

## StoGuard® Air Barrier Installation Manual

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## 1. The Importance of Air Barriers

The quality of the air barrier installation is one of the most important factors affecting the energy efficiency of a building.

Air barrier systems have become mandatory in the years since a definitive 2006 study on energy loss in North American buildings. It found that, for buildings in colder climates, approximately 40% of total energy consumption was being lost through air leakage. Canadian codes now require a continuous air barrier over all occupied buildings.

A well-installed air barrier system also helps to protect a building from water damage. Water is considered the leading cause of deterioration in buildings. Bulk water can enter from the exterior through holes and openings in the cladding assembly. In colder climates, the movement of water vapour from a building's interior can also cause condensation within the walls.

Everything from structural connections to electrical systems can be affected by accumulation of water, leading to serious building safety issues. Water also supports mould growth, creating potential health issues.

Well-designed exterior claddings resist deterioration by deflecting water away from potential holes and openings, and by allowing any water that does penetrate the cladding to drain and dry without damage. Since 1995 the National Building Code of Canada has required that bulk water entry be minimized and drained to the exterior. Water that does pass the outer cladding must be prevented from entering the wall cavity. A waterproof air barrier like StoGuard® meets the code requirement of preventing water penetration.

Interior air may carry a lot of water vapour. In Canadian winters, it is common for building interiors to be mechanically humidified to increase occupant comfort. When warm humidified air escapes through openings in interior walls to cooler conditions beyond, water vapour will condense within the wall assembly. Traditionally a vapour barrier or retarder was installed in the wall to resist diffusion. In the 1980s and 1990s, research conducted at the National Research Council of Canada and other organizations showed that air leaks carried significantly more water into the wall cavity than vapour diffusion.<sup>1</sup> That is why the air barrier is now considered much more important than a vapour barrier.

Energy waste and moisture problems are not the sole reasons for stressing the importance of a well-installed air barrier. Drafts affect occupant comfort. Noise levels increase as sound travels through holes. Uncontrolled air movement introduces pollutants into occupied space. Greater mechanical loads for heating and cooling result in increased cost, reduced efficiency and shorter equipment life.

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<sup>1</sup> At least sixty times more condensation resulted from a 25 x 25 mm (1" x 1") air leak than from vapour diffusion through one square metre of wall over an entire winter season.

## 2. Essential Background

### Components of an air barrier system

The air barrier installer should be aware of the terminology relating to the air barrier system and its constituent components:

1. The air barrier 'system' makes the whole building airtight. It encompasses all the air barrier materials and connections in the building envelope. That includes the roof, walls, and foundations. Because no single contractor installs the whole air barrier 'system' from roof to footings, the responsibility for designing all the components in a code-compliant manner rests with the design professional.
2. Air barrier 'assemblies' are components consisting of a number of air barrier materials and connections that are assembled off site and fitted into the building envelope. Windows are the best example. 'Assemblies' must be installed in an airtight manner.
3. Air barrier 'materials', such as StoGuard<sup>®</sup>, provide the airtight component for large areas of the wall. These materials must be installed in a manner that does not allow holes and voids. Errors in application can add up to failure of the building envelope during a building-commissioning test.
4. Air barrier 'connections' are the components that tie the whole air barrier system together, e.g., StoGuard Transition Membrane. Cooperation with adjacent trades and resolution of material compatibility issues early will help speed a successful installation. Remember, there is no "by others" allowed in the air barrier system installation.

### Planes of protection in a wall system

In addition to the air barrier system, there are two other planes of protection in wall systems that have to connect properly. The three planes are:

- A water-shedding surface – must minimize penetration of bulk water, deflect water away from openings and drain penetrating water from the innermost plane of water penetration.
- The innermost plane of water penetration – a moisture barrier that must be continuous wherever it crosses different cladding components to prevent water entry into the building.
- A continuous air barrier – must encompass the entire building envelope without holes or openings.

Every wall assembly must accommodate those functions. When the wall is assembled, the components must be connected – air barrier to air barrier, moisture barrier to moisture barrier, and so on. In addition, the moisture barrier must be connected to flashings so water that penetrates the outer cladding will be directed to the exterior.

Some materials may have more than one function. StoGuard, for example, is both air and moisture barrier. Multi-function materials save on installation costs, but require even greater care to ensure that there is no break in the functional barrier being installed. For example, StoGuard functioning as a moisture barrier must be integrated with flashings to drain water to the exterior but must also maintain its air tightness function. Sto details show the StoGuard installed first as an air barrier. The flashing is then installed over the continuous air barrier and connected to it with a bridge of StoGuard materials. (See Figure 3.)

**Note:** it is not acceptable to drain a component of the wall assembly into the drainage cavity of an adjacent cavity. For example, windows must be flashed to drain to the exterior.

Design and construction details should clearly illustrate air barrier to air barrier and drainage connections. If there are any concerns or questions regarding the project you are undertaking, request clarification from the architect or building professional who is responsible for the whole air barrier system. Drawings and specifications are required to provide sufficient information to demonstrate conformance with code.<sup>2</sup>

### Third Party Quality Assurance

It is not unusual for air barrier installations to be tested during construction and after the air barrier system is complete. Building envelope specialists work with all parties and will check day-to-day installation procedures, as well as conduct small pressure tests and whole building pressurization tests.

The inspection procedure may require, for example, that a certain number of random window installations be tested. The window installation includes the window and the connecting StoGuard air barrier materials. A problem test on one window installation will draw attention to all the window installations. If there are problems with the connections, the installer who made the connections will have to return to repair them. Having to return to finished portions of the wall to make repairs is time consuming and expensive, so great care should be exercised during installation.

## 3. StoGuard® System and Materials

StoGuard is a liquid-applied system that creates a continuous, seamless waterproof air barrier beneath StoTherm ci EIF Systems as well as other claddings. Tough and durable, StoGuard will not tear like building wraps or paper. It resists water penetration 5 times longer than leading brand building wraps and 28 times longer than conventional building paper.

StoGuard has been tested to show that its performance meets Canadian codes, and has been evaluated by CCMC as a stand-alone WRB and as an air barrier material behind

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<sup>2</sup> (NBCC 2010 Division C, 2.5.2.2)

all claddings. StoGuard is an excellent alternative to bid for all above grade parts of the of the of the wall cladding assembly.

The StoGuard assembly utilizes some or all of these products:

**Sto RapidFill™** — A one-component air barrier and waterproof material used to seal sheathing joints, seams, cracks and transitions in above grade wall construction. Rapid drying time will usually permit same day installation of other Sto air barrier components.

**Sto RapidSeal™** — A one-component air barrier and waterproof material used to protect rough openings and for transition detailing in above grade wall construction. Sto RapidSeal is compatible with concrete, concrete masonry, brick, gypsum, sheathing, wood, cement board and galvanized metal flashing materials.



**StoGuard® Transition Membrane —**

A flexible air barrier membrane for connecting open joints on vertical above grade wall construction. It is used to connect different substrates to achieve air barrier continuity. StoGuard Transition Membrane is set in Sto RapidSeal and integrated with StoGuard materials. Refer to “Movement and Transition Joints” below.

Fig. 1 StoGuard Transition Membrane integrated with Sto Gold Coat

**Sto Gold Coat®** — A ready-mixed flexible coating that is applied by roller directly to the wall sheathing and over sheathing joints filled with Sto Gold Fill. It may also be spray applied. Sto Gold Coat may be used over exterior gypsum Sheathing, Dens-Glass® Gold, Aqua Tough™, Exterior or Exposure 1 plywood and OSB.

**Sto Flexyl** — An acrylic-based, fibre-reinforced, flexible adhesive air barrier, and waterproofing for use on prepared concrete, masonry, plaster, gypsum and cement sheathing surfaces. Combined with Portland cement, Sto Flexyl provides multiple functions, including: air barrier, waterproof adhesive and base coat in StoTherm® ci wall claddings. It is also used as a crack repair and a foundation waterproofing material.

## 4. Installation of StoGuard Materials

### Planning

1. Understand the specification. If you bid StoGuard as an alternate material, make sure you have received the approvals necessary to start the job. Contact your Sto sales representative for assistance if there are any questions.
2. Be aware of all details that involve connecting to another air barrier component. If you are responsible for connecting to an adjacent window, for example, what is the installation sequence and how do you connect to that specific window frame? Which trade is responsible for protecting the rough opening? Are the different specified materials compatible? Call the different manufacturers to confirm.
3. Consider seasonal conditions. StoGuard materials are mostly water-based and must be installed in temperatures and on a substrate that are at least 4°C (40°F) and rising and maintained for a minimum of 24 hours. If these conditions cannot be guaranteed, then temporary protection and heat will be required. Likewise, if rain is expected before the materials have dried, protection will be required.
4. Notify the Sto distributor in advance of the quantity of material required and the anticipated schedule. The distributor will have materials in inventory to start a project at short notice, but larger projects require supply and delivery planning.
5. Have a job meeting with the general contractor, all adjacent sub trades, the Sto representative and envelope consultants prior to start of work. Make sure no element has been missed. Each project is unique. Detailing differs for project to project. Since some detailing can be complex, Sto supports the building and testing of a mock-up wall assembly prior to the project start to ensure that the components can be assembled and work together in the manner specified.

### Substrates

All sheathing substrates should be handled and installed in accordance with code requirements and the substrate manufacturer's recommendations. Failure to properly prepare the substrate can result in delamination of the StoGuard.

1. Sheathing must be free from surface defects or moisture damage. Damaged sheathing must be repaired or replaced prior to the start of work.
2. Freshly poured concrete must be free of form oil, curing compounds or release agents. A detergent wash, water blasting or sandblasting is typically required to remove such surface contaminants.
3. Other masonry surfaces (brick or concrete block) must be free of surface contamination such as efflorescence. Efflorescence is a white chalky deposit that is caused by moisture migration through the masonry. Generally, wire brushing will remove efflorescence from masonry surfaces.

**Note:** Serious efflorescence with large encrustations of lime or salts is usually caused by a water leak. The source of the leak should be identified and corrected prior to removal of the efflorescence and installation of the water resistive barrier.

4. Painted substrates, sometimes encountered in retrofits, should have the paint removed prior to starting the air barrier installation.

**Note:** Lead based paints may have special regulatory conditions relating to their removal and waste disposal. If there is doubt, do a lead test on the paint prior to removal.

## Structural adequacy of the substrate

The substrate must meet code requirements for structural adequacy. The NBCC requires that all the live loads on the air barrier (e.g. wind and mechanical pressures) be transferred to the building structure. The air barrier installer is not responsible for engineering the wall or determining the structural adequacy. However, if there is any question about the condition of the substrate, DO NOT PROCEED until the design professional has approved the substrate.

Substrates acceptable for use with StoGuard® waterproof air barrier:

- glass mat faced gypsum sheathing in compliance with ASTM C1177
- water-resistant exterior fibre-reinforced gypsum sheathing panels in compliance with ASTM C1278
- Exterior or Exposure 1 wood-based sheathing – plywood and OSB
- sound, clean, prepared masonry, concrete or Portland cement plaster/ stucco

Substrates acceptable for use with Sto Flexyl waterproof air barrier:

- glass mat faced gypsum sheathing in compliance with ASTM C1177
- water-resistant exterior fibre-reinforced gypsum sheathing panels in compliance with ASTM C1278
- sound, clean, prepared masonry, concrete or Portland cement plaster/ stucco

## Installation Procedures

This guide provides basic information on installing StoGuard materials. For more detailed information, the Sto website offers a large number of videos demonstrating installation techniques for the different components

<http://stocorp.ca/documentation-center.html> Select *videos: air moisture barriers*.



**Note:** All materials listed in this manual and covered on the Stocorp.ca website are approved for use in Canada. Sto videos covering other products will not be applicable.

Follow the Sto installation details, instructions and specifications. All of the components are engineered to work together as illustrated.

Bear in mind that StoGuard materials are designed to bond with the substrate. Protect surrounding areas before installation starts. Cleanup of overspray or dropped materials can be expensive. If spraying Sto Gold Coat, for example, be aware of where the overspray may drift. Temporary enclosures may be advisable. Murphy's Law states that the likelihood of overspray reaching the ground is directly proportional to the cost of the automobile parked below.

### Sheathing joint treatment with StoGuard RapidFill

Prepare all sheathing joints and spot fasteners with StoGuard® RapidFill™. StoGuard RapidFill is a one-component air and moisture barrier material used to seal sheathing joints, seams, cracks and transitions in above grade wall construction. It is compatible with Sto Gold Coat, StoGuard VaporSeal and StoGuard RapidSeal. Refer to the StoGuard RapidFill Installation Guide at [www.stocorp.ca](http://www.stocorp.ca) for complete installation instructions and details.

Application temperatures should be between 2°C (35°F) and 27°C (80°F). RapidFill may be installed on damp surfaces and in humid conditions.

StoGuard RapidFill is installed with a caulking gun. Sheathing joints up to 12 mm (½") can be filled and sealed with RapidFill; although prefilling larger joints with urethane foam will reduce material use.



Gun the RapidFill in a zigzag pattern over the joint and smooth it with a DRY joint knife, spatula or trowel within 2 to 3 minutes of application. The material should be spread to create a minimum width of 25 mm (1") of material on each side of the joint, with a final wet film thickness of 0.5-0.8 mm (20-30 mils). At inside and outside corners, install the RapidFill so that it extends a minimum of 40 mm (1.5") on each side of the corner.

Sto RapidFill may also be used to seal around penetrations in the wall assembly. Openings exceeding 12 mm (½") should be filled with urethane foam first. Refer to the online Sto RapidFill Installation Guide for more information.

Wall flashings installed over the StoGuard waterproof air barrier should have the top leg of the flashing sealed with a thick bead of RapidFill and tooled so that the flashing fasteners are covered and sealed.

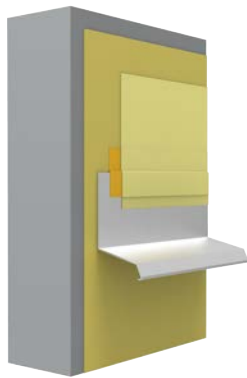


StoGuard RapidFill must be covered with Sto Gold Coat or VaporSeal after it has skinned over and within 48 hours of application to ensure a bond to the RapidFill. After 48 hours the RapidFill skin will develop characteristics that inhibit bonding.

**Note:** At movement joints, such as floor line joints or between different substrates, Sto Transition Membrane should be used. See installation procedures below.

## Flashing

Flashing is an important component of the waterproof barrier. Draining water must have a means of exiting the wall cavity and be directed to the exterior beyond the cladding beneath the flashing.



As a component of the waterproof air barrier, flashing must be integrated with the StoGuard system so that the air barrier remains tight and water is directed to the exterior. Flashing may be a single material or composites designed to minimize thermal bridging. Flashing materials are not supplied by Sto and should be specified by the design professional along with the installation requirements.

Fig. 3 Flashing incorporated in StoGuard system

## Wall area treatment with Sto Gold Coat or VaporSeal

The field of the wall should be coated with two applications of Sto Gold Coat or Sto VaporSeal. Allow the first coat to dry before the second is applied. The joint treatment may be installed before the first or second coats of Sto Gold Coat or VaporSeal.

Sto Gold Coat should be installed with a roller or airless spray gun to a wet film thickness of 0.3 mm (10 mils). Make sure each application is free of pinholes or voids that could result in the passage of air or moisture.

Note that concrete block (CMU) may require more than two coats depending on the absorbency and roughness of the block. Repair all static cracks up to 12 mm (1/2") in the CMU with Sto RapidFill. If cracks appear to be movement-related, consult a structural engineer prior to starting.

## Movement or transition joints

There are points in every installation where the StoGuard waterproof air barrier system will have to transition across moving joints or to a different air barrier material or assembly. In these conditions install StoGuard Transition Membrane. StoGuard Transition Membrane is installed after the Sto Gold Coat or VaporSeal has dried. Install as shown below.

As with any type of transition membrane, a closed-cell backer rod should be compressed up to 40% and inserted into the joint prior to installing the Transition Membrane. This will provide support for the membrane during mechanical or wind pressure changes.

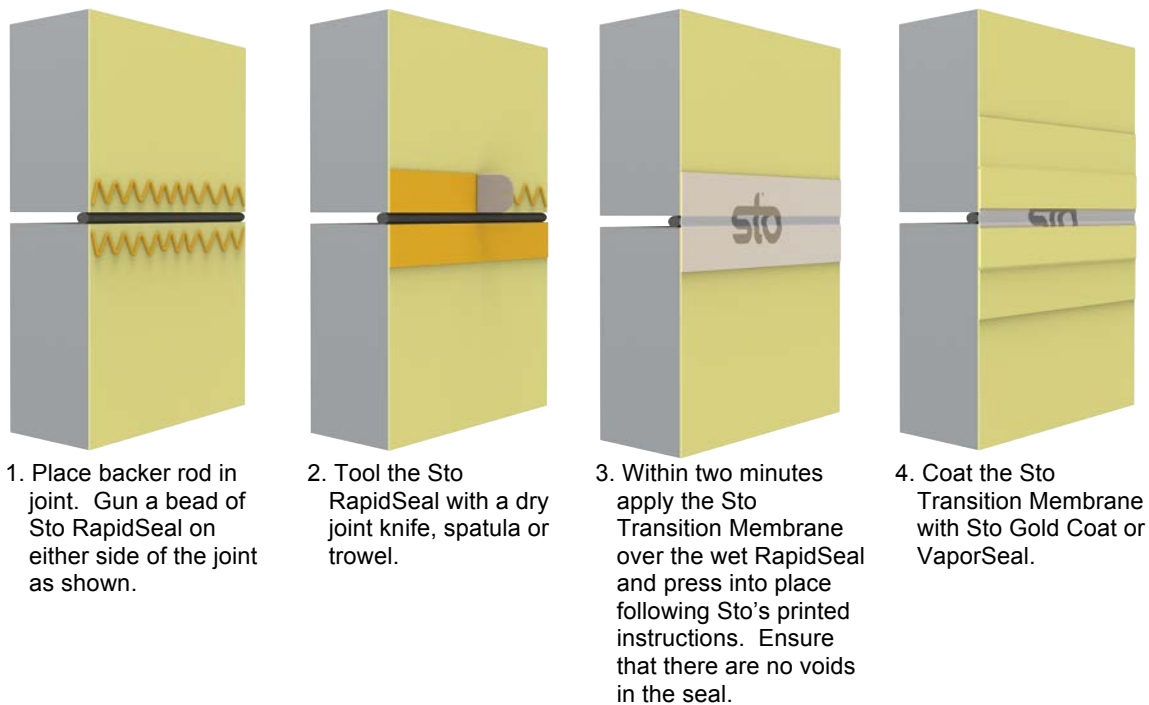


Fig. 4 Installation of StoGuard Transition Membrane

## Rough openings

Protect rough openings with RapidSeal™. Use a caulking gun to apply a generous bead along the surface to be protected. Use a tool, e.g., drywall knife or spatula, with a 150 mm (6") blade width to spread the material. The tool should be dry because the material is moisture cured. Apply enough material to spread it a minimum 0.3 mm (12 mils) wet thickness over the area to be protected and onto the face of the wall 100 -150 mm (4 to 6") all the way around the opening. Note that the material is translucent at less than 0.3 mm thickness: this characteristic can be used a quality assurance guide during application.

## 5. StoGuard product coverage

Sto Guard	Product No.	Package	Sheathing <sup>1</sup>	Masonry <sup>2</sup>
Sto Gold Coat	80265	19 l pail (5 US gal.)	<b>ASTM C 1177</b> 39 – 49 m <sup>2</sup> per coat (425 – 525 ft <sup>2</sup> per coat) <b>Plywood</b> 51 – 60 m <sup>2</sup> per coat (550 – 650 ft <sup>2</sup> per coat) <b>OSB</b> <i>Coverage for 2 coats:</i> 21 – 25.5 m <sup>2</sup> per coat (225 – 275 ft <sup>2</sup> ) <b>Note:</b> <i>Applied at 0.25 mm wet (10 wet mils) per coat. Two coats required for all sheathings.</i>	<i>Coverage for two coats:</i> 9.3 – 28 m <sup>2</sup> at 0.25 wet mm per coat (100 – 300 ft <sup>2</sup> at 10 wet mils per coat) <b>Note:</b> <i>Minimum two coats required.</i>
StoGuard VaporSeal™ R	81294		<b>ASTM C 1177</b> 42 – 56 m <sup>2</sup> per coat (400 – 450 ft <sup>2</sup> per coat) <b>Plywood</b> 60 – 65 m <sup>2</sup> per coat (650 – 700 ft <sup>2</sup> per coat) <b>OSB</b> 49 – 60 m <sup>2</sup> per coat (525 – 650 ft <sup>2</sup> per coat) <b>Note:</b> <i>Applied at 0.4 mm wet (16 wet mils) per coat. Two coats required for all sheathings.</i>	<i>Coverage for two coats:</i> 11.6 – 14 m <sup>2</sup> at 0.4 wet mm per coat (125 – 500 ft <sup>2</sup> at 16 wet mils per coat) <b>Note:</b> <i>Minimum two coats required.</i>
Sto RapidSeal	80270	Cartridge or sausage	Cartridge: 2x4 rough opening: 8.8 m (29 ft) 2x6 rough opening: 6.1 m (20 ft) Sausage: 2x4 rough opening: 6.1 m (20 ft) 2x6 rough opening: 4.3 m (14 ft) • Applied at 0.3 wet mm (12 wet mils)	Rough surfaces will reduce coverage
Sto RapidFill	81295	Cartridge or sausage	Cartridge: 18 – 29 m (60 – 95 ft.) Sausage: 10 – 18 m (35 – 60 ft) • Applied at 0.5 – 0.8 wet mm (20 – 30 wet mils) 25 mm (1") each side of joint	Rough surfaces will reduce coverage

StoGuard Tape 6"	80269	15.2 m roll x 152 mm wide (50' roll x 6" wide)	Prime surfaces with StoGuard Primer or 3M Super 77 spray adhesive
StoGuard Tape 9"	80271	15.2 m roll x 228 mm wide (50' roll x 9" wide)	Prime surfaces with StoGuard Primer or 3M Super 77 spray adhesive
StoGuard Transition Membrane	81272	50 m roll (164 ft roll)	Bond StoGuard Transition Membrane to the substrate using a full bed of Sto RapidSeal.
<ol style="list-style-type: none"> <li>1. Refer to Sto Tech Hotline No. 0614-BSc for coverage over different ASTM C 1177 sheathings</li> <li>2. CMU requires a minimum 2 coats or more depending on porosity and texture of the block.</li> </ol>			

### A final word on installation

Sto Canada wants your experience working with Sto materials to be a good one. With this guide, online videos, published details and specifications, combined with your installation skills, the installation of the StoGuard waterproof air barrier should go smoothly. If there are any questions, comments or recommendations on how to improve this information, please contact your local Sto sales representative.

### For further information:

[http://www.airbarrier.org/resistive/difference\\_between\\_air\\_barriers\\_vapor\\_barriers\\_and\\_water\\_resistive\\_barriers.php](http://www.airbarrier.org/resistive/difference_between_air_barriers_vapor_barriers_and_water_resistive_barriers.php)

[http://archive.nrc-cnrc.gc.ca/obj/irc/doc/pubs/bpn/54\\_e.pdf](http://archive.nrc-cnrc.gc.ca/obj/irc/doc/pubs/bpn/54_e.pdf)

[http://c.ymcdn.com/sites/www.nibs.org/resource/resmgr/BEST/BEST1\\_044.pdf](http://c.ymcdn.com/sites/www.nibs.org/resource/resmgr/BEST/BEST1_044.pdf)

<https://www.cmhc-schl.gc.ca/en/inpr/bude/himu/coedar/upload/Guidelines-for-Delivering-Effective-Air-Barrier-Systems-PDF.pdf>