INDEX

ETERNA's History

ETERNA BUILDING SYSTEMS' manufacturing facility is located in Southeastern Arizona. *ETERNA* BUILDING SYSTEM Inc. is a family owned and operated business. With over 20 years in the business, LaMell John, and his sons, Grady, Jace and Todd will give you the highest quality building material on the market today.

ETERNA BUILDING SYSTEM has been providing Insulated Concrete Form (ICF) material to the building industry in Arizona and other parts of the country. Presently there are over two hundred structures in the Gila Valley area, including homes, doctor's offices and commercial offices constructed with our Insulated Concrete Form (ICF) walls. Many of the private homes were constructed by the homeowners.

The management of *ETERNA* BUILDING SYSTEM Inc. has been involved in manufacturing of this type of building material since it was introduced into the U.S. market in 1989. The block has been manufactured under various names, Rastra, Ener-Grid, and *ETERNA*.

This ICf (Insulated Concrete Form) building material was first introduced into the United States in the state of California under the product name Rastra. Then after a few years the product name was changed to Ener-Grid and production was continued into the late 90's. Ener-Grid's Plant was shut down in the late 1990's do to a legal battle between Rastra and Ener-Grid, which ended in Ener-Grid's bankruptcy.

LaMell John and his family left Ener-Grid's Plant and California during the mid 90's to return to their hometown in the Gila Valley, where they had other businesses. LaMell and his sons continued to believe that this building material would be the future of the building industry. "We knew this product had all the qualities anyone would want in their home. Fire resistance, energy efficiency, termite resistance, high sound abatement qualities and it doesn't rot, mold or mildew. It's practically a maintenance free home that is strong enough to withstand hurricane winds and earthquakes. We just couldn't let this vision go".

After a family meeting we decided to put our resources together and build our own manufacturing facility in Pima, Arizona. With the knowledge we gained from the California plant and the problems that were incurred we made the necessary changes to our production machinery, which lead to the increased production and consistency of our block. Our first block was produced in 2000 under the product name *ETERNA*.

At this time the ICF (Insulated Concrete Form) systems were becoming popular because of the rising cost of lumber and energy, leading the consumers to look for a smarter way to build. This was the perfect time for *ETERNA* to enter into the building market.

An opportunity came up for *ETERNA* BUILDING SYSTEM to enter into a business agreement with a company that already had an established market. In 2001 we enter into a 5-year manufacturing contract with Rastra and shipped building material all over the United States, Virgin Islands, Hawaii, China and Costa Rica.

Our block has been used for custom homes, single-family homes, strip malls, industrial buildings, restaurants, privacy walls, retaining walls, sound walls and more.

In 2006 we ended our contract with Rastra to market our block under our own product name, *ETERNA* BUILDING SYSTEM. We continue to manufacture our block under the same quality standards that gives our costumer the highest quality building material on the market today.

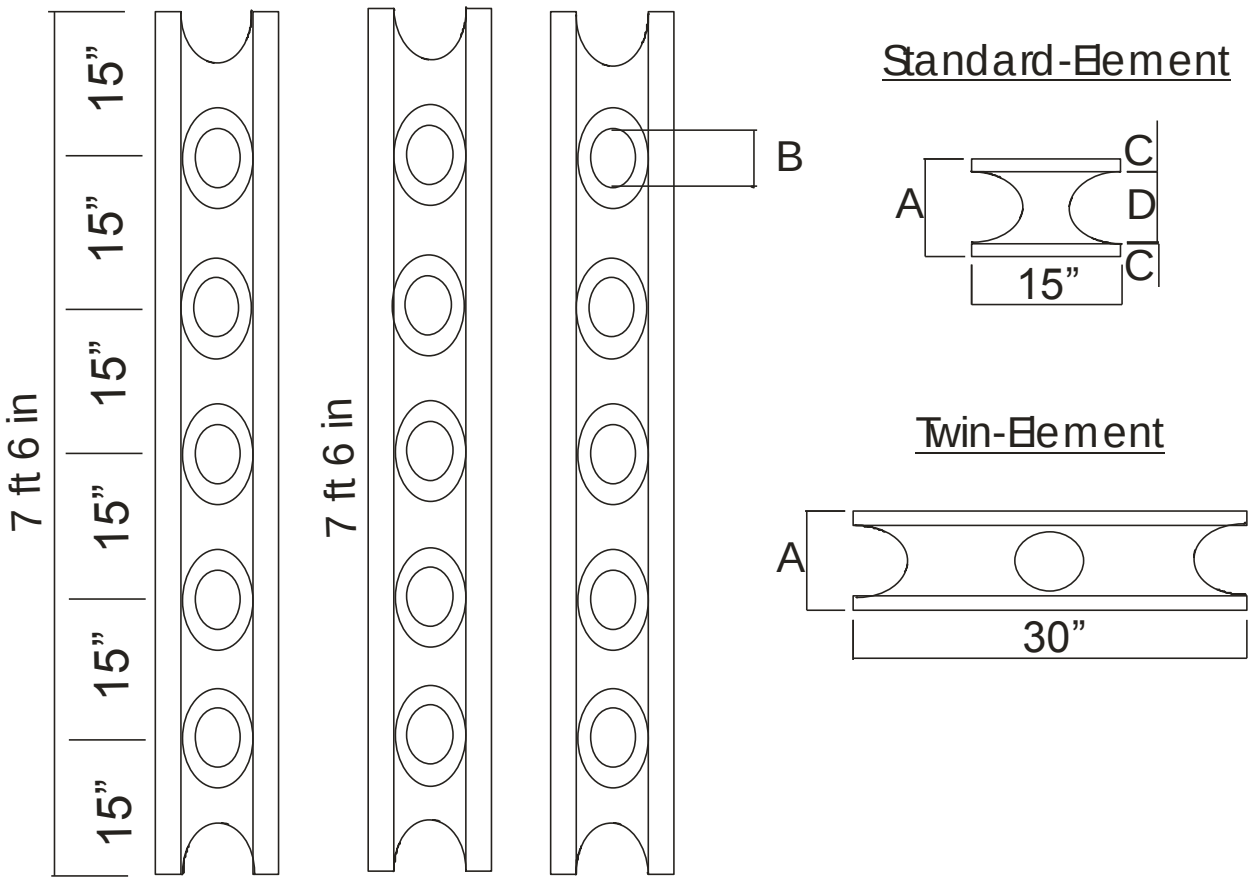
What is *ETERNA*?

First, it is important to find out what *ETERNA* is not. *ETERNA* is not a FOAM BLOCK!

ETERNA block is a hollow core cement based building element comprised of a mixture of Portland Cement, "Recycled Polystyrene" (Styrofoam), admixtures and water: containing approximately 85% by volume of expanded polystyrene beads with a density of between 20 and 24 pcf. and has a compressive strength of ≥ 56 psi and a tensile strength of ≥ 43 psi.

The combination of cement and polystyrene creates a extremely porous material. This porous mixture creates air pockets, which work in combination with the recycled polystyrene to give the *ETERNA* element a high resistance to thermal transfer, or more simply stated a high "R" value.

The standard element is 15 inches high by 90 inches long, and is available in three thickness, 8 1/2 inch, 10 inch, and 12 inch (**see figure 1**). The combination of cement and polystyrene creates and extremely porous material. This porous mixture creates air pockets which work in combination with the recycled polystyrene to give the *ETERNA* element a high resistance to thermal transfer or more simply stated a high "R" value.



Dimensions in inches	A	B	C	D
ETERNA element 8 1/2	8 1/2”	5 1/2”	2”	4 1/2”
ETERNA element 10	10”	6”	2”	6”
ETERNA element 12	12”	6”	3”	6”

Figure 1

The *ETERNA* element is the most versatile building material currently being used today. The ease of cutting (cuts with a hand saw or chain saw), the ability to shape it with a rasp, and the ease with which it is erected, allows *ETERNA* to be utilized in almost any building project. In residential and commercial applications, the *ETERNA* element may be used in basements walls, stem walls, interior walls, exterior walls, as well as site walls. From single story retail or office structures to multi story apartment complexes. If the project can be designed for wood, metal, or block construction, the project can be designed for *ETERNA* block. *ETERNA* can also be used in conjunction with structural steel for larger projects.

ETERNA can be engineered into any project. The *ETERNA* element itself is assigned no structural value. **As shown in figure 2**, the *ETERNA* element has a series of channels that run

both horizontally and vertically throughout the element. These channels, which are spaced 15 inches apart, are filled with concrete to form a waffle grid matrix, which is the structural strength of the *ETERNA* wall. Because of the uniqueness of each project a Structural Engineer determines each projects rebar size, spacing and design strength of the concrete grout (psi). This allows for a greater flexibility in design, therefore, adds to the overall flexibility and ease of the use of our *ETERNA* building material.

Figure 2

In addition to the high "R" factor, the *ETERNA* element also has sound absorbing qualities. This means that the interior of your new *ETERNA* building will be shielded from most outside noises. *ETERNA* is also very effective when creating soundproof rooms.

ETERNA is very effective in areas where high fire resistance is required. The matrix component, which is utilized by, *ETERNA* has yielded a 2-hour fire rating from the Underwriters Laboratories (see technical notes). This allows the use of *ETERNA* in all applications where firewalls are required. The fire rating, in combination with the sound absorption qualities, makes *ETERNA* a natural for multi-unit projects.

Recommended Tools and Supplies

ETERNA may be installed with conventional tools normally used with other building materials, but there are a few additional tools that will facilitate the *ETERNA* installation.

Below, is a list and brief description of those tools. Most of these tools you may already have or they can be purchased at your local hardware store. Others you will probably want to rent and the rest are available through your local *ETERNA* Distributor.

Common	Rental	Distributor
1. Hand saw w/large teeth	1. Fork lift	1. Fast Rasp
2. Keyhole saw	2. Manual lift	2. Squeeze
3. Chain saw	3. Scaffolding	3. Element Pick
4. Circular saw	4. Crane Truck	4. Foam Glue Gun
5. Beam cutting attachment	5. Rebar cutter / bender	
6. Saws all	6. Generator	
7. Hack saw		
8. Drill motor		
9. Hole saw		
10. Level		
11. String		
12. Tape measure		
13. Hammer		
14. Ladders		

Common Tools

1. Hand saw with large teeth. This saw is used to cut the *ETERNA* element by hand. The teeth on this saw should be as large or coarse as you can find. A crosscut saw that is used for cutting trees works very well.

2. Keyhole saw. This is a standard saw used for drywall. Your will use it to scribe the *ETERNA* element as well as to cut small holes for grout or electrical boxes.

3. Chain saw. This is used for cutting large sections out of the *ETERNA* element or for cutting the top of a parapet wall where accuracy is unimportant. (electric is advised)

4. Circular saw. This will be used to cut wood for bucking or for braces. It can also be used with the beam cutting attachment to make long cuts in the *ETERNA* element.

5. Beam cutting attachment. (See number 4).

6. Saws All. This is an all purpose reciprocating saw. The saw is used in many ways – including the cutting of rebar to the cutting of the *ETERNA* elements.

7. Hack Saw. Standard metal cutting saw used to cut rebar or other metal and plastic items.

8. Drill. Standard 3/8” or 1/2” electric drill.

9. Hole Saw. The size will depend on the needs for each project. Typical sizes are 2” to 6”. Used along with the Drill to cut holes for anchor bolt supports, pipes, etc…..

10. Level. A standard 4 foot level is needed; however, a 6 foot or 8 foot level is handy for nice, straight, plumb walls.

11. String Line. Standard masons string line. Used to maintain the *ETERNA* element alignment.

12. Tape measure. A 24 foot tape and a 100 foot tape is needed.

13. Hammer. A standard framing hammer.

14. Ladders. Standard 6 foot or 8 foot step ladder along with extension ladders.

Rental Tools

1. Fork lift. You will need a forklift to unload the trucks during delivery and a forklift can also be used to set the elements (method explained later). The forklift should have 4" wide tongs and an upward reach extending a minimum of 4' higher than your highest walls.

2. Manual lift. This could be any type of hand-operated lifting device such as a Genie Lift, a simple rope or chain, or a block and tackle pulley arrangement. These devices may replace a forklift when setting the *ETERNA* elements. They are used to place the *ETERNA* elements into position which extend above the normal reach.

3. Scaffolding. Used as a working platform as walls rises above waist high.

4. Boom Truck. Typically a medium duty truck with a reach of at least 54 feet that can pick up approximately 1,000 pounds with the boom extended completely in a horizontal position. This is not necessary, but if you are erecting a large building it can increase productivity by allowing the used of double size elements.

5. Rebar cutter/bender. Used to cut and bend rebar for corners and stems. This is not mandatory but is easier and faster then sawing and bending by hand.

6. Generator. A generator is only necessary if your site has no available electric power.

Distributor Available Tools**

1. Fast Rasp. This is a tool used to even up and shape the *ETERNA* element. It is an expanded metal face welded on a rigged frame with a handle. The size is approximately 6" by 8".

2. Squeeze. This device resembles large ice tongs with one exception, the points have been replaced with flat pads to "squeeze" the element on either side, allowing it to be picked up by any lifting device.

3. Pick. This is used primarily with 30" high double elements and rebar panels. It is a round tube with a handle which retracts and extends two arms. The device is inserted into the center cell after which the arms are extended and locked open. The arms then lift the element by the solid nodes on either side.

4. Glue Gun. This is used with the expanding polyurethane foam glue. The gun attaches to special canisters by means of a threaded coupler and has proven to be more manageable than the conventional straw applicators.

******All Distributor available tools can be purchased and/or rented from your local distributor. Check with them for cost and availability.

GETTING STARTED (The Planning Stage)

The *ETERNA* product affords several options for each building application. Because the *ETERNA* element is so versatile, you need to predetermine the method of installation for the walls, windows, doors, electrical, plumbing, etc.., that best suits your architecture and style.

Since the stem walls are the first in the construction schedule we'll start with them. There are several types of stem walls you can do. You can use *ETERNA* element itself as the stem wall, or a conventional poured-in-place concrete stem, standard clock stem, as well as the popular mono-poured concrete. All of these various stem walls will work when using *ETERNA*. However, using the *ETERNA* element as a stem wall gives you quite a few advantages the others don't.

Using *ETERNA* element for the stem wall will add even greater energy efficiency. When using *ETERNA* element as a stem wall you will insulate your concrete slab and stop both heat and cold from being drawn into our home from the outside sources. The cracking generally associated with the expansion and contraction between the stem and the exterior walls will be drastically reduced. Hence, a great deal less stucco cracks, and no foundation line to dictate landscaping heights. A very popular option is to use *ETERNA* as a mono-pour stem wall (figure 4), meaning that you pour your concrete slab and your stem wall at the same time inter-locking them together. If you want the slab to float free from the stem wall (figure 5), then you can grout the stem wall prior to the pouring of the slab. The *ETERNA* will act as an expansion joint around the perimeter of the concrete slab.

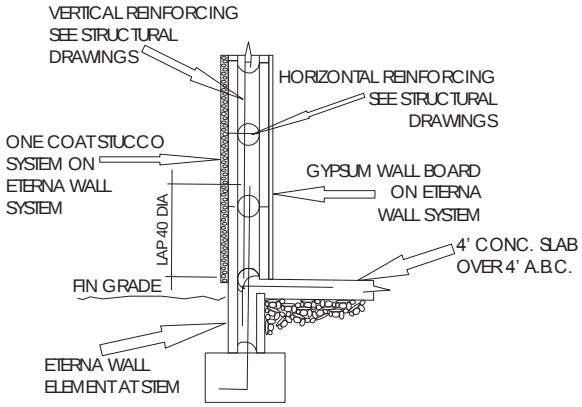


Figure 4

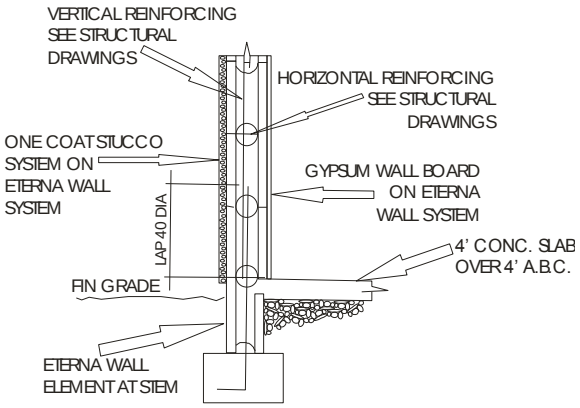


Figure 5

Electrical installations may also be accomplished in several methods. As shown in figure 6, for applications using conduit, you can run conduit within the internal channels or you can imbed the conduit into the face of the *ETERNA* element by routing out the material. The other choice is to route out the face of the element after placement of the concrete into the channels and place romex wire directly into the grove, as shown in figure 6.1. All three methods work well but need to be done at different times during the construction of the *ETERNA* walls. The method you choose may also have some bearing on the cost the electrician will charge as well.

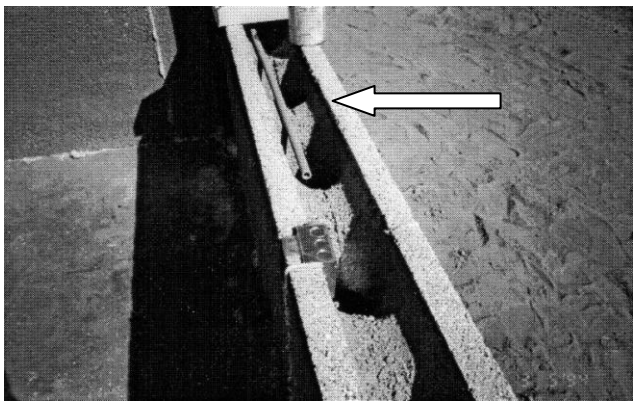


Figure 6

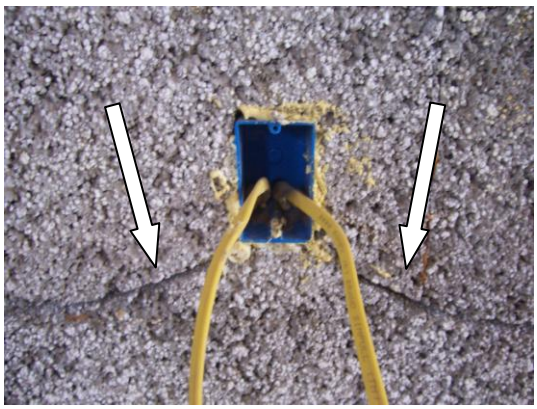


Figure 6.1

If you select conduit in the cells, you may need to have your electrician on site while the *ETERNA* element is being installed so he may run his conduit inside the grout channels. This is much the same thing the electrician would do in standard concrete block construction. This method is usually more expensive and is the slowest in terms of how fast the *ETERNA* element may be installed.

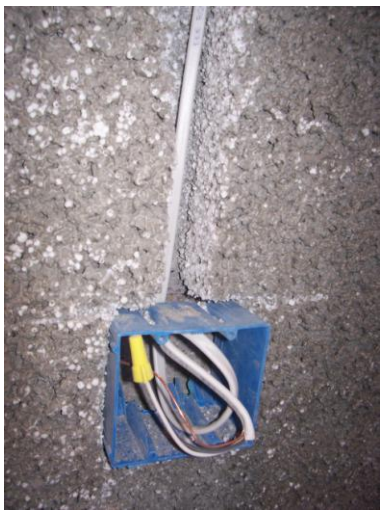
Selecting to rout or groove the face of the *ETERNA* element for either the conduit or romex allows easier installation of the *ETERNA* element. With this method, most of the electrical can be

installed after the *ETERNA* element is placed and grouted. After placing the wire or conduit into the grove, the grove can then be filled and subsequently plastered over to conceal it.

You will need to check with your local building official for the minimum wire and conduit depth requirements from the finished face of the *ETERNA* wall. In most cases the romex wire requirements are one and one quarter inch (1-1/4") from the finished face. This poses no problem because the minimum face thickness of the *ETERNA* element is one and seven-eighths inches thick (1-7/8").

The use of romex is the preferred method because it is the easiest and usually the least expensive method. This is because it simulated more closely the methods electricians' use in conventional frame buildings.

The placements of electrical boxes need to be planned in advance as well. If it is necessary to place an electrical box in an area where a **grout cell** is, you will need to place the box in the *ETERNA* wall **prior** to the concrete placement. It is probable that most of your electrical boxes may be located in areas other than in the grout channels and if so, these may be place after the concrete placement. As shown in 4 pictures - figure 7 below.



All other wire installations such as telephones, alarms, TV cables or speaker wires may be placed within a small groove routed into the *ETERNA* face after placement of the concrete. Again, these installations will later be covered by the application of plaster or wall board.
Plumbing installations may be accomplished similar to electrical conduits with few exceptions. When copper pipes are placed in the grout cells they should be wrapped to protect them from the concrete. If they are to be routed into the face of the *ETERNA* element, the installation would be the same as previously described for electrical conduits. Pex tubing may be placed in either location without concern. As shown below in figure 8.

Figure 8

Vent pipes will need to be placed in the grout cells as they are too large to be routed into the element face. Again, if copper pipes are being used they should be wrapped for protection.

Window and Door Placement

The *ETERNA* element allows a choice for preparing your window and door openings. If the intent is to wrap, slightly round or leave sharp square edges, then the openings may be "BUCKED OUT" (see figure 9). However, if the intent is to "BULLNOSE or FLARE" the opening, then it needs to be bucked with a 2" x 6" countersunk (see figure 10).

Figure 9

Figure 10

After these items have been considered and decisions regarding installation application have been made, you are ready to proceed with your building project.

At this point a checklist of items and procedures should be formed. Below are a few that should be verified. Most of the items on this list are needed regardless of the building material being used. Verify that you have:

1. Blueprints of your building project.
2. Engineer's Report on the *ETERNA* walls. (if required)
3. Necessary tools to install the *ETERNA* elements.
4. Arrange for needed rental equipment.
5. *ETERNA* element Order and delivery time verified.
6. Subcontractors scheduled.
7. Obtained your building permit.
8. Necessary inspections scheduled.
9. Double check all the above.

INSTALLATION OF THE *ETERNA* ELEMENT

Placement of Reinforcement

Once panels are installed and prior to grouting, horizontal reinforcement can be placed directly on the bottom of the horizontal grout cells and vertical reinforcement can be hand centered unless otherwise directed by the engineer's specifications. Should the engineer specify, chairs or other devices may be used to position horizontal or vertical reinforcement in the required locations within the cells.

Footing and Length of Starter Bars or Dowels

Starter bars or dowels should be placed into the footing and extend up into the wall a distance of a least 24" or the length required by code.

Length of Vertical Reinforcement and Depth of Grout

In a multi-story structure, it is important to provide for vertical overlap of reinforcement. For example, if a 10 foot high basement wall is being constructed, the wall may be grouted to the 10 foot level with the required length of rebar extending above the wall, thus creating the overlap in the upper story OR the wall may be grouted to less than 10 feet with the overlap occurring in the lower story. In either case, the required length of rebar would be available to provide the necessary overlap for the next story.

CORNERS

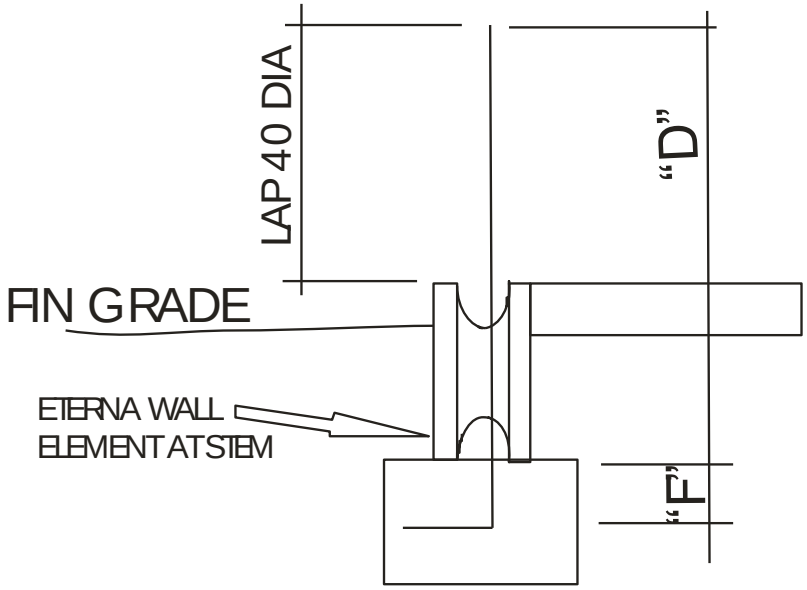
The preferred method for the installation of corners is a 45° angle cut directly through a cell thus allowing for a complete cell in the corner.

Set your corner bars and then you can space the bars in-between the corners on the proper spacing as called for by your structural engineer. This spacing is usually either 15" or 30" on center. If the layout doesn't come out even don't worry, compensation may be achieved in the middle of the wall span.

As the walls are being laid out, note where window and door openings are to be placed. You need to mark your forms with the location of these openings. Rebar needs to be placed on either side of these openings corresponding to the overall rebar configuration. These bars are usually required by the engineer. Care should be taken that the rebar will not interfere with the bottom of the window openings. In the case of doors you will need to make sure the rebar does not extend above the slab in the actual opening.

Now marking the rest of the rebar locations may commence. Start at the corner where installation of the *ETERNA* elements will eventually begin. From that point, measure and mark your forms at the proper spacing as called for by the engineering. Continue this all the way around the footer. Remember to start in each corner and work to the center of the wall section. If the spacing is short you can take up the odd space under a window or door.

Ensure that the rebar size called out by the structural engineer is the size being used. Start by counting how many pieces you need, and then cut that amount. The length of each piece should be 1/2 of the thickness of the footer (f) plus the height of the stem wall(s) plus 40 times the bar diameter (d) plus at least 2" for the hook on the end. For example, with an 8" thick footer and a stem wall which is to be 18" high above the footer with a bar diameter of 1/2" you would have a bar length of at least 44". That would be f + s + d + 2" = 44".



Once you have cut the pieces, bend them so they have a 2" hook on the end. Bend all of the pieces that have been cut. Be sure that you take into account any bars that are going to be placed under windows or in door openings. Check your plans to make sure at what height the bottom of your openings are and be sure your rebar will not interfere with these openings.

Upon completion of this task, place and tie the rebar itself. Placement can be accomplished in one of two ways. It may be placed immediately following the pouring of the footers or it may be placed prior to pouring. Either method is acceptable. Keep in mind that it is very important that the hook is situated at 1/2 the thickness of the footer so that the top will be sticking out of the stem wall a minimum of 40 bar diameters.

A smooth surface on the footer, stem walls, or slab will greatly facilitate the installation of the *ETERNA* element.

INSTALLATION OF THE FIRST ROW

The installation of the first row of *ETERNA* elements could occur in one of two places. It could be installed directly on the footer or it could be installed on top of the stem wall. In either case, before starting to set the first row check the foundation to ensure that it is square and level.

A string line should be placed one-half the thickness of the *ETERNA* element which is being used. Place it to the outside of the rebar extending out of the footer. For example, if a 10" inch element is being used, the distance from the center of the rebar will be 5" inches. Be sure that this string line is kept tight and that it does not sage in the middle. This line will be used to set the height of the *ETERNA* elements and to help to keep them straight. Be sure also that this line is at the proper height and is in line with the outside of the building. This string can be moved to the inside of the wall on the next course if desired.

If the first row is being placed wither on top of the stem wall or the footer, lines should be snapped on the concrete slab for alignment of the first row. Unlike the alignment string for the wall, this line should be snapped on the inside of the rebar, again, one-half the thickness of the particular *ETERNA* element being used as described previously. Hint…it is best to use red chalk to snap the lines because red does not wash off.

When setting the first row start in one of the corners by cutting an element in half on a 45° angle (see corner detail on pg. 31). By cutting the element in this fashion one-half may be set on one side of the corner and the other half may be flipped over for placement on the adjoining side of the corner. This eliminated any waste in the erection of corners.

After setting the elements on the first corner proceed to the next corner, continuing around the building until all the corners are in place. Alignment, plumbing and gluing of the corners should be accomplished as they are set.

The next step to be completed is the installation of the *ETERNA* elements between the corners. Normally, after all of the *ETERNA* elements have been cut and laid in place, plumbing, leveling and gluing is completed. Make sure to stay on the chalk line.
When plumbing and leveling the *ETERNA* elements, wood shims may need to be used. Place the shims on one side or the other to level the *ETERNA* element or to raise it as needed. When placing the wood shims gently tip the element up and put the shim in place. Do not drive the shim into the joint as done while working with other materials, as this will only compress the *ETERNA* material as opposed to raising it. These shims should remain in place until the foam glue has dried completely. They may be cut off or pulled out after the glue dries.

If you are using gun foam for bonding, proceed along the joint between the *ETERNA* element and the foundation and inject a small squirt about every 6 to 8 inches. Be sure not to inject too much, as the foam could fill the cell thus eliminating area for the concrete. The vertical joint between *ETERNA* elements also needs to be glued as well.

If the first row is set on top of the stem wall and it is planned to install the electrical in the cells, now is the time to start the electrical installation. The electrician can, at this point, cut and set his outlet boxes, attach his conduit and install any horizontal runs.

INSTALLATION UP TO THE FIRST GROUT LEVEL

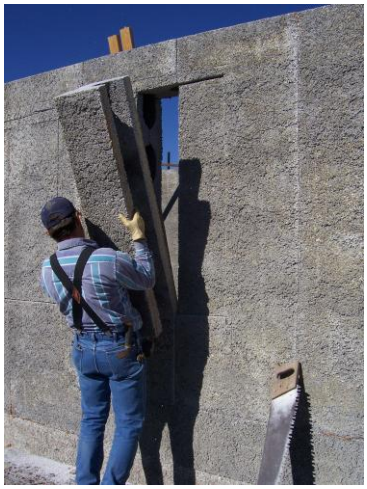
The installation of the *ETERNA* elements up to the first grout level is accomplished in the same manner as the first row installation, starting with the corners and then filling in the rest of the layer. **MAKE SURE THE GROUT CELLS LINE UP**. Work around the building one layer at a time. Set the *ETERNA* element, level, plumb and glue the joint between layers. For best results stretch string for each layer much as you would for the setting of regular concrete block. This will help keep the rows straight and level.

When setting each layer work, from the same side of that wall all the way up. Remember that *ETERNA* elements are like any other material, in that the thickness may vary slightly from piece to piece. You should try to keep one side of the wall flush (usually the inside) and let any differences show on the other side. This lessens the rasping of the wall needed to achieve a smooth finish on both sides.

The height of the first grout will depend on the building; however, the grouting of lifts which exceed a height of 10 feet are not recommended as hydraulic pressure at the base of the wall could exceed material capacities.

WINDOWS AND DOORS






Window and door openings may be accomplished by one of two methods. They may be fabricated while the wall is being installed, or they may be cut out of the solid wall prior to grouting. Usually, larger window and door openings (garage doors) are fabricated during wall installation resulting in the saving of time and materials. However, standard doors and windows of 12 square foot or less are simply cut out of the installed wall.

When designing the openings, it will be necessary to know the rough dimensions of the fixture being installed in the opening.

The openings can be "bucked" with lumber. To do this one of the following three sizes of lumber will be needed: 2" x 4", 2" x 6", or 2" x 8". If the bucking is to be left in the wall as a nailer, either 2" x 4" or 2" x 6" lumber will be needed depending on the element size of 8 1/2 ", 10", or 12". If the bucking is to be removed after grouting, 2" x 8"s should be used for all sizes of *ETERNA* elements.

Pictures below show the two methods of bucking. In both cases the finished opening will be the same size as the rough opening design called out for the fixture.

Regardless of the method used in openings, spreaders should be used to stabilize door and window openings when grouting.

Bracing of long straight runs.
Note: Reinforce window openings with spreaders to withstand force of grout. Spreaders are removed after grout has dried.

PREPARATION OF THE WALLS FOR GROUTING

Upon completion of the *ETERNA* element installation process and prior to the grouting of the completed wall segments, there are various items that will need to be confirmed to ensure a successful concrete installation. These things are:

1. Make sure that all the *ETERNA* elements are glued.
2. Brace any long straight runs so as to minimize any movement that would make the wall difficult to walk when grouting.
3. Cut all window and door openings.
4. Brace inside windows.

5. Place all rebar – horizontal and vertical.
6. Place all bucking.
7. Brace all corners, wall ends and bucking so they can withstand the force of the grout.
8. Place any anchor bolts and ledgers that are needed.
9. Get any needed inspections from your local building authority.
10. Schedule with the concrete company for the grout to be delivered.
11. Schedule the grout pump.

PUMPING THE GROUT

Upon starting to install the grout, place the first grout in the bottoms of any window openings that are over 5 feet wide. To do this just cut a hole in the bucking to let the grout pass through (a 2 inch hole saw works very well). You can replace the piece of the bucking if you wish. With bucking it may be necessary to remove the bottom piece and replace it when it is full to insure the grout stays below the level of the bucking so you have a smooth opening when you remove it.

After you grout the window bottoms then you should start grouting at one corner (not directly in the corner) and move around the building. Fill the wall as you go remembering that the grout, if at the right slump will flow at a 45° angle as it fills. Be prepared to move down the wall as the grout reaches about the 2/3 full mark. Keep moving 2 to 4 cells at a time and watch the grout fills to the desired level. Avoid dropping the mud directly down the vertical hole, let the mud hit a nod area, thus eliminating hydraulic hammering. An option to consider is to cut holes half way up the wall and pump the grout through these openings to the half way point and then gluing the cut out material back in place, working your way around the structure and then coming back and toping the wall off with grout (this will accomplish two things, one being less pressure on the wall from the grout pump, but most importantly if there is a problem with the grout pump or delivery of trucks, cement is not blocking the openings all the way to the top of the wall, thus accomplishing a better pour). Try to avoid over filling as clean up will have to be preformed after the completion of the grouting. If you do spill grout on the finished concrete slab you will want to scrape it up as soon as possible so it does not stick to the concrete.

If the structure being grouted will need two separate grout applications is should be noted that the rebar will need to extend past the point of the first grout at least 40 bar diameters high to accomplish the overlap required to offset the cold joint.

This may be accomplished in one of two ways, stop the grout application below the top of the bar the necessary distance or precut your bars so that they protrude out above the top of the grout line for the prescribed lap splice.

If this is the top of the wall it will be necessary to make sure that the top of the rebar is below the top of the wall at least 3 inches, and that the grout is struck off flush with the top of the wall upon completion. The placement of any top plate anchor bolts should be done at this time also.
As the wall is being grouted be sure all anchor bolts for ledgers plates, adjoining walls and any other connections are mounted in the wall in such a fashion as to allow for proper connection and tightening.

When completed, remember to clean any grout off the slabs. If there are colored concrete slabs, and they are going to be left exposed, then it will be necessary to cover the concrete before grouting for protection from stains.

GROUTING THE SECOND LIFT

Installing the *ETERNA* for the second story is accomplished in the same manner as with the first story. Install your corners first then fill in the middle. Level and plumb each layer as you go. Glue each layer after leveling and plumbing. Work around the building one layer at a time. Do any openings in the same manner as done for the first lift. Again you can go as high as 10 to 13 feet high with each lift. Follow the same check list for grout preparation. Pour the grout in the same manner as before, large window bottoms first and then from the top (or midway) and work around the building

When building multi story buildings it is sometimes helpful to proceed floor by floor. By this it is meant to build the walls to the height just past the first floor ledger height and then after being grouted placing the floor joist and sub-flooring. This will create a surface to work from and eliminate the need for additional scaffolding. This is purely optional, as the walls could be installed to full height and the floors added later.

If a parapet wall around a flat roof is the application, then the top of the wall will need to be cut before you grout. One of the advantages to the *ETERNA* element is that you can cut it so easily. This alone allows you to be as creative as you want with the top of your wall (see figure 21). Cut any shape desired and then grout it. Be sure that you strike off the grout even with the top of the wall.

FINISHES AND WALL PREPARATION

After the grout has had time to setup remove all braces and supports. Then rasp the surface of the ETERNA wall for desired smoothness. The amount of rasping needed will depend largely on your own visual approval and the finish to be used.

After using the rasp to remove the excess glue, rasp any edges that are not smooth. If plastering directly to the inside of the walls, smooth the surface very smooth. Check with the plaster contractor on how much leveling his application will achieve. The exterior of the wall is where most of the unevenness should be. Here again check with the stucco contractor on how much rasping will really be needed. Stucco can cover some pretty rough surfaces. The bottom line is that the rougher the surfaces, the thicker they will need to apply the stucco to cover it, which could result in, increased costs.

Other than any rasping needed there is nothing else you will need to do to the wall to get it ready to be finished. You can stucco and plaster directly to the *ETERNA* element.

This method of installing the *ETERNA* element is but one. The more people that install *ETERNA* elements are more innovations and short cuts that are thought of. This is the best thing

about the *ETERNA* element, there is no one set way you have to install it. The *ETERNA* element is very versatile and can be used and installed in a lot of different ways. You should feel free to experiment and try different things to make the process go smoother and faster for you. The main thing you need to remember is that as long as the grout cells are kept in line you can do almost anything with the element.

TECHNICAL INFORMATION

PRODUCT DESCRIPTION

- MATERIAL COMPOSITION:

  Cement and Recycled Polystyrene, water and additives make up the mixture which is molded in two halves and glued together with expanding foam glue.

- MATERIAL CHARACTERISTICS:

  Material is strong but cuttable cement and polystyrene mixture which cuts easily with a hand saw or chain saw. Groves or channels for wiring may be cut using a router or chain saw. Material can be easily shaped with a rasp to achieve any look desired.

- MATERIAL RATINGS:

Insulation Valve	R-rating of 41.67 without coatings (Laboratory tested)
Fire Resistance	4-Hour fire rating on material made with same matrix
Heat Conductivity	0.0146 btu/hft F
Thermal Resistance	≥ 22 hr. sq. ft. F/btu
Water Vapor Transfer Permeability	7.3
Bulk Density	21 lbs per cubic foot ± 10 %
Tensile Bending Strength	42 psi
Pillar Compressive Strength	81 kip/lft
Sound Resistance	53db sound reduction with coatings
Frost Resistance	20 cycle 0-100 n/c
Average Wall Humidity	< 2.5 % of Volume
Structural Capacities	As shown in tables below

Allowable Axial Loads – 8.5" *ETERNA* Wall

f'c of Grout	2,500 psi
Fy of Reinforcing Steel	40,000 psi
Seismic Zone:	Zone 4, Z = 0.40
Wind Exposure:	C

Allowable Axial Load in Pounds Per Lineal Foot

H Height of Wall Feet	70 MPH (16.03 psf)		80 MPH (20.86 psf)		90 MPH (26.46 psf)	
	#4 @ 30" o.c.	#4 @ 15" o.c.	#4 @ 30" o.c.	#4 @ 15" o.c.	#4 @ 30" o.c.	#4 @ 15" o.c.
8'	1900	1900	1900	1900	1900	1900
10'	1800	1800	1700	1800	---	1800
12'	---	1800	---	1800	---	1200
14'	---	1400	---	---	---	---
16'	---	---	---	---	---	---
18'	---	---	---	---	---	---
20'	---	---	---	---	---	---

Allowable Axial Loads – 10" and 12" *ETERNA* Walls

f'c of Grout	2,500 psi
Fy of Reinforcing Steel	40,000 psi
Seismic Zone:	Zone 4, Z = 0.40
Wind Exposure:	C

Allowable Axial Load in Pounds Per Lineal Foot

H Height of Wall Feet	70 MPH (16.03 psf)		80 MPH (20.86 psf)		90 MPH (26.46 psf)	
	#4 @ 30" o.c.	#4 @ 15" o.c.	#4 @ 30" o.c.	#4 @ 15" o.c.	#4 @ 30" o.c.	#4 @ 15" o.c.
8'	2800	2900	2800	2900	2800	2900
10'	2800	2850	2800	2850	2800	2850
12'	2600	2800	2600	2800	2600	2800
14'	2600	2700	2200	2700	---	2700
16'	---	2700	---	2700	---	2700
18'	---	2700	---	2000	---	---
20'	---	1400	---	---	---	---

PRODUCT APPLICATIONS AND USES

Residential – Homes (any style), Basements, Garages, Workshops, Barns, Greenhouses, Fences, Retaining Walls

Commercial – Office Buildings, Restaurants, Strip Shopping Centers, Malls, Apartment Complexes, Hospitals, Etc….

Industrial – Factories, Warehouses, Equipment Rooms

Sound Abatement – Freeway Sound Walls, Soundproof Rooms

PRODUCT SPECIFICATIONS

ELEMENT DIMENSIONS AND WEIGHTS

Name	Thickness	Height	Length	Core Size	Weight
Standard	8.5”	15”	90”	4.5” x 5.5”	150 lbs
Twin	8.5”	30”	90”	4.5” x 5.5”	230 lbs
Standard	10”	15”	90”	6” diameter	120 lbs
Twin	10”	30”	90”	6” diameter	240 lbs
Standard	12”	15”	90”	6” diameter	160 lbs
Twin	12”	30”	90”	6” diameter	320 lbs

CONSTRUCTION DATA

Concrete Consumption
- 8.5” Elements 0.17 cubic yards per square foot of wall surface
- 10” and 12” Elements 0.26 cubic yards per square foot of wall surface

Reinforcement Consumption
- 15” Centers 1.17 lineal feet per square foot of wall surface
- 30” Centers 0.85 lineal feet per square foot of wall surface

External Coverings
- Single coat stucco directly applied to surface
- Wood, Metal or Vinyl Siding
- Brick, Stone or Tile Veneers

Internal Coverings
- Single coat finish plaster directly applied to surface
- Sheetrock laminated directly to surface
- Tile thin set or mud set
- Paneling glued to surface

Methods of Attachments
- Interior walls – Anchor bolts grouted into *ETERNA*, glue, nailed
- Cabinets – Wood strips routed and glued into the surface

Wall hangings, lightweight – Drywall picture hook, Screw or Nail

Wall hangings, heavy weight – Masonry anchor into the core
Windows – Glued into the opening with Expanding Foam Glue or screwed or nailed to wood or metal bucking in opening
Doors – Screwed or nailed to wood bucking which is anchored to the cores
Pop-outs - *ETERNA* flat panels directly glued to surface
Ledgers – Anchor bolts through the side of element, size and spacing per Engineer's Spec.'s
Top Plates – Anchor bolts in grout cells, size and spacing per Engineer's Spec.'s
Miscellaneous Interior trim pieces – Wood backing routed and glued into wall prior to covering surface

UNLOADING AND STORAGE OF THE *ETERNA* PRODUCT

FORKLIFT SELECTION AND TECHNIQUES

- **Tong Size –**

  The most important factor in selection of the proper forklift is the width of the fork tongs. The proper width is **4" (inch)**. This width gives adequate support to the block for lifting with sufficient additional space around the tongs for quick and easy entry. Although 5" (inch) tongs maybe used, the risk is run of breaking or splitting the blocks due to the tight fit. Additionally, extra time will be used in the entry process for the above mentioned reasons.

- **Tong Spacing –**

  The optimum spacing of the tongs is **60" (inches)** from center to center. This spacing will give the maximum loading support balance to the *ETERNA* elements. If this span is not readily accomplished with the forklift available then a spacing of **30" (inches)** maybe used with the following notes of caution:

  a) Be aware that the weight will be extended over the sides of the tongs and will be susceptible to breakage resulting from rough terrain or sharp bumps.
  b) Only retrieve a maximum of 15 (fifteen) elements (5 high and 3 deep) at a time. This will lessen the pressure on the lifting points.

- **Tong Depth –**

  Caution should be taken to insure that the length of the forklift tongs do not exceed the depth of the desired amount of *ETERNA* to be retrieved in one lift. (Usually 45" inches) If the tongs protrude past the desired point and lift is initiated, damage may be incurred on the adjacent element. This may also result in the tipping of the adjacent stack causing that stack to fall off the other side of the trailer.

- **Truck and Trailer –**

  Truck and trailer should both be on level ground with sufficient room to maneuver the forklift on both sides of the load. The truck and trailer should never be relocated without the tie down straps being in place and tight.

- **Technique –**

  Upon successful entry of the tongs into the *ETERNA* elements, lift them slightly to clear the adjacent elements, (if the forklift has a TILT feature, tilt the forks back slightly at this time to facilitate clearance from the adjacent stacks). Then after it has been established that separation from the rest of the material has been accomplished, lift the product to the desired clearance level and back away. As soon as possible lower the product down to a manageable level in order to accomplish balance and maneuverability.

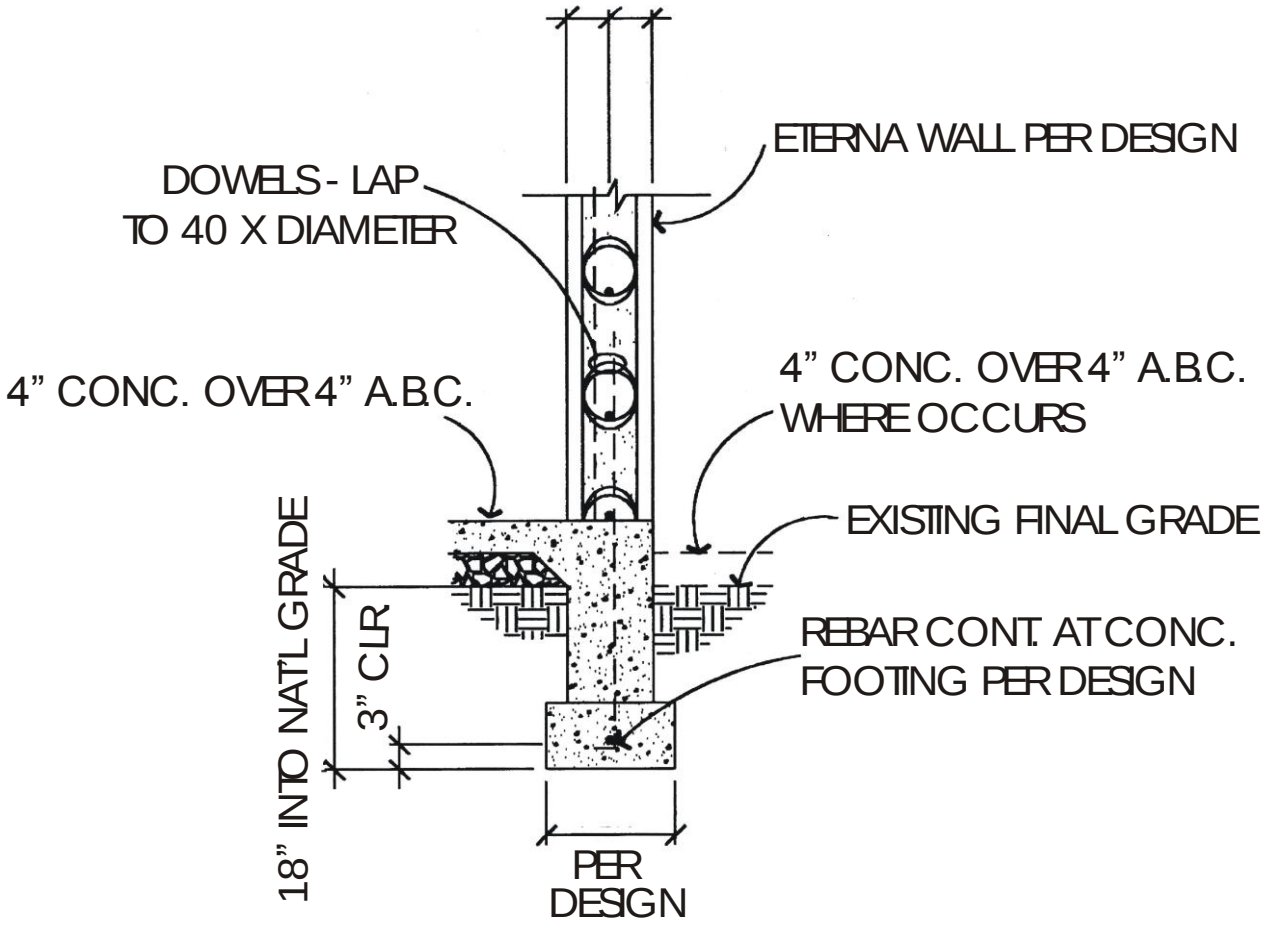
- **Storage Area –**

  The *ETERNA* product should be stored on a flat area. If the storage area is un-level or rough it could result in warped or broken product. Due to the length of the *ETERNA* product this is a very important item to remember and plan for.

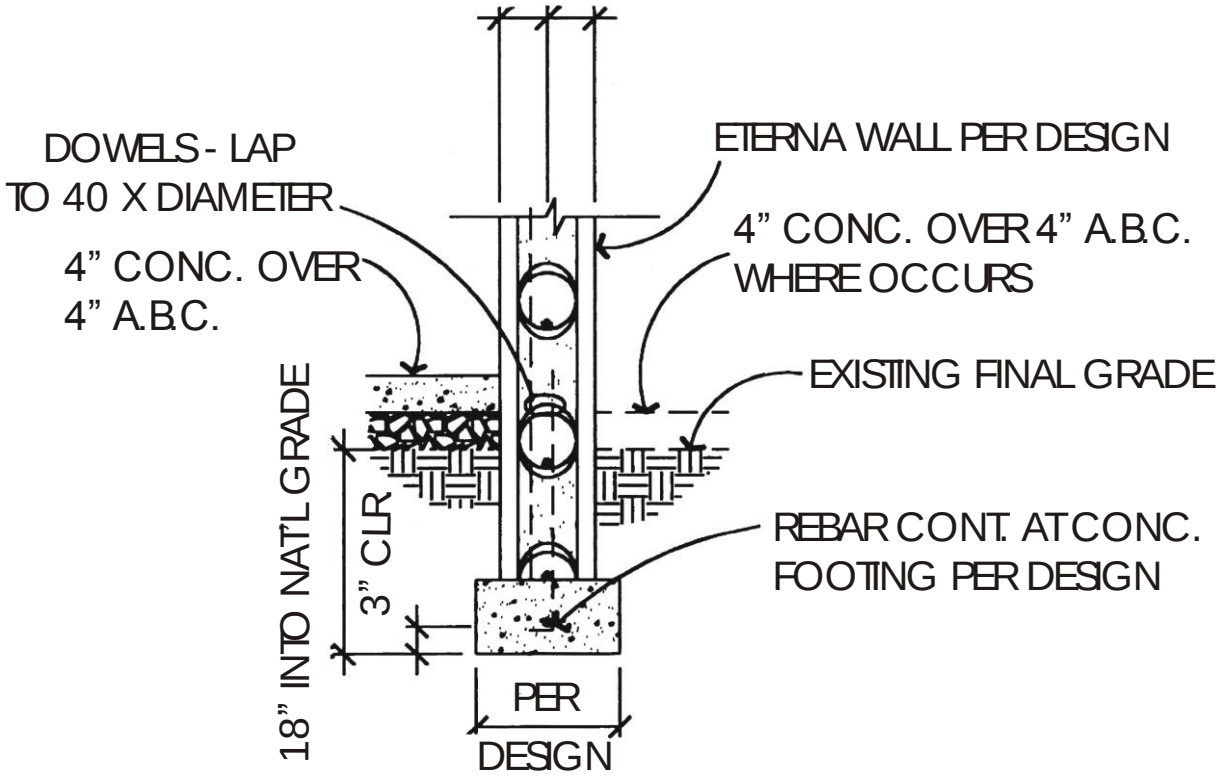
- **Storage and Weather –**

  If the *ETERNA* product is to be stored over time, it should be covered in order to keep the water from saturating the elements. It does not weaken the product; however, it adds sufficient weight to the element in a wet condition.

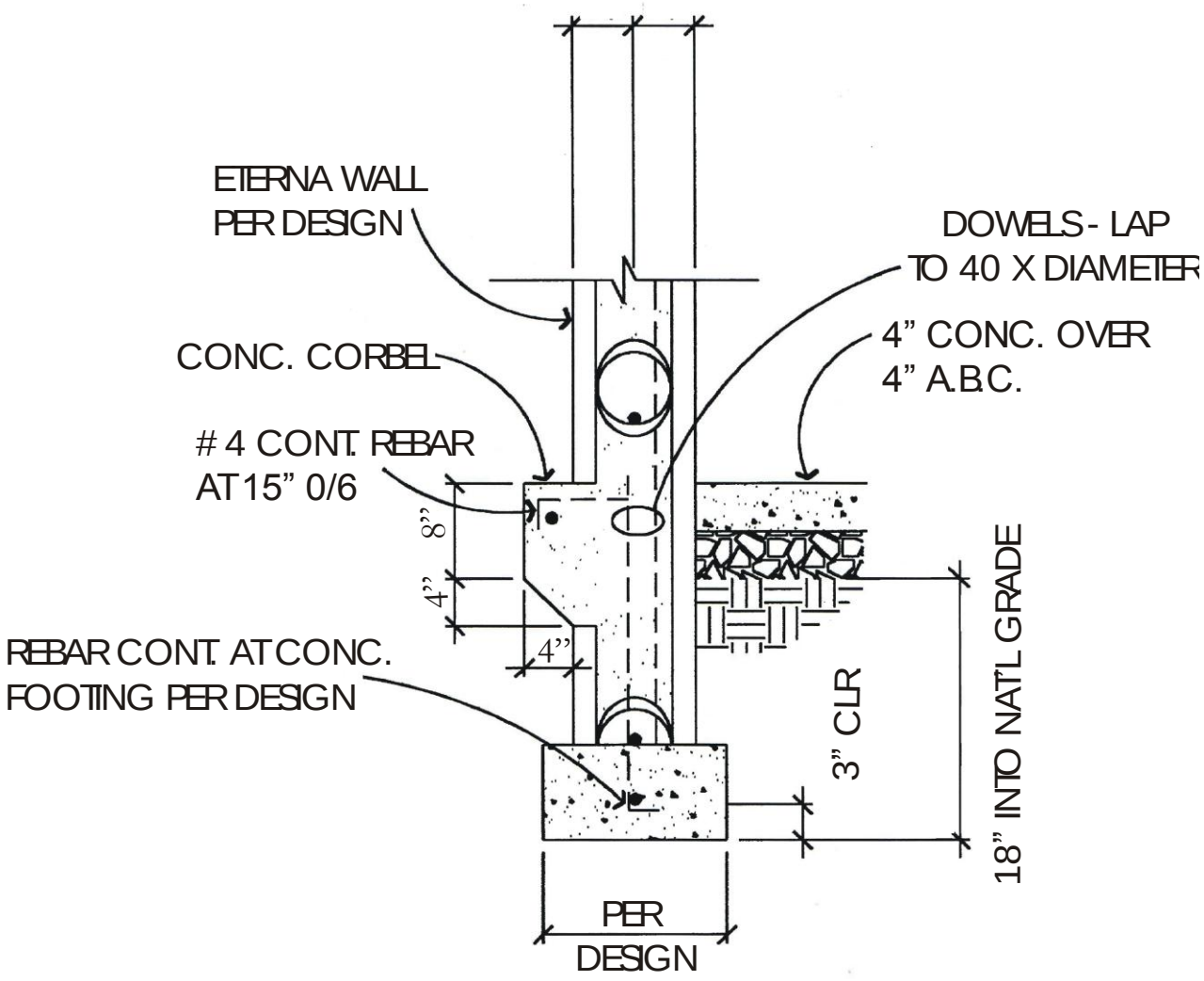
STANDARD DETAILS



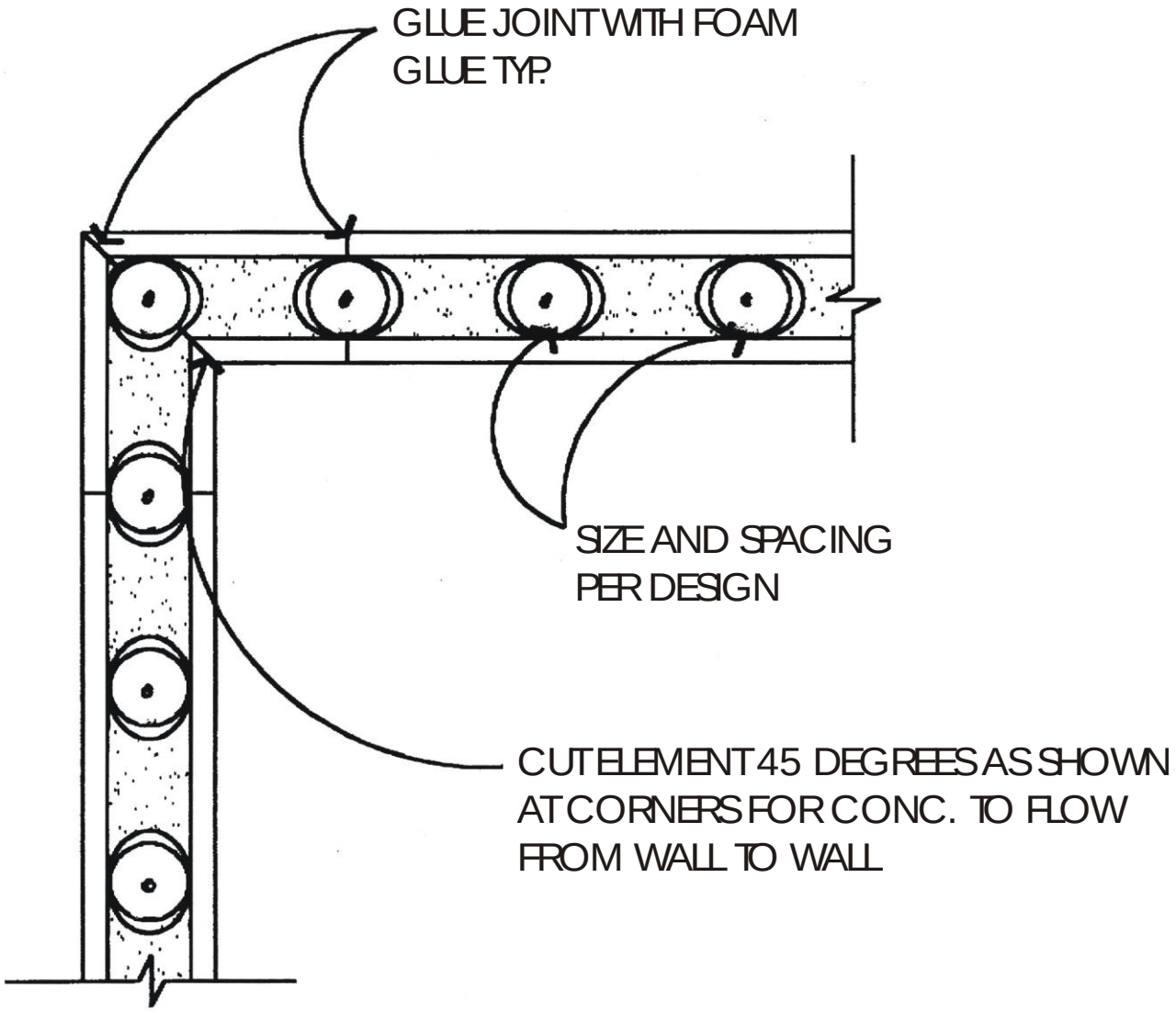
MONO POUR SLAB CONNECTION



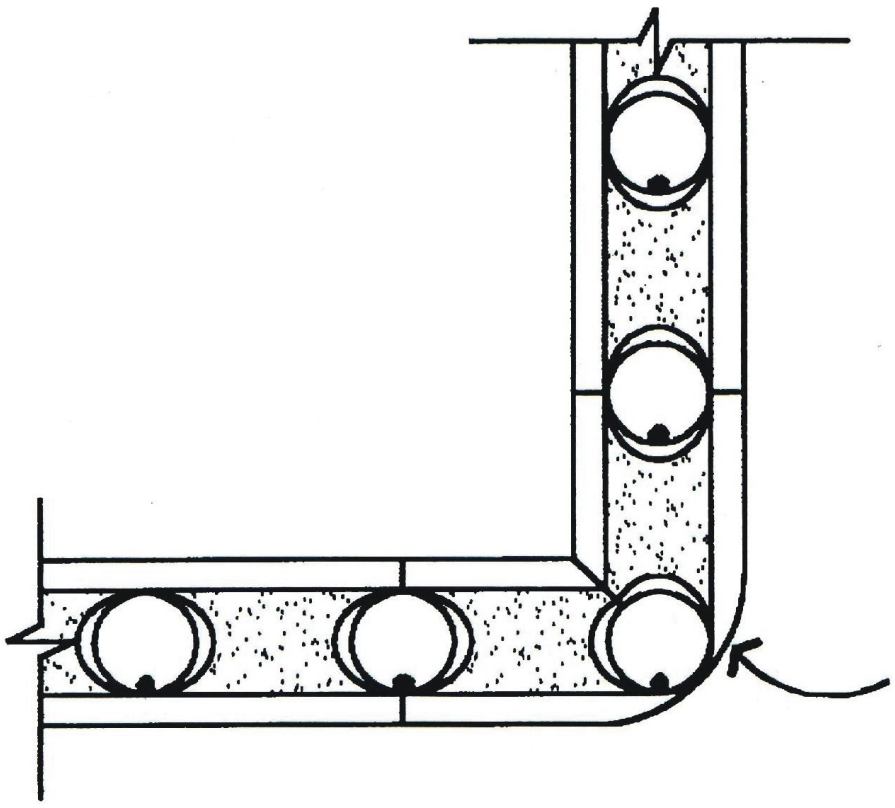
STEMWALL TO FOOTER CONNECTION



CORBEL FOR BRICK/ROCK VENEER

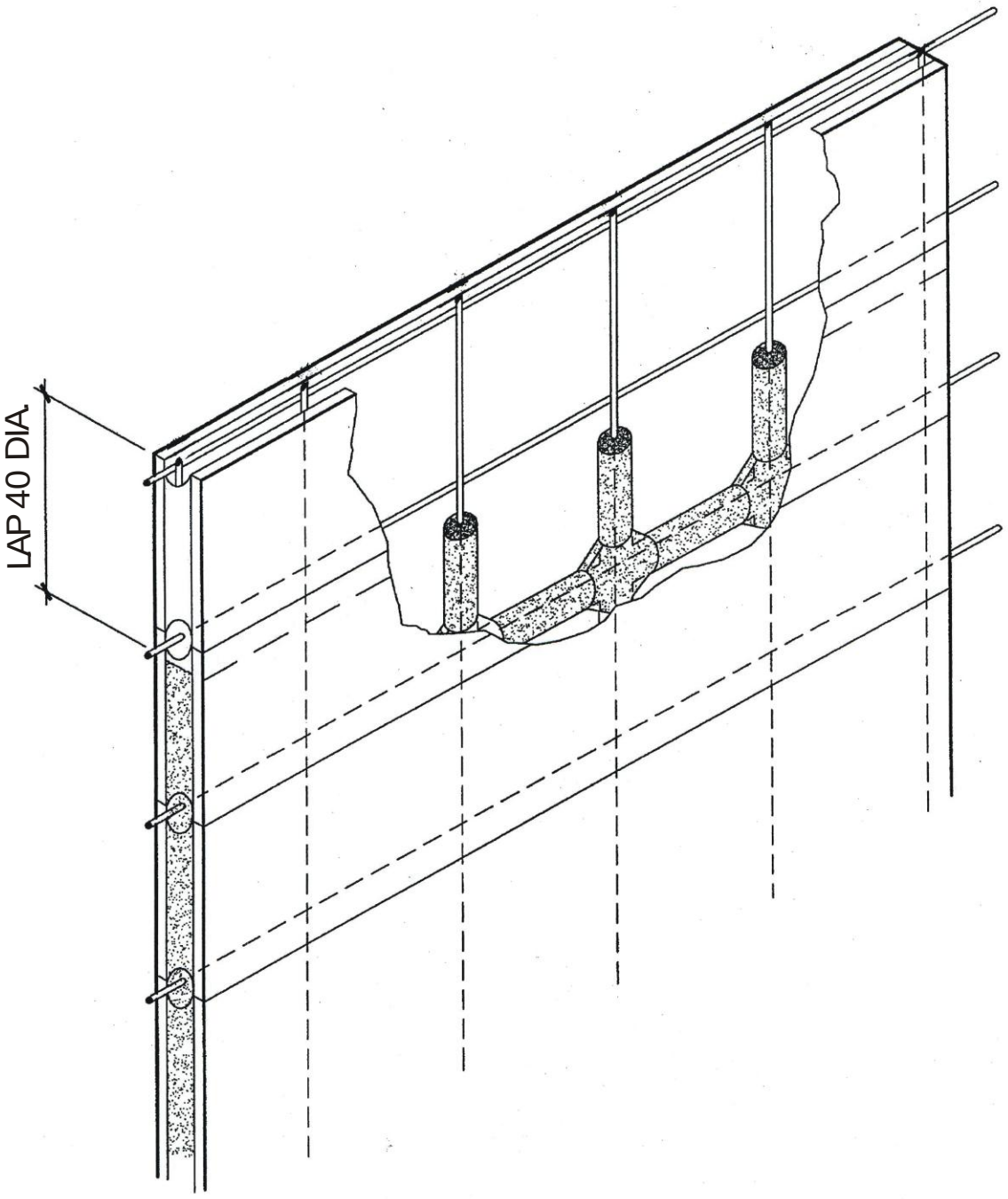


TYP. CORNER DETAIL



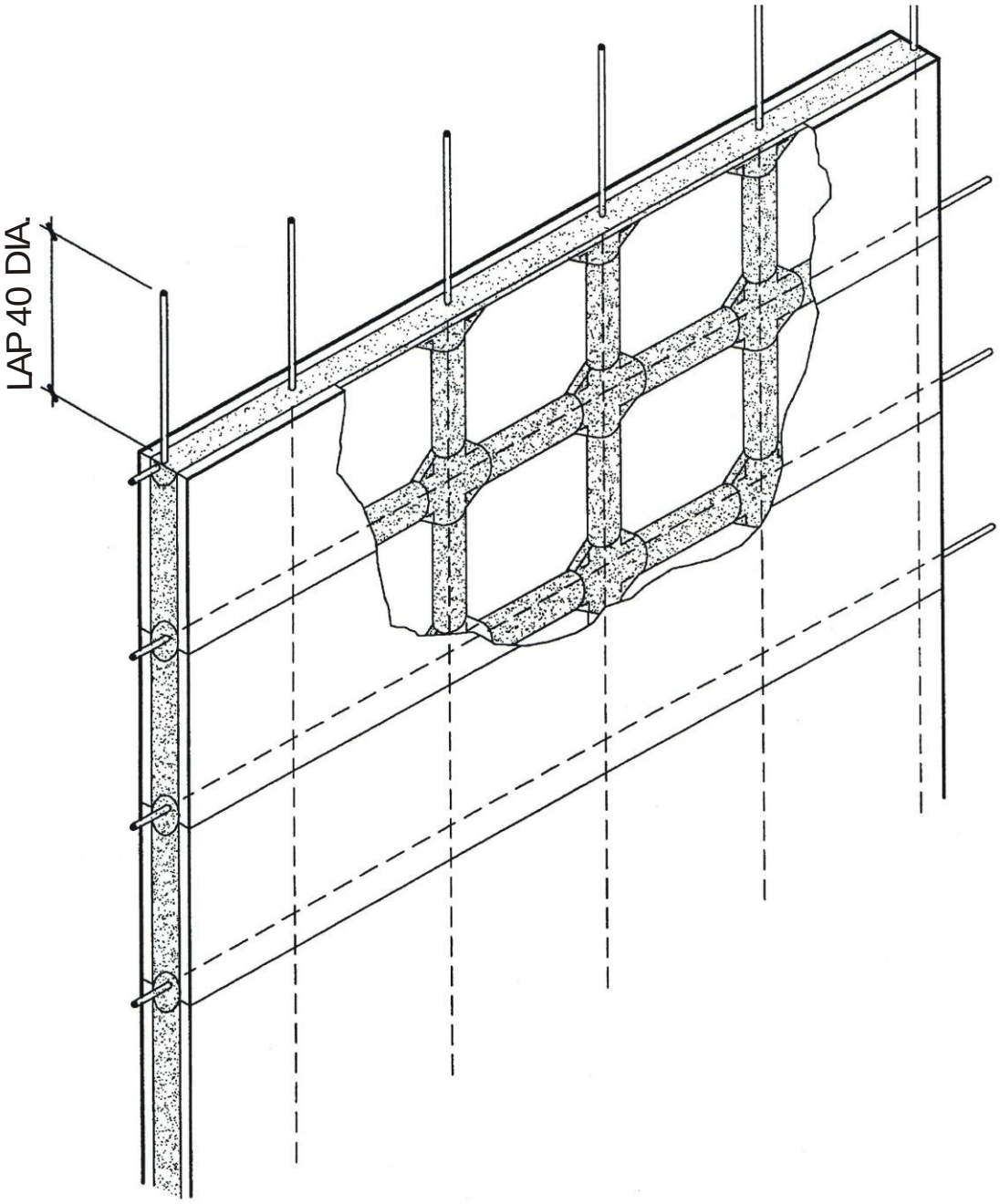
5’ - 0” CORNER UNITS LAID UP HORIZONTALLY.
UNITS MADE BY CUTTING 10’ - 0” UNITS IN
HALF USING A 45 DEGREE CUT

RADIUS CORNER DETAIL



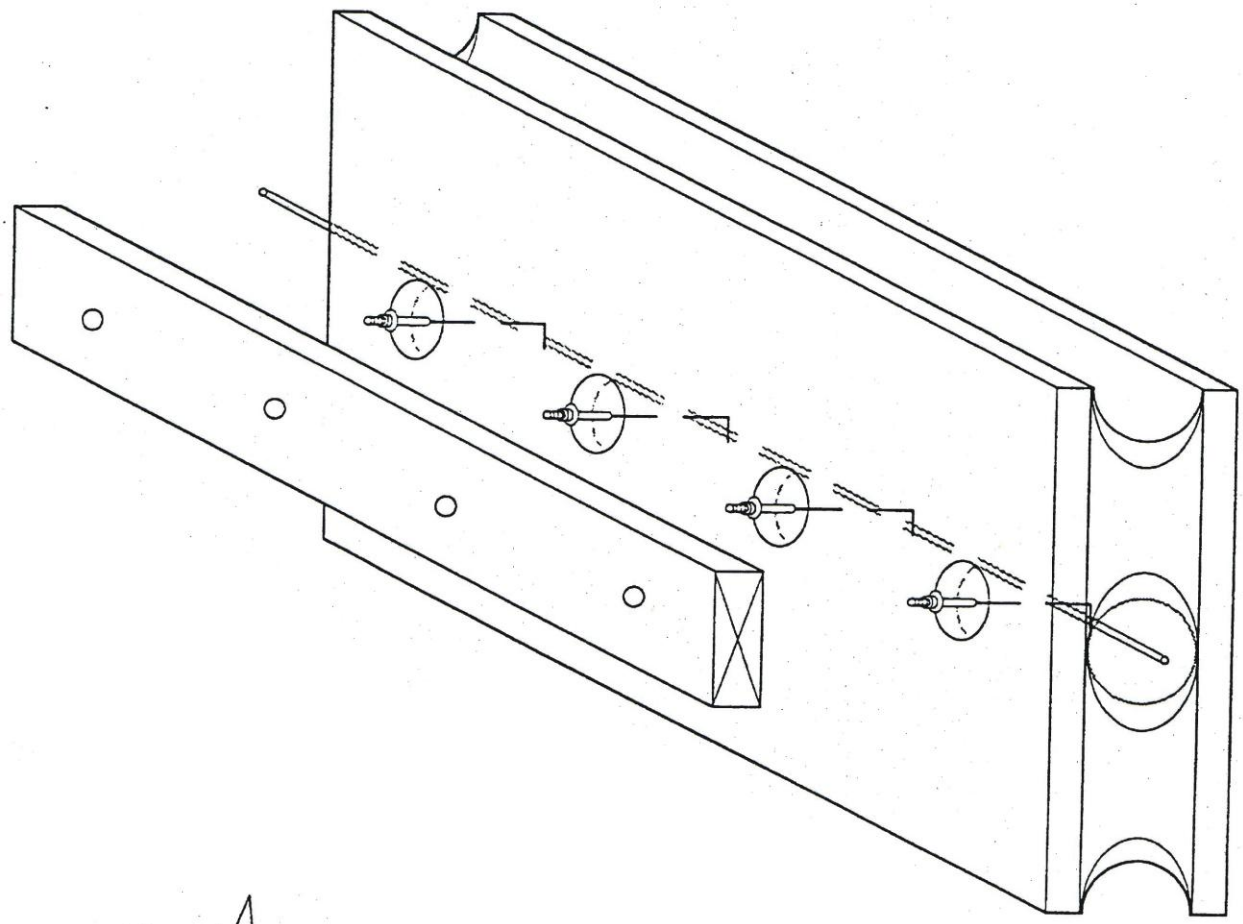
DRAWINGS ARE NOT TO SCALE AND FOR ILLUSTRATIVE PURPOSES ONLY

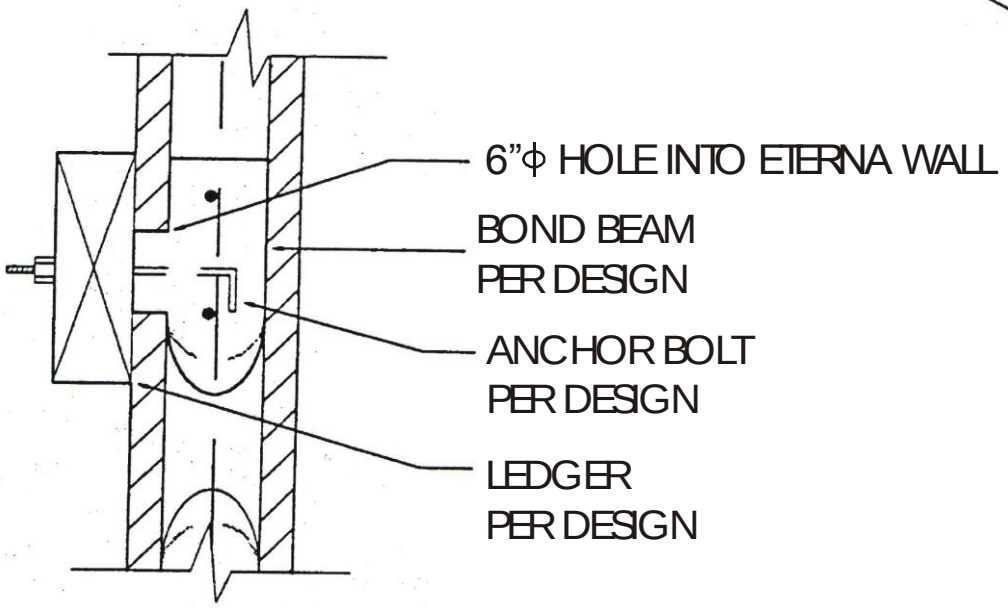
WALL WITH GROUT LEFT LOW



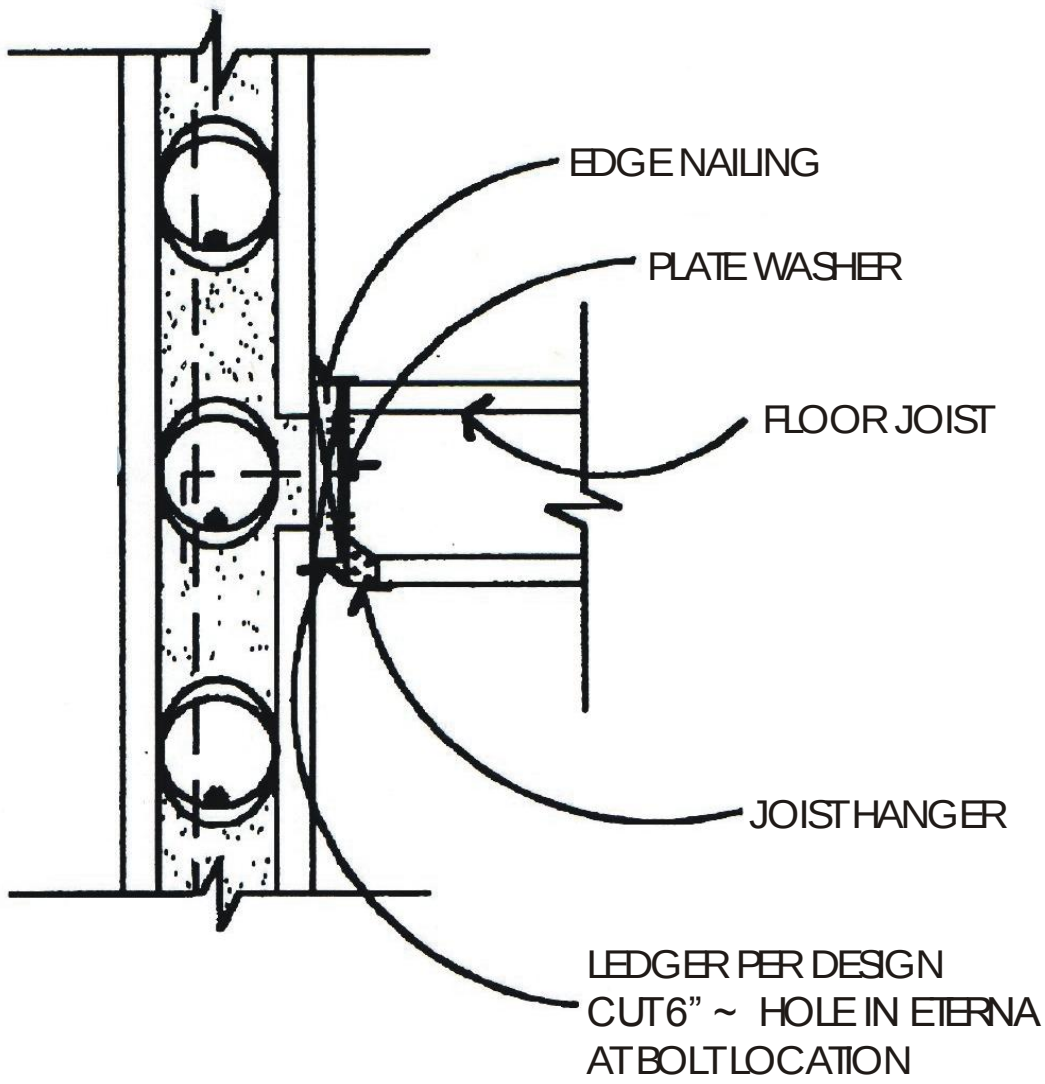
DRAWINGS ARE NOT TO SCALE AND FOR ILLUSTRATIVE PURPOSES ONLY

WALL WITH REBAR LAP LEFT HIGH

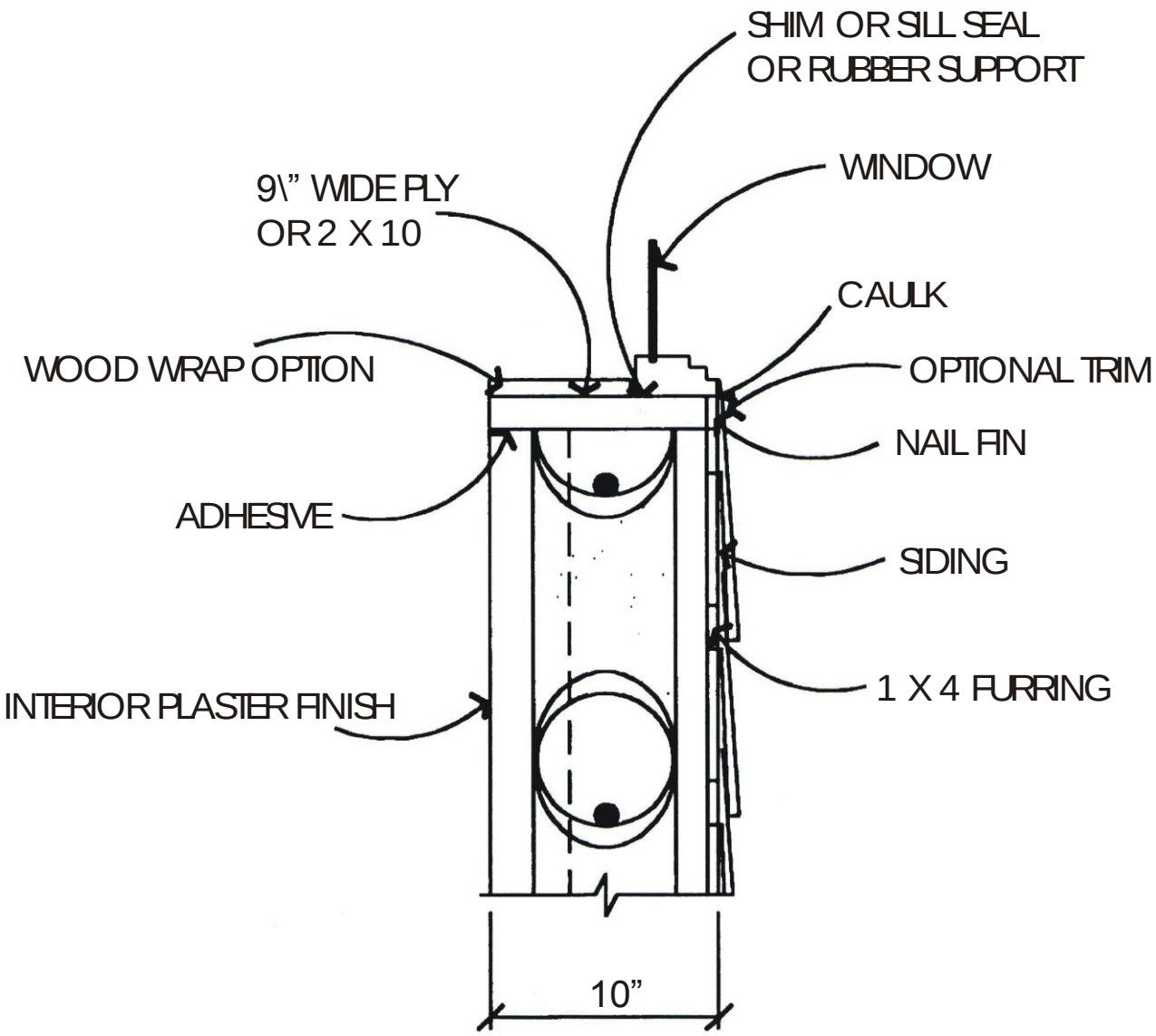




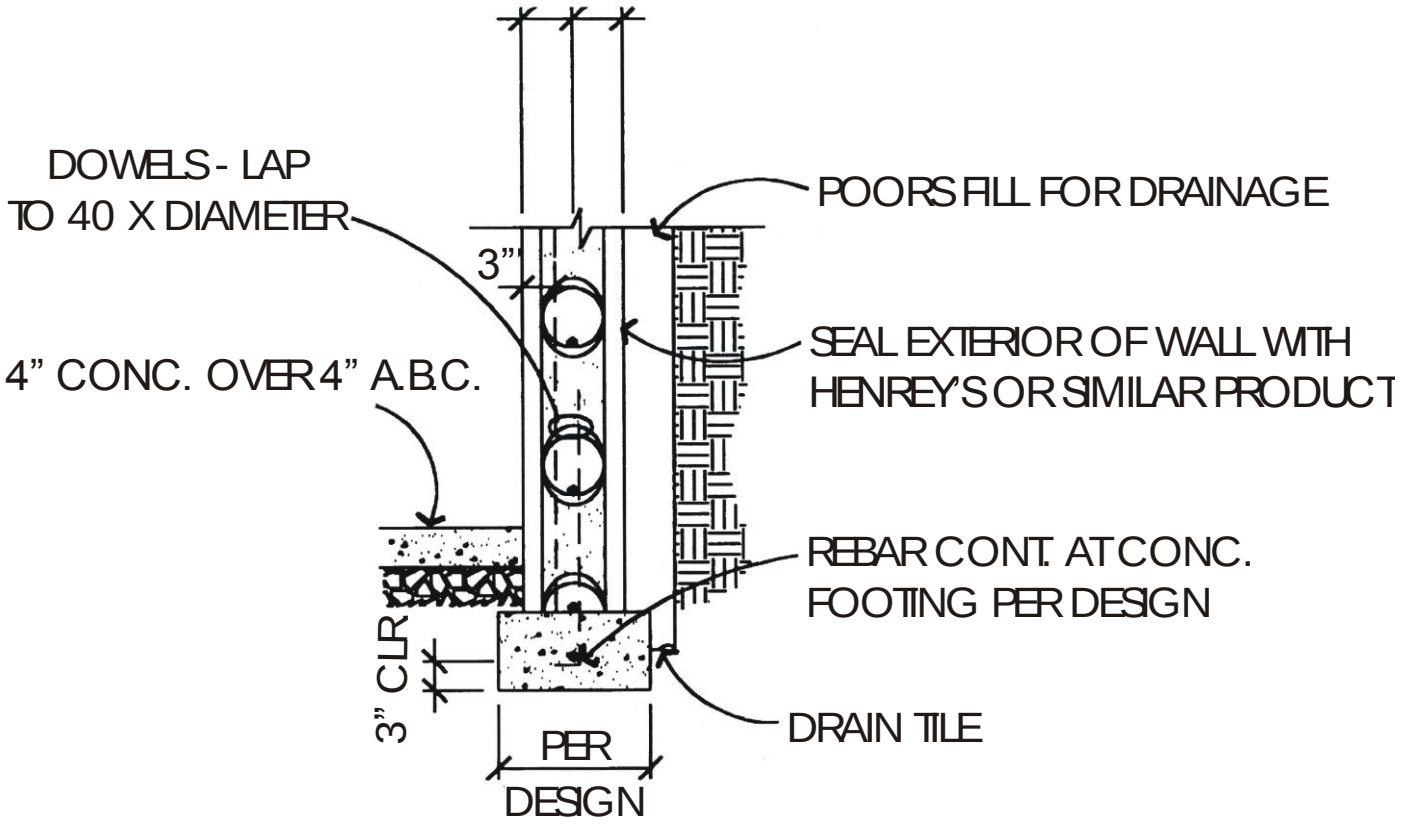
LEDGER DETAIL



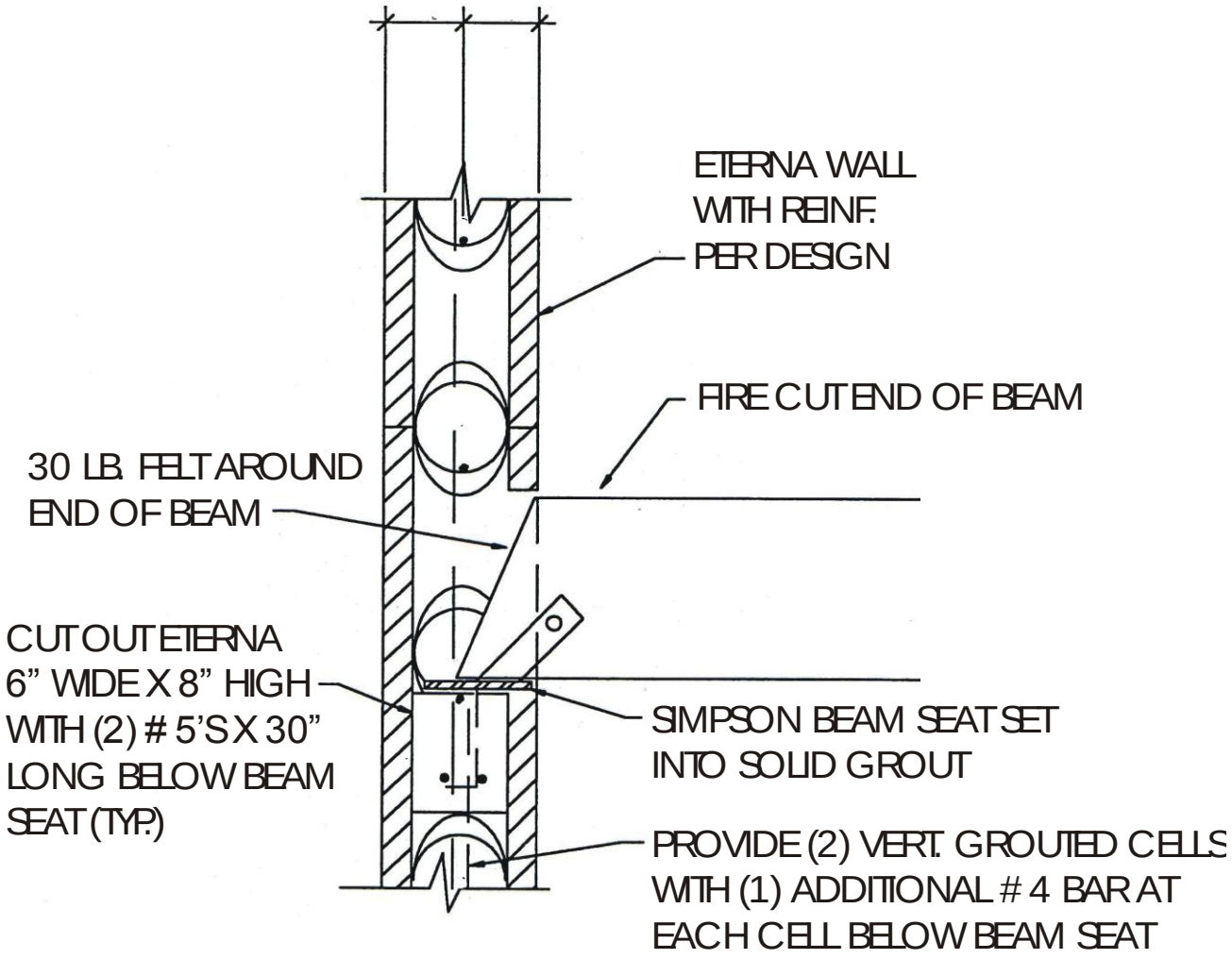
LEDGER & FLOOR JOIST CONNECTION



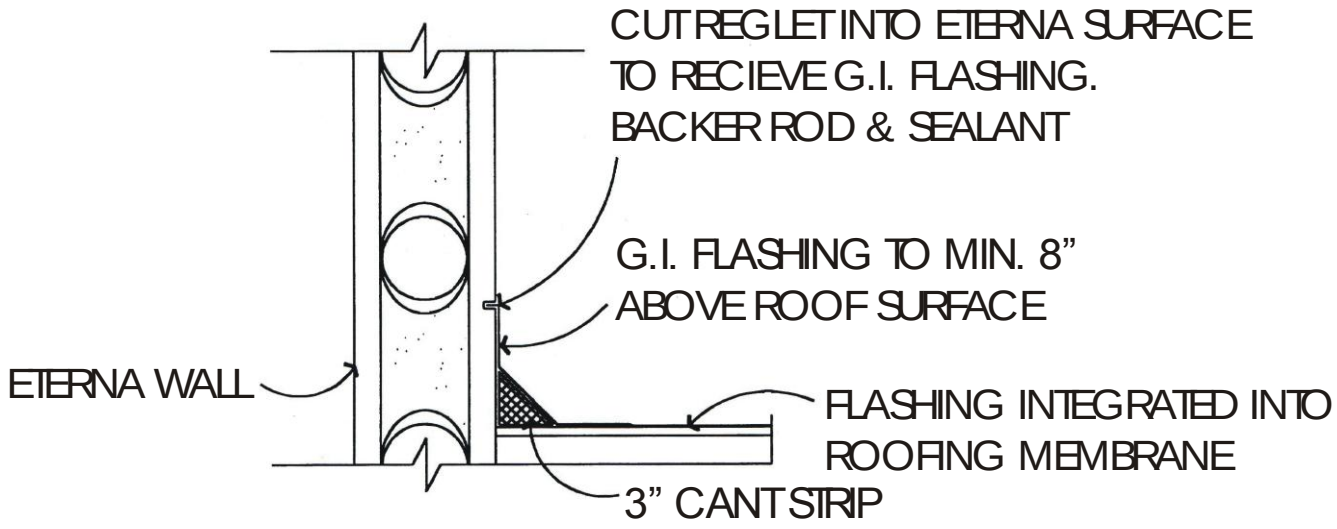
WINDOW WITH WOOD BUCKING AND WOOD SIDING



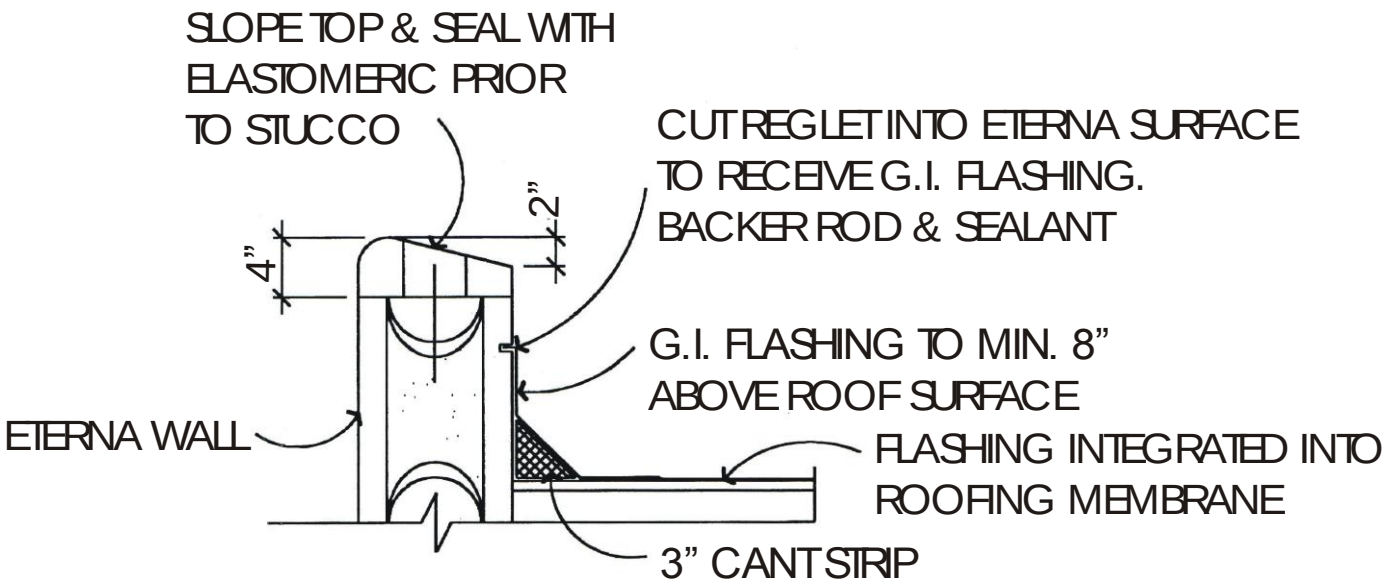
TYP. BASEMENT WALL


ETERNA WALL
WITH REINF.
PER DESIGN
FIRE CUT END OF BEAM
30 LB. FELT AROUND
END OF BEAM
CUT OUT ETERNA
6" WIDE X 8" HIGH
WITH (2) # 5'S X 30"
LONG BELOW BEAM
SEAT (TYP.)
SIMPSON BEAM SEAT SET
INTO SOLID GROUT
PROVIDE (2) VERT. GROUTED CELLS
WITH (1) ADDITIONAL # 4 BAR AT
EACH CELL BELOW BEAM SEAT

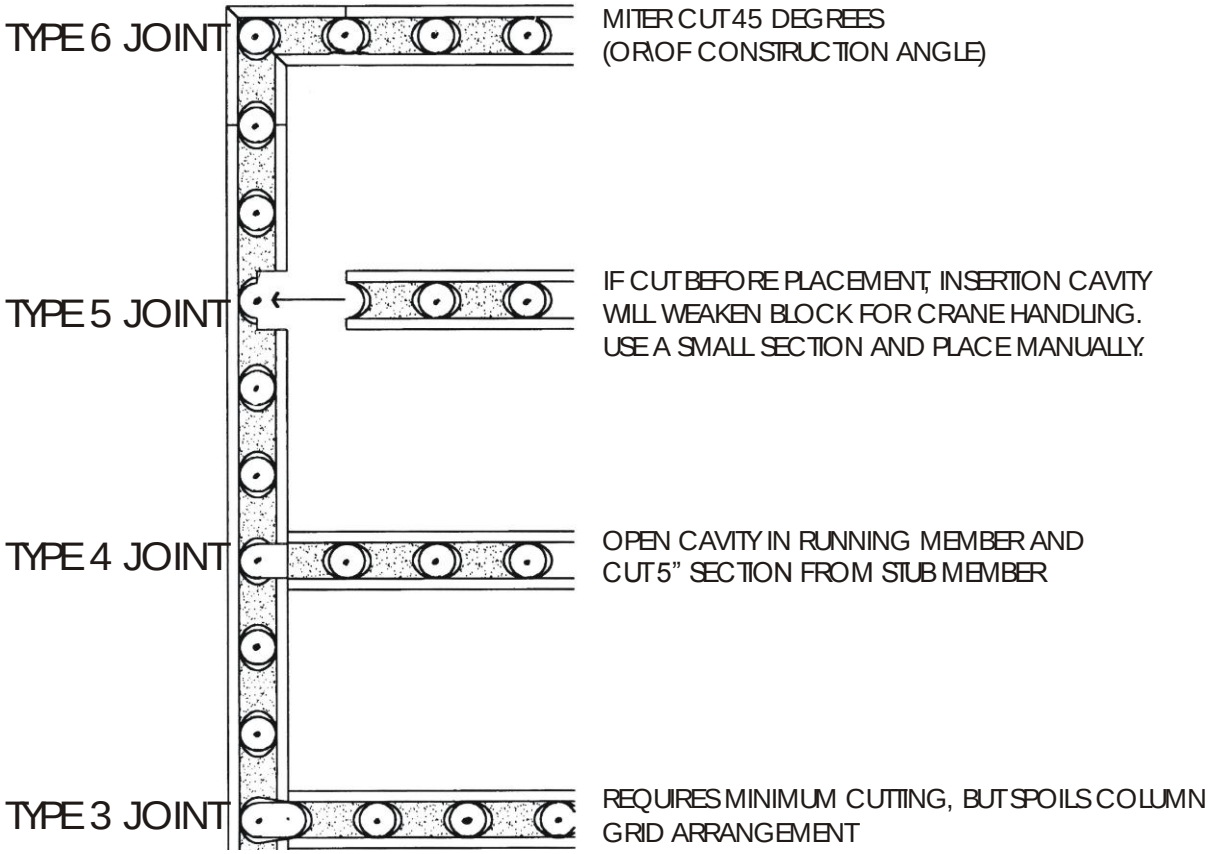
BEAM SEAT



ROOFING AND WALL CONNECTION



PARAPET CAP



DIFFERENT WALL JOINT CONNECTIONS