
GacoBondFoamseal F2100 Adhesive Series

October 2025

Guidelines for Use, Application, & Safe Handling



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Note: This manual contains important information for your application. Retain for future reference.

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I. PROCEDURES FOR USE

A. Handling Instructions

Amrize Building Envelope LLC industry leading GacoBond Foamseal F2100 adhesive system is packaged in 55-gallon drums, and disposable IBC's (intermediate bulk container, e.g. totes). It consists of two parts, the "A" (Iso) side and the "B" (Resin) side. The "A" side is referred to as F2100A and the "B" side is referred to as F2100.

The material is not harmed by short-term exposure to temperatures between 0°F and 110°F. However, material supply should be maintained greater than or equal to 40°F. If a sealed supply system is being used without assist from a diaphragm pump or other mechanical pressure producing mechanism, material supply temperature must be maintained at greater than or equal to 40°F.

The viscosity of the materials increases as temperatures decrease. An increase in viscosity can cause cavitation of the proportioning pumps. This usually produces "off-ratio" mixing of the adhesive, which may lead to adhesive failure.

If material is allowed to get below the recommended supply temperature it should be placed in a temperature controlled room. The materials should be stored in this room until the liquid temperature has been brought up to a temperature greater than or equal to 50°F.

B. Equipment Required

This system is designed to be applied through approved proportioning equipment, impingement or air purge guns. Section II outlines the approved equipment for F2100 application. Contact your Amrize Building Envelope LLC Sales Representative for repair parts and service.

The proportioning pumps should accurately meter the material 1:1 by volume and develop at least 700 psi hydraulic pressure while in use. The adhesive temperature at the heater block and application hose shall be between 105°F and 120°F.

C. Substrate Preparation

The substrate should be clean and dry with loose dust blown off and free from liquids, oil, grease, etc. Recommended substrate temperature is greater than or equal to 40°F. Users may elect to place masking tape on the seams of the substrate to prevent F2100 from seeping through and onto the fixture while in a liquid state. The masking tape should not be wider than 3/4".

D. Fixture Considerations

The fixture (e.g. table) surface should be built as perfectly flat as possible. With F2100 the interior of your home will be as flat as your fixture regardless of the irregularities of the studs and rafters you use.

E. Ceiling Application Instructions



At the proper temperature the F2100 pattern leaving the gun should be adjusted so that the applicator can accurately direct a stream, **not a spray**, to the intersection of the vertical plane of the wooden structural member and the horizontal plane of the substrate. The stream should be directed at one or the other of these two planes within one inch of the intersection itself. The F2100 system was designed to flow under and/or attach to the side of a structural member. This feature yields greater bond strength with a reduction in material usage.

The operator should continually strive to apply a bead size equal to the average bead size as defined in full scale testing of the particular ceiling panel type and size being used. It is permissible to apply a bead of F2100 that is between the minimum and this targeted average. However, the total length of bead measuring between the minimum and the targeted average shall not exceed 50% of the length of the structural member to which it is attached.

Once the F2100 application has been completed, the structure may not be lifted or otherwise moved in less than 2 minutes. If possible all perimeter boards and center boards should be in place prior to application. Cure time may increase due to adverse processing conditions such as low ambient or substrate temperatures, high moisture content of the substrate, marginal material mix, and etc. Follow the adhesion test, found in Section I on page 8 of this manual, if there is any doubt as to time versus cure.

Product Bead Size and Other Considerations for Homes Built to HUD Standards:

The *minimum* bead size requirement for F2100 is 1/8" in height and in width 1/4". The height is measured from the horizontal plane of the substrate to the top of the bead. The width is measured from the vertical plane of the wood member across the bead to its outer edge. When a bead of this dimension is present the gap between the wood member and substrate must be closed by the F2100.

The *maximum* bead size requirement for F2100 is 1 1/8" x 1 3/8" measured in the same manner as described for the minimum bead. A bead larger than this, though permissible, is an indication of poor operator technique or improper equipment adjustment. This situation is excessive and costly and should be corrected.

As a general rule, operators should avoid walking on the fixture to apply F2100 to structural members. However, when applying F2100 to the back side of the peak of a vaulted (cathedral) single-wide or in an attempt to maximize application efficiencies, the operator does have the option of walking on the top of the rafters, between the rafters on top of the gypsum, or alongside the ceiling fixture. If the method is used where the operator walks on the rafters, it should be done prior to applying the adhesive to the bottom chords of the rafters.

As an alternative, the adhesive may be applied via this method after the F2100 bond is complete along all bottom chords providing the operator gives the adhesive sufficient time to cure prior to walking on the rafters. If the operator chooses to apply the adhesive to the peak from a position alongside the fixture, the timing as to when he applies the adhesive is no longer an issue.

The recommended F2100 bead size on the back side of the peak of a vaulted (cathedral) single-wide should measure a minimum of 3/8" thick at the peak, 1/8" thick at a point 7/8" from the peak, and have a minimum width of 1 3/4" (see Figure 2, page 7). Please refer to individual test reports for specific location and quantity specifications. In all cases, temperature of the material as it is mixed in the gun, substrate temperature, and ambient air temperature should combine to allow the stream of material to produce a homogeneous colored bead of insulating adhesive.

One & Two Family Dwellings Built in Accordance with an Evaluation Report:

See the applicable evaluation report for specifications on product bead size. See the last page of this manual for links to specific requirements.

F. Wall Application Instructions



When using F2100 to build walls where you desire maximum bond strength of the adhesive, such as shear walls, you may choose to intentionally create a gap between the framing and wallboard prior to applying the F2100. This gap may be created by placing .062" to .065" thick wood spacers between the top & bottom plates and gypsum at or near the wallboard seams after the framing has been fastened together. The gap will allow F2100 to flow between the framing and the gypsum, yielding maximum adhesive strength.

F2100 adhesive is to be applied axially along the structural members whether the wall is built in near-vertical or horizontal fixture. It should be applied to both sides of any structural members located over a wallboard seam or joint, one side of "in-field" structural members, and one side of the top & bottom plates. The beads need to be continuous, no shortfall is allowed.

The bead height for this application is the distance between the bottom of the structural member, and the point where bead contact to the side of the structural member ends. The bead width is the measurement of a line segment between the side of the structural member to which the bead is attached and a point where the contact to the gypsum ends.

Non-structural walls typically do not require bond strengths as great as those needed for structural walls (shear walls). Therefore, smaller beads of F2100 may be used to assemble these walls.

Various application methods are being used successfully to minimize the amount of F2100 used in constructing non-structural walls. One method is to assemble the walls on a horizontal fixture and apply a smaller bead of F2100 by moving the gun faster, reducing the size of the mixing chamber, or both. A second method uses a "stitch" bead pattern of F2100 on "in the field" studs and a continuous bead on both sides of studs located over wall panel joints, top plates, and bottom plates. A third method is to apply the F2100 while the wall assembly is standing in a near vertical manner (e.g. a 100 - 110 degree angle). With this method the wall framing is usually assembled on a horizontal fixture; the wall panels are attached to the framing by using a limited number of mechanical fasteners around the perimeter of each panel; then standing the wall up squarely against the fixture and clamping the top plate and bottom plate to the fixture to hold it in place while the F2100 is applied.

Note: We suggest you contact your third party engineering firm to recommend testing requirements to gain bead size approval for a smaller bead to be used for non-structural walls.

Product Bead Size and Other Considerations for Homes Built to HUD Standards

The average bead sizes as measured above should be 3/4" in height and 1" in width. The minimum bead sizes should be not less than 3/8" in height and 3/4" in width. A bead size measuring between the minimum and the average may not exceed 50% of the length of the structural member to which it is attached.

One & Two Family Dwellings Built in Accordance with an Evaluation Report:

See the applicable evaluation report for specifications on product bead size. See the last page of this manual for links to specific requirements.

- G. HUD Code Illustrations (For One & Two Family Dwellings, see Illustrations as listed on the applicable Evaluation Report).

**MIMINUM
BEAD SIZE**

**AVERAGE
BEAD SIZE**

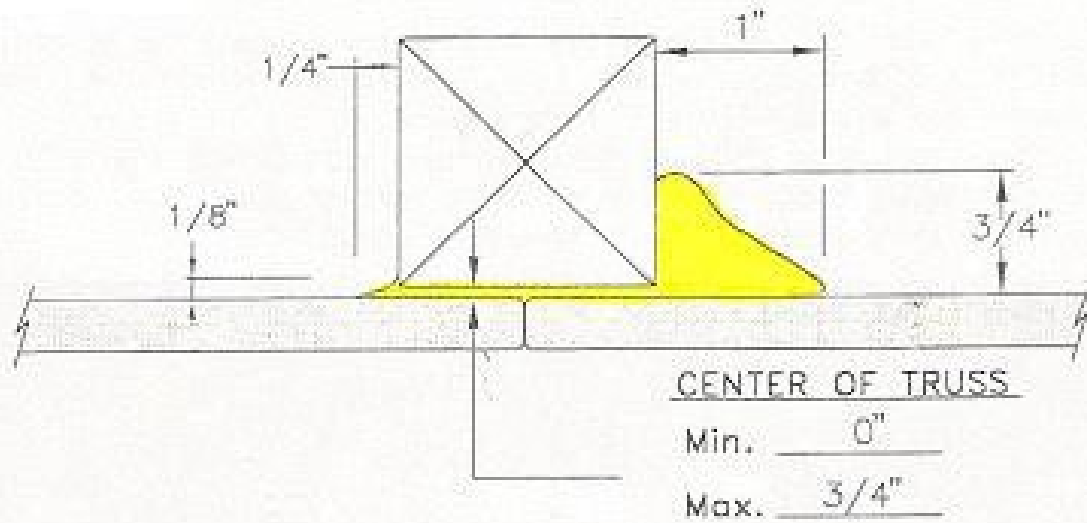


Figure No. 1

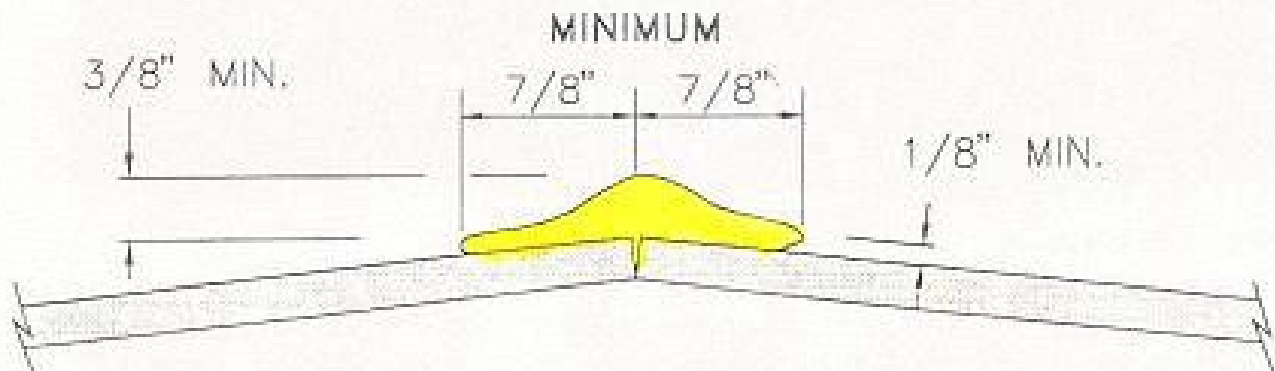


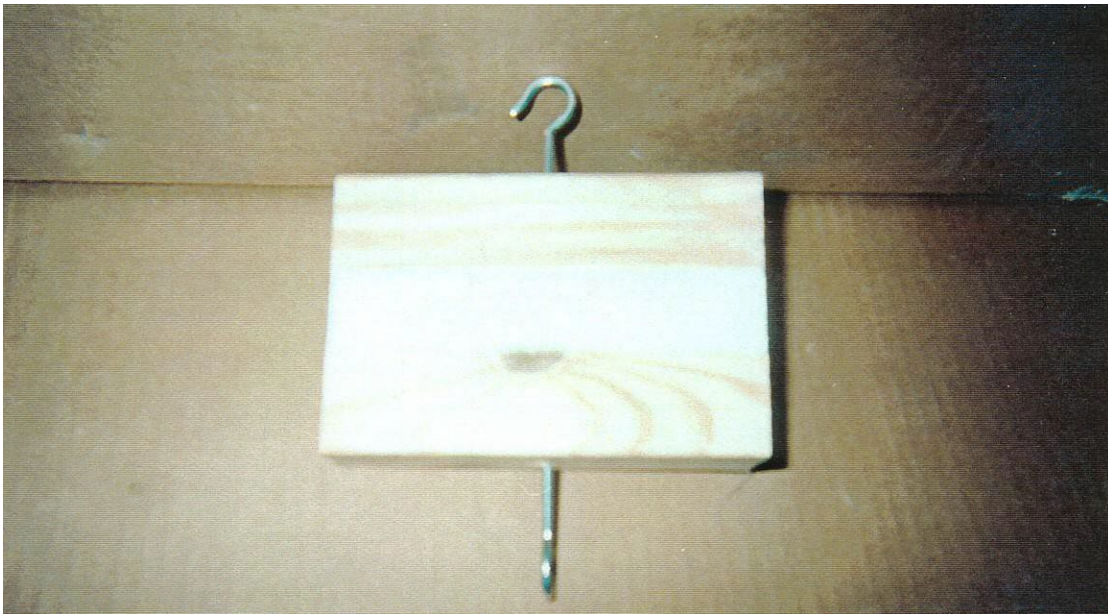
Figure No. 2

H. Engineering Considerations

Your DAPIA or third party engineering review agency must be notified when you contemplate using or changing to our F2100 insulating adhesive system. Amrize Building Envelope LLC, will provide engineering test documentation upon request. Our tests include full scale UL 1296 ceiling diaphragm shear resistance, E-72 wall racking, aging, etc.

I. Adhesion Check

If the foam adhesive quality is in question the bond strength can be quickly checked by applying a 1" bead between two 2" x 2" x 3" pine boards and trimming such that the boards are separated by a 1" thick block of foam 3" long and 1 1/2" wide. It should take more than 40 lbs of force to separate these boards after a 15 - 20 minute cure. Separation forces of less than 40 lbs indicate poor adhesive quality and the equipment should be examined for possible maintenance.



J. Repair Procedures

Inevitably there will be times when the gypsum board is damaged after the unit is constructed and when it is no longer convenient or possible to use the Foamseal F2100 process to repair or replace the damaged panel. For these cases we recommend the use of our F6400LVR repair adhesives and process. Information and full engineering test documentation on this product and procedure is available from Amrize Building Envelope LLC upon request.

K. Cleaning Procedures

Use PC-40, a non-flammable solvent, for use as panel cleaner and general clean up. It may be used to clean uncured single component adhesives such as F6400LVR from preprinted wallboard without smearing the ink. PC-40 should be tested for suitability to each application, prior to use.

Use GC33 for use in cleaning the gun. GC33 is a more aggressive solvent for use with cured and partially cured urethane adhesives.

Contact Customer Service at the Jameson Company 269-684-4451.

Please see the SDS for safety information regarding the product you are using for cleaning.

II. EQUIPMENT OPERATION and MAINTENANCE

A. Approved Application Equipment

It is necessary to understand and follow the instructions in the Graco/Gusmer Operating Manual to insure proper and safe operation of the equipment. For daily start-up, shut-down, trouble-shooting and maintenance instructions please refer to the Graco/Gusmer Operating Manual for your specific piece of equipment. Amrize Building Envelope LLC recognizes the following list of approved application equipment.

- Graco/Gusmer FF1600/FF1600-Dgt Proportioning Unit
- Graco A20 Reactor Proportioning Unit
- Graco A25 Reactor Proportioning Unit
- Graco/Gusmer Model D Gun
- Graco/Gusmer Model GX7 Gun
- Graco Fusion Gun
- Graco/Gusmer Gap Pro Gun

B. Operating Parameters for F2100

- Primary heater should be set to a temperature range of 105-120 degrees F.
- Hose heat should be set to a temperature range of 105-120 degrees F. Units equipped with digital hose heat should check the controller to ensure it is set within this range. Units equipped with manual hose heat (FF1600) should set the hose amp meter to the 4.5 - 5.0 range using the control knob. Use a hose thermometer under the hose insulation approximately 10' down from gun (due to hose insulation, the thermometer may read approximately 10°F lower than the internal temperature). Once temperature is within range, as identified by correct foam cell structure, lower the amp meter to a setting that will maintain the correct temperature & foam cell structure.
- Air pressure gauges should be set at approximately 40-60 psi.
- Desiccant filters should be checked to ensure color is blue, if pink, change cartridge.

- Fluid in Lube cup or Lube bottle should be clear, change if cloudy or discolored.
- Fluid pressure gauges should be within 300 lbs of each other, adjust or balance pressures as necessary.

C. Recognized Solvents

Amrize Building Envelope LLC recognizes the following solvents for proper equipment maintenance.

- GC33-PH Gun Cleaner
- Graco Throat Seal Liquid (TSL) 206995
- PC 40 Panel Cleaner
- Graco Fusion Quick-Shot Grease 248280

III. TECHNICAL AND SAFETY INFORMATION

Please refer to the SD sheet for the most recent Health and Safety information.

A. Handling of Liquids

- Open drums slowly to release any pressure.
- Do not pressurize drums.
- Release pressure in lines before opening valves or fittings.

B. Engineering Considerations

The application of F2100 in its specified manner as a stream is considered a pour operation (rather than a spray operation). To increase yield, effort should be made to minimize the amount of atomization or spray that occurs during application. Measurements of MDI level that have been made in typical plant operations have consistently been well below the accepted PEL ceiling of 0.02 ppm near the operator's breathing zone. However, every situation is different, and it is impossible to extrapolate these previous measurements to other circumstances.

The recommended approach is to: (1) identify the areas and activities that present potential for exposure to isocyanate and solvent fumes; (2) identify the hazardous material; (3) Have the area monitored under typical operating conditions by a competent industrial hygienist; (4) Introduce appropriate ventilation to correct any exposure above the PEL/TLV; (5) In situations where engineering controls cannot bring the exposure down to safe levels without unreasonable efforts, insure that those exposed wear OSHA approved personal protection equipment. If there is uncertainty as to whether the level of MDI or solvent vapors exceeds the PEL/TLV, OSHA approved fresh air supplied respirators should be worn by those in that area.

For new installations where the level cannot be measured in advance, Amrize Building Envelope LLC can offer the following general guidelines as a starting point. The vapor density of MDI is

considerably greater than air at room temperature. Therefore, it is best to locate exhaust vents near the floor.

The greatest possibility for overexposure occurs during maintenance operations, particularly when bleeding off pressurized lines containing hot MDI or when working with solvents in a closed, unventilated area. It is desirable to have the workbench and the proportioner pump in an area where good ventilation can be provided while someone is working with these materials. OSHA has told us that an air velocity of 100 feet per minute away from the worker's face is normally sufficient to prevent back-diffusion of vapors. Ideally a small hood could be built over the machine and the workbench to achieve that air velocity while moving a minimum amount of air.

Additionally, if the drums are stored in a temperature controlled booth which workers must enter to change drums, we recommend either very good ventilation be provided while the worker is in the booth or that a small ventilation fan be placed near the floor to prevent the buildup of fumes in the booth.

The intent of ventilation is to eliminate acute over exposures. Therefore, carefully locate the intake and the exhaust vents so that one does not contaminate the other before the vapors are neutralized.

The finished foam adhesive is non-toxic. All of the MDI has reacted to form inert urethane shortly after application. Small excesses of MDI, caused by momentarily running out of material, for example, will react with atmospheric humidity to form ureas within a matter of a few hours.

C. Fire Hazards of Cured Foam

Urethane foam is formed by a chemical reaction that generates a great deal of heat. It is also an excellent insulating material, causing the heat to be retained, particularly in the core of thick sections. The center of a foam bun 4" - 6" thick can easily reach temperatures in excess of 350°F within 10 minutes after processing. When adjusting the gun, large buns of foam are frequently generated. These can become so hot that they burst open, emitting smoke, fumes, and even flames.

When performing maintenance or adjustment, we recommend that the operator make several small buns rather than one large one and that any sizable buns be taken out of the building, broken open, and allowed to cool before being thrown in a waste container. Fire extinguishers should be kept in the area.

F2100 is intended for use only as an adhesive bead. It must not be used as an insulation material. If used as insulation, it would constitute a fire hazard

WARNING:

Foam plastic products used in construction must meet certain flammability standards and be installed only as specified by code regulations. F2100 has been tested and is approved for use only as described in sections I.E. and I.F. of this manual.

D. Training of Workers

Employees should be instructed concerning isocyanate and other chemical hazards and the precautions to be followed. Please refer to the MSDS sheet for the most recent Health & Safety information. Please contact Amrize Building Envelope, LLC if you need additional information.

E. Storage, Shipment, and Handling

F2100 is shipped in 55-gallon non-returnable drums, and disposable IBC's (intermediate bulk container, e.g. totes).

Cold, heat, and water are factors that are most likely to cause problems. Therefore, it is essential that these chemicals be stored inside at greater than or equal to 50°F, and out of contact with water. Material on line should be kept at 65°F to 95°F, unless a sealed system without pump assist is in place.

Although there is slight danger of crystallization or separation on freezing, the viscosity increase makes for difficult handling. For drum shipments that have been exposed to cold temperatures, holding for a short time at 90°F – 120°F while agitating until the liquid temperature has been raised to 65°F – 95°F is sufficient to lower the viscosity to tractable levels. Because of localized heating, drum band heaters are not recommended unless administered carefully and under controlled conditions. Unopened containers will have a storage life of up to twelve months in these conditions.

Moisture, either as vapor or liquid, is the most probable source of isocyanate contamination. When containers have been opened either for sampling or partial withdrawal, the air above the isocyanate should be replaced with nitrogen or dry air having a maximum dew point of – 40°F. Desiccant filters may also be used. The absorbing media should be replaced periodically. Carbon dioxide cannot be used as a purging gas due to its solubility in isocyanates. Lines leading from storage tanks should be protected with plugs or caps to protect residual isocyanate from coming in contact with moisture.

F. Empty Container Recommendations

- Used Drum Disposal - It is difficult to address the peculiarities of every local and state ordinance. It is incumbent upon the user of the product to confirm in advance of need that the containers are disposed of in an environmentally sound and legal manner.
- "Disposable IBC" Disposal – Amrize Building Envelope LLC has contracted with NCG for pick up and proper recycling of your empty tote containers. Information regarding the program can be found directly on the tote containers themselves or you can also visit their website at www.nationalcontainer.com.

RESEARCH / TESTING REPORTS

Product Evaluation Report # ICC-ES ESR 4927 <https://icc-es.org/search-wpsolr/?q=ESR-4927>



SUSTAINABILITY GUIDE

- GREENGUARD® GOLD Children & Schools Certified
- GREENGUARD® Indoor Air Quality Certified
- Contributes to LEED® and other green building rating system credits:
 - LEED-NC and LEED-CI EQ Credits 3.2 and 4.1, and *ID Credit 1.1-1.4*
 - LEED-EB MR Credit 2.2 *Environmentally Preferable Materials*
 - LEED for Schools EQ Credit 3.2 and 4, and *ID Credit 1.1-1.4*
 - LEED Core & Shell EQ Credit 4.1 and *ID Credit 1.1-1.4*
 - Green Guide for Health Care EQ Credit 4.1
 - NAHB Model Green Home Bldg Guidelines – Sect 7, Global Impact 7.1.3
 - CHPS (Collaborative for High Performance Schools EQ Credit 2.2

REGULATORY COMPLIANCE

- SCAQMD (South Coast Air Quality Management District), Rule 1168
- California Air District Regulations
- Ozone Transport Commission (OTC) model Rule for Adhesives & Sealants



REFERENCES/RESOURCES

- The Alliance for the Polyurethanes Industry, 1300 Wilson Boulevard, Arlington, VA 22209.
Websites: www.polyurethane.org, www.plastics.org
- SDS for F2100 and F2100A available from company website: www.gaco.com or contact your Customer Service Representative.
- Product Data Bulletin for F2100 Adhesive System available from company website: www.gaco.com or contact your Customer Service Representative.
- National Container Group for proper recycling of empty totes, company website: www.nationalcontainer.com