

PIP Foam Estimating and Application for CMU

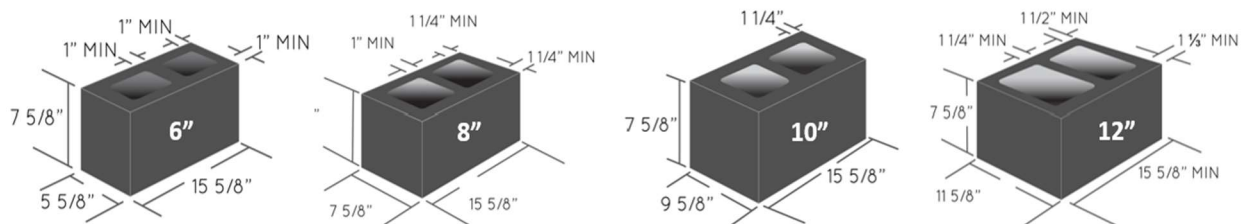
This information is provided for understanding on how to estimate the required amount of PIP foam to be used in Standard Concrete Masonry Units (CMU) (concrete blocks). Mathematical calculation basics included in this document may be useful in other type PIP applications.

Actual usage may vary according to conditions and notes in this guide. HBS makes no guarantees to the accuracy of any estimates based on the information provided in this guide and takes no responsibility for its use.

Consider the following in estimation of CMU.

- 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 10ft. to every 2ft.
- Elevation plans will show the number and locations of the bond beams and verticals. Lintels will normally extend 16" to 24" beyond the openings and they will be full of concrete.
- Applicator will drill the mortar lines and repair the holes. If the walls are going to be covered with some sort of facade, the applicator can drill in the center of each core. **Remember, the holes must be filled to ensure the fire rating integrity of the walls.**

Exterior of the CMU's needs to be sealed against moisture if installing PIP Open Cell Foam.



Terms

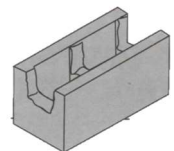
Bond Beam : A horizontally reinforced element in a masonry wall that provides resistance to shear loads and also helps distribute lateral loads throughout the wall section.

Verticals: Vertical reinforcement used in masonry walls **to resist tensile stresses**. Masonry columns and pilasters are also reinforced vertically to increase resistance to loads.

Pilaster: A strengthened section that is designed to provide lateral stability to the masonry wall. Pilasters can be the same thickness as the wall but most often project beyond one or both wall faces.

Lintel: A structural member placed over an opening in a wall.

Rebar Filled Bond Beam(course): A type of Concrete Masonry Unit (CMU) with a notch running through it designed to accommodate placement of horizontal rebar. The purpose of a bond beam is to provide horizontal support along



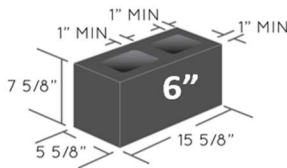
For application and details related to specific linear applications please contact your HBS Technical Department.

Manual Calculations

Manual Calculations for Void Spaces	
Square Feet	L x W
Square Feet to Board Feet	LxWxH / 12
Board Feet to Cubic Feet	BDFT / 12
Cubic Feet to Cubic Inches	Cubic FT x 1728
Convert Feet to Inches	FT x 12
Convert Square Feet to Square Inches	FT x 144
Convert Square Inches to Square Feet	IN / 144

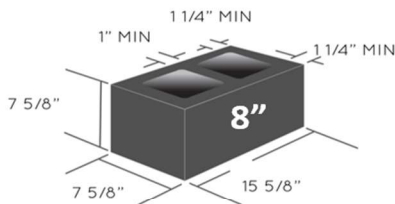
CMU Volume Calculation	
CMU Block Size	Cubic Feet (ft ³) of SPF
6" x 8" x 16"	0.19
8" x 8" x 16"	0.25
10" x 8" x 16"	0.33
12" x 8" x 16"	0.39

CMU Square Feet of Wall Space	
CMU Block Size	Cubic Feet (ft ³) of SPF
6" x 8" x 16"	0.21
8" x 8" x 16"	0.28
10" x 8" x 16"	0.37
12" x 8" x 16"	0.44



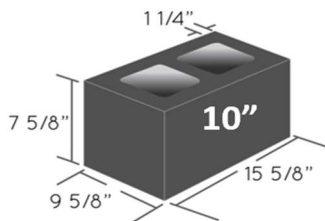
6" CMU, (6x8x16)

- Width $(5 \frac{5}{8} - 1 - 1) = 3 \frac{5}{8}$ "
- Height $7 \frac{5}{8}$ "
- Length $(15 \frac{5}{8} - 1 - 1 - 1) / 2 = 6 \frac{5}{16}$ "
- Core Volume $3 \frac{5}{8} \times 7 \frac{5}{8} \times 6 \frac{5}{16} = 174.48 \text{ in}^3$
- Total Material Volume per Block $174.48 \text{ in}^3 \times 2 \text{ (holes)} = 356.96 \text{ in}^3 \text{ (0.21 ft}^3)$



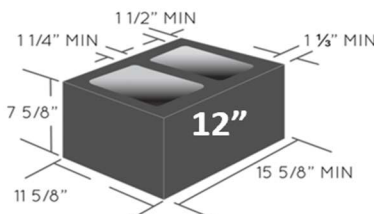
8" CMU, (8x8x16)

- Width $(7 \frac{5}{8} - 1 \frac{1}{4} - 1 \frac{1}{4}) = 5 \frac{1}{8}$ "
- Height $7 \frac{5}{8}$ "
- Length $(15 \frac{5}{8} - 1 \frac{1}{4} - 1 - 1 \frac{1}{4}) / 2 = 6 \frac{1}{16}$ "
- Core Volume $5 \frac{1}{8} \times 7 \frac{5}{8} \times 6 \frac{1}{16} = 236.91 \text{ in}^3$
- Total Material Volume per Block $236.91 \text{ in}^3 \times 2 \text{ (holes)} = 473.82 \text{ in}^3 \text{ (0.27 ft}^3)$



10" CMU, (10x8x16)

- Width $(9 \frac{5}{8} - 1 \frac{1}{4} - 1 \frac{1}{4}) = 7 \frac{1}{8}$ "
- Height $7 \frac{5}{8}$ "
- Length $(15 \frac{5}{8} - 1 \frac{1}{4} - 1 \frac{1}{4} - 1 \frac{1}{4}) / 2 = 5 \frac{15}{16}$ "
- Core Volume $7 \frac{1}{8} \times 7 \frac{5}{8} \times 5 \frac{15}{16} = 322.57 \text{ in}^3$
- Total Material Volume per Block $322.57 \text{ in}^3 \times 2 \text{ (holes)} = 645.14 \text{ in}^3 \text{ (0.37 ft}^3)$



12" CMU, (12x8x16)

- Width $(11 \frac{5}{8} - 1 \frac{1}{2} - 1 \frac{1}{2}) = 8 \frac{1}{8}$ "
- Height $7 \frac{5}{8}$ "
- Length $(15 \frac{5}{8} - 1 \frac{1}{2} - 1 \frac{1}{4} - 1 \frac{1}{2}) / 2 = 5 \frac{11}{16}$ "
- Core Volume $8 \frac{5}{8} \times 7 \frac{5}{8} \times 5 \frac{11}{16} = 374.04 \text{ in}^3$
- Total Material Volume per Block $374.04 \text{ in}^3 \times 2 \text{ (holes)} = 748.08 \text{ in}^3 \text{ (0.43 ft}^3)$

Installation Guidance

Safety and PPE

Each company is responsible for their own individual Safety and PPE program. Ensure all workers involved in the installation of PIP Foam are assigned the proper PPE according to your companies Safety and PPE Program.

Examples of but not limited to PPE Items.

- NIOSH-approved full face or hood type supplied air respirator.
- Chemically resistant coveralls.
- Chemical resistant gloves (e.g., nitrile) fabric coated nitrile.
- Safety Glasses.

Equipment

- Same Proportioner and gun used for application of high pressure spf .
- Pour Nozzle assembly for gun (e.g., **Graco Fusion AP Pour Adapter Kit part#248528**).
- Additional Plastic Tubing (1/4" inside diameter 3/8" outside diameter) Available at most hardware stores.
- Hammer Drill.
- Masonry Bit 5/8".
- Mortar (to patch holes) tools associated with mixing mortar.
- Infrared Thermal Imaging Camera (not required but does help in locating rebar and verticals as well as making sure foam is filling each cavity).
- Rolling Scaffold.

Process

- Locate concrete, rebar-filled bond courses and areas above and below windows and verticals. Thermal imaging camera is useful in finding these areas. Review with GC location of steel wire which is typically used every other course or pre-determined courses. 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 10ft. to every 2ft.
- Drill 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. 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.
- Test Pour. Always do a test pour prior to actual injection to ensure proper processing.
- **Do not pour on top of rising PIP Foam, Backpressure Damage Risk.**

To protect from pouring in rising foam: Never pour over 80% of cream time. (e.g., cream time in mockup is 10seconds 80% of 10seconds = 8 seconds(injection time).

- Build a mockup. HBS recommends building a cardboard mockup of the approximate dimensions of the cavity to practice timing.
- 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.

Core fill times may vary from core to core as Brick Masons can throw varying amounts of mortar in block cores.

- As the cores are filled, care should be taken for backpressure. Backpressure of the foam can escape out of the injection point. Skin injection risk!
- Clean the fill holes with a wire brush to insure a clean hole before patching.

Remember, the holes must be filled to ensure the fire rating integrity of the walls.

Product Information and Processing

PIP Foam Product										
Product	Set Weight	Mix	Gal A	Gal B	Lbs. A	Lbs. B	Shelf Life A/B	**BDF.T.	**FT ³	**IN ³
PIP 50 (Open Cell)	1000	YES	51	51.5	520	480	12/6	**15,500	**1,291	**2,230,848
PIP 250CG	1000	NO	51	51.5	520	480	12/6	**4,500	**375	**648,000
PIP 250CG Slow	1000	NO	51	51.5	520	480	12/6	**4,500	**375	**648,000
PIP 250A-FR	1000	NO	51	51.5	520	480	12/6	**4,500	**375	**648,000

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PIP Foam Product Processing Parameters						
Product	Storage Temp	Iso Temp	Resin Temp	Hose Temp	PSI	Mix Chamber
PIP 50 (Open Cell)	50-85	130-145	130-145	130-145	600-1000	01/02
PIP 250CG	50-85	95-105	95-120	95-120	900-1300	01/02
PIP 250CG Slow	50-85	95-105	95-120	95-120	900-1300	01/02
PIP 250A-FR	50-85	90-115	90-115	100-115	1000-1400	01/02