



Sealants

Lack of maintenance and replacement of aged or degraded sealants can cause damage to the building envelope and will negatively affect its durability.

The main purpose of using sealants in a building envelope is to fill joints and gaps between building materials and to form a seal that keeps water penetration and air infiltration at bay. While sealants may seem like a small detail item on the outside of your building, they can contribute to the development of large problems if they fail and allow moisture to get into the walls.



What is Sealant?

Sealants are glue-like materials capable of being shaped or formed, and are generally used between building panels or between different components of the building envelope. They quickly cure and transform into a flexible semi-solid material that reduces the flow of water, air, dust or smoke. Sealants can provide seals around windows, doors, dryer vents, and other types of penetrations such as pipes, chimneys and electrical wires.

Sealants can allow for slight movement of different parts of the building envelope caused by changing temperatures, strong winds or humidity. Most building materials joined by sealants will expand when getting warmer or wetter, and shrink when cooling off or drying out. Sealants help to ensure that the building envelope functions properly in these changing conditions.

To perform such duties, sealants must be able to:

- bond to surfaces with sufficient strength
- resist exposure to natural elements (e.g., water, sunlight, temperature variations)
- accommodate expected movement of building materials.

Sealant used at the perimeter of a window and between precast concrete panels.



Sealants are used at many different locations in the building envelope. They are important building components and must be adequately inspected and maintained.

Maintaining your building envelope

This publication is one in a series of bulletins designed to provide practical information on the maintenance of the building envelope of multi-unit residential buildings, including townhouses, low and high-rise residential buildings.

What is a building envelope/enclosure?

The building envelope or building enclosure includes all parts of the building (assemblies, components and materials) that are intended to separate the interior space of the building from the exterior climatic conditions. It includes, for example, the foundation, exterior walls, windows, exterior doors, balconies, decks and the roof.

Who should read this bulletin?

Anyone who lives in or looks after a multi-unit residential building should read this bulletin, including residents/unit owners, strata councils, housing co-operatives, maintenance managers, property managers or building owners. Proper maintenance of the building envelope can help prevent damage and avoid costly repairs in the future.



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Lack of adhesion between sealant, flashing and stucco will allow water ingress at this building detail (balcony connection).

Types of Sealants

There are many types of sealants on the market and they are formulated for different uses and applications, such as exterior cladding surfaces, glazing, roofing, or interior applications.

Sealants vary in their initial cost and in how long they will last, also called service life. They also vary in their flexibility at different temperatures and their ability to bond to different surfaces. Some sealants are not compatible with other sealants or with certain building materials and will react to form unsightly and messy by-products. These reactions can be unpredictable and may impair the intended function of some building components.

Sealants used in residential construction accommodate different levels of movement and can be classified as: low-movement, medium-movement and high-movement sealants.

The selection and careful installation of sealants is critical in ensuring that the building envelope will be protected against moisture and air intrusion. When changing a sealant type to another, special care must be taken to remove all of the old sealant residue to ensure a good bond. Some joints, especially wider ones, require special attention. In these cases, a bond breaker or backer rod is inserted into the joint before the sealant is applied to provide a solid backing for the sealant, and allow the sealant to work properly in the joint.

There are also many situations where a joint should **not** be sealed (e.g., weep holes at the bottom of windows or glazed walls), and specific training is required to identify those situations.

Not a Do-It-Yourself Job

Inspecting, maintaining, selecting and applying sealants is complicated and a job for a professional, and is not a do-it-yourself maintenance item. The previous table is intended to provide you with an overview of what a professional would review and consider to make sure the correct sealant is used in the right place.

Why do Sealants Need to be Maintained?

Sealants deteriorate over time and typically last between 2 and 50 years depending on the type of product used, the exposure to weather and movement due to such factors as dimensional changes in the building elements.

To be effective, sealants rely on their bond to

the building components and their inherent flexibility and therefore must be replaced when either fails. The bond between the sealant and the substrate can fail, the sealant itself can fail, or the substrate can break.

Sealants can sometimes be damaged by vandalism. Also, gulls and other birds may often pick at silicone sealant, damaging or entirely removing the sealant in places.

Sealants keep water out of vulnerable parts of the building assembly. Although the use of sealant is inevitable on most buildings, good design tries to minimize the amount of sealant used. So, if you see sealant on your building, you should expect that it is there for a very good reason and needs to be maintained.

A relatively small investment in maintaining the sealant – and replacing it, when necessary – will help to prevent damage at a particular location in your building envelope including possible damage to the wall itself and your building's structure.

What Maintenance Must be Performed on Sealants?

The major steps of a maintenance plan for sealants include: inspection, cleaning, touch-up, repair and replacement. Because there are so many different types of sealants and many causes of sealant failure, these steps should be carried out by a trained professional.

When a professional is hired to review the condition of the sealants on your building, they should carry out these basic steps in a sealant-maintenance program:

- 1) **Inspection** – to review the sealant joints for five main signs of failure:
 - *loss of adhesion* – the sealant is separating from the surfaces to which it was applied
 - *loss of cohesion* – visible cracks or splitting within the sealant itself
 - *loss of elasticity* – sometimes indicated by loss of flexibility
 - *weathering* – could include, for example, blistering, chalking, discoloration or cracking
 - *improper installation* – a wide range of symptoms that could lead to problems
- 2) **Cleaning** – to remove mildew and dirt. For some sealants, the accumulation of mildew and dirt may impair the sealant ability to perform its function. Most sealants, except for silicone, are reasonably resistant to dirt



Sealants found at exterior cladding joints require maintenance to ensure adequate building envelope performance.

pick-up. Alcohol-based cleaners should not be used for silicone sealants; a mild soap-and-water solution is usually adequate.

3) Touch-up – to repair localized minor pinholes or gaps in the sealant. Touching-up problem areas is not a long-term solution, since applying a sealant over an existing sealant (even a compatible product) will result in an inferior seal compared to the original installation. Touch-ups should be recognized for what they are – a temporary measure designed to prolong the life of the existing sealant until a more permanent solution (involving replacement of affected areas) can be scheduled.

4) Repair – when a section of sealant isn't sticking to the joint, or when large splits or bubbles develop in the sealant, repair is necessary. This involves complete removal of the failed sealant, cleaning of the joint down to the base surface, and application of new sealant.

5) Replacement – when a significant portion of the sealant in a given area shows signs of failure, or when the sealant has lost its flexibility, or there is some reason why imminent failure is expected, it is time to consider replacing the sealant. Different areas of the building envelope may require replacement of the sealant at different times, depending on exposure to weather. For example, sealants usually break down more quickly when exposed to sunlight, so the sealant on the south side of the building (which is exposed to the sun) may require replacement long before the sealant on the north side of the building shows any signs of problems.



The sealant at the guardwall connection to wall has begun to fail; a regular inspection and maintenance plan will detect this type of failure before it converts into a costly repair item.

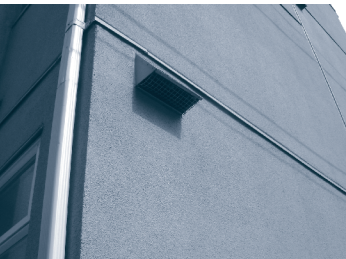
How Often Must Sealants be Inspected and Maintained?

Sealants should be reviewed every year or as specified in your maintenance and renewals manual. The action taken at that point – cleaning,

Typical Sealants Used on the Building Envelope

Sealant Type	Characteristics	Typically Used in...
Silicone	<ul style="list-style-type: none"> very durable, flexible over wide temperature range can accommodate high amount of movement in the joint poor resistance to tearing or abrasion adheres to a wide variety of materials, but picks up dirt easily commonly used in wet locations life expectancy 10-50 years 	around windows, dryer ducts, pipes
Polyurethane	<ul style="list-style-type: none"> adheres to a wide variety of materials can accommodate a medium amount of movement in the joint very resistant to tearing and abrasion waterproof and flexible life expectancy 5-20 years 	exterior cladding joints of many kinds but not commonly used in windows
Polysulfide	<ul style="list-style-type: none"> good adhesion to steel, aluminum and glass can accommodate a medium amount of movement in the joint should be protected from sunlight life expectancy 5-20 years 	windows, especially sealed insulating glass units
Butyl	<ul style="list-style-type: none"> adheres to a wide variety of materials can accommodate a low amount of movement in the joint resistant to moisture life expectancy 2-10 years 	interior joint around window to sheathing membrane or rough framing (should be replaced if found in exterior cladding joints that require higher amount of movement)
Asphalt	<ul style="list-style-type: none"> adheres to a wide variety of materials can accommodate a low amount of movement in the joint life expectancy 2-10 years 	roofing applications
Latex (acrylic, acrylic latex or vinyl caulk)	<ul style="list-style-type: none"> only used indoors, not on the exterior building envelope 	interior trim (should be replaced if found in exterior applications)

Sealants used in inappropriate locations may create conditions that can cause serious rot in wood framed and clad buildings. Reviews by building envelope consultants should identify these locations.



Sealants around vents must be maintained to ensure proper protection against moisture ingress.

Sealants do not last forever and typically require replacement more often than the materials they join.

touch-up, repair or replacement – depends upon the observed condition of the sealant.

Generally, do not try to extend the service life of the sealant past the manufacturer's recommended interval. The table on page 3 suggests typical expected service life for each type of sealant, but the range of years may vary with different manufacturers or applications, or if regular inspection of the sealant reveals that it is performing adequately.

It is best to check the manufacturers' literature for more information on expected service life and engage a trained professional to develop a sealant maintenance program.

Go for quality. In most cases, using the best quality materials will lower future servicing and repair costs.

Who Should be Called for Service?

A building envelope consultant should be hired to review the state of the building's sealants, and develop appropriate recommendations for renewal. Expert knowledge is required to identify the proper type of sealant with the correct physical and chemical properties for the particular location. Moreover, professionals who specialize in this area will also have a good understanding of the type of wall and roof systems in your building envelope.

Their report should indicate the condition of existing sealants, causes of deterioration or failure, and whether the sealants can be selectively replaced or require complete replacement.

Your maintenance manager should maintain a log of inspections and complaints and renewals or repairs. Maintenance and repairs to sealants should be acted on promptly.

Applying sealant requires skill and knowledge. Depending on the specific building envelope component that requires maintenance and repair, a trained glazier, roofing or cladding contractor should be hired to perform the maintenance and renewal of sealants.

Action Plan Tips

- Sealants require maintenance and inspection every year because they are a critical element in the building envelope's protection against water ingress.
- Hire a building envelope consultant to review the state of the buildings sealants, and develop appropriate recommendations for renewal.
- A good sealant maintenance program should address the following: inspection for signs of failure, cleaning, touch-up, repair and replacement.
- Hire an experienced contractor for maintaining or renewing sealants.
- Invest in good quality sealants to get best performance.
- Notify the maintenance manager of your building if you believe there is a maintenance problem with the sealants.

For More Information

1. *Properly Sealed Construction Joints*, published by National Research Council Canada, Institute for Research in Construction. Available online at www.nrc-cnrc.gc.ca
2. *Incompatible Building Materials*, published by Canada Mortgage and Housing Corporation. Available online at www.cmhc.ca
3. *Coatings, Adhesives and Sealants*, published by National Research Council Canada, Institute for Research in Construction. Available online at www.nrc-cnrc.gc.ca
4. *Best Practice Guide: Flashings*, published by Canada Mortgage and Housing Corporation. Available online at www.cmhc.ca
5. *Sealants – The Professionals Guide*, published by The Sealant, Waterproofing and Restoration Institute (SWRI). Available online at www.swrionline.org
6. Sealant manufacturer's literature
7. *Joint Sealants*, National Institute of Building Science (NIBS), Adhesive and Sealant Council, Inc. Available online at www.ascouncil.org

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