BuildBlock®

INSULATING CONCRETE FORMS

Build it once. Build it for life.

Installation Manual

Version 5-1-08

BuildBlock Building Systems LLC
9701 N. Broadway Extension
Oklahoma City, OK 73114

Phone: 405-840-3386
Fax: 831-597-0792
Web: www.buildblock.com

BUILDBLOCK® BUILDING SYSTEMS, LLC

INSTALLATION MANUAL

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This manual was designed to be used as a reference guide only. This manual is not intended to be used as a replacement or substitute for the actual training by an experienced and properly trained BuildBlock building professional. Before starting any project BuildBlock recommends that you receive proper training. BuildBlock also recommends that you consult with design professionals familiar with the type and scope of project to be built. Training is available by contacting BuildBlock Building Systems LLC at www.buildblock.com or 866-222-2575.

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Product Warnings

Many new types of treated wood products using ACQ (alkaline copper quaternary) are highly corrosive to metal components. BuildBlock Building Systems LLC recommends that any metal products or components **should not be used** in contact with these treated lumber products unless you ensure the compatibility of your treated lumber with the metal components. Please consult with your project engineer to specify the type and sizing of all corrosion resistant metal connectors, anchor bolts, fasteners or other metal components. Please note that metal connectors, anchor bolts, fasteners or other metal components will corrode and loose their load carrying capacity, if installed in corrosive environments.

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LIMITED PRODUCT WARRANTY
BUILDBLOCK® INSULATING CONCRETE FORMS

BuildBlock Insulating Concrete Forms are warranted for 180 days from the invoice shipping date only to the original purchaser and or the purchaser of forms from a BuildBlock approved Distributor or Dealer. All forms are warranted to be free from defects in material and workmanship which may cause the BuildBlock Forms to be unusable or not perform as the manufacturer's design intention for use as a form for poured concrete walls. This warranty is effective and enforceable only if the BuildBlock Forms are handled, stored, transported and installed in accordance with the BuildBlock Installation Manual, or any other installation instructions or guidelines published by BuildBlock Building Systems, LLC, and local building codes. Furthermore this warranty is effective only if BuildBlock Building Systems, LLC has received written notice of the defects along with proof of purchase from a warranted source (as stated above) within 30 days of the first discovery of a defect but in any event no later than within 180 days of the date of shipment of said forms by BuildBlock Building Systems, LLC. NOTE: After 180 days from invoice shipping date, all forms are out of the warranty period.

THIS WARRANTY EXPRESSLY EXCLUDES AND IS IN LIEU OF ALL OTHER WARRANTIES WHETHER WRITTEN OR ORAL. EXCEPT AS EXPRESSLY SET FORTH ABOVE, BUILDBLOCK BUILDING SYSTEMS, LLC MAKES NO REPRESENTATIONS OR WARRANTEES OF ANY KIND, EXPRESS OR IMPLIED, IN FACT OR IN LAW, INCLUDING, WITHOUT LIMITATION, THE WARRANTY OF MERCHANTABILITY OR WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE.

BuildBlock Building Systems, LLC's liability and the purchaser's sole and exclusive remedy from alleged defects in the materials or manufacturing of the BuildBlock Forms shall be limited to the replacement of an equivalent amount of the defective product or a refund of the invoice charged for the defective product less shipping and handling charges (as BuildBlock Building Systems, LLC may elect) if full payment has been made. In no event shall BuildBlock Building Systems, LLC be liable for any consequential or incidental damages, losses, costs, or expenses of any person of any kind (including without limitation, loss of profits or injury to credit, reputation, or goodwill) directly or indirectly resulting from any alleged breach of warranty contained in this Manufacturer's Limited Warranty.

No other entity, person, Corporation, Company, or firm has any authorization or authority to bind or assume on behalf of BuildBlock Building Systems, LLC any other liability affirmation, representation, or warranty regarding or in connection with the sale of BuildBlock's Insulating Concrete Forms except as stated in this Manufacturer's Limited Warranty.

No further warranty is expressed or implied that is not mentioned in the above text. This is the complete and full warranty of BuildBlock Building Systems LLC for its Insulating Concrete Forms for Concrete.

Dated: January 21, 2007

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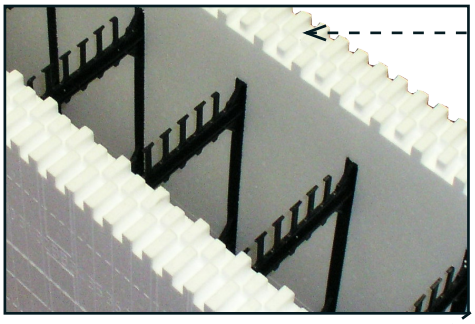
For the most recent version of this document go to: www.buildblock.com/manual
For more information or to order BuildBlock ICFs and other products,
visit our website at www.buildblock.com.

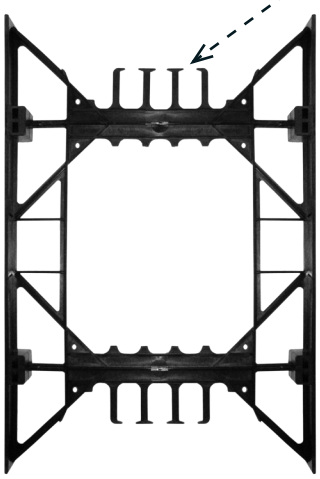
BuildBlock Installation Manual created by Michael Summers (RepPro Services 405-664-0010) for BuildBlock Building Systems LLC.
Technical Writers: Michael Summers, Mike Garrett | Technical Drawings: David Arambula (Delinitive Concepts)

BuildBlock Insulating Concrete Forms

1.1 BuildBlock Features

Constructing with BuildBlock will not only save you many hours during the building process but will be an enjoyable experience. The many features built into the BuildBlock forms are the reasons for the efficiency and ease of use.

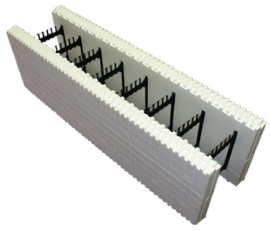




- **Completely reversible** (no top or bottom, left or right)
- **Interlocking connections** have more surface area to hold blocks together without the use of adhesive foam in most cases
- **Longer web fingers** for securing two pieces of rebar in each row of fingers, helping to eliminate void problems
- **Molded-in high-density plastic webs** (also referred to as "ties"); Sheetrock and finishes are screwed into the 1½″ wide web flange.
- **Heavy-duty attachment points** (over 450 lbs. screw pull-out strength) built into the face of every web; used to attach vertical bracing during construction, exterior/interior finishes, and cabinetry
- **Longer corners** than the industry standard require less corner bracing. This feature results in quicker installations and walls that are more plumb and straight.
- **Patented corner web** provides **corner attach points** for securing sheet rock, siding, and other finishes. The corner holds the vertical rebar up to ⅝″ diameter; PVC schedule 40 (¾″ diameter) pipe can be placed down the corner hole located in the outside foam for additional support and to attach finishes to as well.
- Block designed with **1″ repeating pattern and cut lines,** giving you a factory edge with each cut while wasting very little material. In comparison, competing blocks have 2, 4, 6, or 12 inch repeat patterns thus increasing their waste substantially.
- **Horizontal cut lines every 2″ vertically,** eliminating the use of a level when installing window and door bucks
- **Built-in tape measure** across the block face; saves you the trouble of pulling out a tape measure every time you need to cut a block
- **Highly visible web markings** make sheet rock and finish attachment easy.

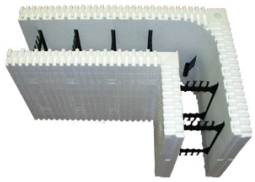
1.2 Product Specification Overview

Straight



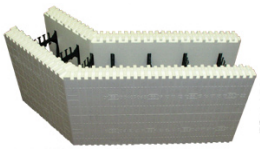
	4" Products	6" Products	8" Products
SPECIFICATIONS	4" STRAIGHT*	6" STRAIGHT	8" STRAIGHT
LENGTH	48"	48"	48"
WIDTH	9" (4" Core)	11" (6" Core)	13" (8" Core)
HEIGHT	16"	16"	16"
RETURN	NA	NA	NA
CONCRETE VOLUME	.065844 cu. yd.	.098765 cu. yd.	.131687 cu. yd.
SURFACE AREA	5.33 sq. ft.	5.33 sq. ft.	5.33 sq. ft.
EPS DIMENSION	2½" each panel	2½" each panel	2½" each panel
QTY PER BUNDLE	12	12	12
PRODUCT ID	BB-400	BB-600	BB-800

90° Corner



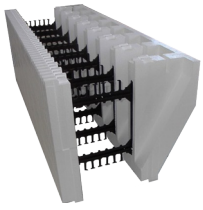
SPECIFICATIONS	4" 90 °CORNER	6" 90 °CORNER	8" 90° CORNER
LENGTH	31" (ext.) / 22" (int.)	33" (ext.) / 22" (int.)	35" (ext.) / 22" (int.)
WIDTH	9" (4" Core)	11" (6" Core)	13" (8" Core)
HEIGHT	16"	16"	16"
RETURN	19" (ext.) / 10" (int.)	21" (ext.) / 10" (int.)	23" (ext.) / 10" (int.)
CONCRETE VOLUME	.054574 cu. yd.	.086528 cu. yd.	.121517 cu. yd.
SURFACE AREA	5.56 sq. ft.	6.00 sq. ft.	6.44 sq. ft.
EPS DIMENSION	2½" each panel	2½" each panel	2½" each panel
QTY PER BUNDLE	12	12	12
PRODUCT ID	BB-490	BB-690	BB-890

45° Corner



SPECIFICATIONS	4" 45° CORNER	6" 45° CORNER	8" 45° CORNER
LENGTH	28" (ext.) /24.272" (int.)	28" (ext.) / 23.444" (int.)	28" (ext.) /22.615" (int.)
WIDTH	9" (4" Core)	11" (6" Core)	13" (8" Core)
HEIGHT	16"	16"	16"
RETURN	16" (ext.) /12.272" (int.)	16" (ext.) / 11.444" (int.)	16" (ext.) /10.615" (int.)
CONCRETE VOLUME	.054985 cu. yd.	.080841 cu. yd.	.105425 cu. yd.
SURFACE AREA	4.89 sq. ft.	4.89 sq. ft.	4.89 sq. ft.
EPS DIMENSION	2½" each panel	2½" each panel	2½" each panel
QTY PER BUNDLE	12	12	12
PRODUCT ID	BB-445	BB-645	BB-845

Brickledge

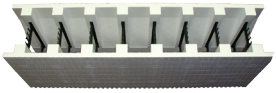


SPECIFICATIONS		6" BRICKLEDGE	8" BRICKLEDGE
LENGTH		48"	48"
BOTTOM WIDTH		11" (6" Core)	13" (8" Core)
TOP WIDTH		16"	18"
HEIGHT		16"	16"
RETURN		NA	NA
CONCRETE VOLUME		Entire block: 0.134148 Corbels only:0.035556	Entire block: 0.167074 Corbels only:0.035556
SURFACE AREA		5.33 sq. ft.	5.33 sq. ft.
EPS DIMENSION		2½" inside panel; 1" min. outside panel	2½" inside panel; 1" min. outside panel
QTY PER BUNDLE		6	6
PRODUCT ID		BB-6BL	BB-8BL

See next page for Double Taper Top forms.

1.2 Product Specification Overview, cont.

Double Taper Top Straight Form



SPECIFICATIONS		6″ STRAIGHT	8″ STRAIGHT
LENGTH		48″	48″
WIDTH		11″ (6″ Core)	13″ (8″ Core)
HEIGHT		16″	16″
RETURN		NA	NA
CONCRETE VOLUME		.130128 cu. yd. Corbels only: .031363	.16305 cu. yd. Corbels only: .031363
SURFACE AREA		5.33 sq. ft.	5.33 sq. ft.
EPS DIMENSION		2½″ each panel	2½″ each panel
QTY PER BUNDLE		12	12
PRODUCT ID		BB-6DT	BB-8DT

1.3 Product Technical Details

Expanded Polystyrene density	1½ lbs/cu.ft.
Average thickness of EPS	2½″ per panel (5″ total)
R-value	R-21 foam value
Effective R-value (concrete, form R-value, air infiltration reduction, and thermal mass)	R-30 to R-52
Actual R-value per inch of EPS Foam	4.2/inch
Thermal Mass (form & concrete)	4″ core: 47.5lbs/sq.ft. 6″ core: 72lbs/sq.ft. 8″ core: 96lbs/sq.ft.
K-Factor	.24/inch
Water absorption	- 3% (ASMC272)
Water vapor	0.56 perms per 2.5″
Sound class	52 with ½″ sheet rock on inside
Fire wall	3 Hour Fire Rating *on 6″ Wall (Loading 5000lb. per lf. throughout test.)* *(Post test loading 12,000 lbs per lf. with no additional depletion.)*
Concrete compressive strength	Recommended 3000 psi
Recommended concrete pouring temperature*	15°F to 120°F (-9°C to 49°C)*

*Properly handled, specially formulated concrete can be poured at temperatures as low as -15ºF (-26ºC). Consult your ready mix company. **Important:** At temperatures below freezing, you must cover all exposed concrete with insulating material.

1.4 Transportation, Handling, and Storage of BuildBlock Forms

Proper transportation, handling, and storage of BuildBlock Forms are required to prevent damage and deterioration, to ensure the quality of the forms for the end user, and to honor warranty requirements.

Transportation

BuildBlock forms are packaged by the manufacturer in sturdy bundles using corrugated trays and strapping. “Breaking” bundles and transporting unbundled forms voids the warranty on the unbundled forms. BuildBlock will not ship unbundled forms unless expressly requested by the customer and an additional fee applies to do so. BuildBlock highly recommends transporting bundles of forms in an **enclosed** trailer. Use of an open flat-bed trailer is not recommended and may result in damage which is not covered by the manufacturer’s warranty. If using an open trailer, position forms so that wind travels through the cavities, carefully position strapping to avoid damage to forms, and cover the load with a tarp, if possible. When accepting a shipment of forms, the customer should inspect each bundle. In the unlikely event of an issue, the **customer must note the damage on the Bill of Lading** when signing. Customer should then contact BuildBlock Quality Control immediately to begin the warranty process.

Handling

The vast majority of form and web damage is a result of mishandling, not manufacturing issues. BuildBlock forms should be handled with care to prevent damage to the EPS material (especially the connection grid) and the plastic webs. If using a forklift be especially careful not to damage webs when lifting bundles. A forklift is typically not required. Bundles can be easily carried by one or two people. A 2x4 or conduit pipe may be placed through bundles and used as handles.

Storage

Secure interior warehouse storage is ideal. Storing forms outside for extended periods of time may result in damage or deterioration by weather elements, insects (especially in termite infested areas), or rodents. Keep in mind that forms are lightweight and easily blown around by wind. We recommend keeping forms in bundles until ready for use. Be careful to secure bundles if adverse weather is expected. If forms are stored outside for more than a few weeks, they should be covered and protected from UV (ultraviolet) rays. Prolonged exposure to UV rays causes yellowing (oxidation) of the EPS. Though this does not affect the integrity of the forms, you must clean the forms to remove the layer of oxidation prior to bonding anything to the surface (such as waterproofing or exterior finishes). After the forms have been installed and filled with concrete, this can easily be done using a stiff brush or power washer.

Recommended Tools and Accessories

2.1 Tools & Accessories List

- **Hand saw or short shark tooth saw**
- **Skill saw**
- **Keyhole saw**
- **Table saw (optional, for convenience)**
- **Hammer drill, cordless drill**
- **Rebar tie tool**
- **Hot knife or Hot Knife Kit combo***
- **Hammer**
- **Framing square**
- **Concrete trowel**
- **Level**
- **Tape measure**
- **Transit or laser level**
- **Mason's line and chalk line**
- **Rebar bender and cutter**
- **Wall alignment (bracing) system***
- **Scaffold planks**
- **Concrete pencil vibrator, 1" maximum**
- **External vibrator (Arkie Wall Banger)***
- **Foam guns, foam, and foam cleaner***
- **Work gloves**
- **Sun Screen**
- **Broom and floor scraper**

*These tools and accessories are available from BuildBlock. See **www.buildblock.com/products.asp** for details and purchasing information.

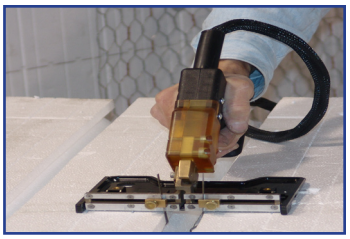
Bracing / Wall Alignment Systems

Bracing ICF walls is vital. See Section 9 of this manual for details. There are many bracing systems available through BuildBlock. For details, visit our website at www.buildblock.com and select the Products tab.

Bucking

There are just a few options regarding the materials to use to "buck" the openings in ICF walls. **Treated lumber** and the **Vbuck® Vinyl Block-out System** are the most widely used options. BuildBlock recommends **Vbuck** because it keeps organic compounds out of the project. It wraps the block for a tight seal and creates dead air space baffles between the concrete and the opening. You can order **Vbuck** from BuildBlock and it will be delivered along with your ICFs. See Section 8 of this manual for details.

Hot Knives and Accessories



Hot knife kits come with the knife, the sled to stabilize the cut, and an array of blades to get the job done. Electrical boxes, grooves for wiring and the new radius blade makes short work of electrical, plumbing, and radius concerns in ICFs. Available from Wind-lock and BuildBlock. (See details at www.buildblock.com.)

Foam Adhesive

Low-expanding foam adhesive is a staple product on an ICF job site. It can be used to secure the first course, to hold blocks together if needed, to fill uneven areas, and much more. The foam, foam gun, and gun cleaner are available through BuildBlock. (See details at www.buildblock.com.)

ICF Hand Saw

Finally, a hand saw designed for ICFs that you can put in your back pocket on the job site. This precision saw makes short work of field cuts and has a great balance and feel. This saw comes in two different sizes and is available from Wind-lock.

Super Groover Kit

The **Super Groover Kit** is on the professional level of Wind-lock products and offers the installer a belt-pack transformer for precise control of temperature and ease of use. The industrial hot knife lasts twice as long as conventional products currently available. (Regular hot knives and kits are available through BuildBlock.)

ICF Grappler

The Grappler is a great product to place on the face of the ICF foam (before sheetrocking) in areas you suspect will have repeat connectivity, such as curtain rods and picture areas, just to name a few. The Grappler grabs the foam and stays in place. It is then covered with sheetrock and acts as a stronghold for screws.

For more ICF related tools, accessories, and products, see our Recommended Products page at:
http://www.buildblock.com/productsRecommended.asp

ESTIMATING

3.1 How to Estimate Blocks for Your Project

Follow the instructions below to estimate how many BuildBlock forms you'll need for your construction project. Or, download our automated estimator program from our website at: http://www.buildblock.com/support/estimate.asp.

1. Divide wall height by 16″ and round up. This is the number of courses required. (Keep in mind that BuildBlock is reversible. This feature allows you to cut the block in half and use an 8″ high section instead of the full 16″ tall block. For example, if you were figuring a 10′ wall height, you could use a full 7 courses plus 1/2 of 1 course to achieve 10′. (Example: 7 courses = 9′-4″ plus ½ of 1 course = 8″ of height to make 10′.)
2. Multiply the # of 90° corners in the structure by the # of courses required. This is the number of 90° corner forms required.
3. Multiply the # of 45° corners in the structure by the # of courses required. This is the number of 45° corner forms required.
4. Use the chart below to determine the total square footage of all 90° forms to be used. (Number of 90° forms multiplied by sq. ft. per form.) Do the same for the 45° forms.
5. Determine the total square foot area of wall being formed (perimeter in feet x height, minus 80% of window and door openings). Subtract total square foot of all 90° forms and all 45° forms to be used.
6. Divide the remaining square footage of the wall by 5.33 to determine the number of straight forms required. Add a small number of forms for possible waste. You do not want to be short on material. Expect some mistakes, mis-cuts, or special areas that require additional waste, so have a few extra forms on hand.

3.2 Estimating Buck Materials

To estimate buck materials for windows or other openings, calculate height of opening x 2 plus width of opening x 2. To estimate door openings, calulate height of opening x 2 plus width of opening **x 1,** since there is usually no bottom to a door opening. Note: Window and door openings are usually created slightly larger than the actual window or door size so we recommend adding a couple of inches to each leg of an opening for your material purchases. V-Buck comes in lengths of 8 ft. or 16 ft. Dimensional lumber comes in lengths starting at 8 ft. and every 2 ft. additional lengths up to a maximum of usually 18 ft. to 24 ft. You do not want to use cut pieces unless properly braced so figure carefully. Cross bracing of bucks is important. See notes on building and bracing bucks in Section 8 of this manual.

3.3 Estimating Concrete Volume

Estimate the required concrete volume by the following calculation: Divide total square footage of wall to be formed, including corners, by 53 or 40 (for 6″ or 8″ forms, respectively). This equals the number of cubic yards of concrete required. Add 1½ to 2 additional yards for waste and the pump. (You do not want to be short on concrete. Delays are too expensive on manpower and pump costs.) See Section 10.2 of this manual for concrete mix design.

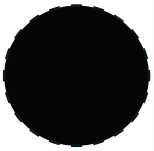
Square Feet Per Block

Form Type	4″	6″	8″
Straight	5.33	5.33	5.33
90° Corner	5.56	6.00	6.44
45° Corner	4.89	4.89	4.89
Brick Ledge	NA	5.33	5.33

3.4 Choosing The Right Rebar

Rebar comes in two standard grades, 40 and 60. This refers to the tensile strength in thousands of pound per square inch, so grade 60 has a tensile strength of 60,000 psi. The size of rebar is indicated in increments of ⅛″ (inch), so a #3 rebar is ⅜″ in diameter and so forth. While grade 60 rebar is stronger than grade 40, it is also harder to bend (which is why grade 40 is so widely used). The pricing may vary depending on your supplier, but either grade may work fine. In the engineering of steel, the size and grade must be taken into account. Make sure you figure steel size and grade according to engineering tables or your engineer's specifications.

REBAR

SIZE	GRADE
#3 (3/8″) 	40, 60
#4 (1/2″) 	40, 60
#5 (5/8″) 	40, 60

3.5 Estimating Rebar

Reinforcing rebar is placed vertically and horizontally in an ICF wall. The size and spacing of the reinforcement is called for by one of two methods -- your structural engineer or our engineered rebar tables. BuildBlock also recommends the "Prescriptive Method for Insulating Concrete Forms in Residential Construction, Second Edition," as a guide to help assist you with reinforcement and other construction details. This can be found on our website under Support.

The basic formula to figure rebar is as follows. *(In this example, the reinforcing was specified as ½" (or #4) rebar on 18" on center (or 1.5') vertically, and in each course horizontally with a 2' overlap on the horizontal ends.)* Make sure you overlap all steel ends no less than 48 diameters of steel size used.

Example: #4 (½″) x 48 diameters = 24″
#5 (⅝″) x 48 diameters = 30″

Horizontal Rebar Formula — Linear ft. of perimeter of structure / 18 ft. (covers 2′ overlap) x number of courses for horizontal. This gives you the number of 20 ft. sticks of rebar (standard length available from most suppliers).
(**Note:** Depending on engineering, horizontal rebar may be used every other course, but must be on first and last courses.)

Vertical Rebar Formula — Linear ft. / 1.5′ plus 1 bar extra for each 90˚corner and 2 bars on each window and door opening side.

Examples: 350 lineal ft. project / 18 x 8 courses =144 horizontal 20′ bars
350 lineal ft. /18″ = 234 vertical rebar + number of corners + windows and doors x 2 = total vertical rebar

Lintel Formula — Lintels require extra rebar and we use ⅜ or #3 rebar to make stirrups. Order enough bulk #3 rebar to meet your needs according to the tables you are using. Figure horizontal lintel bars from engineering tables or prescriptive method tables. Note: Lintel steel needs to be wider than opening width by 18″ into each side of wall.

Always order a few extra bars of rebar.

Note: Cut your **vertical rebar** 1½ - 2″ short of the wall height to avoid rebar coming up through your top plate. If building another level on top of this level, cut the rebar 2′ longer for overlap into the next floor. Some installers cut rebar to wall height less 1½ - 2″ for the first level regardless if another level is installed. They believe the rebar impedes pouring the wall. Once poured, they stab 4′ vertical rebars in the wet concrete for tying the next level together. This requires additional steel but may be helpful.

FOOTINGS

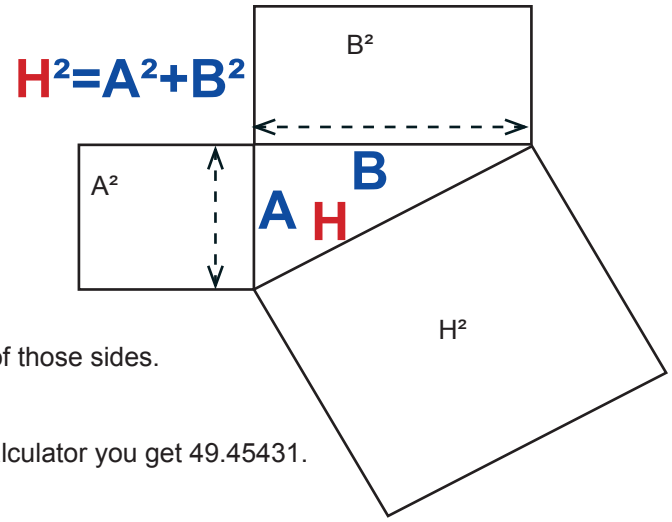
4.1 Layout

Nearly all projects will begin by installing a footing or foundation under the structure you are planning to build. In order to do this properly, you will need to familiarize yourself with a layout method that insures proper placement and accurate squaring of the project. The use of levels or a laser will help you in the layout process. There are several methods you can apply to achieve your layout. Here are some popular methods.

Pythagorean Theorem

This age old formula is used often to find the right triangle of two sides.

$H^2=A^2+B^2$



A field example would be as follows:
A=25′
B=42′-8″
If you have a measurement that has inches built along with feet like B, then divide the inches by 12 and that would give you 42.666667.

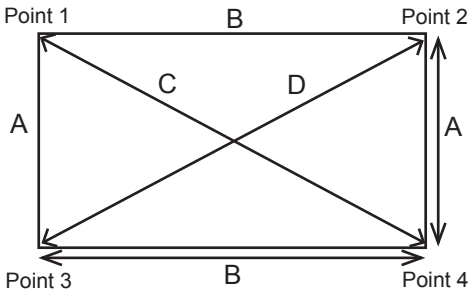
Now multiply A and B by themselves you get the square of those sides.
A) 25 x 25 =650 **B)** 42.666x 42.666=1820.0729
Add those squared numbers and you get 2445.729.
If you the use square root symbol on your construction calculator you get 49.45431.
Now find your inches: 0.45431 x 12 = 5.45″ (or 5½″)
H=49′-5 1/2″

With a construction calculator, enter A as the rise then enter B as the run and push square. The answer will be your diagonal H dimension.

Another way to get a 90° angled corner is to use the **framers method:** Leg A is set to 3 ft, leg B is set to 4 ft, and H is set to 5 ft. This will give you a 90° angle. Be careful to use Diagonal Squaring to double check your layout before digging or setting blocks. These distances can be multiplied by 10 to be more accurate on a larger layout.

Diagonal Squaring

A method of squaring a box or rectangle by measuring the diagonals of a square and adjusting the square until the diagonal length is even. **Note:** This allows us to make a perfect square box or rectangle.



In order for this method to work, both A sides must be the same length and both B sides must be the same length before measuring the diagonal measurements C and D.

To adjust the square, when C and D are not equal, two points on a given line will have to be adjusted left or right or up and down until C and D are equal in length. Re-check A and B sides to maintain correct dimensions.

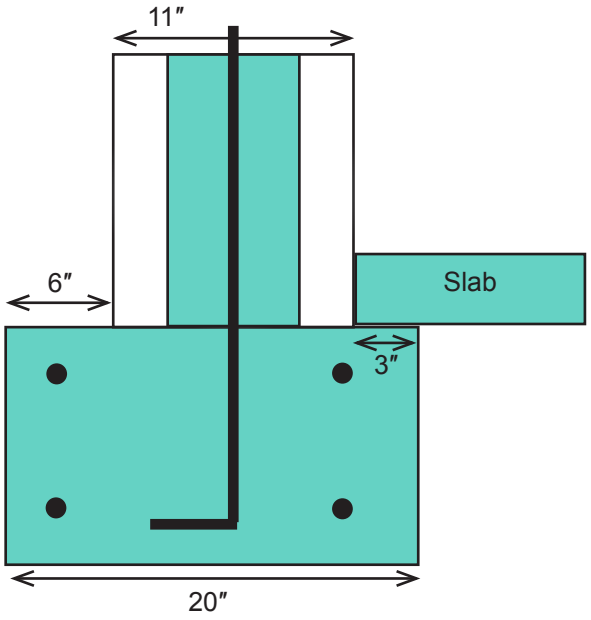
Note: BuildBlock forms are designed on 1″ increments. Using 1″ spacing on your wall layouts will eliminate waste and keep all cuts on factory cut lines.

4.2 Excavation

The excavation of footings or foundations for ICF structures is a very important step to an overall successful building experience. Having good communications with your backhoe operator insures your ditch markings will be interpreted and dug properly. For instance, some operators like to use a center line as their basis, some an outer edge. Also, knowing what type of veneer will be used on the structure will help with ICF block placement over the width of the footing to be dug.

An example would be a 6″ ICF wall: Total thickness 11″ plus a brick ledge, another 6″ to the outside of the form, and an additional 3″ to the inside of the form for the floating slab to rest or be pinned to.

By taking into account these factors, you will obtain an accurate outside wall measurement on the footing and allow for placement of the form, avoiding structure shrinkage or expansion due to misplaced footings, which can be costly and time consuming to fix. It also sets the stage for proper rebar placement at the footing first course stage and for lateral support at the base of your ICF structure. This placement is of a crucial nature because of the webs in the forms. You ideally want the rebar in the center of the form and centered between the webs. The optimal way to achieve this is a “Wet-Set” procedure which is covered on pages 22-24. Depending on type of construction used in your area, please review our construction details to match your building method.



Note: In ground footings are never perfectly straight. Please take this into account when you need a brick ledge or slab ledge as in the drawing above. If you don’t leave some extra width, there will be places which are not wide enough for these applications.

Building Footings to Applicable Codes

Footings distribute loads from the structure to the ground and in most cases are either specified by an engineer or architect. They are regulated, standardized and inspected by local building code officials. They vary dramatically across the country. If you are planning to build in an area that has no restrictions regarding footing size and re-enforcing standards, BuildBlock recommends you seek a local structural engineer to specify your load requirements and footing sizings. This step will avoid costly structural problems and assure your structure sits on a proper foundation. Keep in mind there are a variety of factors that play into the design of a foundation. Most building professionals seek the services of a structural engineer: So should you!

Minimum Width of ICF and Concrete Footings for ICF Walls

There are a variety of factors that play into the design of a foundation:

- Soil Bearing Capacity and Soil Type
- Structure Loading
- Code Compliance
- Proper Reinforcing
- Frost Lines
- Moisture Control

BuildBlock highly recommends the consultation of a structural engineer familiar with your region's soil load bearing capacities for accurate footing designs. Because different engineers recommend various footing thicknesses and widths, we are providing two footing charts for your convenience.

CHART 1

Minimum Width of ICF and Concrete Footings for ICF Walls

ABOVE GRADE		Load Bearing Value of Soil (psf)				
PROFILE	**Rt. (plf)**	**1,000**	**1,500**	**2,000**	**2,500**	**3,000**
BB 600	1,590	w=20" h=8"	w=13" h=8"	w=13" h=8"	w=13" h=8"	w=13" h=8"
BB 800	1,790	w=22" h=8"	w=15" h=8"	w=15" h=8"	w=15" h=8"	w=15" h=8"

ABOVE GRADE		Load Bearing Value of Soil (psf) 2 story				
PROFILE	**Rt. (plf)**	**1,000**	**1,500**	**2,000**	**2,500**	**3,000**
BB 600	3,130	w=38" h=12"	w=25" h=10"	w=19" h=9"	w=15" h=8"	w=13" h=8"
BB 800	3,550	w=43" h=13"	w=29" h=11"	w=22" h=10"	w=17" h=9"	w=15" h=9"

BELOW GRADE		Load Bearing Value of Soil (psf)				
PROFILE	**Rt. (plf)**	**1,000**	**1,500**	**2,000**	**2,500**	**3,000**
BB 600	3,130	w=38" h=12"	w=25" h=10"	w=19" h=9"	w=15" h=8"	w=13" h=8"
BB 800	3,550	w=43" h=13"	w=29" h=11"	w=22" h=10"	w=17" h=9"	w=15" h=9"

BELOW GRADE		Load Bearing Value of Soil (psf) 2 story				
PROFILE	**Rt. (plf)**	**1,000**	**1,500**	**2,000**	**2,500**	**3,000**
BB 600	4,670	w=56" h=16"	w=38" h=14"	w=28" h=12"	w=23" h=11"	w=13" h=8"
BB 800	5,310	w=64" h=18"	w=43" h=15"	w=32" h=13"	w=26" h=12"	w=22" h=11"

Minimum Width of ICF and Concrete Footings for ICF Walls, cont.

CHART 2

The following chart is from the ***Prescriptive Method for Insulating Concrete Forms in Residential Construction (Second Edition)***.

TABLE 3.1
MINIMUM WIDTH OF ICF AND CONCRETE FOOTINGS FOR ICF WALLS[1,2,3] (inches)

MAXIMUM NUMBER OF STORIES[4]	MINIMUM LOAD-BEARING VALUE OF SOIL (psf)				
	2,000	2,500	3,000	3,500	4,000
5.5-Inch Flat, 6-Inch Waffle-Grid, or 6-Inch Screen-Grid ICF Wall Thickness[5]					
One Story[6]	15	12	10	9	8
Two Story[6]	20	16	13	12	10
7.5-Inch Flat or 8-Inch Waffle-Grid, or 8-Inch Screen-Grid ICF Wall Thickness[5]					
One Story[7]	18	14	12	10	8
Two Story[7]	24	19	16	14	12
9.5-Inch Flat ICF Wall Thickness[5]					
One Story	20	16	13	11	10
Two Story	27	22	18	15	14

For SI: 1 foot = 0.3048 m; 1 inch = 25.4 mm; 1 psf = 47.8804 Pa

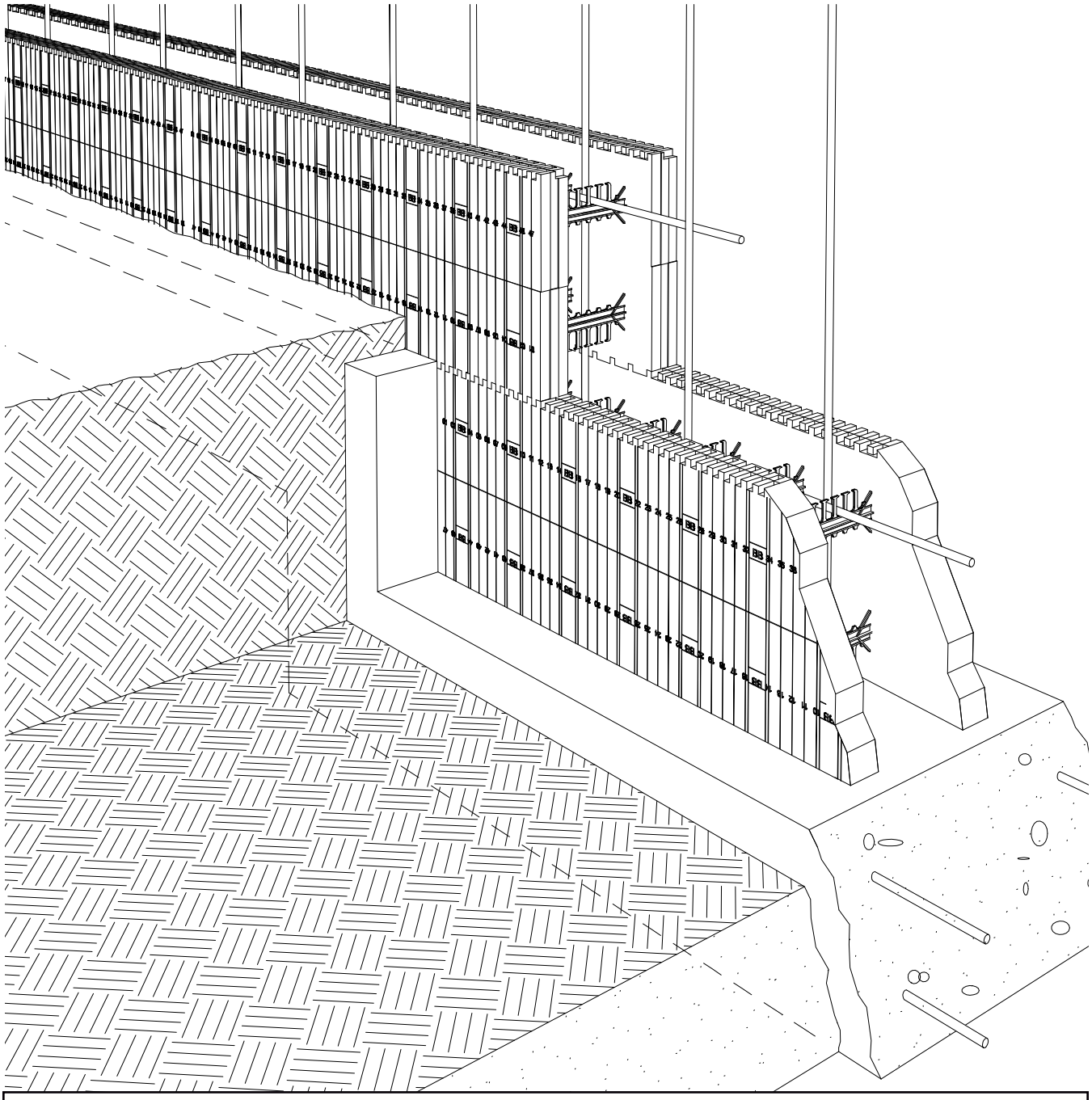
[1]Minimum footing thickness shall be the greater of one-third of the footing width, 6 inches (152 mm), or 11 inches (279 mm) when a dowel is required in accordance with Section 6.0.
[2]Footings shall have a width that allows for a nominal 2-inch (51-mm) projection from either face of the concrete in the wall to the edge of the footing.
[3]Table values are based on 32 ft (9.8 m) building width (floor and roof clear span).
[4]Basement walls shall not be considered as a story in determining footing widths.
[5]Actual thickness is shown for flat walls while nominal thickness is given for waffle- and screen-grid walls. Refer to Section 2.0 for actual waffle- and screen-grid thickness and dimensions.
[6]Applicable also for 7.5-inch (191-mm) thick or 9.5-inch (241-mm) thick flat ICF foundation wall supporting 3.5-inch (88.9-mm) thick flat ICF stories.
[7]Applicable also for 9.5-inch (241-mm) thick flat ICF foundation wall story supporting 5.5-inch (140-mm) thick flat ICF stories.

Note: BuildBlock Building Systems assumes no liability for foundation requirements. Each area of the country has different soil and seismic conditions. These charts are for reference only.

About Step Footings

One of the outstanding features of a BuildBlock form is its completely symmetrical web design. This means two identical half-height forms are produced when the form is cut in half horizontally.

This feature is particularly useful for step footings — an elevation change at the footing level. Plan your step footings in increments of one block height (16″) or half-block height (8″). This will insure an easy transition and that your forms will line up properly. It also eliminates wasted forms.



4.3 First Course Placement

There are two methods by which to make a footing and first course connection. There are many regional applications but all will either employ a **wet set** or a **dry stack** process. See the CAD details about the method you will use. Keep in mind, all the CAD details can be constructed using either method.

Wet-Set

A wet-set is a method by which you place the first and second courses of BuildBlock ICFs into a freshly poured and properly leveled footing as a footprint or stem course. This method creates a water stop at the footing, allows for proper rebar placement through the webs and into the footing, and allows the installer to level the first course of block into the footing as opposed to leveling the footing to exacting standards. This method also (if used as a stem course) gives the job an insulated stem wall. Please note: Footing must be level to within ½″ for a proper wet-setting of forms.

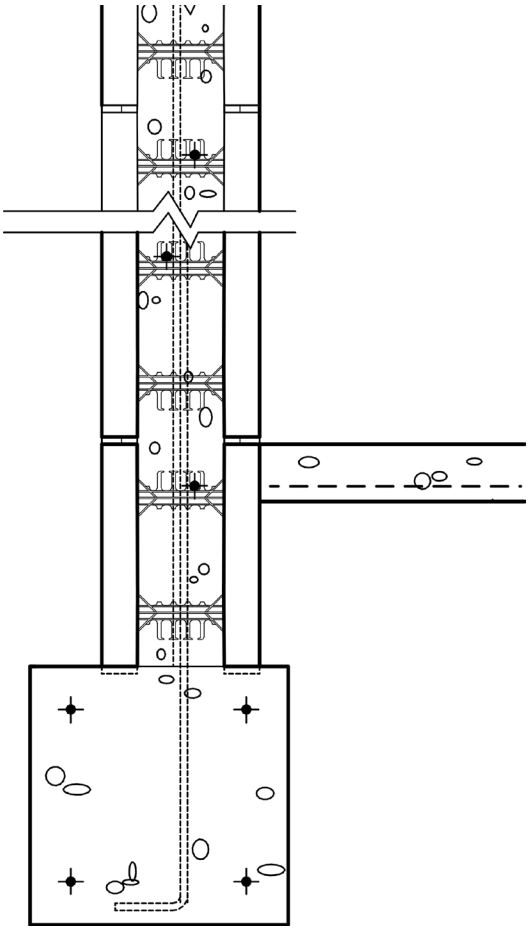
Picture on left shows a finished Wet Set: The first course is poured and ready for the slab to be poured. (See CAD Details 6, 7 and 8.)

Dry-Set or “Glue Down”

The dry set method relies on a finished footing or slab that is level, clean, and has the rebar placed properly. Most ICF professionals use foam adhesive to secure the blocks to the surface. It works well and will hold the base of your block in place, but for an extra edge try securing a 2x4 to the outer base of the block for extra support or a guide. This method does not come with the sense of urgency a wet-set might encounter and can be leveled as you go with shims. Many builders choose to find the highest point of the footing and work with shims to level the blocks: This eliminates having to shave the blocks. (See CAD Detail 20.)

About Stem Reinforcing Rebar

BuildBlock strongly recommends the use of **local structural engineers** and the **Prescriptive Method for Insulating Concrete Forms Vol. II** for reinforcing guidelines attributed to your local codes and project particular specifications. The first and last course of your wall must have horizontal rebar placement as per recommendations set forth by those guidelines and specified by local codes. As you place your horizontal steel, do so in a staggered, inside to outside manner, so a space will be available for your vertical rebar to thread through downwards. This will allow you to install the vertical rebar after the wall is stacked. The time savings in tying steel is considerable. **Note:** Check with your local inspector or engineer to be sure this procedure is allowed or recommended. Some installations or engineering may require all horizontal steel to be placed to the outside or inside portion of the wall.



Having your steel pre-bent and ready to stab into the footing is helpful. Layout the steel around the perimeter along with the block so you can “grab and stab” as you place the block. The picture to the left shows a wet-set stem with the rebar placed just like the drawing on the next page. If you are not doing a wet set, you will have to align and properly place the steel coming out of the footing so that it lines up properly within the blocks. (See next page.)

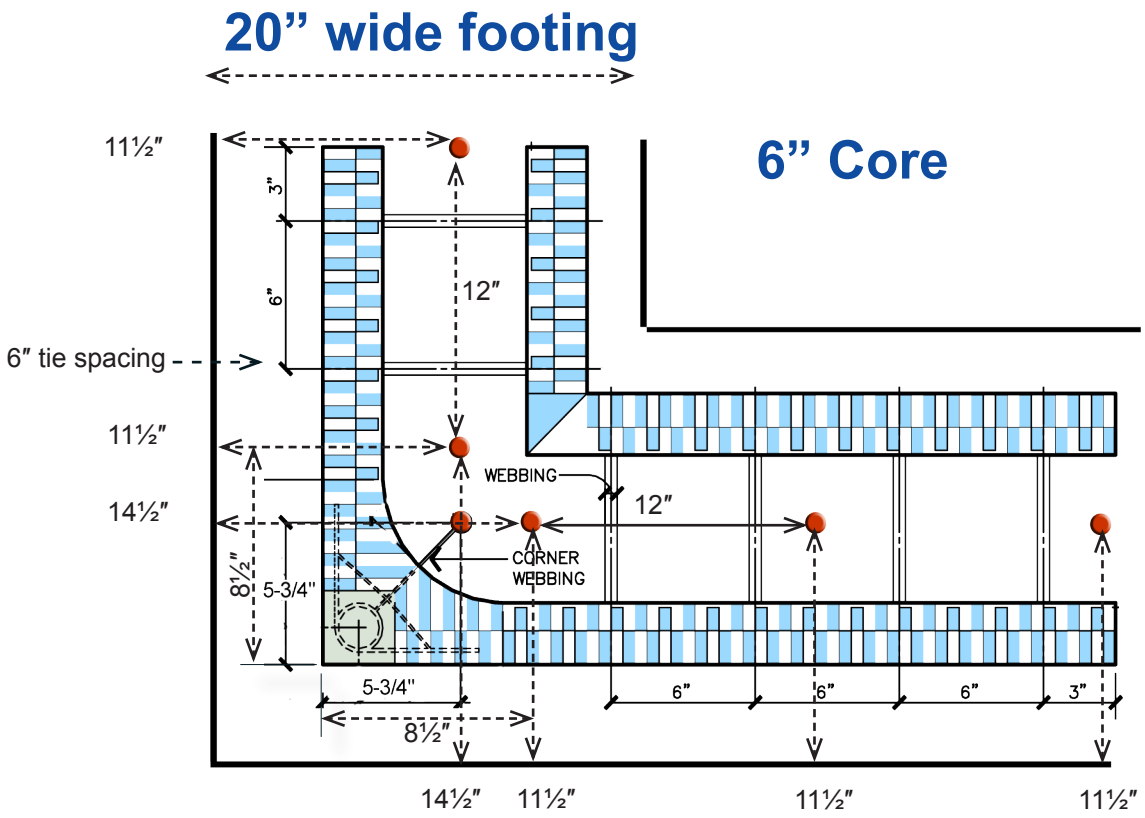
TIP:

If applicable in your area, you can cut **1¼″ PVC pipe** into 1″ height rings and place them over your stem rebar before you stack the walls. This is a neat trick for holding your vertical rebar in place at the base of the wall. Please check with local inspectors first. Some will not allow this method.

Rebar Footing Pin Placement

In the example below, the footing is 20″ wide and the rebar is placed on 12″ OC. The brick ledge is 6″ to the outside of the block. (Note: The two corner pin placements are crucial to a good layout.)

For center of block pins, the measurement is 11½″ from outer edge of footing or 8½″ from edge of block or wall.
For the two corner pins, the measurement is 14½″ one direction and 11½″ the other direction for each pin.
For the corner web steel, the measurement is 11¾″ both ways.
If using 8” block, adjust measurements accordingly.



Note: The use of two corner pins is not required but helps in setting the rebar into the proper position when the block is not wet-set. If using outer corner pins for the stem only, you can eliminate them in the upper walls and use the corner web placement point only.

4.4 Pouring Footings

When your footings are dug and you place and tie your rebar, you are ready for a footing inspection *(if applicable)* and a call to your local concrete provider. Here are some things to keep in mind during this phase:

- Your footings need to be accessible by a concrete truck. If not, you may have to get a trailer pump to fill the footing. (In which case you'll have to order your mud as a pump mix.)
- Don't wet your mud too much, it weakens the mix considerably — a bad thing for structural concrete!
- When you pour your footings, use a jitterbug if wet-setting or a screed to level the footing.
- To set concrete pour height to level install #3 rebar pins every 3 to 4 feet with level to your pour height. Pour and level concrete to these pins.

4.5 Wet-Set Prep

1. Plan ahead to have plenty of help on hand for the pouring.
2. Reset your string or laser lines for outer wall width. Set your height to 15½″ above the footing.
3. Pre-build some large corners by gluing a straight to the short side of a corner and distribute them to all corners of the job.
4. Try using a block on top of the two you glue together to hold it in place while it dries, therefore eliminating strapping or the use of bungee cords to hold these together. Don't allow glue near these connections or you won't get them apart.
5. If you have long runs, glue two blocks together to make larger sections to set at once. Distribute around perimeter.
6. Distribute your rebar dowels around the site so you can access them easily.
7. Make sure you have concrete trucks spaced with enough time so you can set blocks as you go. Otherwise the concrete will set up and you will not be able to wet set blocks or stab the steel rebar pins. The temperature will affect set times greatly.
8. Two or more people need to be available to pour and level concrete while two people set blocks behind them.

Wet-Set — Step by Step

1. Set up all string lines per plans to wall first course top outside edge. String height should be 15½″ to 16″ above finished footing or slab height. This allows the first course to be set ½″ to 1″ into wet concrete. (Adjust string height according to concrete mix design and/or slump. Larger aggregate size and particular mix designs may be harder to push the block into for setting.)
2. Start at any corner pouring concrete and setting block. Work down a wall side to a window or door opening. Work from the other corner of this wall back to the window or door opening.
3. Where the walls meet, you will have irregular cuts. Try to line them up in door and window openings if you can.
4. Re-check previously set block for movement from wind and such as you go.
5. Stab the dowels to your established specifications (12″ OC - 18″ OC, etc.).
6. Stab your dowels to the base of the footing and then pull them up 2″ from the bottom of the footing.
7. After your wet-set has hardened, you are ready to establish your door opening thresholds if using a slab on grade application. Find your openings and remove 3½″ of both sides of the foam. Try to keep the web cross throughs. Keep in mind when you cut rough openings you will need to make the opening large enough to accommodate not only the window or door but the bucking materials and jams if required. Use the foam you removed to bulkhead the opening you cut out.
8. It is vital to protect the tops of your new stem from concrete spills. (See TIP on the next page.)
9. When you feel the wet-set stem blocks have had time to dry (sometimes the same day but usually the next), use a small trailer pump and fill the stem with a ⅜ chip mix 3000 PSI or greater concrete mix (see Section 10.2 for concrete design mix). When pouring leave slightly rough and leave stem slightly less than full. This helps avoid getting concrete in the connections which would make block stacking impossible.
10. Screw a 2x6 to the outside of the door openings you have made and level with the top of the stem, so when the slab guys come they will pour over your block cut out to the 2x6 to create a concrete threshold for all door openings.
11. Now you're ready for the plumbers, heat and air, and slab.
12. If applicable, now place the 1¼″ x 1″ PVC rings you cut (see page 20).
13. If you are making a crawl space stem wall, follow above procedures with exception to string line height. Adjust to desired height and figure your block heights along with the ability to use half blocks to build to designed height. Make your vertical steel come to within 1½″ of the top of the form, unless you are taking the wall up from the crawl stem, then 2′ above height for upper wall overlap. Don't forget to place Simpson ties or anchor bolts for rim joist banding specified by your structural engineer before your pour, if required.
14. Consider using a termite shield if you are in a high risk zone. Flashing mounted inside the void, over the inner foam, down from the top, lipping out under your rim joist will work all though there are other options becoming available for ICFs.

For more complete wet-set instructions see the Technical section of our website.

When to Set Up Braces

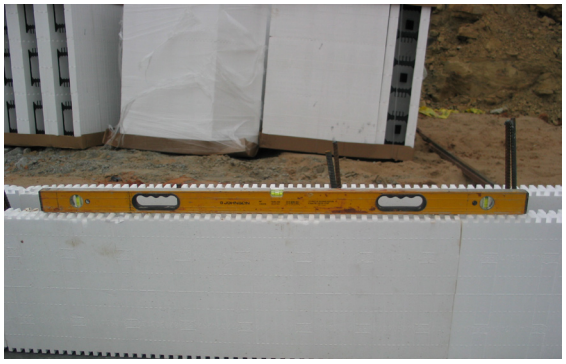
Set up your braces inside or outside the structure on 4 to 7 ft. spacing after the second or third course is placed. All though BuildBlock corners are designed larger to help keep them from moving, it's always a good practice to secure your corners with bracing each way from the outside to maintain plumb. See details about bracing in Section 9 of this manual.

Wet-Set Tips

- Pour footing in sections: This prevents your footing concrete from setting up prior to stem block placement.
- Start at corners and work inward on all walls.
- Set your block to the string line and check for plumb and level using a bullet level.
- Make sure you have the correct slump concrete. When pouring your foundations, a **slump of 6″ to 8″** is not so dry as to set up rapidly or be difficult to work. It also is not so wet that the forms have a tendency to float up.
- If you run into trouble – **don't panic!** Wet-set as much of the project as possible, then finish off your footers and dry set the remainder. If you do this, remember to **make sure you set rebar pins before the concrete dries.**
- Have on hand one or two packages of **Fritz-Pak FR-1**, a powder concrete retarder. Tossing one in a truck can help buy time if your foundation concrete is getting hot. This is a much better option to make concrete workable than watering it down. Remember – the more water you add, *the weaker your concrete becomes.*
- An inexpensive ways to protect the top of your block from other contractors and concrete spills is **ULINE Industrial Tape S-1850**, 3″ durable tape. (Call 1-800-958-5463 for details.) Or, try a 2½″ wide C-channel to protect the connections – a great tool to screed to as well when pouring a slab on grade.

Somebody is gonna pay for this! *And it will be* ***you****, in terms of time, with a small tool trying to clean the dry concrete out of these knobbies so you can stack your wall! ARRGGG!!! Be sure to leave concrete slightly rough and an inch or two below the connections and protect the top of your block. (Note: This type of construction is used for slab on grade applications in conjunction with a stem wall.)*

4.6 Dry-Set Step By Step



For a dry stack to be effective, you will need to place your connective rebar in the footing properly so it is in the **center of the block void** and it **is not in the way of the 6″ OC webs** in the block when you set it.

The dry-set procedure begins with a clean, debris-free footing or slab. You will free stack two or three courses of block before gluing anything.

1. Snap outside wall lines on the slab or footing. Make sure your layout is square and correct. You may also snap inside lines once outside lines are placed. This helps since most people work from the inside of the structure.
2. Start your first course in a corner, going around the entire perimeter, keeping all corners pointing in the same direction.
3. Try to keep your blocks on your chalk line.
4. Keep in mind you don't want any cut blocks next to a corner if possible.
5. Each wall will most likely have a cut block. Locate the cut under a window or in a door opening. (Note: You will be removing blocks that are in an opening area after we finish these steps. This process will reduce your install time dramatically and you can reuse the cut pieces later.) If no opening is available, try to place the cut block at least 4 to 6 feet from a corner if possible.
6. Note: It is very helpful at this time to know that if a wall does not fit perfectly in length to your chalk line, minor adjustments to wall lengths are acceptable and will greatly facilitate the stacking process. This step will allow you to use the standard grid pattern in the BuildBlock forms, eliminating cuts that do not match the factory 1″ cut lines in the face of the form. If this is not acceptable, any cut blocks will have to be cut between factory lines giving you a "bastard connection" that will continue vertically with every other course thereafter. Because the corner blocks are reversed for each course, your cuts on these connections will be offset 12″ between courses. It is important to note that EPS blocks continue to shrink a small amount over the first six months from the date of manufacture. The above method will help solve length and size issues. Make sure your rebar pins work out within the walls. Otherwise they will have to be moved. This should never happen. Double-check everything.
7. Stack your second course, reversing all corners in the opposite direction from the first course. This will create a one foot stagger on all blocks. This second course locks the blocks together. At this time you can stack a third course or proceed to the next step. Note: If you have windows that are low in the wall, you may want to stop at two courses.
8. Now is the time to attach the two or three course stem or wall to your chalk line, leveling and checking for plumb as you go. (Note: Make sure your rebar pins do not interfere with the placement of your forms. Otherwise some pins may have to be moved and replaced.)
9. Using a level or laser level, level the entire stem to the same height. Use wood shims and foam adhesive to perform this step.
10. It is important to make these courses level as it will haunt you throughout the stacking process if not taken care of here.
11. Remove the forms in the door and window openings at this time. You are ready to install door and win bucks (see Section 8 of this manual) and continue the stacking process.

Dry-Set Tips

- By setting your first course of block at the high point of the slab or footing, you will be able to shim the low sides to make the block even and level — a crucial step to insure a quality finished job. Note: Few slabs or footings are perfectly level in the real world. It's a lot easier to shim a few blocks than to cut the bottoms off.
- Establish your door and window openings with center line markings on the slab or footing. This will allow you to know where to place blocks or rebar. You don't want rebar sticking up through a door opening.
- Pay attention to the details of the rough openings that are provided by your door and window manufacturers, keeping in mind the type of bucking materials and method you decide to use.
- Layout your blocks with the intention to set two courses high, around the perimeter of your structure. Having a man prepare your bucks at this time is an expeditious use of manpower while other team members set the block.
- Stagger and set your blocks loose or apply adhesive only to the outer edge of the block to establish a hinge effect for easy movement with no gluing until you get two courses fit and level. An excellent method is to stack two courses locked together before gluing to the slab. This will allow you to adjust wall lengths a little if necessary to stay in factory cut lines. This will eliminate any non-standard cuts or minor block shrinkage and everything will stack out much faster. Note: All ICFs will shrink some with time. Blocks will vary in a very small amount in length and width over time.

When to Set Up Braces

Set up your braces inside or outside the structure on 4 to 7 foot spacing after the second course. All though BuildBlock corners are designed larger to help keep them from moving, it's always a good practice to secure your corners with bracing each way from the outside to maintain plumb. See details about bracing in Section 9 of this manual.

Above-Grade Wall Placement

5.1 Placing BuildBlock Walls

We will begin on the slab for this section. If you did a wet set, you can still benefit from the sequence of events that follows. Assuming you have set your first course (or two-course stack), you are ready to begin building the walls.

- Look at the face of the form. It has a built-in rule and cut markings both vertically and horizontally. The vertical cut lines are on 1″ centers and allow proper 1″ repeat pattern with the top and bottom connections. A center line horizontal mark and corresponding marks are on 2″ centers. BuildBlock was designed to help you stack and cut faster and more accurately without having to use a tape measure with every cut.
- Begin once again in the corners staggering or reversing the corners each time you stack in order to create a staggered stack. Work toward the middle of each wall. Pay close attention that your ties line up in each stack to avoid having to search for studs when you get to the sheetrocking stage. Unless you cut a corner block in length, all webs should line up automatically.
- BuildBlock forms are set up on 1″ grids, meaning the connectivity on the tops and bottoms of the form repeat the pattern every 1″ instead of every 2″, 4″, 6″ or 12″ like other ICF products. This feature minimizes waste, so take advantage of this unique design when building your walls. Small cut-offs can be used throughout your walls. Any piece with two webs is safe to use. In special places, even pieces with one web can be utilized with proper care. These are best used in the next to last course between concrete pours. This allows a secure connection to the top and bottom of short pieces. Try to space these throughout the walls away from corners and openings or lentils.
- Each course between corners will have a cut block somewhere in the wall. Try to place this cut in a window or door area. The cut should happen in each course as you build the wall up. These cut faces may need to be braced if the foam distance to an existing web is over 3″. Mark all cuts for bracing or gluing when installed. Later you can foam the cut edges to replace the bracing in most cases. (See ample outer bracing photo in Section 9.4.
- Check that you're level, plumb and square as you go, remembering to stagger the corners and the blocks, like brick masons stack brick. BuildBlock does not recommend the use of foam adhesive to glue the blocks on top of one another except possibly in the last one or two courses. Drying adhesive may cause the blocks to rise or not fit together properly, so use glue sparingly. Because the tolerances in the forms are so precise they do not allow much room for expansive foam. The blocks hold together by themselves. Believe us, or better yet try it for yourself. Then spend the money you saved on something else. This can amount to well over $100.00 or more per small job.
- The last course can be tacked down to avoid lifting up. Make sure you *only spot tack* it.
- Place your horizontal rebar with a 2′ overlap in the rebar holders built in to the ties. We recommend alternating the horizontal rebar slightly inside on one course and to the outside on the next. This allows a center gap for your vertical rebar to be placed after your walls have been stacked. Take care the rebar does not touch the foam. Concrete should be able to fully surround rebar in order for it to pass code and perform properly.
- When stacking, should you encounter a gap it should not be larger than ¼″. If it is, scab it with wood across the gap into the corresponding block ties on both sides and fill the gap with foam.

Placing BuildBlock Walls, Cont.

- When you reach an opening buck, cut the forms with a hand saw for a good fit. BuildBlock recommends that all cut blocks that stack into the side of a buck be 1/4″ shorter than the actual size to allow for settlement and the ability to square the buck. Take care in these areas. Forms cut too tight can cause openings that won't adjust and bulge. Openings too loose may increase the risk of a blowout. Don't forget your rebar lintels above the opening and on the sides or the support rebar required by your engineer. It's no fun to have to go back to fix things like this later!

- When you get to the top of your wall, you can do one of three things to help keep the top of the wall straight. (Please note that if your vertical bracing is spaced closer, you may not need to use the items below to straighten the top of your walls.)
    1. You can install wood along the top on both sides strapping them together as you go with short strips of wood to form a ladder-looking brace to keep the wall straight.
    2. You can install a rigid wire truss type system in the top course but you have to include it in your budget. These products are available from concrete block suppliers. Match truss size to form size used.
    3. You can use a medium gauge 2x2 or 3x3 one-eighth inch thick angle iron on both sides of the form. This makes a great screed stop. Using a clip over the top will hold them in place and keep your wall top straight. All of these methods work well.

1

2

3

BRACING NOTE:

Set up your bracing inside or outside the structure on 4 to 7 foot spacing after the second course. See Section 9 of this manual for details.

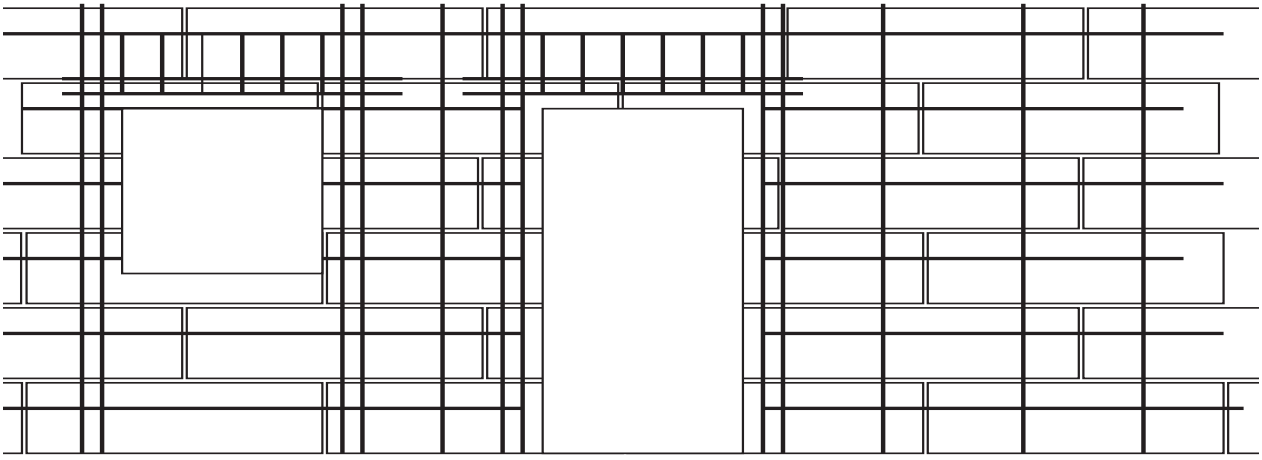
Rebar Reinforcing

All ICF form systems require rebar for reinforcement. Rebar is placed both horizontally and vertically in the forms as you stack the walls to form a grid, strengthening the wall system. All openings require that you build a lintel of rebar over it to dissipate span loads in the bearing areas of the walls. Every ICF project is subject to and will benefit from a structural engineer's specifications or the consultation of the book ***Prescriptive Method for Insulating Concrete Forms in Residential Construction (Second Edition)*** or both. BuildBlock urges you to take proper steps regarding your rebar selections and placement. Here is a brief on rebar placement:

Stagger horizontal rebar

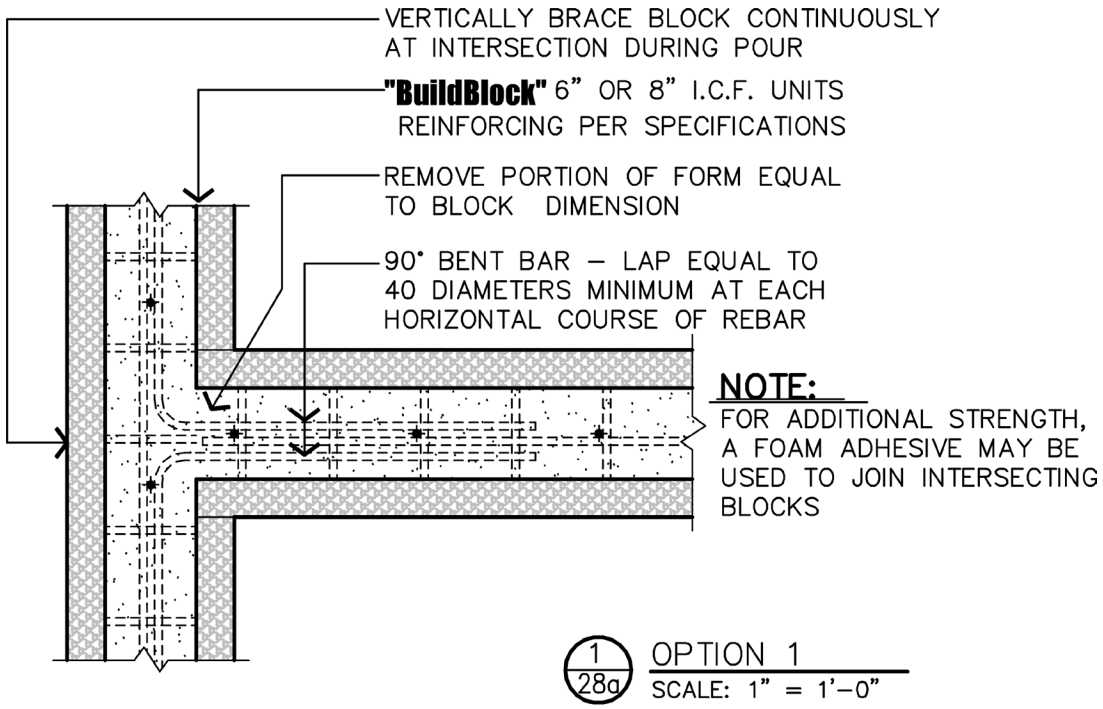
- Rebar starts at the footing level with rebar coming up from the footing and into the wall void. This step keeps the base of the wall in place and ties the two systems – footings and walls – together.
- Place horizontal rebar by slightly staggering it in each course to the inside then outside of the wall.
- All rebar must overlap — in most cases 36 to 48 times the diameter of the bar, but consult your structural engineer on this. Example: 36 times ½″ rebar is an 18″ overlap on your steel.
- Place your lintel rebar as you build up and over openings. Consult the lintel chart. We recommend all lintel horizontal bars extend 14″ to 18″ past each side of the window or door opening.
- Vertical bars can be pre-cut and ready to stab once you have built your walls to top plate height. Make them 1½″ shorter than the wall in which you place them. Many installers have vertical rebar for each floor pre-cut to height so no cutting is required.
- Remember that PVC ring you slipped over the piece of rebar coming from the footing on the stem? Stab your vertical bars into the PVC ring to hold in place and tie the bar to the top horizontal bar. Some installers believe the PVC ring is unnecessary. We believe it's best to hold verticals in between the webs so we recommend it. Make sure the ring is no taller than ½″ to ¾″ so concrete fills the ring fully. We use 1¼″ or larger PVC pipe to cut rings.

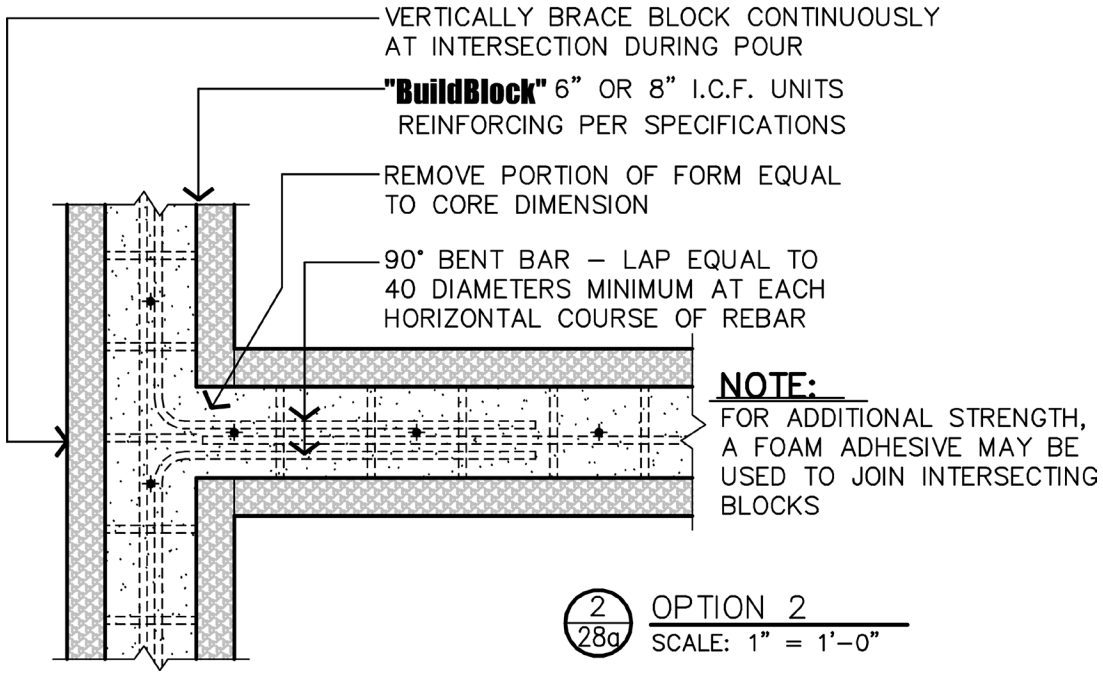
The picture below is an example of how rebar might look placed in an ICF wall. ***WHAT TO SEE:*** *Horizontal rebar in each course; Lintels over openings; Extra verticals near openings; Vertical steel.* ***Note:*** *Two bars of rebar are recommended on each side of a window or door opening.*



Intersecting Walls

When you need to build T-wall intersections, follow the detail below for options regarding how they can be built. Don't forget to back brace the intersection. Use a full height 2x4 T (made out of two 2x4s in T fashion). Screw the flat portion to the back of the wall opposite the block T. Brace the bottom and two-thirds height positions to a secure point in the ground. Please note that the T cut may be anywhere in the form. These are just examples. Failure to brace this area properly could result in a bulged area on the back side of T.



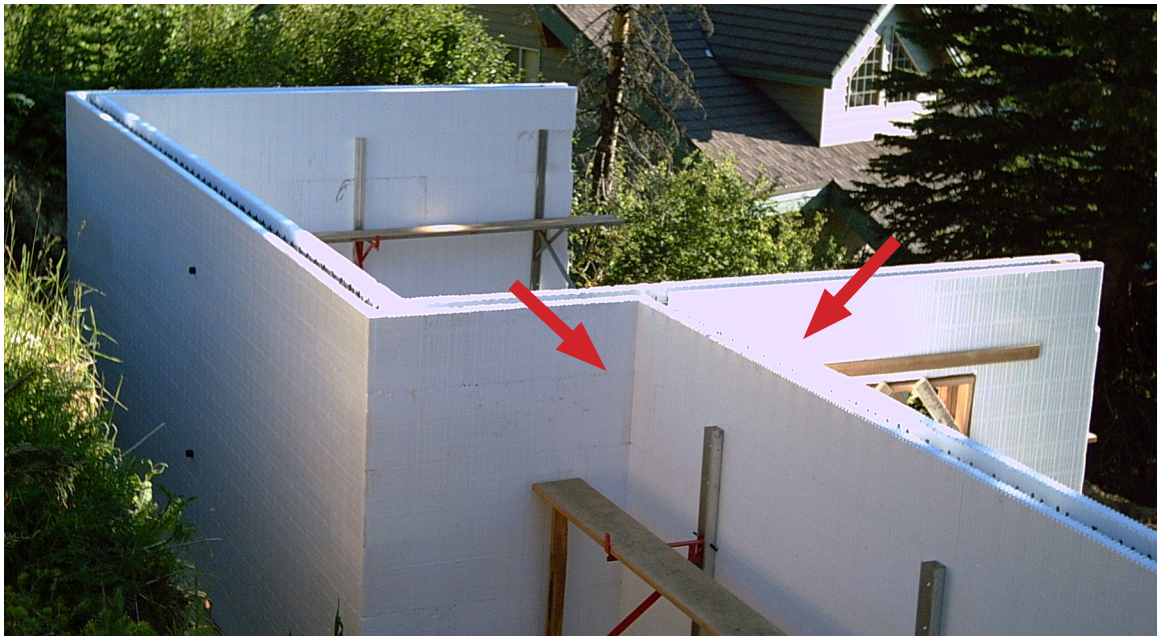


Pictured above: CAD Detail #28a

Intersecting Walls, cont.

Pay attention to the rebar placement tie in. You can use **pre-bent 90º rebar** to flow into the T from the walls.

Applying bracing described in the diagram is crucial to a successful T pour. See photo below of a T wall prior to being poured. Also, some contractors will use braces on either side of the T (indicated by arrows) before a pour for extra support.



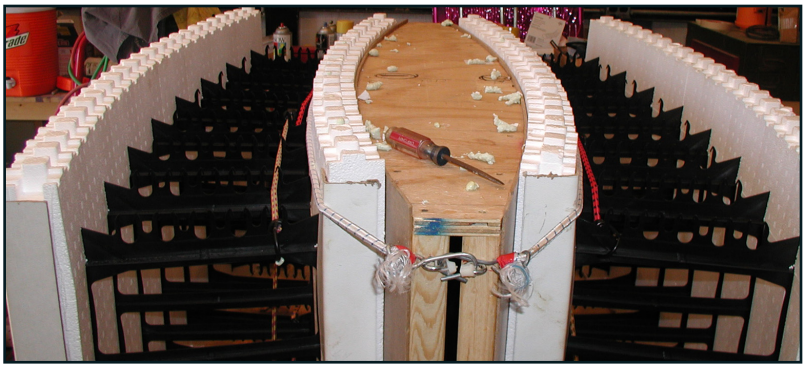
Radius Walls

BuildBlock forms can be cut to form radius walls of any degree. There are numerous methods for handling a form once cut to the particular radius. We will go through the most expedient method.

Once you have determined the radius from your plans, look at the radius chart for the proper material removal and make a jig to hold your form in the radius position. A jig is the fastest way to glue together lots of forms.

WHAT TO SEE:

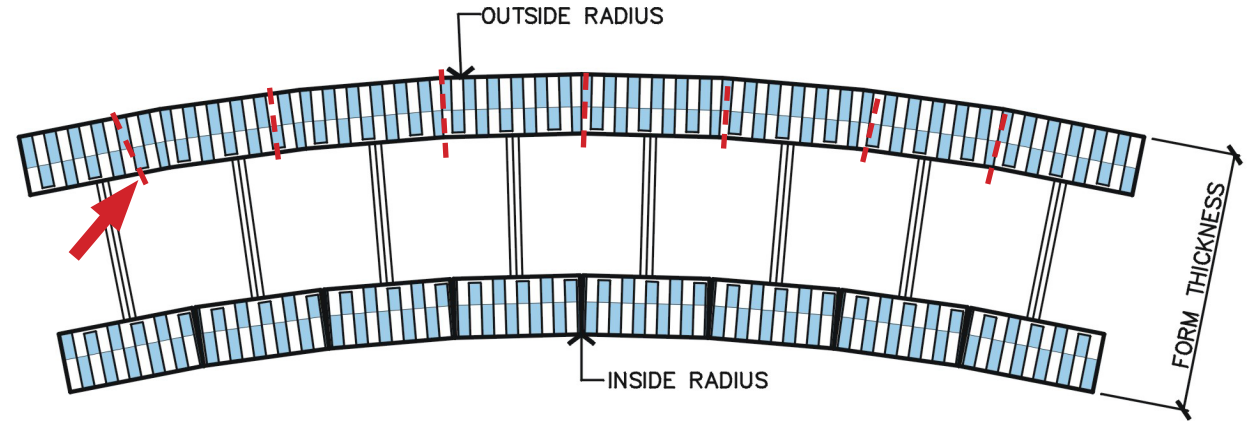
- Radius jig holding blocks together while being glued with adhesive foam.
- Basement radius wall with intersecting straight T walls and angled T walls.
- Wood ladder strapping on the top of the wall.
- Vertical rebar placed extending up through the wall for another level to be poured later.*
- Wood bracing
- Pre-built supply of radius forms in wait to be stacked.
- All internal bracing due to terrain.
- Spiral staircase supports being placed as the walls are poured.



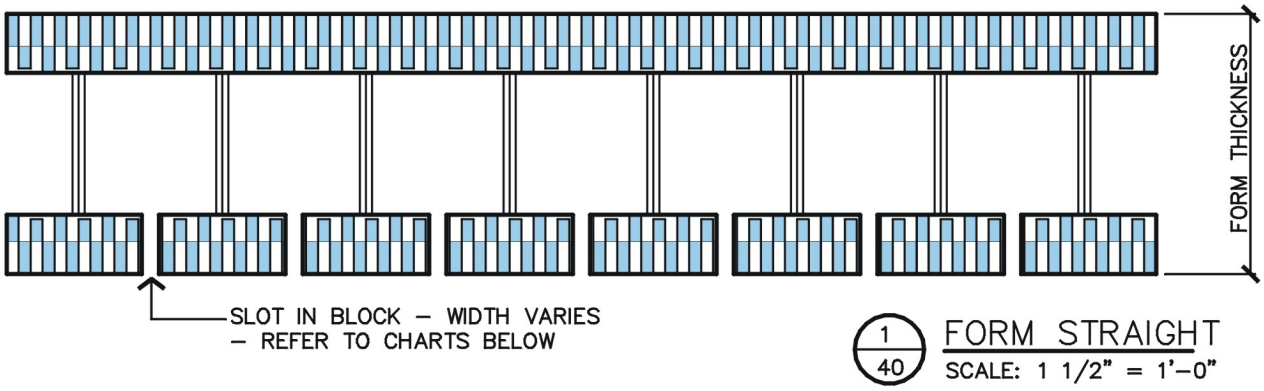
*Some professionals do not extend the vertical steel above the wall in order to eliminate it being in the way during the pour. Instead, they use 3′ or 4′ dowels placed immediately after pouring the wall for tying the second floor to the first floor. This takes extra steel but may be helpful.

Radius Wall Chart

Relief cuts (indicated by dashed lines and arrow below) are sometimes placed in the inside radius foam in the corresponding cells to allow for very tight radiuses. (Not required in most cases.) **Below:** CAD Detail 40.



2/40 FORM CURVED
SCALE: 1 1/2" = 1'–0"



1/40 FORM STRAIGHT
SCALE: 1 1/2" = 1'–0"

WALL INSIDE RADIUS	SLOTS SPACED AT 6" O.C.			
	4" STRAIGHT FORM (FUTURE)	6" STRAIGHT FORM	8" STRAIGHT FORM	10" STRAIGHT FORM (FUTURE)
2 FEET	1 1/2"	1 3/4"	2"	2 3/16"
3 FEET	1 1/16"	1 5/16"	1 1/2"	1 11/16"
4 FEET	13/16"	1"	1 3/16"	1 5/16
5 FEET	11/16"	13/16"	1"	1 1/8"
6 FEET	9/16"	11/16"	13/16"	15/16"
7 FEET	1/2"	5/8"	3/4"	7/8"
8 FEET	7/16"	9/16"	5/8"	3/4"
9 FEET	3/8"	1/2"	9/16"	11/16"
10 FEET	3/8"	7/16"	9/16"	5/8"
15 FEET	1/4"	5/16"	3/8"	7/16"
20 FEET	3/16"	1/4"	1/4"	5/16"
25 FEET	1/8"	3/16"	1/4"	1/4"
30 FEET	1/8"	3/16"	3/16"	1/4"
40 FEET	1/8"	1/8"	1/8"	3/16"
50 FEET	1/16"	1/8"	1/8"	1/8"
60 FEET	1/16"	1/16"	1/8"	1/8"
70 FEET	1/16"	1/16"	1/16"	1/8"
80 FEET	1/16"	1/16"	1/16"	1/16"
90 FEET	1/16"	1/16"	1/16"	1/16"
100 FEET	1/16"	1/16"	1/16"	1/16"

WALL INSIDE RADIUS	SLOTS SPACED AT 12" O.C.			
	4" STRAIGHT FORM (FUTURE)	6" STRAIGHT FORM	8" STRAIGHT FORM	10" STRAIGHT FORM (FUTURE)
2 FEET	3"	3 1/2"	4"	4 3/8"
3 FEET	2 3/16"	2 9/16"	3"	3 5/16"
4 FEET	1 11/16"	2 1/16"	2 3/8"	2 11/16"
5 FEET	1 3/8"	1 11/16"	2"	2 1/4"
6 FEET	1 3/16"	1 7/16"	1 11/16"	1 15/16"
7 FEET	1"	1 1/4"	1 1/2"	1 11/16"
8 FEET	7/8"	1 1/8"	1 5/16"	1 1/2"
9 FEET	13/16"	1"	1 3/16"	1 3/8"
10 FEET	3/4"	7/8"	1 1/16"	1 1/4"
15 FEET	1/2"	5/8"	3/4"	7/8"
20 FEET	3/8"	1/2"	9/16"	5/8"
25 FEET	5/16"	3/8"	7/16"	1/2"
30 FEET	1/4"	5/16"	3/8"	7/16"
40 FEET	3/16"	1/4"	5/16"	5/16"
50 FEET	1/8"	3/16"	1/4"	1/4"
60 FEET	1/8"	3/16"	3/16"	1/4"
70 FEET	1/8"	1/8"	3/16"	3/16"
80 FEET	1/8"	1/8"	1/8"	3/16"
90 FEET	1/16"	1/8"	1/8"	1/8"
100 FEET	1/16"	1/8"	1/8"	1/8"

5.2 Second Story Walls And Up...

Most ICF jobs that are taller than one story take advantage of the floor being placed before the second story wall is built. Some builders prefer to build tall walls and pour them in up to 12′ to 16′ stages.

One course of block is above the plate height; pour for a course that is clear of ICFLC brackets. It's easier to pour and you already have a foot or more of your next story wall in place.

Wall height is 14′ 8″.

Vertical rebar is 2′ or more above the first pour to create a connectivity overlap for the 2nd story walls.

The ICFLC joist hanging brackets are set for a 12′ plate height on 4′ OC. This is the wall in conjunction with the joist side loading. The bearing wall joist hangers were run at 2′ OC.*

Kicker braces were added to the top of the wall for the extra height.

Openings braced for pour.

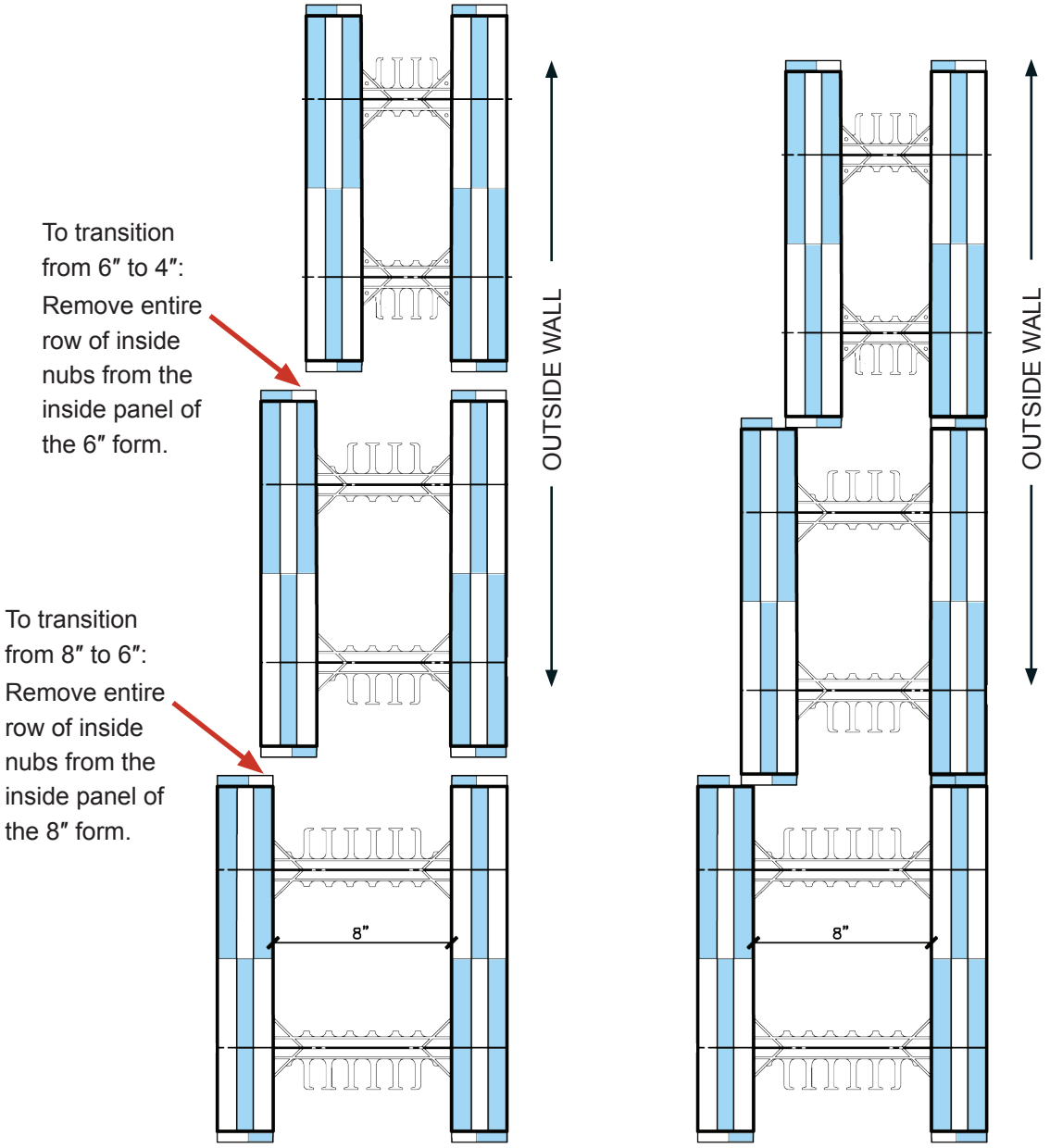
*For proper spacing of wall joist hangers, refer to Simpson engineering on CAD Details 15 through 15e.

Everything works the same on the 2nd story except your materials are usually on the ground: Get a sky lift and save your back! **Photo Below:** This partial 2nd story has lots of openings, steps in height, bulkheads for what will be a stick frame attic and bracing to the inside.

Transitioning from 6″ Forms to 4″ Forms or 8″ Forms to 6″ Forms

There are times when you must transition between block sizes, such as when building a house with 6″ walls on top of a basement with 8″ walls or a 6″ second story on top of an 8″ first story.

When stacking 4″ forms on top of 6″ forms, you must remove the **inside nubs** of the **inside panel** of the 6″ forms to create a level connection. Likewise, when stacking 6″ forms on top of 8″ forms, you must remove the **inside nubs** of the **inside panel** of the 8″ forms. (See diagram below.) Simply break off the nubs or saw them off using a key hole saw.



4″, 6″ & 8″ forms prior to removing indicated nubs and connecting.

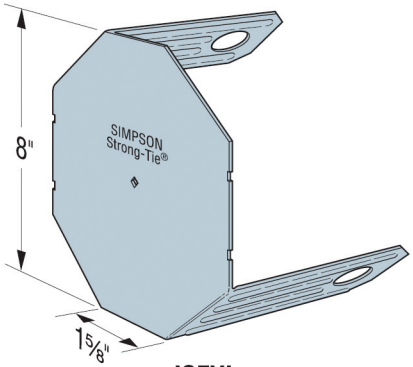
4″ form connected to 6″ form
6″ form connected to 8″ form
after removing indicated nubs.

2nd Floor / Joist Hanger Options

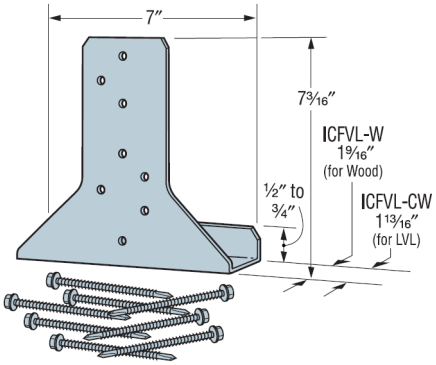
BuildBlock recommends the **Simpson Strong Tie ICF joist hanging system** for rim joist/joist hanging applications. Each system requires structural engineering to comply with manufacturers specifications. There are several other methods as well:

- BuildBlock Brick ledge form turned to the inside creating a truss ledge.
- Anchor bolts placed in 2x12 ledger boards, holes cut in the walls, ledger board attaches to the wall with the bolts entering the holes (on 12″ OC or some engineered spacing). Ledger board bucks cover the holes. See CAD Detail #14.
- Steel truss weld plates and steel floor/roof trusses **(A)**
- Wood frame on top of ICF wall. (See CAD Details 21-23.)
- LiteDeck/Insul-Deck Concrete Floor/Roof

For detailed information regarding the installation of Simpson ICFVL, ICFVL-W, and ICFVL-CW, see BuildBlock CAD Details #15 - 15e.



ICFVL



ICFVL-W and ICFVL-CW

Beam Pockets

In the event you need to create a bearing plate in a wall for a structural horizontal support beam, they are very easy to build if you follow these guidelines:

- Determine the proper placement height of bearing plate and size of the beam. Consult your engineer.
- Cut out foam and ties to accommodate beam size.
- Brace the backside of the beam pocket well with 3/4 plywood or 2x4 scabbing to support the back foam panel once the webbing is removed.
- Re-use the cut-out portions of the foam to bulkhead the sides of the pocket or make small bucking from wood to hold back the concrete on both sides of the beam pocket.
- Secure the bulkheads with adhesive foam and/or screws to prohibit movement.
- If you need a bearing or weld plate at the base you can insert it after you have poured the concrete and the pocket has set a bit but is still workable.
- Make sure the height of the beam pocket is figured correctly.

- The picture to the left shows a large I-beam pocket for support of a loft second floor.
- This beam is being prepared by the framers to accept sheetrock or a wood veneer.
- The backside of this beam pocket is an outside wall that shows no signs of placement which is as it should be.
- This steel beam used a ⅜″ to ½″ thick bearing plate, 5″ x 8″ in size with pins protruding 7″ down into the wall cavity. It was welded in place after setting. Bearing plates need to be adequate in size for the load resting on them. Please consult your engineer for sizing.

It should be noted here that beam pockets and the placement of them will coincide with other trades such as framers and truss engineering. It's best to know during the stacking phase where these beam pockets will be so you don't have to rush to make one on pour day. If you suspect by examining the plans that you may need to install a beam pocket, have a conversation with your trades and get specs and placement conversations started early.

End Walls, Bulkheads And Retaining Walls

There are times when you may experience walls that stop or “dead-end”. At these “bulkheads” it is vital to build a strong end cap capable of stopping the concrete. There are two ways to achieve bulkheads:

1. Use dimensional treated lumber, placed inside the form and secured on both sides with screws and adhesive foam.
2. Use dimensional treated lumber or other hardy material as a form placed across the outer face of the form to retain any concrete. Once this buck or bulkhead is removed, the concrete will be exposed unless it’s intended to remain in place, in which case 6″ ring shank nails should be used as anchors similarly to wood window bucks. Brace securely.

Tips:

- Brace this wall on both sides for plumb to prevent sway or movement.
- If this wall is a retaining wall, place “dead-men walls” perpendicular to your runs on an engineer prescribed spacing and reinforce for backfill as specified.

A “Dead-Man” centered on a 30′ retaining wall formed as a T-wall intersection.

Gable Walls

Option 1

One method to construct a gable end is on the floor to be installed as a **one-piece unit.**

1. Construct the gable wall, including any necessary rebar. Connect forms together with zip ties and foam adhesive. To minimize waste, be cautious when foaming outside the gable dimensions.
2. Snap a chalk line for the sloped gable cuts and make the cuts with a pruning, reciprocating or other type of saw. Screw 1x4s along the cuts on both sides of the wall.
3. Ensure that appropriate wall alignment and scaffolding system is in place for safe installation.
4. Using appropriate lifting equipment, place the sloped gable wall in place in the squared wall. Pieces of plywood can be screwed into the 1x4s during the placement to help contain the concrete.

Make sure all necessary roof attachment hardware is available prior to concrete placement, as it must be installed during or immediately following the pour.

Option 2

Another option for construction of a gable wall is to assemble the gable in place.

1. Allow blocks to run past your desired pitch angle or cut.
2. Stack all block courses stepping at each course, leaving a small amount of block to be cut off once wall is completely stacked.
3. Using a chalk line mark the line to cut the gable pitch at desired angle on both sides. Cut on chalk line for desired finished gable.
4. Brace gable with proper braces to secure.

When pouring gable, the concrete will work fine at a 5½″ to 6″ slump mix design unless gable slope is too extreme.

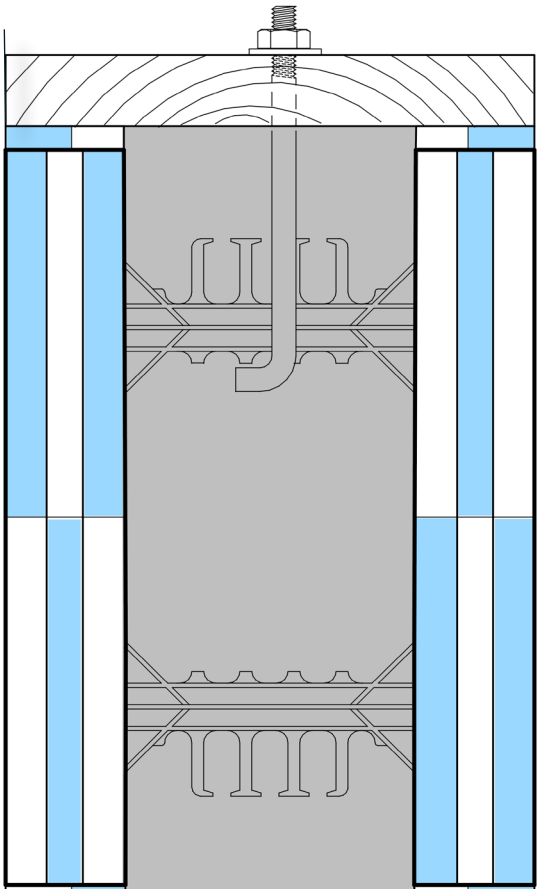
5.3 Anchor Bolts

Making the transition from a concrete wall to a wood-framed roof will require the placement of no smaller than 8″ and often 10″ anchor bolts between 2 to 4 feet apart (see anchor bolt engineering diagram). The placement can be site, code, or regionally specific, based on wind and other load requirements, so consult your local building requirements and engineers.

Tips for placing anchor bolts:

- Before the pour, determine where you will be placing anchor bolts and mark the forms near the top of the wall accordingly.
- Use **FritzPak FR1** in the pump truck when you near the top 12″ of the job to give your team of finishers and anchor bolt placers time to do their jobs. This is a common concrete retarder and will buy you an additional 30 to 45 minutes of working time to finish off your wall top.
- Have a finish man to level out and trowel the top of the wall.
- Have a man available to start anchor bolts right behind your finish man.

This picture shows a 8″ anchor bolt set in the wall 2½″ from the concrete to accept a 2x12 treated dimensional lumber top plate with 1″ bolt relief above the nut. Anchor bolts have been used in ICF form construction since day one and have many applications. (See the CAD Details 6 through 14a and 23-24 for ideas and technical placement.) The IRC 2003 code requires 7″ embedment into the concrete. Note: Make sure you leave anchor bolts extending above the concrete level at least ¾″ above your plate height for proper tightening.



You can also use anchor bolts to:

- Secure rim joists
- Place perpendicular to vertical walls to attach heavy gauge steel angle for brick ledges or other areas creating bearing support. See CAD Details 14, 29 and 35.

To form a solid concrete bearing point in the face of the wall:

- Cut a round or square hole in the wall between two webs.
- Secure anchor bolt to a piece of plywood or dimensional lumber larger than the hole.
- Secure plywood to the ICF wall with the anchor bolt inserted into the hole. The wood keeps the concrete from spilling out into the floor and you have anchor bolts in the void ready to become surrounded by concrete. These can be made to any size for major supports or attachment anchors. See CAD Details 14, 29 and 35.

Basement Wall Placement

6.1 Foundation Drainage

Foundation drainage – the ability to evacuate hydrostatic pressure and ground water up-surge – is a vital factor for a dry basement. BuildBlock recommends the use of the Form-A-Drain ("FAD") foundation drainage system pictured to the right. A plastic lineal with slits on one side is covered by a silt cloth to avoid silting in the drainage system. The system is designed to form the footing and is inter-connected with PVC pipe to create an outside/inside french drain that stays in place without wasting or using wood.

- This basement footing was specified to 18″ in depth, so the trench at the bottom of the grade was dug 10″ deeper than the 2x8 FAD lineals.
- The FAD profile used was 8″ and built on top of the trench.
- Steel was placed and the lineal braced with FAD spacer straps.
- On this job, the forms were wet-set into the wet concrete footing. Note the string-lines and the use of a form over a corner section to hold it in place as mentioned in the wet-set step-by-step instructions.
- The drain was evacuated to daylight by gravity, however the use of a sump pump would be the alternative if no daylight grade to drain was available.
- A fine gravel backfill was placed to the top of the lineal after the first course was placed. Additional gravel was placed after the wall was built and poured to the height of at least one course of block. Note: Don't forget to waterproof your wall before backfilling. See Section 6.4 for details.
- Another layer of silt cloth was placed on top of the gravel before the backfill was placed, after the walls were poured and the floor trusses were placed to help support the walls.
- **Note: Never backfill basement walls until the floor system is in place to support the tops of all walls from moving in from backfill pressure.**

The tried and true method of creating a french drain out of slotted PVC pipe is pictured above:

The system is built to the shape of the outer profile of the structure and either drained to daylight or to a sump drain.

If a sump is used, it will most likely reside inside the basement and plumbing will have to run up a wall, through the footing or under it. The french drain is often covered in silt cloth and gravel much like the FAD system.

6.2 Stacking Basement Walls

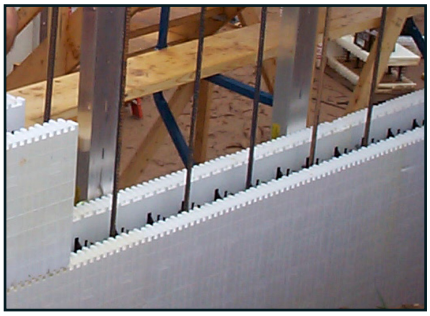
Basement walls stack the same as above-grade walls. You can wet-set or dry stack basement first course blocks The main differences are: most likely the use of an 8″ form* (as opposed to the 6″ form most often used above-grade); a more closely spaced or larger size rebar schedule to handle the backfill pressures; and less windows to build.

Follow the same guidelines for wall stacking and apply your new rebar schedule. You may stack one course taller than your basement ceiling height to envelope your floor trusses. (See second floor truss options in Section 5.2.)

*Either 6” or 8” forms may be used for basements, depending on soil conditions, backfil heights, and floor levels above the basement. It is very important to check with an engineer regarding local codes and soil conditions when determining the best size of form to use for a specific project.

WHAT TO SEE:

- Installer using a wood block and mallet to set the forms (not recommended unless necessary)
- Vertical rebar placed at the footing phase
- Braces to the inside with walk boards
- Wood banding at the top of the wall (not needed in most cases)
- Service penetrations
- Floor trusses set
- Decking started
- Waterproofing and protection mat in place
- Gravel bed over drain system



6.3 Basement Wall Brick Ledges

If you plan to have a brick or stone veneer on your above-grade walls, then you need a **bearing ledge** or **"brick ledge"** near the top of your basement walls. BuildBlock has the solution in our easy-to-use 6″ (BB-6BL) and 8″ (BB-8BL) brick ledge forms. Our brick ledge form isn't limited to basement use. Here are some other ways our brick ledge forms can be used in your projects:

- Below a pier and grade beam foundation (See CAD Detail 26.)
- An interior ledge for second story floor support (See CAD Detail 34.)
- Standard Brick Ledge (See CAD Details 16-19.)

Our brick ledge forms can be cut to make inside or outside corners. Cutting marks are located on top of all brick ledge forms to help you. (See CAD Details 41-44.)

Here are some things to take note of when building a brick ledge:

- It is vital to have this bearing ledge engineered and built with required rebar placement. Seek professional engineering for this or review our new brick ledge engineering tables on our website.
- If you need to stagger the grade of your brick ledges for a walkout or sloping finish grade backfill, you might need to employ other brick ledge forming methods along with the BB-600, BB-6BL, BB-800, or BB-8BL to achieve this. You may not be able to achieve proper backfill pressure engineering using a 6″ concrete core block. Consult the ***Prescriptive Method for Insulating Concrete Forms in Residential Construction (Second Edition)*** and your local structural engineer.

Alternative Brick Ledge Method #1

Method #1 uses a **pre-shaped metal bracket** that is attached to the wall ties at the brick ledge grade and supported by bracing in the same spacing manner. (See photo on next page.)

1. Establish the route of the brick ledge.
2. Cut 5″ concrete access holes in the outer foam at 6″ OC. Place metal bracket over holes. Place horizontal bar in trough held up by chairs or tied to stirrups. Brace securely.
3. Special rebar stirrups are placed through the holes to the void of the block and tied to brick ledge horizontal and block existing steel.
4. When the wall is poured the concrete flows out of the holes and into the steel form to create a ledge. The steel form is removed after the pour is cured. Note the waterproofing used to seal the wall from water (page 44).

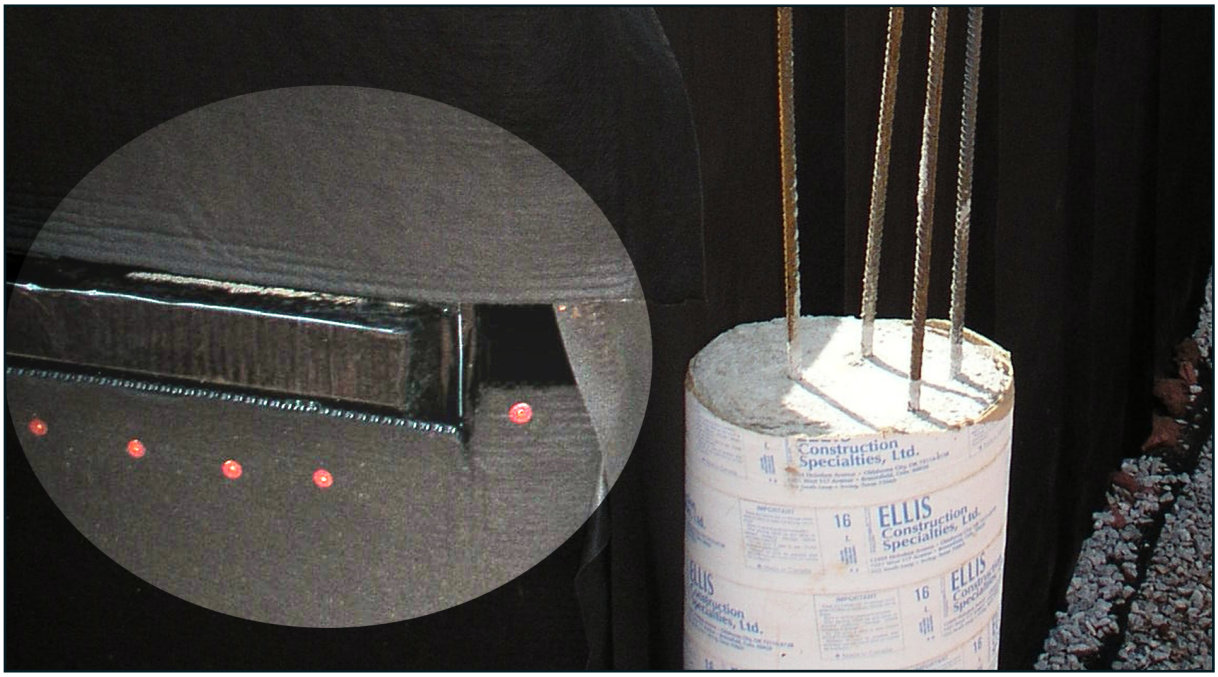
Alternative Brick Ledge Method #2

Method #2 can be formed using **plywood and brackets.**

1. Establish the route of the brick ledge.
2. Cut the access holes as indicated in method 1.
3. Brace the wooden ledge as above.
4. Place the special rebar stirrups through the holes to the void of the block and tie to existing steel. The wood forms can be removed after the ledge has cured.

Brick Ledge Photos

6" Buildblock Form Placed Over the Brick Ledge Form



Alternative #1

6.4 Basement Wall Waterproofing

There are many waterproofing systems from which to choose. Some are widely used with results you can count on and others are newer methods designed to save labor and material costs. Some of the newer spray-on membranes for ICF may have success based on the regional skills of the applicator so research your options and results before choosing one. Waterproofing options include:

- Self-adhesive 60 mil membranes with protection mat to protect membrane from backfill (ex. Tamko)
- Spray-on membranes (ICF-friendly)
- One-step mat type protection (ex. SuperSeal, DMX)

This method insures no penetration through the block below grade and is a tried and true method but is time-consuming to install.

In the picture on the right, the installer is placing a **self-adhesive membrane** (BuildBlock recommended):

1. First the block was cleaned thoroughly of debris and the yellowing of UV breakdown (if any).
2. An ICF primer was then applied to help the adhesive stick.
3. The membrane was applied to the wall starting at 1′ above backfill grade and rolled downward, overlapping 4″ and terminated 4″ or 6″ over the footing. (Use an adhesive caulk like MP1 to help the membrane stick to the concrete or seal this bottom edge.)
4. An ICF-friendly mastic was used (Hydrocide 800 B) to cover all terminations in the membrane, top and sides, on the outside of all seams.
5. A protection mat by Carlisle was attached at the top of the wall and draped over the membrane to stop backfill damage (backfill material punching or tearing holes in your membrane).

The picture to the left is the **Platon waterproofing system:**

- One step application barrier product with hangers and termination strips. (NOTE: more hangers are recommended.)
- 6″ overlap
- System creates air gap between wall and backfill to stop hydrostatic pressure.
- Peel & stick membrane around the top is not yet installed.

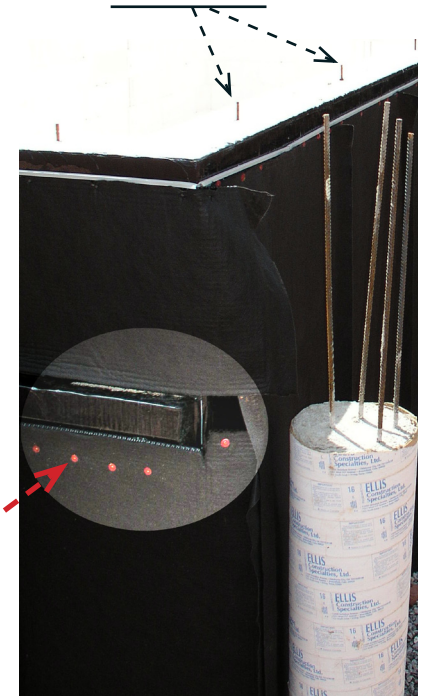
Note: BuildBlock assumes no liability on basement waterproofing. Seek your local supplier for application methods. A leaky basement means problems for years to come.

Basement Wall Waterproofing, Cont.

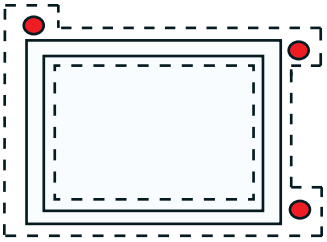
The picture below speaks loudly about waterproofing, basement walls, brick ledges, and how to prepare for natural grade footings that will tie into your basement walls.

WHAT TO SEE:

- This basement wall has been built to receive a stick frame structure on top. Note the anchor bolts.
- This project had three places in which the house's footings and stems were intersecting with the basement.
- The contractor included three piers in the basement footings.



- The elevation of the piers were built to be the height of the bottom of the footings for the house on grade above. (Note: The basement was smaller in size than the structure above.)
- The rebar in the pier was later bent into the footing trenches dug into the backfill and then encapsulated by the new footing concrete on-grade.
- The reason for this method is that an absolute bearing pier allows for no movement in backfilled soils and the basement wall will suffer no penetrations regarding tie-in steel or other attempts to tie a basement wall into a footing for a structure above. Without this method, many foundation leaks have been created.
- The walls and the steel-mold formed brick ledge were waterproofed by the 60 mil self-adhesive membrane.
- In this case, the installer placed penetrations through the mat to hold it in place under the brick ledge. This could cause water leakage into the basement cavity.
- A Carlisle protection mat with silt cloth was applied as described on the previous page except for on the brick ledge detail.
- Easy access of 4″ from the wall to the pier so the wall could be properly waterproofed.



Circles = Piers
Dash line = Footings
Solid line = ICF

6.5 Termite Protection for Below-Grade Applications

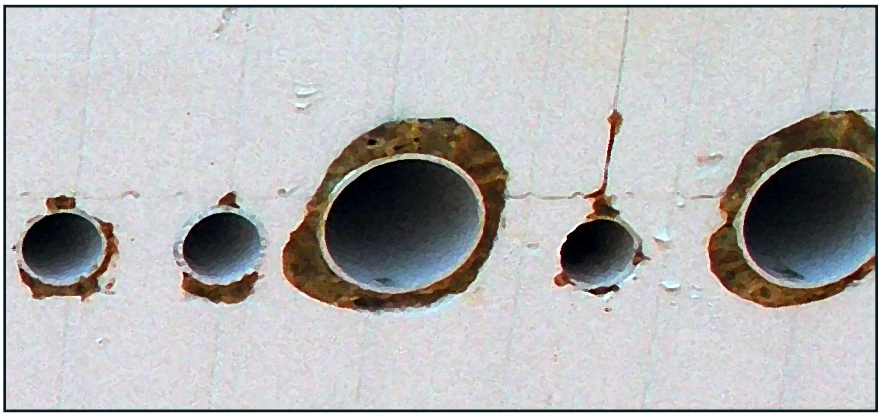
EPS is not a food source for termites, but they may burrow into unprotected foam surfaces. Below-grade use of foam insulation products like ICFs are banned in "very heavy" termite infestation regions, except when applied with "an approved method of protecting the foam plastic and structure from subterranean termites damage." It is very important that you refer **your local building codes** in regard to what constitutes "approved methods of protection" in your area, if applicable. For regions in need of such measures, BuildBlock recommends the use of **650 XTM Waterproofing Membrane with Termite Barrier Meshed Reinforcement** by **Polyguard**. Underseal is a sealant barrier which stops water, contaminants, methane, termites, and radon gas. For details, see their website at **www.polyguardproducts.com**.

7.1 Installing Utility Access

Utility access is a very important step in planning, prior to concrete placement.

Access ports may include:

- Gas
- Electric
- Plumbing
- Water
- Communications



Note: *With a little effort, perfectly round holes could have been cut to receive these pipes. Otherwise, fill the voids with spray foam. Quality speaks for itself. Also, spread sleeves apart somewhat so concrete is not obstructed by the sleeves. Proper vibrating is required around all sleeves during the pour.*

Sleeves

To accommodate services that pass through outside walls, service sleeves must be installed prior to pouring. Otherwise, you must bore through the concrete! A little planning here will save you drilling into concrete that has hardened beyond its yield strength by two-thirds or more. Access ports are easy to install by inserting a PVC pipe into the wall. Even if you are not sure if you have service in that wall or not.

- You can sawtooth-cut a wider-than-wall piece of PVC and use it to bore into the foam, OR
- Make an imprint in the foam with the PVC sleeve; then use a long keyhole saw to cut through the foam. Make another imprint, cut the other side.
- Insert the sleeve and secure with adhesive foam. Brace or scab if necessary. You can cut off any excess PVC pipe at a later time.

8.1 Window And Door Bucking Options

There are many options for bucking out an opening in a BuildBlock wall. We will address the three most popular methods: inside mounted dimensional lumber, outside mounted dimensional lumber, and the **VBUCK® Vinyl Block-Out System**.

Treated Wood

There are two ways to use treated dimensional lumber to buck a BuildBlock wall opening.

Inside Mount

- The first is referred to as an inside mount. Rip the 2x material to fit into the void of the wall. Use foam adhesive and screws with plastic cap washers inserted from the side to secure the buck.

Outside Mount

- The second method is called an outside mount. This would be utilizing the entire dimensional lumber width over the entire profile width of the block. Match or rip width of the lumber to the block width.

With both methods, it is recommended that you use 6″ galvanized ring shank nails set through the wood into the void area so the concrete can capture the nails and the bucks remain adhered to the concrete when the bracing is removed. Alternate these left and right of center every 8″ to 12″ up and down the buck.

***Note:** Always stack the **header** on top of the side legs for maximun support.*

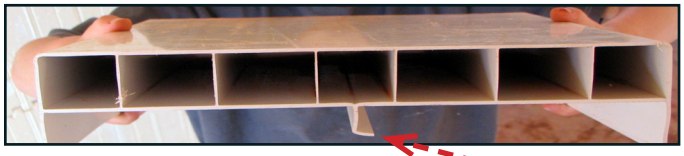
***Note: Bottom** seal must be installed inside the outside legs. Not correct in photo above.*

Window And Door Bucking Options, Cont.

VBUCK® Block-out System

Building your bucks out of **VBUCK** is the third method. Working with **VBUCK** is as easy as with wood. You will need to brace it stronger, but the end result is a great companion for your BuildBlock project. The **VBUCK** system includes the 16′ planks, outside and inside corner connectors, and corner braces such as the man in the picture is installing. (**VBUCK** corner braces are optional; plywood triangles will work.)

Note: **VBUCK** has a J-channel for receiving concrete which eliminates the need for ring shank galvanized nails and totally seats the 11″ and 13″ BuildBlock profiles for a clean, tight seal. Keep in mind the **VBUCK** profile dimensions when making rough openings and you are on track to a successful installation.



Clean and neat window and door openings.

8.2 Buck Construction

When using wood for bucks, BuildBlock recommends 2x6, 2x8, 2x10 or 2x12 treated lumber as the best choice. The outside dimension of the BuildBlock 11″ form is closest to 2x12 dimensional lumber. You can rip 2x material to fit the forms whether you place your bucks inside the foam cavity or to the outside of the blocks.

Bucks will be subject to a significant downward and side-to-side pressure. Build the bucks as you would a header in a door or window opening so the top plate rests on the sides. Openings in BuildBlock walls need to be designed with the proper reinforcement rebar on all sides and, most importantly, the top (referred to as the lintel). See our lintel engineering chart or the Prescriptive method details.

Door Buck Construction

Start by knowing the required rough in dimensions for all openings. These may be obtained from your window and door suppliers. Make sure the inside dimension is large enough to allow for your door system jambs and shimming to plumb your installation. Door bucks will usually only have three parts – two sides and a top. To keep the bottom aligned, a temporary support should be used when bucks are placed.

Window Buck Construction

Window bucks differ from doors in that they have a bottom. If using wood, you can use treated 2x4s on the bottom, spread out to the outside, allowing a space in the middle to fill under the openings with concrete. The bottom pieces need to fit inside the sides to act as a brace for concrete pressure pushing inward.

If using **VBuck**, a 4″ hole saw on 10″ centers will make ample holes for you to fill the underside of the opening in order to eliminate voids in this area. After the pour, clean the bucks when the concrete is fresh. It's much easier to do now than later, and you'll have a nice clean opening when you are finished. A clean job encourages other trades to do more quality work.

Keep your inside dimension or rough opening large enough to allow for proper window placement and shimming if necessary. It's very difficult to make an opening larger when your window doesn't fit. A little extra space goes a long way.

Note: *All bucks placed to the outside need to be angle braced like the* **VBuck** *photo on the previous to keep them square and true.*

8.3 Door Placement

- When you have your doors located and the bucks prepared, place the bucks in the walls and secure them firmly.
- If using **VBUCK**, you can use 1x4 wood screwed into a buck and back-braced to a web tie to help hold it. You can build a brace from 2x6 material, banding the inside of the buck on center on all three sides and then supporting the banding with T or cross-bracing. (BuildBlock recommends using a band no smaller than 2x6 for **VBUCK** in the center of the buck to prevent the **VBUCK** from curling inward during the pour. Not needed for wood bucks.) **VBUCK** also sells a yoke and tie system to brace bucks. BuildBlock webs have 3/16" holes pre-made into all webs to allow the use of this method. See the **VBUCK** website at **www.vbuck.com** for additional information.
- When placing the buck in the wall, allow for a ¼" gap between the forms and the back sides. This will allow for adjusting the buck prior to pouring. Once the opening is plumb and square, this gap can be filled in with spray foam.
- When using wood bucks to the outside, a 3½" strip of wood on both sides around the buck perimeter made from 1x4 or standard plywood to accommodate the forms will help stacking blocks around the buck and will secure the buck and blocks like **VBUCK** does. This is not required but very helpful. If not used your bucks will either have to be inside mounted or glued in place to the blocks before pouring. Make sure bucks are square and plumb.
- Secure your flanges with the 1x4 back bracing previously discussed. (**VBUCK** users can skip this step.)
- To insure the buck is anchored into the concrete, use 6" galvanized ring shank nails with no less than 3" into the void, preferably further.
- With wood bucks, the nail or screw anchors need to alternate left and right on the sides of the bucks every 8" the entire length of the sides and header.
- When building your walls over the openings (called lintels), consult the Prescriptive Method, your engineer's requirements, or the BuildBlock engineering tables, as this is a critical step for structural integrity.
- After everything is in place and you have braced the buck properly (bottom brace, top brace, and 2x4 T bracing), check for level and plumb. Keep the braces on your door and window headers for seven days after the pour to insure the concrete has cured properly. Do not load your headers for fourteen days minimum without bracing in place. You may remove all cross bracing for side to side loads in three days.
- You can install flashing after the concrete has been placed and the doors are installed.

Note the concrete threshold poured to the outside wall edge.

8.4 Window Placement

Window bucks are set in place when you have reached the appropriate wall height level for the base of the window. In most cases, you are placing window bucks on your second course. It is vital that you have a window schedule with all rough opening sizes. If building for a customer, make sure all parties sign off and agree on locations and sizes. It's costly to have to go back and re-set or cut in new windows and doors.

- Set your bucks around the perimeter close to its location in the wall.
- Once in place, the bucks should be secured much like the door buck techniques, made straight and plumb, and the forms stacked around them.
- Once again, we stress that you should have your lintel, side and top support rebar ready to install and distributed along with the bucks. (See lintel diagram and openings engineering page or comply with the recommendations supplied by your structural engineer or Prescriptive Method charts.)
- Ties closer than 3″ to the buck can obstruct the flow of concrete and could create voids. Keep a minimum of 3″ or more between the last tie and the buck. If this is not possible, be sure to mark the window side that is closer to the webs and remember to vibrate more during the pour to solve this concern.
- Wood users use 2x4 treated material in the bottom of windows to crate a fill space under the openings.
- **VBUCK** users can drill the 4″ holes to create a fill space.
- Brace your bucks securely using the same 2x6 banding and cross bracing techniques for **VBUCK** and 2x4 cross-bracing for wood users. See photo below.
- If any web fingers are within 3″ of a buck header, cut the fingers off to allow concrete flow beneath them.
- A story pole comes in handy for setting your window header and sill heights. Example: Take one of your PVC corner dowels and mark the header height of your windows or doors on the pole and cut the pole off at that height. Place the pole at your opening and measure down to locate your sill heights. Before attaching your bucks to the wall, double check your header heights one last time with your story pole. (The pole is then re-usable: Simply push the shorter piece into the corner hole first and push it down to the bottom with the longer one.) Note: Sometimes the doors will be (or can be adjusted to be) the same as the window header height around the structure.

For larger openings than 3' wide, additional bracing and "bracing legs" (long 2x4 wood legs screwed to the vertical bucks and run to a base plate will help keep your openings straight and plumb during the pour.

8.5 Arched Windows And Bucks

Arched windows are easily achieved using either wood or **VBUCK**.

FOR VBUCK USERS:

Contact your BuildBlock Distributor or Dealer or call **VBUCK** directly at 1-888-578-2825 to consult with them. If you fax them your openings to scale, they can make the radius for your particular job and ship them to you. If you plan this in advance, in your bid process, you will not be surprised by extra costs associated with fabrication or shipping. When these bucks arrive, use them as a template against the BuildBlock forms to cut the proper radius. (Mind your flanges.)

FOR WOOD USERS:

- Cut 2 pieces of ¾″ plywood 3″ larger than the rough opening and with the same radius as the window to create a flange around the block.
- Next, use 2x4 wood to brace between the plywood to the correct thickness of the buck. The plywood should be flush to the outside of the BuildBlock forms as a receiver to stack block into.
- Follow with masonite pieces to bend; place and secure to the 2x4 studs to the appropriate rough opening dimension.
- Secure each piece of masonite separately. You may want to add several pieces of masonite to achieve a desired buck thickness.
- Once built, set the arched buck into place and build around it as you would any buck, bending the appropriate header rebar lintels and side supporting rebar as called for.

You can create an arched brace from the plywood and use it inside the radius for support for both methods.

WHAT TO SEE:

- Radius and standard bucks in the building process
- Concrete threshold
- Interior and exterior bracing being set
- No internal buck bracing set yet

Bracing and Corner Bracing

9.1 Bracing Options

All insulating concrete form systems require bracing to achieve plumb, level walls. It is a critical step that should not be overlooked or taken too lightly. Bracing should be placed every 4 to 7 feet in a wall that has no openings and all corners should be braced each way. For walls with openings, place braces on each side of each opening (on the same side of the wall) to reduce movement.

There are two basic ways to brace your ICF walls: (1) improvised wood or metal bracing, and (2) professional bracing (also called "wall alignment") systems.

Improvised Bracing

- **2x4 wood or metal bracing:** Fixed angular braces such as these do not allow for quick adjustments but can be re-used in the project elsewhere.
- **2x4 wood or metal with a turnbuckle installed in the down leg:** Closer to a professional set of ICF braces; you will appreciate the adjustment capabilities.

TIP: Screw improvised braces to in-ground stakes. Adjustments to wall can be made more easily than when naililng.

Professional Bracing Systems

There are many bracing systems made for ICFs. BuildBlock recommends four systems, which can be ordered through our MyBuildBlock Online Order System:

- Panel Jack by Reechcraft
- Mono-Brace
- Plumwall
- Superior Alignment Systems

All are metal or aluminum, C-channel systems with turnbuckles to adjust your walls. Most have the ability to place walk boards for top of wall access and others interact with scaffolding for taller ICF pours. Visit the BuildBlock website for brace details: http://www.buildblock.com/products/bracing/ICF_bracing.asp.

If you are an ICF professional, we highly recommend that you invest in the proper bracing to help make your pours a consistent success every time. These professional systems will help you install faster and achieve more professional results. Most quality professional crews use these systems.

9.2 Bracing Methods: Inside vs. Outside

Inside Bracing

When you brace inside the slab of a structure, you can use a 2x6 wood foot to attach your brace to. Use the foam adhesive to glue the wood to the slab and you will have a cleat to secure to. If you plan to stain the concrete slab, you might want to brace to the *outside*, as the glue will show through the stain process. You can also drill into the slab using tap con screws. If using a wood floor, just screw to the floor decking. (**Note:** Do not use screws if in-floor radiant heating is installed.)

Outside Bracing

Bracing to the outside allows the inside space free of obstruction and creates a good workspace. We have seen contractors without walk-board bracing wheel men on roll-around scaffold to place forms and concrete. This is more labor intensive but works well.

9.3 Bracing Techniques

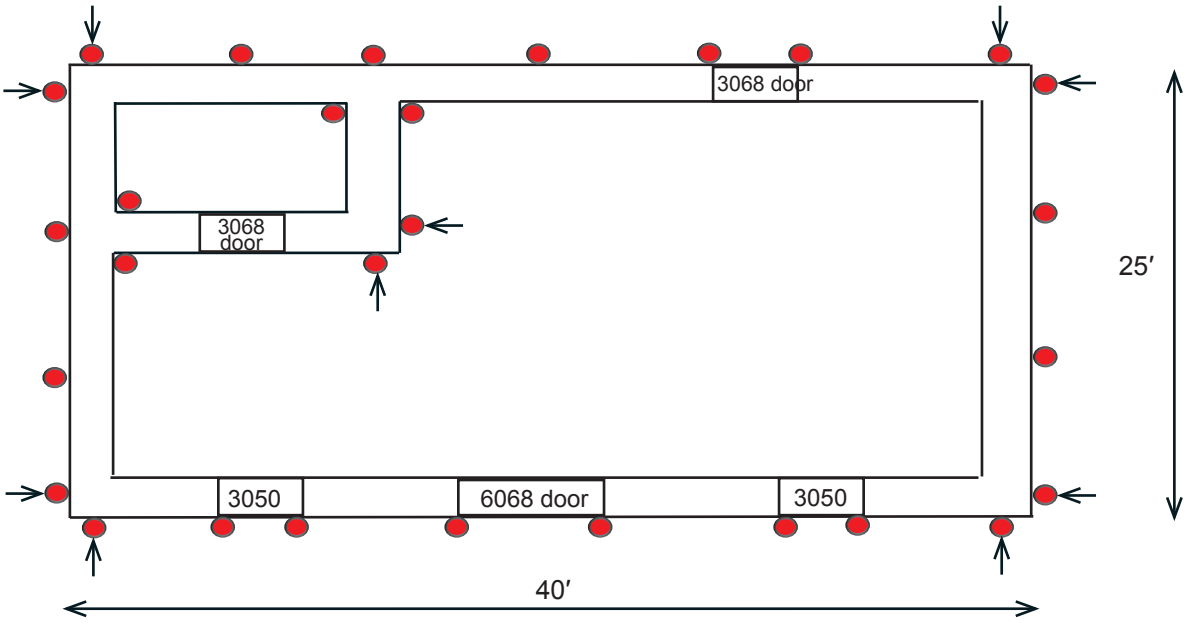
Once you have decided which bracing method (inside or outside) your job requires:

1. Place your braces vertically on the wall at the proper spacing and secure them to the ground so they won't pull the walls out of plumb!
2. Brace inside and outside corners and bring to plumb.
3. Brace areas of special need like windows, doors, bulkheads and short walls and areas you deem prone to any movement.
4. End walls should be braced on both sides and from top to bottom, on both sides, near the end.
5. Repeat the process until you have sufficiently placed all braces.
6. Attach the braces to the walls with strong course-threaded screws. (Attach screws to the BuildBlock hard points designed into every web and noted on the block face with the letters BB.)
7. You can also tie the block to the brace with tie wire every odd course for added strength by protruding the outer foam and around a tie, back through the foam and to the brace. This should not be needed except in extreme cases.
8. A string line should be placed at the top of all walls to keep your walls in check after your braces are set.

TIP: ICF walls have a tendency to settle slightly so some installers will lean their walls in ¼″ off plumb to allow for this natural occurrence. If the walls are tilted in, it is much easier to adjust the walls out by gently pushing from the inside after the pour. This is only a suggestion. Other installers swear by staying plumb during the entire process. Also note another method is to make 1″ slots in the brace stiff back to allow the screws to move down slightly if the wall compresses any. For this to work, screws must be slightly loose with a washer under the screw head. Professional braces are made this way to account for this tendency in all ICFs.

Bracing Diagram

Below is a simple diagram of an **outside bracing job site.** The red dots represent where you might place bracing in order to shore up everything.



(Note: We recommend using 5 ft. spacing if using walk boards.)

Below Grade Bracing

Bracing basement walls will nearly always employ inside bracing techniques. When excavating a basement, remember to give yourself an extra 3-4 ft. over-dig so you'll have plenty of room to work around the exterior and to place bracing for T-walls and such. Since basement walls are usually heavier, use a closer spacing of **4 to 6 feet apart.**

Note: Excavated basement walls should taper slightly so they don't cave in. Use caution not to become trapped while constructing basements. The soil at your job site will determine how much to over-dig the basement excavation.

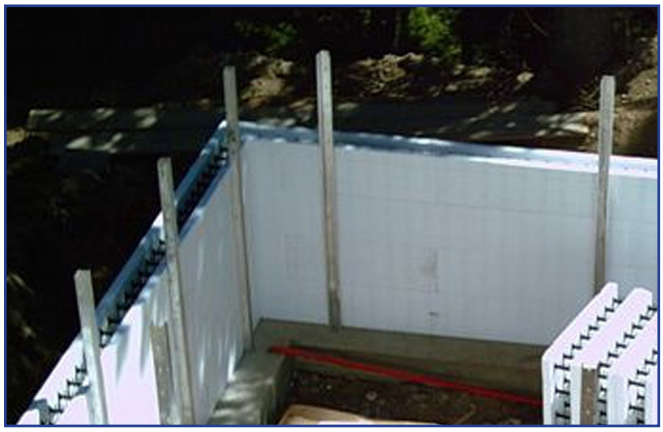
1. Place your braces on the wall vertically and secure to the footing, slab, or un-poured excavated ground.
2. Brace inside and outside corners and bring to plumb.
3. Brace areas of special need like openings, bulkheads, short walls and areas you deem prone to any movement.
4. End walls should be braced on both sides and from top to bottom, on both sides, near the end.
5. Repeat the process until you have sufficiently placed all braces.
6. Attach the braces to the walls with strong course-threaded screws (if possible, into the BuildBlock hard points for stronger pull-out strength).
7. A top string line should be placed to keep your walls in check after your braces are set.

9.4 Bracing and Corner Bracing Examples

Minimal Outer Bracing

More Secure Outer Bracing

Minimal Inner Bracing



More Secure Inner Bracing w/ Walk Board

Ample Outer Bracing with “Scabs” on Non-Factory or Irregular Cut Joints (No Walk Boards)

9.5 About Blowouts

"Blowout" is the word used to describe a failure in a part of the walls capability to hold concrete. However, we hear more words like ***#&&!*%!*** or other non-printable expletives when one of these events occur. BuildBlock forms are so strong, it will be rare to experience a blowout caused by form failure. More often it will be caused by an oversight in construction or mud which is too wet with water (high slump concrete mixture). Sometimes webs can be broken in shipping. If a bundle of forms appears damaged, look for web damage before installing blocks.

The main thing to note is that a blowout only effects a small portion of a wall. If you have one, here's how to handle it:

1. Continue your wall pour in another area so you don't loose any time.
2. Use a coping saw to cut out a clean opening where the damage is located and save the foam piece.
3. Use your hands to remove the excess concrete in the blowout area. Use gloves to protect your hands. Concrete burns are very dangerous.
4. Clean up the removed foam piece and the area around the blowout.
5. Glue the edges of the foam piece and replace it back into the hole.
6. Take a piece of plywood which is 12″ longer on each side of the affected area and screw it into the ties on both sides of the opening.
7. Brace adequately across the patch.
8. Pay special attention to the opposite side of the wall where the blowout occurred. You might brace that area as well, if it looks as though the foam has been "stretched" or stressed. You can tell by looking at the composition of the beads. If they have separated, they are compromised and need a patch as well.
9. When re-pouring near the patch, once the area has been refilled, allow it to set a while before topping that part of the wall further.
10. Remove the patch when you take your braces down. The only damage left will be some concrete stains on the wall foam. This cosmetic only.

This blowout occurred when an installer (name withheld) dropped his tool in the void during construction of the wall. He cut a hole in the base of the foam and retrieved his tool, then glued the foam piece back and walked away! Had he braced this area with a scab or 2x4 across, we would not have this lovely story to tell!

Concrete Placement

10.1 Pre-Pour Checklist

When you have finished building your BuildBlock ICF structure and are ready to pour, use this handy list to make sure you have not overlooked something. Assuming you have followed the steps for all things prior to this stage, your walls should be ready to pour.

- ❒ Make sure your job site is accessible to ready mix trucks, pump trucks, and/or line pumps.
- ❒ Check for wall level with string-line or laser level and trim tops to level.
- ❒ Trim off knobbies for a smooth top plate surface to screed to. (Do not allow them to fall into the wall cavity.)
- ❒ Re-check your braces to insure they are screwed to the wall and are firm and secure on the bottom of the wall. It is good to leave all brace screws in professional braces slightly loose so they may slide down if the wall compresses during the pour.
- ❒ Re-check all braces for plumb.
- ❒ Inspect your openings bracing, and fortify areas you suspect movement could occur.
- ❒ Check for square on all openings and make sure your access holes are cut on the bottoms of the window bucks.
- ❒ Re-check walls at splices; fortify with scabs and banding to insure no separation or movement.
- ❒ Look at all joist hangers, inside and out, to ensure they are installed at correct locations, stable, and firmly secured.
- ❒ Re-think your service penetrations and enlist your other trades for their OK on placement and quantity.
- ❒ Re-check your service penetrations for movement.
- ❒ Re-check your rebar placement and tie off areas where vertical meets horizontal at the top of the wall.
- ❒ Anchor bolt placement has been marked off.
- ❒ Re-check your brick ledge forms, bracing, and reinforcement.
- ❒ Have materials on hand to repair blowouts, if necessary.
- ❒ Re-check your walk boards or scaffolding for security and stability.
- ❒ All beam pockets have been determined, built, and braced securely.
- ❒ Make sure your pump truck has ample time to set up before the concrete arrives.
- ❒ Proper amount, type, and slump of concrete has been ordered.
- ❒ Have proper timing of your concrete trucks in place. (Example: 30 minutes apart)
- ❒ Have slump test kit ready to test each load to 5″ or 6″ slump.
- ❒ A wash out location has been determined for your ready mix trucks and pumpers.
- ❒ Have your pencil vibrators or other vibration methods ready.
- ❒ Discuss with your crew who will tamp and vibrate the lower wall areas.
- ❒ Have materials placed on the job site.
- ❒ Sweep and clean up job site area during and after the pour.

Having these things off your mind will allow you to focus on concrete placement. If your concrete comes to you hot or too wet, don't hesitate to send back the truck. It is a rare occurrence, but the pressure of wet concrete and the consequences of pouring it are worth the wait to get it right.

10.2 About Concrete Mixes

BuildBlock recommends the use of a ⅜″ chip or rock mix 3000 PSI or stronger concrete mix for your walls. Your ready-mix plant will most likely have a mix design for a ⅜″ chip mix and will refer to it as a pump mix. There are several alterations you can make to the recipe of concrete to combat weather occurrences, such as fly ash and air entrainment. But do avoid adding calcium to your mixes as it has a negative impact on the rebar reinforcement. If pouring in cold weather, have hot water added to formulate the mix.

Below is an example of a typical 3000 PSI - 3/8″ chip mix design:

	With Fly Ash	Without Fly Ash
1. Cement Content	5.5 bags (517lbs.)	6.5 bags(611 lbs.)
2. Fly Ash* (Class C)	1.5 bags (141lbs.)	0
3. Coarse Aggregate**: ASTM C-33 #8 100% passing the ½″ screen 85-100% passing the ⅜″ screen	1270 lbs.	1270 lbs.
4. Fine Aggregate: ASTMC C-33 (Sand - FM*** 3.70)	1620 lbs.	1620 lbs.
5. Water to make a 5″ to 6″	40-46 gallons	40-46 gallons

6. Entrained Air****(for workability): 4% to 6% or 1 oz. per bag cement/fly ash
7. Water Reducer: Encouraged
8. Slump = 5½″ to 6″ out of the pump
   (Proper slump is very important. Do not use less than 5″ slump concrete out of the pump hose. Voids could be an issue.) Note: We always measure the concrete slump before it ever goes into the pump. A ½″ extra slump will be absorbed by the aggregate during the pumping process so wetting the concrete to a 6″ slump will usually give you a 5½″ slump concrete at the hose end.

Depending on the type of material and individual gradation, these ratios may have to be adjusted. Consult with your local ready-mix supplier. The pump may be the controlling factor (for example, new pump vs. old pump, boom pump vs. trailer pump, etc.).

You may want to make some test cylinders as the concrete comes out of the pump. Take a 5-gallon sample and make five 4″ diameter by 8″ high cylinders for testing. Your mix design should yield 3000 PSI at a **designed slump of 5½″ to 6″** to pour properly. If not conveyed properly to your concrete company, they may bring out a 3000 PSI mix with a 4″ slump design. If you wet it to pour, your concrete **will not** be 3000 PSI strength. Note: Most common mixes are designed to be wetted to a 6″ slump maximum to obtain the mix designed strength. If you have any concerns, just order a stronger mix design (ex: 3500 psi).

Notes

*The use of Fly Ash improves the flow ability of the concrete and reduces the amount of Portland cement required. This saves you money and results in a concrete mix which is more “green” in terms of LEED points.

The **maximum aggregate size for 6″ block is ½″ (**⅜″** is recommended). The **maximum** aggregated size for 8″ block is ½″ (**⅜″** is recommended.) The larger the aggregate, the more problems you will have with concrete flow.

***FM = Fineness Modulus for sand.

****6% Entrained Air results in better flowing concrete.

For information about recommended concrete pouring temperatures, see Section 1.3 in this manual.

10.3 About Concrete Delivery Systems

There are a few options for placing concrete in BuildBlock forms.

- **Boom Pumps**
  Boom pumps work the best because they have full job site access from one place, there is no "hose factor," and it can move a tremendous volume quickly.
- **Trailer Pumps**
  Typically used for smaller applications, trailer pumps are sometimes used for big jobs. The down side is hose management (heavy hose across ICF walls) and pumping lesser concrete volumes which results in a slower, longer pour time.
- **Truck Chute (Not recommended)**
  Right off the truck chute is done sometimes when the conditions are perfect (like a basement with minimal over dig) and where you are confident you can direct the chute around the job site. However, chute filling can be messy and wasteful and you are more tempted to water down your mix which will decrease its strength.
- **Bucket System (Not recommended)**
  A bucket system with attached funnel whereby a large container of concrete is hoisted around the site via fork lift or other means requires more labor and time.
- **Conveyor Delivery (Not recommended)**
  Conveyor delivery is another possibility but only if you have a trunk hose to direct concrete into the wall cavities. Check with local suppliers.

Note: Trying to save money by settling for a less efficient concrete delivery system will cost you extra time and labor and will result in a messy job site and probably wasted concrete that will require later clean up.

The Importance of a Reducer System

When you order your pump truck, make sure it has a **reducer system** to help with rate of delivery. Most trucks come with a big 5″ hose and you need more flexibility on the wall than that alone can provide. Most companies now have a **flexible end hose attachment** in their system that you can close off with your hands after your pumper stops the machine. Others may have hoses that seal off when the pump stops pumping. This will save you from concrete spills time and time again. Check on these things when you order your pump truck.

10.4 Placing Concrete

- Concrete is heavy and *falling* concrete, well, it can exert some *real force* into the void when pouring. BuildBlock recommends you pour your projects in lifts of 3 to 4 feet high in the void around the perimeter of your project.
- If your mix is correct, you can approach the underside of your windows from either side to create a "flow" under the opening and get most of the void under the opening full. You can come back when you top off the wall (usually a slightly wetter mix) and top off through the holes on the bottoms of the windows.
- Begin pumping the walls ***away*** from a corner. Let the concrete "bounce" off the inner foam and ties to help diffuse the impact as it travels to the bottom of the form. As you fill the forms have a man lightly begin tamping them using an external vibrator such as the **Arkie Wall Banger.** This will help consolidate the base of the wall.
- You will begin to notice that you can create an arch or "flow" of concrete that will start a move downward as you have built up a mass in an area of the void. That is a great technique that you should try to employ as you fill around the project. This way the concrete flows ahead of you and does not fall as far, resulting in less vibration on the wall.

Consolidating Concrete

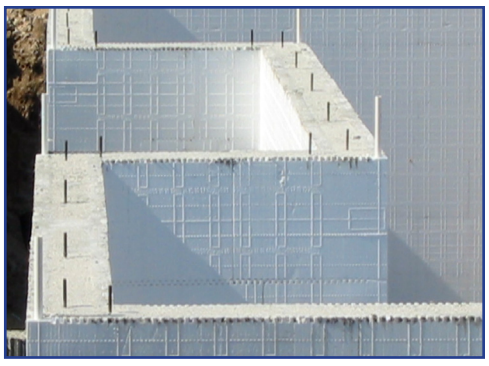
- Using a **¾" (maximum 1") pencil vibrator** in the top two-thirds of your walls to consolidate the concrete is **highly recommended.** Do a quick insert, then remove the vibrator at a withdrawal rate of approximately 3 to 5 inches per second in a pattern of every other cell. It is best to have a man follow the pumper with this method as you go around the perimeter.
- Take care around doors and windows; be diligent in these areas with consolidation as they are the "busiest" in terms of rebar and ties.
- Avoid vibrating the vertical rebar, as it could make the aggregate separate from the concrete itself in the lower parts of the wall. The lower parts should have been consolidated by the tamping done during your first lifts.
- If you need to stop the pour before you have reached the top, try to do so in the middle of a form so no cold joints and block joints meet.

Topping Off Your Project

To get a nice smooth finish and avoid being rushed by hot concrete, toss a bag of **FritzPak FR1** into the concrete truck when you are near the last half of the last block. FR1 is a dry powder additive that increases workability of concrete without water so you don't weaken your mix. Check out FR1 at www.fritzpak.com.

- As soon as you top off the walls, smooth the top with a trowel and you will have a nice, level top for your framers to set the top plate.
- Start setting your anchor bolts as soon as you finish troweling your wall tops. They should be marked and ready for insertion. (In the photo on the right, anchor bolts were placed in the center of the wall.) Note the off-sets on the corner bolts. The top plate ends need anchors near each end. At the corners, two top plates will join requiring the proper placement of two bolts. They will not be symmetrically placed. Otherwise, you will not be able to hold the ends of each top plate down properly.

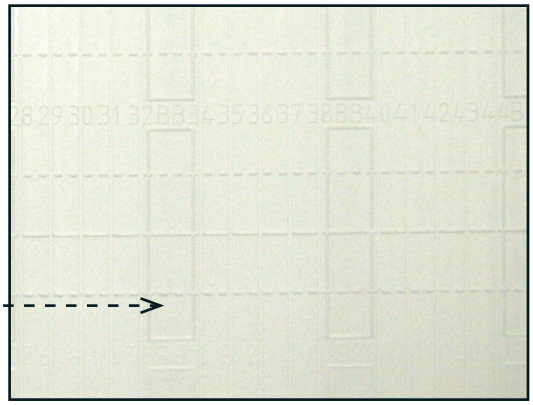
WHAT TO SEE:
Anchor bolts evenly spaced both in height and width. Two bolts placed in each corner. Smooth concrete finish.



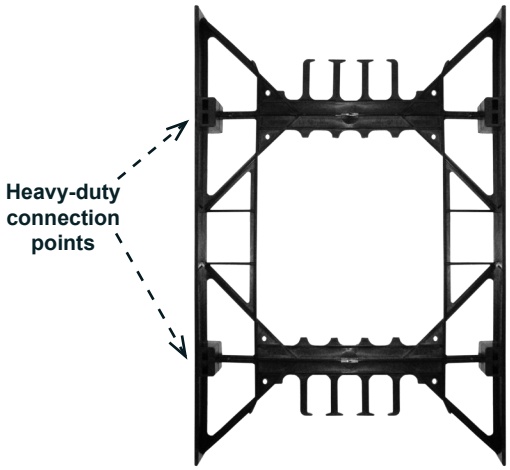
11.1 About Interior Walls

Most builders utilize BuildBlock walls as a barrier from outside elements to maximize their efficiency. Some want to use BuildBlock forms to create interior walls to separate activity rooms, home theaters, and the like from the rest of the house. The largest percentage of builders will then build interior walls from wood. It is a snap to connect wood interior walls to BuildBlock walls because of the many connectivity ties in the forms.

Look at your walls and see that every 6" horizontally there is a design that looks like this to attach to.



Beneath that design, submerged one-half inch into the foam, are **ties** (also referred to as **webs**) to which you can screw your internal wood walls. You can use ring shank nails for speed but BuildBlock recommends you use screws for best results. In every tie facing you there are two additional **heavy-duty connection points** marked on the face of the form with a **BB**. These hard points have *tremendous* pullout strength (very close to wood pullout tests). See our website for more information.



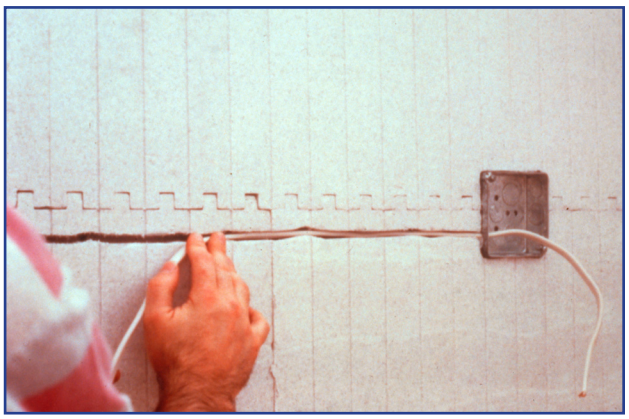
Because the ties are so numerous, you have ample connectivity for cabinets and the like. If you prefer more rigid connectivity, such as for very heavy items, place Simpson ICFVL ledger connectors in the wall where you believe you want this connectivity to take place. For larger areas, such as behind cabinetry, you can replace sheet rock with ½" plywood where needed so you can screw into the wall at any spot desired.

In the picture to the right, internal wood framing was attached to the BuildBlock ICF walls with screws. Tap cons can also be used here if needed.

WHAT TO SEE:

- Wood top plate on short wall.
- Floor trusses for attic floor above stick frame wall.
- Very tight openings in intersecting walls.
- V-BUCK openings

Electrical and Plumbing



Electrical and plumbing services are easy to add to BuildBlock walls. The picture to the right shows a man placing romex inside a horizontal chase cut into the foam using a hot knife. We have seen other tools used such as routers and even chain saws to make chases. The important thing to notice is when making a horizontal chase. It can best be done where the blocks connect to one another. Vertical runs can be made in the foam between the ties. You have 2½″ of foam available to remove to make a hole for boxes. Most boxes are 2½″ to 2¾″ deep, so with a ½″ sheetrock return there is plenty of space available.

There is 1″ of space between vertical webs at each horizontal block course connection to allow wiring and small plumbing to run horizontally through a wall.

NOTE: Check (or ask your electrician to check) the new NEC code book for **electric box connectivity to ICF walls.** If they are no longer permitting you to connect the box to the concrete, you must use a tab side mounted box and attach the box to one of the tabs. Additional foam gluing will secure the box better.

Plumbing is achieved in the same manner by creating chases in the foam and using adhesive foam to secure any pipes in place. Keep in mind you will not be able to use a pipe diameter larger than 2½″ in the walls, from the foam to the concrete. For larger pipe runs, choose an inside wood framed wall. (2″ schedule 40 pipe is approximately 2½ OD.)

It is not recommended that you run plumbing in the void of an ICF wall and then pour concrete around it unless necessary. It has a tendency to create voiding and is unrecoverable should the pipe fail. If using plumbing inside a wall cavity, extra vibrating will be required to allow for proper consolidation.

When planning your project it is always wise to consult with any trade that the ICF wall will impact. This helps each trade prepare for their respective installations and alterations, if any, to those methods or materials more suited for ICF job sites.

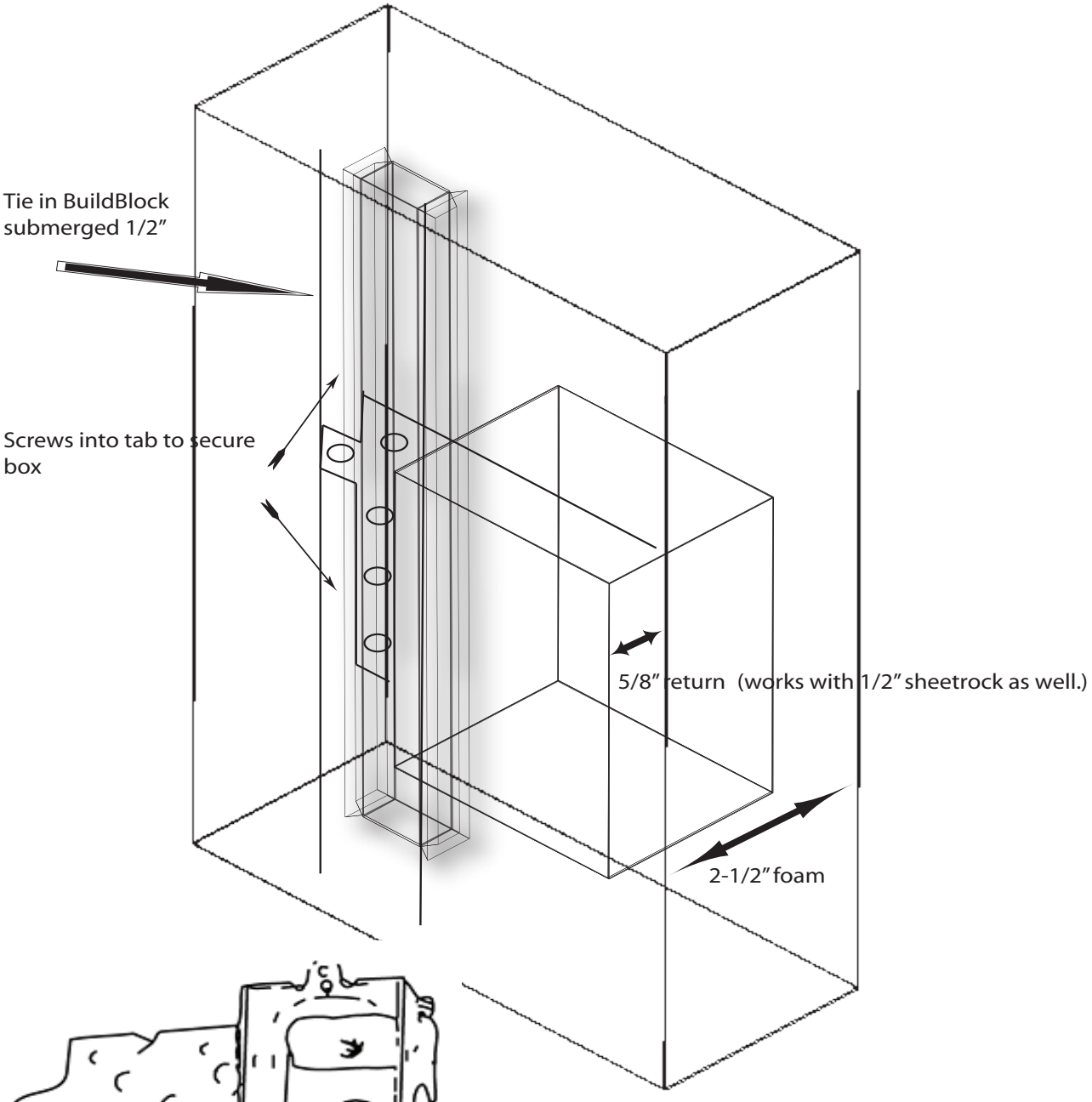
Note: Place all wiring as deep into the foam as possible to meet code requirements and keep inspectors happy. Check local requirements.

New Electrical Code Solutions

Electrical Box Detail

Compliance to new codes that do not allow metal electrical boxes to attach to concrete.

Use a side mount box and secure it to the ties in the face of the block. Use foam adhesive to stabilize other side.

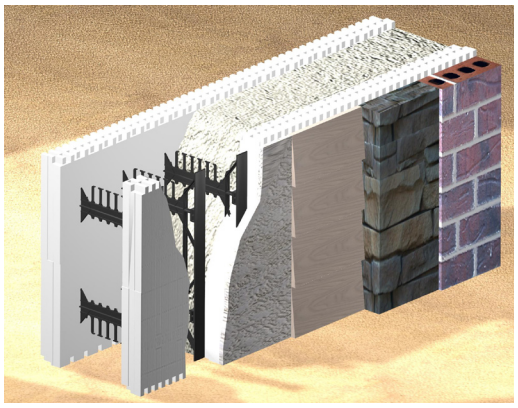


Part Number
Steel City 806 SW
www.tnb.com search for 806 SW

11.2 Veneers And Coatings

There are no limits to the types of veneers you can attach to a BuildBlock wall. BuildBlock forms can accommodate all traditional methods of installation and help save money on some. For instance, since the BuildBlock form has the interlocking 2½″ foam outer layer, you can eliminate house wrap altogether. Here's a run down:

- Brick and natural stone can attach to the ties found in the form on 6″ OC.
- Adhesive veneers such as traditional stucco and EIFS and a host of new veneer products made for ICF are no more difficult than conventional methods. In fact, veneers that utilize the foam backing may be able to skip the step of attaching their base foam for vapor barriers; these products may, in some cases, be applied directly to the BuildBlock forms.
- Siding of all types can attach directly to the wall via the ties on 6″ OC without a vapor barrier.
- Vertical, stamped, stained concrete is on the rise across the country and works well with ICFs. Many shapes and styles makes this a neat option.



Vapor Barriers and Water Resistive Barriers on Above-Grade Applications

There is much misunderstanding regarding vapor barrier and water resistive barrier requirements on above-grade ICF applications. Some, but not all, EIFS systems have ICC-ES code approval to install on ICF without a vapor barrier. However, even this approval may be circumvented by local code requirements. It is very important to research your local code requirements and refer to the applicable sections of the **2003 International Residential Code** noted below:

R701 EXTERIOR COVERING

703.1 General.

703.2 Weather-resistant sheathing paper.

703.3 Wood, hardboard and wood structural panel siding.

703.4 Attachments

703.7.4.2 Air space.

703.9 Exterior insulation finish systems, general.

703.9.1 Weather-resistive barrier.

703.9.2 Flashing, general.

Table 7.304 Weather-resistant siding attachment and minimum thickness.

Because each job is different geographically and in terms of use and exposure, BuildBlock does not endorse any particular product listed here or their application. This page is simply a reference tool for BuildBlock customers. Each manufacturer has different specifications so research your local installation contractors and make a choice based on product and installation quality. Here are some brands to consider:

- Synergy Products www.senergy.cc
- Styro Industries www.styro.net
- Miricle Coat www.icfwallcoating.com
- Parex www.parex.com
- PermaCrete www.permacrete.com
- Grail Coat www.grailcoat.com
- Multi Coat www.multicoat.com
- Omega Products www.omega-products.com
- Dryvit www.dryvit.com
- FossilCrete www.fossilcrete.com

This concludes our installation manual.
If you have additional needs or questions,
please contact your local distributor or dealer
or call BuildBlock Technical Support at 405-840-3386.

IMPORTANT

Periodically, this document will be revised.
You can download revised sections, or the most recent version of the entire manual,
by going to the following URL:

www.buildblock.com/manual

For the most recent versions of our CAD Details, go to:

www.buildblock.com/technical/CAD_details.asp