problems with the other sealants.

- Acrylics can usually be removed easily. The joints can be repaired with Acrylic, Silicone or Hybrid sealants.
- Polysulfide sealant can be recognized by the specific smell of sulphur released while burning. Can usually be removed with ease, and repaired with the same material or a hybrid sealant.
- Polyurethane sealants are often recognized by the hardened skin, possibly showing some may sorts of plasticizers there is a chance of plasticizer migration when repair is made with another sealant.
- Silicone sealants can be cut away easily. Material residue can prevent the use of another type of sealant, as they will not bond to the residual old silicon sealant.

## ► MAINTENANCE

The maintenance of sealant joints mainly consists of regular inspections, and when needed, local repairs. Also, maintaining the construction of material where the joint was sealed in good shape. This accounts for, amongst others, the joints in facades and glazing joints.

A group of joint sealants in need of specific attention are the SANITARY JOINTS also called the joints in wet cells (Bathrooms, kitchens, abattoirs, food processing industries etc.). Aside from the usual inspection and maintenance as described above, these joints have other criteria playing a role: In these locations mostly a Sanitary Silicone sealant is used. These sealants contain a fungicide, making them somewhat more resistant to fungi. The fungicide used can be sensitive to strong detergents, making the fungicide ineffective. Detergents containing Chlorine can make the fungicide completely ineffective.

## ► FOR JOINTS IN WET CELLS THE FOLLOW THESE GUIDELINES

- Spaces should be well ventilated to control the air humidity.
- For cleaning joints no strong or aggressive detergents should be used.

## ► REPAIRING CONNECTION AND EXPANSION JOINTS

When the sealant no longer functions sufficiently, the joint must be repaired locally or as a whole. It is best to remove the entire joint by cutting it out with a sharp knife and, if necessary, grinding it down with an angle grinder. This creates a completely clean surface on which to apply the new sealant. It is advisable to apply the same sealant to prevent differences in colour or problems with tolerance. However, if a different material is chosen for the repair, then it is necessary to test whether both materials tolerate each other. For the correct pre-treatment of the joint sides and the possible application of a primer, or for performing an adhesion test. For the right joint dimensions and use of a backing material, please read the factsheet 'Joint dimensions and constructions'.

Before applying new sealant and for information on the influence of temperature on the final result, please read the factsheet 'Influence of temperature on storage and/or transport'. If the old sealant joints cannot be removed completely, as may occur at joints with old butyl-mastic or asphalt joints, using a different method is necessary. Possibilities are the use of, e.g., impregnated tape or slab joints. In this case, the best is to seek advice beforehand.

## ► REPAIRING SANITARY JOINTS

Remove joints as much as possible with a sharp knife. To remove residue of old sealant use SiliKill, creating a fully smooth surface again. Remove residual detergent from the surface with a degreaser, leaving no traces. To achieve optimal bonding, apply the sealant to the tile. Usually, on cutting edges of tiles, less bonding is achieved. Floor joints and eventual leakage can cause a wet surface.

# POLYURETHANE FOAM



## Introduction

In 1937, Otto Bayer formed a solid plastic by mixing two chemicals, polyol and isocyanate. The two chemicals formed a solid plastic. The resulting plastic was Polyurethane, a new plastic. However, when this process was repeated, something different appeared. Sometimes it was observed that the chemical was contaminated with water on mixing and significantly different reactions took place. The chemicals ‘fizzed’ with bubbles and the polyurethane expanded and the plastic formed which is known as polyurethane foam. It was discovered by mistake, although now it has many uses around the home and in manufacturing industry.

## ► POLYURETHANE ADVANTAGES & LIMITATIONS

POLYURETHANE	
ADVANTAGES	LIMITATIONS
<ul style="list-style-type: none"><li>• Good adhesion to most common substrates</li><li>• Thermal conductivity (<math>\lambda</math>-value <math>\pm 0,030 - 0,035</math> W/m.K)</li><li>• Noise reduction</li><li>• Water vapour open</li><li>• Very low density = high volume from</li><li>• One canister (handy, cheap and “green”)</li><li>• Seal and fills all kinds of shapes</li><li>• Easy to use</li></ul>	<ul style="list-style-type: none"><li>• Current formulations contains isocyanates</li><li>• Post expansion (uncontrollable)</li><li>• Temperature sensitive during application</li><li>• Pressurized canister (dangerous at high temperatures)</li><li>• Flammable propellants</li><li>• Not UV stable</li></ul>

## ► POLYURETHANE FOAM TYPES

Within Bostik we do have different types of polyurethane foams. These types can vary per application and specification. Our mapping will be as follows:

- **Type Straw (hand held) and gun foams**
- **DIN 4102 classified by flame behavior**
- **One and two component foams**
- **Expanding foams**
- **Specialty foams**





## ► HAND HELD AND GUN FOAMS

Application wise polyurethane foams come in two different types. We have so called hand held formulations and gun grade formulations. Hand applied polyurethane foams are equipped with a straw that can be screwed to the valve on top of the dome. The so called gun foam needs a 'pu-gun' to apply the material.

HAND HELD PU FOAM	
ADVANTAGES	POINTS OF ATTENTION
<ul style="list-style-type: none"><li>• Hand held polyurethane foams will have no additional costs of buying a foam gun</li><li>• Simple and easy to apply</li></ul>	<ul style="list-style-type: none"><li>• Difficult to dose</li><li>• Should be emptied in one go to avoid blocking the straw with cured material</li><li>• After flow possible</li></ul>

GUN GRADE PU FOAM	
ADVANTAGES	POINTS OF ATTENTION
<ul style="list-style-type: none"><li>• Easy to dose, easy to apply</li><li>• No after flow from gun</li><li>• Reusable</li><li>• Less waste</li></ul>	<ul style="list-style-type: none"><li>• Additional costs for gun and PU cleaner</li></ul>

## ► FLAME BEHAVIOUR – DIN 4102-1 & EN 13501-1

CLASSIFICATION	ADDITIONAL CLASSIFICATION		EN 13501-1	DIN 4102-1
	No smoke production	No flaming droplets/particles		
Non-combustible without burning elements	X	X	A1	A1
Non-combustible with burning elements	X	X	A2 - s1 d0<	A2
Flame resistant	X	X	B, C - s1 d0	B1
		X	A2, B, C - s2 d0	
		X	A2, B, C - s3 d0	
		X	A2, B, C - s1 d1	
		X	A2, B, C - s1 d2	
			A2, B, C - s3 d2	
		X		D - s1 d0
		D - s2 d0		
		D - s3 d0		
Normally inflammable	X	X	D - s1 d2	
		X	D - s2 d2	
		X	D - s3 d2	
			E	
			E - d2	
Easily flammable			F	B3

The fire-technological properties of building materials are defined in:

- Not combustible
- Flame retardant
- Normal flammability

The classifications are carried out according to DIN 4102-1 (A1, A2, B, B1, B2 and B3) as well as DIN EN 13501-1 (A1, A2, B, C, D, E, F). Polyurethane foams are mainly familiar under B1, B2 and B3 tested accordingly DIN 4102-1. Below a table to display the meaning of the test and to show the equivalent of the EN 13501-1 in relation to the DIN 4102-1.

## ► 2 COMPONENT POLYURETHANE FOAM

<b>One Component Polyurethane Foam (OCF or 1K)</b>	<b>Two Component Polyurethane Foam (2K)</b>
Polyurethane insulation foam is available in aerosols. Expands to 30 times its original volume, and hardens under the influence of moisture in the air and substrate. Early 70s one component PUR foam was first used in the construction of buildings.	2K foams are curing without humidity and additional moisture. Curing through integrated hardener. Faster curing behavior than 1K and 2K foams have a higher density and higher strength.

### **The application fields of the 2 component foams are:**

- Big cavities / gaps that need to be filled in one process
- Areas where the access of sufficient air humidity and / or moisture from the subsurface is not present
- Mounting window and door frames of doors up to 40 kg

## ► EXPANDING FOAMS

Insulation, gap filling, energy saving, fire safety and even bonding of door posts, stone, and insulation panels are just a few smart solutions that Bostik offers for the professional craftsman who demands efficiency in costs, time, environment and quality. For those professionals Bostik's full portfolio of expanding foams is the answer and fulfils the needs and demands of the job and legislation.

## ► SPECIALTIES

Last but not least, Bostik has standard and specialty foams, due to product behavior during application or once cured.

One example is:

Foam adhesives: one-component, low-density foams – the foam adhesive has superior gluing and sealing qualities. Bonds well with most construction materials, except “Teflon”, polyethylene and silicone surfaces. – Main use is for installation of insulation panels (EPS and XPS), installation of roof tiles and pipes and multiple types of cementitious, concrete and stony materials.



**Bostik P925 Foam'N'Fix Turbo Multi-Use:**  
Quick setting universal foam adhesive

# Areas Of Applications

## ► FILLING

Polyurethane foam can be used to fill cracks and holes in building structures. For instance, spaces between walls, frames and doors. For these applications Bostik supplies the best quality premium foams, such as high yield or traditional forms with user-friendly guns. It is recommended to fill crack or hole up to 50% to 70% because this form will begin expanding immediately after application.



## ► BONDING

Bostik manufactures a range of unique one and two component high-end foams based on polyurethane for bonding of various materials. The environment, time saving, clean application, low-cost and simplicity are key terms that form the basis for the development of these products.



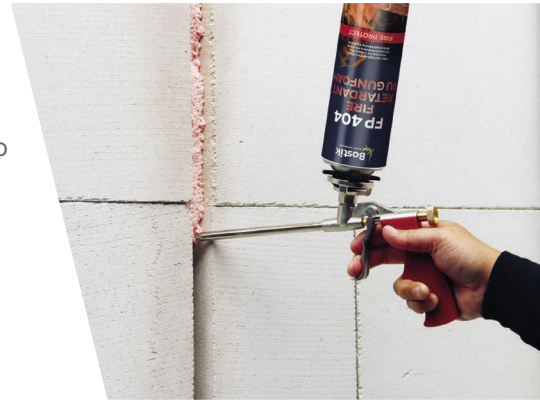
## ► INSULATING

Insulating, i.e. making frames or building structures such as wall and roof elements, airtightness and other characteristics of polyurethane foam. Airtightness eliminates undesirable airflows and is based on the Passive House standard. Bostik supplies unique foams with a very high insulation value and very low air permeability, exceeding this standard by far.



## ► FIREPROOFING

Bostik supplies high-end foams for linear joints in fire compartments positioned both horizontally and vertically. These foams can also be used as an insulating barrier to make small surface penetrations fire resistant and to prevent smoke, heat and fire passing through.



# Applications Guidelines

## ► FOR HAND HELD PU FOAMS

1. Remove cap and screw the straw firmly onto the valve.
2. Shake the canister vigorously prior to use at least 20 times.
3. To apply foam, turn the canister upside down and press the adaptor. Half fill the cavity and, in case of low humidity, lightly spray the foam with water. The foam will expand to fill the rest.
4. Only use in well ventilated areas.
5. Store canister upright between +5°C and +25°C.
6. Pressurized container! Protect from sunlight and do not expose to temperatures exceeding +50°C. Do not pierce or burn, even after use.
7. Contains flammable propellants. Do not spray on a naked flame or any incandescent material. Keep away from sources of ignition. No smoking.



## ► FOR PU GUN FOAMS



1. Hold the canister with the valve turned upwards and affix an applicator gun with NBS-thread to the canister. We recommend a NBS Gold (see instructions in the gun box). Shake the canister vigorously prior to use at least 30 times.
2. Turn canister upside down and apply the foam.
3. To regulate the flow of the foam, loosen the valve at the back of the handle. Half fill the cavity and, in case of low humidity, lightly spray the foam with water. The foam will expand to fill the rest.
4. Only use in well ventilated areas.
5. Store canister upright between +5°C and +25°C.
6. Pressurized container! Protect from sunlight and do not expose to temperatures exceeding +50°C. Do not pierce or burn, even after use.
7. Contains flammable propellants. Do not spray on a naked flame or any incandescent material. Keep away from sources of ignition. No smoking.





Half fill the cavity and, in case of low humidity, lightly spray the foam with water.



The foam will expand to fill the rest.



Once the polyurethane foam has been expanded and has exceeded its cutting time (can be found at each technical data sheet of the polyurethane foams) the polyurethane foam excess can be cut.



## ► POLYURETHANE FOAM CLEANERS & GUNS

- **BOSTIK P100 FOAM'N'CLEAN POWER**  
Powerful polyurethane foam cleaner  
A professional and powerful cleaner of stains and residues from both 1 and 2 component fresh polyurethane foam from basket, valve and surfaces.



- **BOSTIK PU GUN UNI NBS 9070**  
Premium PU foam gun  
Rugged and lightweight cast aluminum. Fully coated in PTFE for quick and easy maintenance and cleaning. Nickel-coated set screw on back closes the nozzle and/or adjusts the flow.



- **BOSTIK PU GUN ULTRA GUN ECONOMY**  
Standard PU foam gun  
Standard PU gun with ergonomic handle. The adapter is fitted with a nickel coating and a PTFE bearing to prevent adhesion of PU foam.





## Smart help:

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