Concrete Masonry Unit Block Fill Installation and Estimating Guide

EQUIPMENT AND ACCESSORIES

Required Equipment

Same Proportioner, Hoses and Gun as used for Gaco's Open Cell and Closed Cell Foam.

Pour Nozzle/Air-Cap Kit Assembly for Gun – recommended models include the following:

Graco Fusion Air-Purge (AP) Pour Adapter Kit, Part # 248528. This kit includes an Air Cap, 2 Teflon Rings (1 for flat mixing chamber and 1 for round mixing chamber), and 2 feet of hose.

Pour kits are also available for the P2, Probler and PMC guns.

Tips and Kits are available from your regular parts supplier.

Plastic Tubing – recommended size: $1/4$" interior diameter & $3/8$" exterior diameter; approximately 4" to 6" in length. Tubing is available at your local hardware store.

Drive Drill and Wooden Dowels – $3/8$" or $1/2$" Drive Drills with $3/8$" and $7/16$" masonry bits are recommended for drilling holes for block fill applications; Use $3/8$" to $1/2$" wooden dowels to plug holes after filling. Drills, Bits and Dowels are available at your local hardware store.

Block Mortar Mix – Check with the masonry contractor on site for a block mortar mix and recommended tools for spot patching of holes made in the block and mortar joints. The masonry contractor can help you with your selection of materials and tools to make patching the holes fast and easy.

Suggested Additional Tools

InfraRed Thermal Imaging Camera, i.e. FLIR

While not required, a thermal imaging camera does help you locate rebar and bond courses.

It is also a valuable tool during installation to help monitor the filling of block cavities to ensure you are completely filling each cavity. The best images are often obtained from the inside – it only takes one to two minutes for the heat signature to show through the block.

Proper PPE

Personal Protective Equipment (PPE) is essential.

Ensure all workers involved in the installation of GacoProFill are assigned the appropriate PPE and have it available when arriving on jobsite.

PPE for Installation from INTERIOR of Building – Applicators and Assistants should wear:

- A NIOSH-approved full face or hood-type supplied air respirator (SAR) as outlined in your company's Respiratory Protection Program
- MDI-resistant chemical gloves (e.g., nitrile), or fabric gloves coated in nitrile, neoprene, butyl, or PVC
- Chemically resistant long-sleeve coveralls or chemically resistant full body suit with hood
- MDI-resistant fitted boots/booties

PPE for Installation from EXTERIOR of Building – Applicators and Assistants should wear:

- A NIOSH-approved full face-piece Air Purifying Respirator (APR) with organic vapor/particulate (P100) cartridges or a supplied air respirator (SAR)
- Safety goggles (where respirator does not cover the eyes)
- MDI-resistant chemical gloves (e.g., nitrile), or fabric gloves coated in nitrile, neoprene, butyl, or PVC
- Chemically resistant long-sleeve coveralls or chemically resistant full body suit with hood
- MDI-resistant fitted boots/booties

Please visit www.spraypolyurethane.org for additional information.

GENERAL PROCEDURES

Jobsite Prep & Material Estimation

A jobsite walk through to review the planning and start-up of the block fill project is recommended to coordinate the project with all other personnel on site.

Before starting work, a thorough review of the drawings for the block fill project will help the applicator locate concrete, rebar-filled bond courses and areas above and below windows and verticals. Again, a thermal imaging camera may be useful in finding these core filled areas when doing a jobsite walk through.

Steel wire block reinforcement is generally used in every other course. Rebar is placed vertically in the block and anchored with concrete approximately every 4' on center in many CMU structures. Headers and lintels usually contain rebar above and below in these areas for added strength. Bond courses may occur every 6-10 courses and these are filled with concrete. Check these areas before attempting to add foam as this will save you a lot of time during the drilling process once they are located.

See Unit Volume Calculation on next page for more information.

Unit Volume Calculation

The following information can be used as an estimating guide for filling concrete block cores with polyurethane foam. Please be advised that it is always recommended that a moisture resistant coating or sealer be specified to be applied on the exterior of CMU construction when using GacoProFill for filling concrete block cores.

- 6" block requires 0.17 cubic feet of insulation
- 8" block requires 0.25 cubic feet of insulation
- 10" block requires 0.33 cubic feet of insulation
- 12" block requires 0.39 cubic feet of insulation

Example:
A project requires 8,000 8" block; 12 board feet = 1 cu ft
8,000 x .25 = 2000 cu ft x 12 bf/cf = **24,000 board feet**
Using a yield of 15,000 bf/set, 24,000/15,000 bf/set = **1.6 sets of GacoProFill**

If you prefer to figure by the square feet of wall space, use the following information:

- 6" block wall will require 0.19 cubic feet of insulation per sq ft of wall
- 8" block wall will require 0.28 cubic feet of insulation per sq ft of wall
- 10" block wall will require 0.37 cubic feet of insulation per sq ft of wall
- 12" block wall will require 0.44 cubic feet of insulation per sq ft of wall

Example:
A project has 10,500 square feet of 12" block; 12 board feet = 1 cu ft
10,500 sq ft x .44 cu ft/sq ft = 4,620 cu ft x 12 bf/cf = **55,440 bf**
Using a yield of 15,000 bf/set, 55,440/15,000 = **3.7 sets of GacoProFill**

Don't forget to exclude the bond beams and verticals, as they will be full of concrete. Verticals are normally on 2', 3' or 4' on centers and bond beams can be anywhere from the bottom and top course on walls shorter than 10' to every 2'. The elevation plans will show the number and locations of the bond beams and verticals. Schools can be very difficult as the government normally dictates 24" verticals and bond beams. That only leaves a 16" x 16" void to be filled per every 24" x 24" of wall. Also remember lintels will normally extend 16" to 24" beyond the openings and they will be full of concrete.

There isn't going to be as much foam required as you would think because of all the mortar and other debris inside the walls. Consult with the masonry contractor as they can show the applicator how to drill the mortar lines and repair the holes without leaving a trace. If the walls are going to be covered with some sort of facade, the applicator can drill in the center or each core. Remember, the holes must be filled to ensure the fire rating integrity of the walls. Don't attempt to get the foam to run down the back side of the wall much beyond 16" as it will start frothing before it settles on the bottom of the cavity.

If you can spray straight down into the blocks, you can use a cannon or extension tip which shoots a straight stream of chemical. You can probably shoot down 5' or more inside the blocks with the cannon tip.

Drilling Fill Holes

Using a 3/8" to 1/2" drive drill with a 3/8" or 7/16" masonry bit, begin drilling holes 4 courses off of the floor into the 3/8" mortar joint centering over the core of each half block. Holes should be drilled every 4 to 5 courses.

Care should be taken to avoid drilling on mortar joints with wire block reinforcement. If block reinforcement is encountered, move up or below a course and begin drilling or drill on the block itself. Holes should be drilled in each half block side by side at the mortar joint or between mortar joints in the center of each half block itself to ensure drilling into the core.

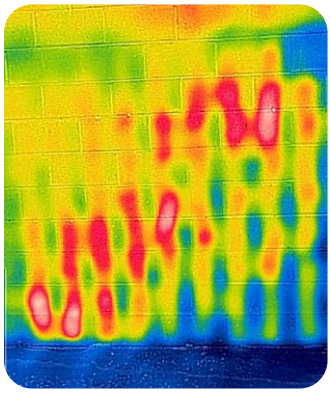
Filling Cores with GacoProFill Foam

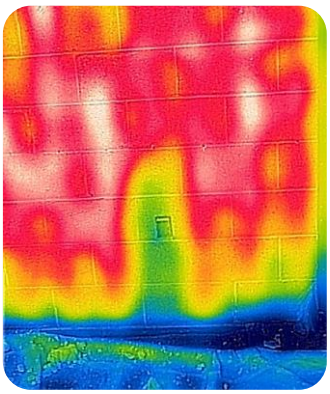
Always perform a test spray into a trash bag first to check for mix and rise before installation in walls.
NOTE: It will splatter if a trash bag is not used.

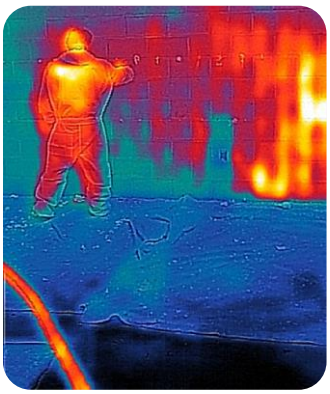
With pour cap and tube installed on gun, place tube into cavity working from the bottom of the wall up, taking care to fill each and every cavity. Again, a check with a thermal camera helps ensure every core cavity is being filled. A record of the thermal images can also be recorded for the building owner as a proof of performance for the project.

When foam is installed in an 8" concrete block, it can travel 4 courses or more on a 6 second trigger pull using a Graco AR4242 (01) mixing chamber in a Fusion AP gun depending on machine temperature, pressure settings and concrete block temperature. This will be trial and error and must be tested and checked on every job. When injecting, count down the number of seconds you are injecting to develop a feel for how much foam is required to fill a core. Doing this preliminary trial will develop the hole/fill pattern for the entire project.

- Core fill times may vary from core to core as Brick Masons can throw varying amounts of mortar in block cores.
- Larger concrete blocks will require longer trigger pulls and larger diameter mixing chambers.
- Again, this can all be checked using a thermal imaging camera and by viewing the travel distance of the foam in the block.







Filling Cores with GacoProFill Foam (cont.)

As the cores are filled, a tapered wooden dowel pin should be inserted into the fill hole once the tubing is removed to keep the foam from spilling out of the fill hole as the applicator moves down the wall.

Develop a sequence for filling that will complete the job in an efficient and cost effective manner. Make sure that personnel drilling fill holes are well ahead of the fill applicator.

Cleaning and Patching Fill Holes

Clean the fill holes with a drill/wire brush attachment to insure a clean hole before patching. The GacoProFill foam is very easy to clean and remove from concrete block.

Visit with the Masonry contractor on site to get the mortar mix for patching the mortar joints and holes or purchase mortar tubes that fit in a standard caulking gun. If the contractor is not available, a visit to a local home center will get you the materials needed to make the repairs on the fill holes. These are small repairs; take care in making sure they are done neatly and correctly and they should not be noticeable after making the repairs. Fill holes may be cleaned and repaired four hours after the foam has been injected.

Do a final walk through of the project to make sure that all of the loose foam has been cleaned up and disposed of. Make sure there are no areas on either side that may have had some foam bleed through gaps and openings that were not noticed beforehand and make sure that they are cleaned and taken care of before leaving the project site.

Coating/Sealer

Please be advised that it is always recommended that a moisture resistant coating or sealer be specified to be applied on the exterior of CMU construction when using GacoProFill for filling concrete block cores.

APPLICATION PROCEDURES

Drum Storage
Store GacoProFill Poly drums at 50°F to 100°F (10°C to 38°C) when not in use.

Drum Prep
Prep GacoProFill Poly drums to 60°F to 80°F (16°C to 27°C). In order for the drum to be ready to use, it must be in a temperature range where the proportioner can take it the rest of the way to spray temperature. *Example: If your drum temp is 80°F and you have an E-20 with a delta T of 50°F, your maximum spray temperature can only be 130°F. With this information it is important to know the delta T of your proportioner and drum temperature to achieve the proper spray temperature. For those of you with Recirc capabilities, you can recirculate GacoProFill Poly to raise the drum temperature, but do not recirculate the product over 100°F.*

Mixing
GacoProFill Poly must be mixed on high speed to achieve a milky solution prior to application or recirculation. It must be continuously mixed during application. If GacoProFill Poly is in the line from the previous spray day, it must be recirculated into the drum and mixed before spraying can take place.

Flushing
When changing from a closed cell product to GacoProFill, pre-mix the GacoProFill Poly drum prior to flushing. Purge the Poly side of the system with water to get the closed cell product out of the system, then come in behind with pre-mixed GacoProFill Poly to flush out the water. Remember to flush the entire Poly system including recirc lines, proportioner and spray hose. Use water again to flush the GacoProFill Poly out of the system before you go back to the closed cell product. Follow steps 1-5 on Tech Tip 028, *Eliminate Cross Contamination by Flushing with Water*. For a more detailed step by step flushing procedure refer to Tech Tip 045, *12 Proper Flushing Techniques*. Tech Tips can be found on **gaco.com**.

Substrate Limitations
Substrates should be clean, dry and warm. While clean and dry offers the best success for adhesion, warmer substrates provide better yields. The colder the substrate the lower the yields we can expect. Do not spray if surface temperatures are within 5 degrees of the dew point. Substrate moisture levels should be below 18%. Use Psychrometer for exact measurement of temperature, humidity and dew point.

Spray Pressures
1,000 to 1,200 psi for optimal performance.

At 70°F (21°C) ambient temperature:

- **Recommended starting pressure setting is 1,000 psi using an AR-4242 (01) mixing chamber.**
- **Recommended starting pressure setting is 1,200 psi using an AR-5252 (02) mixing chamber**

Spray Temperatures
120°F to 135°F (49°C to 57°C). The lower temperature spectrums are used in warmer climates/seasons and the higher temperature spectrums are used in colder climates/seasons. If the foam is reacting too fast, then it is too warm and temperatures need to be dialed down and possibly the pressure reduced if needed. If the foam is reacting too slowly, then you need to increase temperatures and possibly pressures.

At 70°F (21°C) ambient temperature:

- **Recommended starting temperature setting for A, B & Hose Heat is 120°F (48°C).**

Equipment Settings		Reactivity Time	
Pre-Heaters - Iso (A):	120°F to 135°F (49°C - 57°C)	Cream Time:	1 - 2 seconds
Pre-Heaters - Poly (B):	120°F to 135°F (49°C - 57°C)	Tack Free Time:	6 - 10 seconds
Hose Heat:	120°F to 135°F (49°C - 57°C)	Cure Time:	4 hours
Recommended Spray Pressure:	1,000 to 1,200 psi (dynamic)		