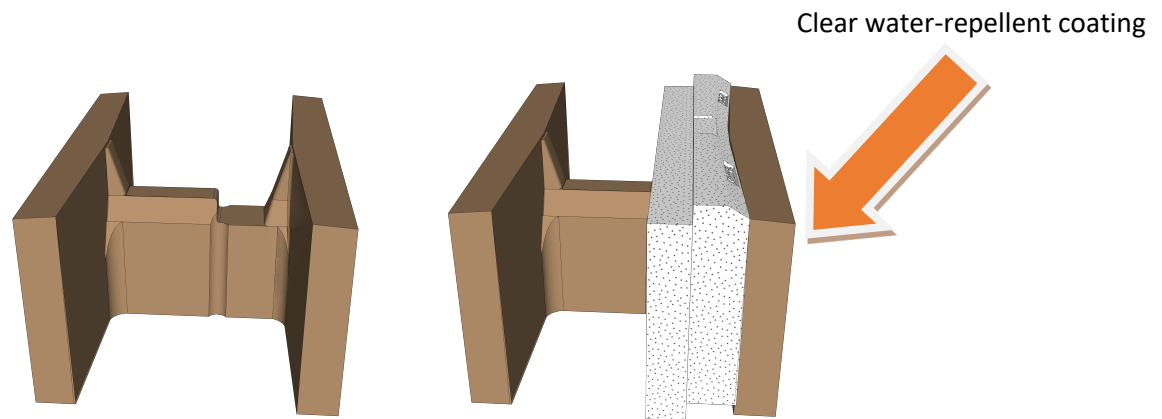


Hi-R H was developed through a collaboration of Korfil and the Concrete Products Group. David Nickerson, founder of Korfil invented the first pre-insulated block in 1971. In 2010 fifteen independent concrete block producers from across the United States formed The Concrete Products Group (CPG) to research and jointly develop new concrete masonry products and technologies. Hi-R H is just one of our products.

<https://concreteproductsgroup.com/>

12 x 8 x 16 Hi-R H



Hi-R H is a solid grouted barrier wall. The masons completely fill the open area behind the insert with grout. This solid section of concrete behind the insulation insert acts a barrier for both moisture and air penetration. ASHRAE eliminates the air barrier requirement for fully grouted CMU walls like Hi-R H.

A Hi-R H wall has three lines of defense against moisture penetrating to the interior space.

1. The Hi-R H CMU and mortar both contain Rainbloc integral water-repellent.
2. The wall is solid grouted; the entire space behind the insert is filled with masonry grout.
3. After the wall is built and cleaned, a clear water-repellent coating is applied to the exterior

CPG has developed a series of design guides to help architects and structural engineers detail Hi-R H. Not every CPG company manufactures all of the CMU in these guides, this document will describe the design guides and then reference the specific products we manufacture in Syracuse. At the end of this document we'll show construction photography of most of these details being built in the walls.

1. The Spec-Thermal Detailing Guide

This guide provides details on how to design and build the Hi-R H System. CPG producers in different regions manufacture various shapes. The Spec-Thermal Detailing Guide lists them all and in a section below we'll list which shapes we manufacture in Syracuse with a page number in the guide where you can find the design details.

Barnes & Cone has manufactured Korfil Hi-R for over 25 years, however because most of our projects are located in Climate Zone 5 and 6, we now find it harder to comply with the current energy code using this older version.

While we can still manufacture the Hi-R, the majority of our production is the newest and most energy efficient Pre-Insulated CMU, the **Hi-R H**. In a section below we'll list the specific Hi-R H shapes we produce in Syracuse.

2. The Thermal Properties Guide

This guide lists the thermal values for various shapes and density Hi-R H. The CPG companies produce different densities depending on aggregate availability and the climate zone we service. All of the thermal values CPG publishes comply with the calculation procedures outlined by the National Concrete Masonry Associations "Thermal Catalog of Concrete Masonry Assemblies" and ASHRAE 90.1. We certify compliance to both these documents. We never present "effective r-values". Effective r-values are misleading because they are modified for the benefits of thermal mass. Because the energy code already recognizes mass by requiring less insulation for mass walls, if effective r-values are used for code compliance, it is taking credit for mass twice. Accordingly, effective r-values cannot be used for energy code compliance. In a section below we'll list the R-Values and U-Factors for each shape, for the density you are considering for this project.

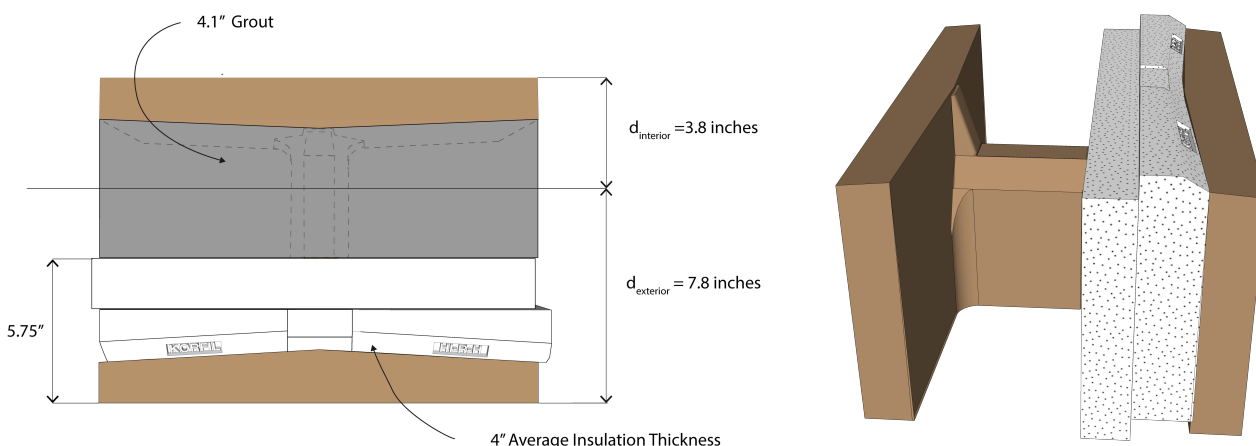
3. The Structural Design Manual

David Biggs, P.E., S.E. developed the Structural Design Manual for CPG. The manual provides structural details using the specific Hi-R H properties. At Barnes & Cone we manufacture the 12" Hi-R H using the 4" thick insulation insert. The thicker insert makes compliance easier in Climate Zone 5 & 6. The section properties of this CMU are shown on page 12 Figure 6B in the manual. On-line spreadsheets are available to reduce structural design time. Descriptions of these interaction diagrams can be found on page 46 of the 2020 Edition of the Structural Design Manual. The manual has five design examples which illustrate how to use various spreadsheets.

Please contact us to discuss the CMU you'll be designing with. If the compressive strength of masonry of the 12" Hi-R H that you are designing with, exceeds f'_m 2,500, you'll want to consider designing the walls using Table 16B on page 25. Using this strength with a #5 bar can significantly reduce the lap splice lengths, significantly reducing mason labor cost. The mason contractors will reflect this in their bid.

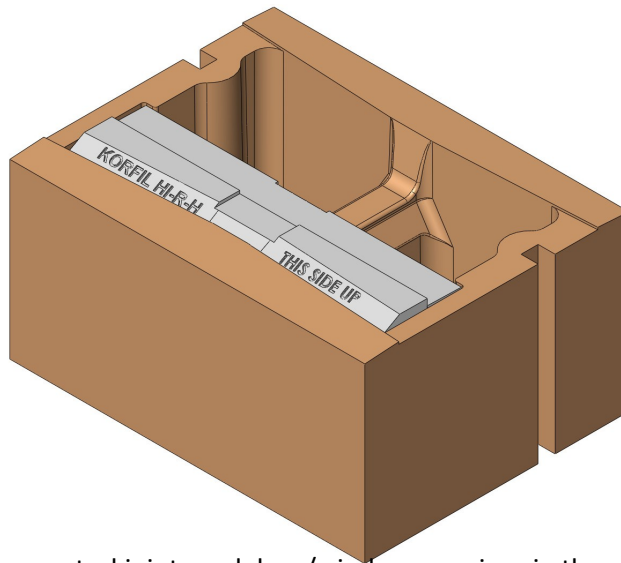
12 x 8 x 16 Hi-R H Regular

This is the basis of the Hi-R H CMU we manufacture in Syracuse



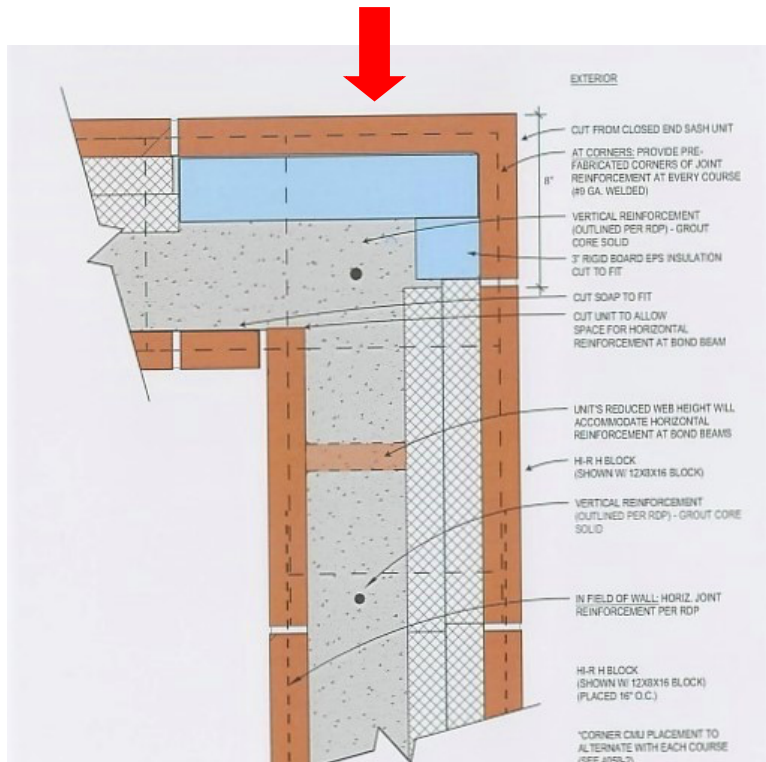
The 12 x 8 x 16 Hi-R H Regular is the CMU that is used for the majority of the wall. This CMU is illustrated on page 7 of the Spec-Thermal Detailing Manual. This same CMU is also used for bond beams, details are on page 21, Figure 4.

The 12 x 8 x 16 Hi-R H Jamb



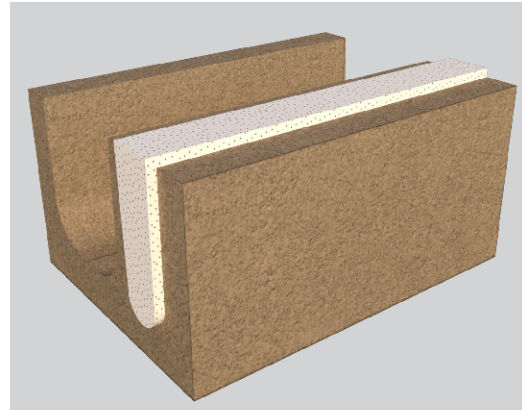
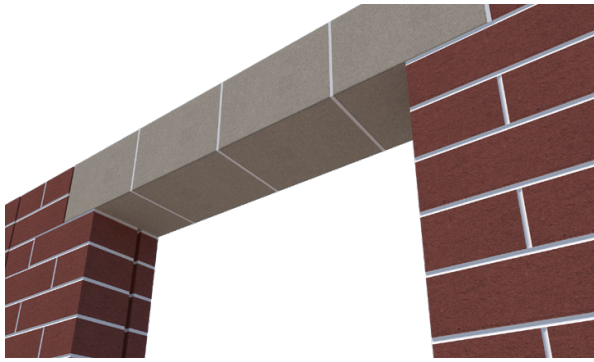
The 12 x 8 x 16 Hi-R H Jamb is used for control joints and door/window openings in the wall. Control joint details can be found on page 29, figure 11 of the Spec-Thermal Detailing Manual. We also provide 12 x 8 x 8 Hi-R H Jamb units that are needed to keep bond. Page 40, Figure 20 details this CMU in a window jamb application.

The 12 " Hi-R H Bonded L-Shape Corner



There are several choices for return corners. For most styles of Hi-R H, the Bonded L-Shape Corner is the most versatile. Barnes & Cone provides the EPS pieces shown in blue and the mason installs the pieces as they build the wall. Construction details can be found on page 56, Figure 34 and page 57 Figure 35.

The 12 x 8 x 16 Hi-R/Hi-R H Lintel



The 12 x 8 x 16 Hi-R/Hi-R H Lintel is a solid bottom CMU that is used over door and window openings. Barnes & Cone provides the EPS piece shown in white. Construction details can be found on page 46, Figure 25.



Lintels can be built on wood supports using single 12" Hi-R H lintel units, or prefabricated in our factory. Prefabricated Lintels are assembled in our plant with carbon fiber. The same color and texture of the walls can be used, or an architectural highlight color and texture like ground face.

Thermal Values

Thermally, Hi-R H walls can easily comply with the Energy Code. Hi-R H is manufactured in almost all of our colors and textures. However, certain colors like white sands can produce a much higher density CMU than earth tone colors produced using lightweight aggregates. The lower the density 12" Hi-R H, the higher the R-value it can achieve. Please contact us early in the design process so we can discuss these color/density/aggregate variables.

Our most popular mix design for Hi-R H is lightweight, approximately 100 pcf. Listed below are the thermal values for each of the shapes listed above:

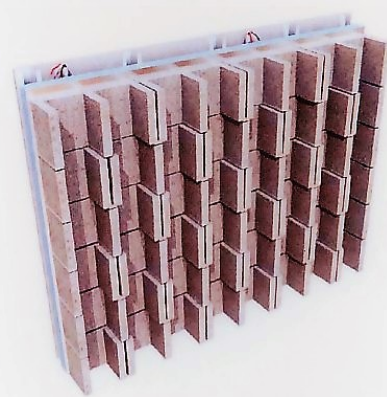
Size	Approximate Density	R-value	U-Factor
12 x 8 x 16 Hi-R H Regular	100 PCF	R-Value 16.84	U Factor- 0.059
12 x 8 x 16 Hi-R H Jamb	100 PCF	R-value 12.50	U Factor- 0.08
12 " Hi-R H Corner Bonded L-Shape Veneer	100 PCF	R-value 16.84	U Factor- 0.059
12 x 8 x 16 Hi-R/Hi-R H Lintel	100 PCF	R-value 6.30	U Factor- 0.159

[NY] TABLE C402.1.4
 OPAQUE THERMAL ENVELOPE ASSEMBLY MAXIMUM REQUIREMENTS, U-FACTOR METHOD^{a, b}

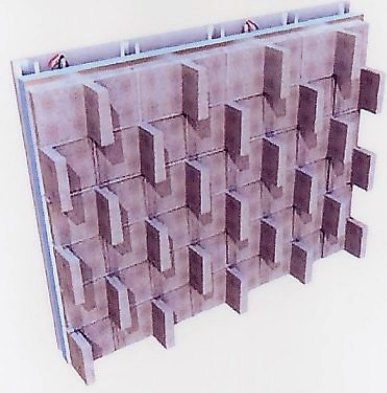
CLIMATE ZONE	4 EXCEPT MARINE		5 AND MARINE 4		6	
	All other	Group R	All other	Group R	All other	Group R
Roofs						
Insulation entirely above roof deck	U-0.032	U-0.032	U-0.032	U-0.032	U-0.032	U-0.032
Metal buildings	U-0.035	U-0.035	U-0.035	U-0.035	U-0.031	U-0.031
Attic and other	U-0.027	U-0.027	U-0.027	U-0.021	U-0.021	U-0.021
Walls, above grade						
Mass ^d	U-0.104	U-0.090	U-0.090	U-0.080	U-0.080	U-0.071
Metal building	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052
Metal framed	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064
Wood framed and other ^e	U-0.064	U-0.064	U-0.064	U-0.064	U-0.051	U-0.051
Walls, below grade						
Below-grade wall ^c	C-0.119	C-0.119	C-0.119	C-0.119	C-0.119	C-0.119

Page 22 of the 2020 Energy Conservation Construction Code of NYS contains the prescriptive compliance table that is easiest to use for mass walls; Table 402.1.4. In the first column go down to the **Mass** line, then in the **Walls above grade** row, go to the Climate Zone your project is located in. For example, for compliance the average U Factor of the Hi-R H wall cannot exceed 0.09 in Climate Zone 5.

To determine compliance an average U-factor must be calculated using the quantity of each of the shapes listed above. If preliminary plans are available we can assist by providing an approximate take-off. A spreadsheet we use to make this calculation is being sent with this document, this spreadsheet is just an example.



Interior web configuration of a conventional 2 core CMU is shown above.
 The interior web configuration of a 1 web CMU is shown below



In conventional CMU walls, grout fills the wall vertically, it's confined to the columns formed by the 2 cores. Hi-R H CMU have 1 web, there is no confinement, grout flows through the wall both vertically and horizontally. Grouting is faster with less concern of pockets forming in the grouted area.

TMS 402/602 “Building Code Requirements and Specifications for Masonry Structures” states that “flashing is installed at all interruptions in the vertical plane of a masonry drainage wall, such as tops of the foundation, above shelf angles, over openings and above bond beams.” At all of these locations the masons must stop and install flashing, weeps, drip edge and end dams. The Code also requires these materials be specified and detailed on the drawings.

Hi-R H walls are simpler to design and to build. Hi-R H walls are not drainage walls, the entire wall is filled with grout so except for sills, there is no flashing, weeps or any of the other masonry drainage accessories. Masons save time because they don’t stop laying block to install the flashing and accessories. Architects don’t have to detail the flashing and accessories on the plans. Elimination of the flashing materials and increased grouting efficiency, helps offset some of the expense of completely filling the wall with grout and the longer time it takes a mason to install a CMU with an insulation insert.



Construction Photography

Hi-R H is more than just a Pre-Insulated block. It’s a complete system with all the shapes masons need to build your wall, from the below grade foundation to the top of the above grade wall.



12x 8 x 16 Hi-R H Foundation

The 2020 Edition of The Hi-R H Structural Design Manual provides design details on using Hi-R H for commercial foundations.



The open ends of the 12" Hi-R H easily slip into vertical bar locations.
Except for the Hi-R H Jamb, masons don't have to lift the block up and over the bar.

No need to use conventional block at corners, control joints, wall openings, bond beams or lintels.
There is a Hi-R H CMU for all these locations.



Building a corner with 12" Hi-R H L-Shape Corner



Building a control joint with a 12" Hi-R H Jamb

Standard rubber control joints fit into the sash of the 12" Hi-R H Jamb CMU. Conventional 9 gauge x 9 gauge ladder joint reinforcement is used in the Hi-R H System.



Building a door opening with a 12" Hi-R H Jamb CMU

Flat ends are available for wall openings if door and window frames don't cover the sash.



Building a bond beam with a 12" Hi-R H

The regular 12" Hi-R H is also used as a bond beam. This photo shows the first course of a multi course bond beam. Hi-R H is a solid grouted wall, adding additional bond beam courses for deep beams is significantly less expensive than in a conventional wall. The grout is already in the cost of the wall, the only additional cost is the horizontal bar.



Building a lintel with 12" Hi-R H Lintel units.

This photo shows the first course of a multi course 18 foot Pre-Fabricated Lintel after the masons placed it on the wall with a forklift and slings. The Hi-R H Lintel strikes a balance between insulation, grout and reinforcement. Enough room remains in the grouted section behind the insert for large reinforcing bar for high load applications. Prefabricated Hi-R H lintels are delivered on our trucks fully cured. The lintel is ready to receive reinforcing steel, grout, and the additional masonry courses to complete the reinforced masonry lintel or beam. Hi-R H Lintels can also be built on the job, supported by wood until they cured. Lintels can be produced in any color or texture.



The preliminary design for the wall shown below was: steel frame, masonry veneer, exterior insulation board, exterior sheathing, light gauge metal studs, batt insulation within the studs, vapor barrier, gypsum board interior and paint.



Photo above shows exterior Spec-Brik Hi-R H being constructed

Photo below shows that same area on the interior.



The masons, using one 11 5/8 wide Spec-Brik Hi-R H block- replaced nine layers of other materials and provided:

Structural masonry walls

Attractive exterior and interior finish

Moisture barrier

Thermal mass energy performance

Great impact resistance

4 hour fire rating

If you would like suggestions on control joint locations, or if you have questions the colors, textures and densities available in Hi-R H, please contact us.

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