Standard ICFs™

An

Insulating Concrete Wall Forming System

Installation Instruction Manual

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Preface

This manual consists of Installation Instructions (text) and Installation Guide (graphic details). It is intended to assist the installation contractor in the methods and details of constructing walls using **Standard Insulating Concrete Forms** (Standard ICFs™). This manual does not preclude the necessity for the installer to use generally excepted construction practices, to rely on past and proven experience, or to follow design plans and specifications.

It is the responsibility of the installer to be abreast of the most up to date construction techniques and information available, to work in a safe, efficient, and workmanship like manner, and to construct walls in accordance with applicable building codes and regulations.

Structures built with Standard ICFs™ should be designed, engineered, and constructed in accordance with the applicable governing building codes and regulations including American Concrete Institute (ACI) 318.

Standard ICF™ Corporation is committed to producing the highest quality products and warrants their products against substandard materials and manufacturing defects that do not conform to their own published specifications. However, Standard ICF Corporation assumes no responsibility for the installation, for any accessory materials, or for the performance of a product or system once they have been installed.

Consistent with our history as an innovator, Standard ICF™ Corporation will continue to research and develop new innovations that will make our products more user-friendly, more fail safe, and more cost effective. We reserve the right to modify or to update the products and literature we produce. Therefore, it remains the responsibility of the user to obtain the most recent information available.

When it is required, please do not hesitate to consult a Standard ICF™ Corporation "manufacturer's representative" for information concerning the installation of Standard Insulating Concrete Forms.

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Management

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System Description and Specifications

Standard Insulating Concrete Forms (Standard ICFs™) are an exclusive hybrid insulating concrete forming system (***patents pending***) used to build monolithic concrete walls for above and below grade applications. Standard ICFs™, with their unique design and combination of features, provide benefits that are exceedingly user-friendly and failsafe, resulting in more cost-effective installations. Walls built with Standard ICFs™ are extremely strong, soundproof, and energy efficient. Compared to traditional concrete forms and concrete block, they are extremely lightweight and require much less effort to handle and install.

Standard ICFs™ are a 7-inch modified flat-wall, block type, concrete forming system. They are made of Expanded Polystyrene (EPS) insulating foam plastic panels with an integrated High Density Polyethylene (HDPE) hard plastic stud wall-tie bracket system. The HDPE used is derived from recycled material. The EPS is a lightweight multi-cellular moisture resistant material made from expandable beads containing pentane gas and flame retardant additive.

Standard ICFs™ are manufactured using Molded Type II EPS in accordance with ASTM E84. Standard ICFs™ are molded to a net cured weight density of 1.5 pounds per square inch. Underwriters Laboratories Inc. (UL) test results indicate the EPS used has a flame spread of 10, and a smoke development of 300. The forms can be recycled and there are no HCFCs or HFCs emitted during the manufacturing process. The finished product has no off-gassing, fumes, odors, or toxins. When filled with concrete they form a monolithic concrete wall that has a fire resistance of 3 hours with 5/8-inch drywall. When burning, Standard ICFs™ produce less than half the toxins of burning wood. They have a calculated thermal resistance of R-Value R-26+ with a performance up to R-50 and a sound transmission classification of STC-50.

The 1 5/8-inch wide stud flanges and the exclusive 3-inch x 3-inch corner brackets, which are readily marked, are located every 12-inches on center as measured from the inside or outside corners. The brackets are recessed ½-inch below the exterior surface of the foam panels and are used to fasten a variety of exterior and interior wall coverings using course thread screws. The stud flanges align to form continuous uninterrupted studs with no spaces or gaps. The internal wall-ties have a tandem re-bar saddle that will accept the placement of either ½-inch or 5/8-inch horizontal re-bar. The forms have ¾ x ¾ -inch interlocking tongues and grooves on all edges with an exclusive stop-block and a corresponding notch system to facilitate proper form stacking, stud alignment, and to insure against lateral form movement.

Standard ICF™ straight forms are 48-inches long, 16-inches high, 11 ¼-inches wide, and weigh 5 pounds. The corner forms are 48-inches (18+30) long, 16-inches high, 11 ¼-inches wide, and weigh 5.8 pounds. Both forms have a surface area of 5.33 square feet and will form a nominal 7-inch (6 1/5-inch) interior concrete core. One cubic yard of concrete will fill 10.5 straight forms or 13.75 corner forms.

The Standard ICF™ 7-inch (one size) modified flat-wall forming system, which can be used to build a majority of residential and light commercial buildings, eliminates the need for various sizes of forms. This highly energy efficient method of building simplifies construction, reduces the quantity of inventory needed, and lowers the amount of investment required, making them very cost competitive with other types of wall systems, including wood construction.

Standard ICF™ Specifications

- Forms are manufactured using Type II EPS in accordance with ASTM E84.
- EPS panels are molded to a net cured weigh of 1.5 psi.
- UL tests results with a flame spread of 10, and smoke a development of 300.
- Finished wall has a fire resistance of 3-hours with 5/8-inch drywall.
- Stud Wall-Tie Brackets are made with recycled HDPE.
- No HCFCs or HFCs are emitted during the manufacturing process.
- Forms do not off-gas and does not produce fumes, odors, or toxins.
- Calculated R-Value: R-26+, with a performance of up to R-50.
- Sound transmission class: STC-50.
- Stud flanges are 1 5/8-inches wide by 16-inches high.
- Stud flanges are recessed ½-inch below the exterior surface of the foam panels.
- Studs are located 12-inches on center measured from corners.
- Studs align to form continuous uninterrupted studs with no spaces or gaps.
- Corner brackets are 3-inches wide (both directions) by 16-inches high.
- Re-bar saddle will accept either ½-inch or 5/8-inch horizontal re-bar
- Nominal 7-inch modified flat wall system with a net 6 ½-inch concrete core.
- Straight Forms: 48-inches long, 16-inches high, 11 ¼-inches wide.
- Corner Forms: 48-inches (18+30) long, 16-inches high, 11 ¼-inches wide.
- Weight: Straight Forms are 5.8 pounds each; Corner Forms are 5 pounds each.
- Surface Area: 5.33 sq. ft. per form (straight or corner).
- One cubic yard of concrete fills 10.5 straight forms, and 13.75 corner forms.

Applications and Design Plans

Standard ICFs™ are very versatile and can be used to build residential, light commercial, agricultural, and industrial buildings. Plans should be developed to insure that the building conforms to the accepted rules of architecture and engineering, and to have a single overall design, method, and/or style to achieve the desired objective. It is important to consider the 11 ¼-inch wall thickness of Standard ICFs™ in the planning and design stages of the building.

Estimating
Calculating the number of forms needed for your project is rather simple.

A. Gross number of forms needed:
To determine the total number of forms, multiply the wall height, which is calculated in increments of 16-inches (the height of Standard ICFs™) by the total length of the building walls, this will equal the total square foot of walls to be built. Then divide the total square footage of the walls by 5.33 square feet (the total surface area of a form). The dividend will be the gross number of forms needed.

B. Total number of *corner forms* needed:
To determine the total number of corner forms needed, divide the wall height by 16-inches, which will be the total number of courses. Then multiply the dividend by the number of building corners; the product will be the total number of corner forms needed.

C. Total number of forms displaced by window and door openings:
Considering the size of Standard ICF™ straight forms, 4-feet wide by 16-inches high, calculate how many full size uncut forms will fit in each opening. For example, one opening 3-feet wide by 7-feet high will *not* accommodate any full-size uncut forms. One opening 5-feet wide by 7-feet high will accommodate five (5) full-length uncut forms, and an opening 16-feet wide by 7-feet high will accommodate twenty (20) full-size uncut forms. Add the total number of full size uncut forms for each opening to determine the total sum of forms that will be displaced. In this example, 25 forms are displaced.

D. Total number of *straight forms* needed:
Add (B) the total number of corners and (C) the number of forms displaced by window and door openings, and then subtract the sum from (A) the gross number of forms needed. The remainder will be the total number of straight forms needed.

E. Total number of *corner forms and straight forms* needed for the project are the totals of (B) and (D) above.

It is not always possible to determine the exact number of forms needed to complete a project. For that reason, it is always a good idea to have extra forms on hand to make up for errors, miscalculation, and oversights.

Footings
Level footings should be designed to transfer and distribute the load they will support and be in compliance with governing building regulations. Construct level footings within a vertical tolerance of plus or minus ¼-inch while corresponding with design plans. Shims or a bed of mortar can be used under the first course to compensate for unlevel footers. Having a level footer and/or a level first course is very important. Minimum size footings should be 8-inches thick by 20-inches wide. Larger footings may be required.

Step footings require vertical steps of 16-inches. Although, Standard ICFs™ can be cut in half horizontally without compromising the integrity of the wall-ties when an 8-inch

height is needed. This technique is accomplished by alternating the top and bottom halves as the first course and secure them in place with foam adhesive. The second course will also need to be secured with foam adhesive.

Place the vertical steel reinforcing (re-bar) dowels in the footer at regular intervals to correspond with the design of steel reinforcing required in the wall. This will provide solid attachment to footings. Several methods can be used to hold vertical re-bar in place. **First**, attach an open wire loop at the top of the re-bar dowels large enough so that the vertical re-bar can be passed through and held in place at the bottom once the wall assembly in completed. **Second**, a two-inch length of PVC pipe (a ring) can be slipped over the dowel and serve the same purpose as the wire loop. Both the wire loop and the PVC ring need to be sized correctly so the vertical re-bar is held reasonably tight to the vertical dowel protruding from the footer. **Third**, various market-ready re-bar positioners are available, and **fourth**, the vertical re-bar can be bushed into the correct location as the first lift of concrete is being pumped in place. All of these methods allow for full-length re-bar to be used. A **fifth** way is that the vertical re-bar can be installed in two or more pieces with joints that overlap 36 times the bar diameter and tied with wire. With this method the vertical bar can be tied to the horizontal re-bar with wire, and the forms will be installed by slipping them over the vertical re-bar. See: Vertical Re-bar

To prevent injury it is very important that safety protection caps be place over the vertical dowels after they are installed and then removed once the first course is in place and/or when they are no longer a safety hazard. Safety First!

Wall Layout

Locate the corners and establish the exact building dimensions on the footings, making sure that all corners are square and/or correctly aligned in accordance with the design plans. Place chalk lines on footings along building perimeter and then install a temporary 2 x 4 guide board on the footings along and on the outside of the line using 2 ¾- inch cut concrete nails or Tap-Con™ screws every 4-foot. It is a good idea to mark the location of window and door openings on the footer at this time and during the installation of the first course.

Materials and Tools

Placement of materials and tools, and locating the general work area inside the perimeter of the wall will make the installation of the wall assembly and concrete placement easier and safer. Tools and materials required to install and construct buildings using Standard ICFs™ are those hand and power tools used in work associated with ordinary carpentry, concrete, and reinforcing steel (re-bar) installations. No specialized tools are required.

Each installation contractor, depending on their construction experience, developed skills, and level of investment, will develop their own method of working with Standard ICFs™ that will allow for safe and efficient installation of Standard ICFs™. Their experience will help to determine the list of materials and tools that they will prefer to use. All questions regarding the installation of Standard ICFs™ ™ should be directed to a Standard ICF™ Representative.

Handling and Storage

Proper handling and storage of forms is important because damage can weaken a form and compromise its effectiveness as a concrete form. Damaged forms can often be used without concern when care is taken to reinforce the weakened area. Minor surface damage will not jeopardize their effectiveness. Store forms to protect them from high winds, storms, and from the activities associated with a construction site. For long-term storage it is important to protect the forms from the effects of exposure to UV rays from sunlight.

First Course

Placement of the First Course should begin at the corners. Position all corner forms on the first course in one direction only, left or right facing, and on the inside of the temporary 2 x 4 guide board that is installed along the wall perimeter, marked with chalk lines. Work from opposing corners toward the center of the wall, gluing all forms in place to the footing with two good size beads of minimum expanding foam adhesive. At the option of the installer, because the first course is glued in place, it may not always be necessary to install the temporary guide board.

Mesh the form tongue and groove ends tight together while setting the forms in place with the tongue-side-up. The footers should be clean and free of standing water. Damp footers can actually insure a better bond to the footer when using foam adhesive. Alternate the direction of the corner forms, as the courses are stacked in place to ensure proper stud alignment and staggering of joints. See Gluing Forms.

For reference purposes, mark the location of window and door openings, utility penetrations, and other significant wall features with a magic marker on the inside side of the first course at this time. This will help, as it is important to locate cut forms and splices where there is a window or door opening, to minimize cut forms and the need for spices. Cut a form ¼-inch smaller than the measured opening to eliminate the possibility of having too much material in the wall length making it difficult to straighten and/or plumb the wall. The ¼ gap can be filled, when the wall is fully assembled and before concrete is placed, with minimum expanding foam adhesive.

To minimize the need to make additional measurements, it is a good idea to mark the length of the first cut piece on the side of the panel that faces the interior of the building, because all subsequent forms in this vertical location of the wall will be cut the same length. The marked measurement should be large enough to be seen from a distance. Before the second course is put in place any re-bar positioning devices being used should be installed.

Cut Forms and Splices

Most often it will be necessary to cut a form to fit into a space that is less than 48 inches long, creating a reacquiring series of cut forms and splices somewhere within the length of the wall assembly. The cut forms and splices should have a staggered and reacquiring vertical alignment and are best located wherever there is a window or door opening to

minimize the amount of cuts and splices. If there are no window or door openings in the wall, the location of the staggered and vertically aligned cut forms and splices can be anywhere between the two corners.

Cut a form ¼-inch smaller than the measured opening to eliminate the possibility of having too much material in the wall length making it difficult to straighten and/or plumb the wall. The ¼ gap can be filled, when the wall is fully assembled and before concrete is placed, with minimum expanding foam adhesive.

The stud wall-tie brackets will not have a stacked continuous alignment in the location of the cut forms and splices, consequently some stop-blocks located on the inside of the top tongue will need to be trimmed off the form below, before setting the cut form in place. To minimize waste, it is important to save and try to use all cut pieces with one or more wall-ties in place.

Splices need to be placed on both sides of all cut forms when the cut end creates a distance between stud wall-tie brackets that is more than 10-inches, or when the cut end of a form is more than 4-inches from the stud wall-tie bracket. This is done by attaching a piece of 1 x 4 or a piece of wood across the middle of the cut joint on both sides of the forms using course thread screws. The wood piece should be long enough to bridge the cut end gap and be attached to at least two stud flanges. Splices can also be used to strengthen other perceived weak places in the wall assemble. It is much easier and less time consuming to install a splice than it is to repair a bulge or blowout.

Additionally, straight forms that are miter cut and assembled to create 45-degree and other acute or obtuse angle corners, will need to be reinforced and braced to accommodate the pressures of concrete during concrete placement; this is also true for forms used to create curved walls. See: Gluing Forms, External Bracing, and Installation Guide.

Cutting Forms

It is easy to cut forms with the use of a carpenter's handsaw or a reciprocating power saw (Saws-all), using a medium tooth blade for cutting both foam and hard plastic. Standard ICFs™ can either be cut in half horizontally or have as much as 4-inches cut off the top of either side of the form without compromising the integrity of the wall-ties or the strength of the form. The use of a table saw can speed full-length horizontal cuts. A small "keyhole type" drywall saw is handy for making cuts, trimming forms to fit, and for cutting holes for utility penetrations.

It is important to try to avoid cutting the wall tie part of a bracket, which would compromise the ability of the form to hold up during concrete placement. As an example, this can occur at intersecting walls and when locating a beam pocket. These areas will need to be strengthened with splices or other methods of reinforcement applied to the exterior. Tie wire can also be used to strengthen these areas.

Always cut a form ¼-inch smaller than the measured opening to eliminate the possibility of having too much material in the wall length making it difficult to straighten and/or plumb the wall. The ¼ gap can be filled, when the wall is fully assembled and before concrete is placed, with minimum expanding foam adhesive.

Gluing Forms

With the exception of gluing the first course to the footer and gluing the top course to the one below, gluing is not required. However, for the sake of assured quality, we do recommend that all horizontal joints be glued. Many seasoned installers prefer to glue all the horizontal joints, while others do not. We specially encourage those just starting out to glue. Gluing ensures a more fail-safe installation, so "when in doubt, glue".

Gluing not only gives a lot of stability to the wall assembly to withstand the forces created by concrete placement, but also adds stability during severe and unpredictable weather conditions during installation. It is also important to glue forms that were cut to fit in complicated or difficult areas where the integrity of the forms has been compromised, and where straight forms were miter cut to form corners. In addition to gluing, these areas may also need to be reinforced with pieces of wood or metal supports using course thread screws and/or tie-wire.

Glue horizontal joints with a 3/8 to ½-inch bead of minimum expanding foam adhesive along the outside edge of the horizontal tongue on both sides of the lower form just before setting a form in place. It is not usually necessary to glue vertical joints except at the ends of the cut forms prior to concrete placement. However, it is very important to *glue the top course to the course below to prevent the top course from floating* when concrete is being pumped in place.

Applying *minimum expanding foam adhesives* with a foam applicator gun has become the preferred method for attaching ICF forms together horizontally, to footings, and to filling and reinforcing gaps, spaces, and holes associated with cutting and assembling ICFs. As an alternative, *foam-compatible contact-cements* may be used for assembling miter cut corners. See: First Course, Cut Forms and Splices, and Cutting Forms.

These foam-compatible adhesives, applicator guns, and contact cements can be acquired through your local building supply store or through specialty outlets such as ICF Building Products: www.icfbp.com, Windlock Select: www.windlockselect.com, or Demand Products: www.demandproducts.com.

Additional Courses

The second course and all additional courses can begin as soon as the horizontal re-bar is placed in the first course. Like the placement of the first course, start at the corners and work toward the center of the wall. Alternating left and right corner forms (changing the direction of the corner forms) will force the alternating alignment of vertical joints and align the stud flanges throughout the wall system.

By following the form placement and cutting patterns established in the first two courses develop an installation method and pattern which can be repeated throughout the wall ensuring a user-friendly and more fail-safe installation.

Horizontal Re-bar

Horizontal steel reinforcing bar (re-bar) must be installed as the wall assembly is erected. The re-bar is placed in the tandem re-bar saddles provided on the center of each wall-tie every 12-inches on center, although, it may only be necessary to install horizontal re-bar every second or third course. These dual re-bar saddles will accept both ½ and 5/8-inch re-bar. All overlapping splices, including those at corners, should overlap 36 bar diameters and should be tied with wire. It will also be important to plan the placement of re-bar to correspond with other elements of the wall assembly. It is a good idea to check the details of window and door openings, lintels, and other wall features to determine the required steel reinforcing. It is much easier to place re-bar as the wall assembly is being erected than it is after. See: Vertical Re-bar.

Engineering and architectural specifications and drawings will determine the size, grade, and the position of the steel reinforcing bars. The placement and design of steel reinforcing shall be in accordance with local standards and regulations, and in conformance with ACI 318-95 Building Code Regulations for Structural Concrete.

Vertical Re-bar

Vertical steel reinforcing (re-bar) dowels should be placed in the footer at regular intervals. These dowels should correspond with the design of the re-bar required in the wall. This will provide solid attachment to the footing. See: Footings.

The vertical re-bar is most easily put in place full length after the wall assembly is erected and prior to concrete placement. Several methods can be used to hold vertical re-bar in place. **First**, attach an open wire loop at the top of the dowels large enough so that the vertical re-bar can be passed through and held in place at the bottom once the wall assembly in completed. **Second**, a two-inch length of PVC pipe (a ring) can be slipped over the dowel and serve the same purpose as the wire loop. Both the wire loop and the PVC ring need to be sized correctly so the vertical re-bar is held reasonably tight to the vertical dowel protruding from the footer. **Third**, various market-ready re-bar positioners are available, and **fourth**, the vertical re-bar can be bushed into the correct location as the first lift of concrete as it is being pumped in place. All of these methods allow for full-length re-bar to be used. A **fifth** way is that the vertical re-bar can be installed in two or more pieces with joints that overlap 36 times the bar diameter and tied with wire. With this method the vertical bar can be tied to the horizontal re-bar with wire, and the forms will be installed by slipping them over the vertical re-bar. See: Vertical Re-bar

It may be necessary for workers to hold and/or move the vertical re-bar into place during concrete placement. If this is done, care should be taken to insure that the re-bar is maneuvered into proper position as the concrete is being placed. This will need to be done during all lifts of the concrete pour. See: Concrete Placement.

If vertical re-bar is not to extend and connect to a wall of an additional story above, it should be cut to a length 1 or 2-inches shorter than the wall height. If the vertical re-bar is to extend and connect to a wall of an additional story above, it should be cut to a length so that it will overlap 36 bar diameters with the vertical re-bar that will be installed above. Or, short pieces of re-bar can be placed in the fresh concrete at the top of the wall, that are long enough to protrude into and connect to the wall that will be built above.

The vertical re-bar can be tied in place or it can be held in place when concrete is being pumped into the forms. It is important to know that for above grade walls the re-bar should be held in the center of the wall cavity. For below grade basement foundations where there is lateral load (pressure) against the wall the vertical re-bar is best held off center on the tension side (basement side) of the wall with a minimum of 1-inch concrete cover. It is important to plan the placement of re-bar to correspond with other elements of the wall assembly and to check the details of window and door openings, lintels, and other wall features to determine the required steel reinforcing. See: Horizontal Re-bar.

Engineering and architectural specifications and drawings will determine the size, grade, and the position of the steel reinforcing bars. The placement and design of steel reinforcing shall be in accordance with local standards and regulations, and in conformance with ACI 318-95 Building Code Regulations for Structural Concrete.

Intersecting Walls (T-walls)

To connect intersecting walls it will be necessary for the concrete and steel re-bar of both walls to be linked together. To accommodate for the re-bar and the flow of concrete, sections of the foam panel on one side of the adjoining wall will need to be removed. To form a non-fire rated T-wall, remove sections of foam located above and below the wall-ties and between the flanges of the studs. It is important to avoid cutting the stud wall-tie brackets, whenever possible.

When the cutting wall-ties is unavoidable, such as when forming a solid monolithic fire rated T-wall, or when the entire side of the adjoining wall needs to be removed, it will be necessary to reinforce the intersecting area in order to withstand the pressures created during concrete placement. Reinforcing is usually accomplished by supporting the area with pieces of wood attached with course thread screws, and replacing the cut plastic wall-tie brackets with wall ties made of wire to hold both sides of the wall assembly together. See: External Bracing.

External Bracing

Bracing is not required under normal circumstances for the pre-molded corner forms. This is especially true if the horizontal joints are glued and the correct concrete slump is being used during concrete placement. Many installation contractors choose to use vertical plumb boards at the corners to insure that the installation of the wall assembly is plumb and the building is square.

External corner bracing is required when corners are made from straight forms miter cut to form a corner. In this case the corners will need to be reinforced and braced to accommodate the pressures of concrete during concrete placement. To reinforce mitered corners, the cut joints should be glued with foam-compatible contact adhesive or minimum expanding foam adhesive and taped. The corner will need to have temporary wood or metal supports applied vertically and tied together through the wall with wall ties made by using tie wire and braced with kickers from two directions.

The construction of intersecting walls (T-walls), gable end walls, and other complicated or difficult areas where the integrity of the forms has been compromised, will also require external bracing. Care should always be taken when placing concrete in these areas, lowering the risk of form separation, wall deformity, budges, and blowouts. See: Intersecting Walls, Cut Forms and Splices, Bulkheads, Gluing Forms, and Window and Door Openings.

Window and Door Openings

Window and door frames (bucks) are installed by placing a vinyl or wood frame that has the same inside dimensions as the required rough opening (RO) size as supplied by the window and door manufacturer.

Use pressure treated 2 x 12 dimensional lumber to construct the top and sides of the frame, but use two 2 x 4's on the bottom leaving a space between them for concrete to be placed under window or door openings. It may be advisable for this space to be filled with a third piece of 2 x 4, to be used for attaching finished materials, once the concrete has filled the cavity under the frame. The frame is left in place after the concrete is cured providing a fastening surface for the installation of the windows, doors, and finish trim.

Attach temporary 1 x 4 wood flanges on all edges of the wood frame to position and hold the form in alignment with the wall. Additionally, temporary vertical, horizontal, diagonal and/or cross bracing will need to be installed to reinforce the frame to prevent the weight of the concrete from pushing in, down, and up against the frame causing it to move and/or change shape. It should be noted that ready-mixed concrete weighs approximately 4000 lbs. per cubic yard and bracing should be built accordingly.

Metal fasteners (nails, screws, or bolts) should be installed into the frame (top, sides, and bottom) prior to the placement of concrete so they protrude into the wall cavity securely anchoring the wood frame in-place once the concrete is cured.

Commercially available preformed plastic and vinyl frames are installed similarly and provide the same utility. Follow the instructions for installing vinyl frames as provided by the manufacturer. Manufacturers of these products are: PolyCon, Inc.: www.adjust-a-buck.com, and Vinyl Technologies, Inc.: www.vbuck.com.

Window and door openings require that concrete steel reinforced lintels be built to span the openings carrying the load of floors, roof, and point loads from beams, girders, and trusses. Care should be taken when sizing, locating, and installing re-bar during the

construction of lintels. Additionally, placement of concrete must be consolidated to ensure that the steel reinforcing bar (re-bar) are fully embedded and that no voids occur in the concrete. This is especially important in areas around window and door openings, and in lintels where the positioning of re-bar may inhibit concrete flow. For this reason, it is always best not to place any concrete into lintels until the elevation of the concrete lift being placed can fill the wall and lintel cavities at the same time, creating a continuous monolithic pour.

Engineering and architectural specifications and drawings will determine the size, grade, and the position of the steel reinforcing bars. The placement and design of steel reinforcing shall be in accordance with local standards and regulations, and in conformance with ACI 318.

Bulkheads

Bulkheads are required to stop concrete at open-ended walls and need external support to keep them in place. A bulkhead is made by using a 2 x 12 with temporary 1 x 4 flanges attached vertically to each side and placed over the end of the wall. Adequate bracing or strapping must be installed to keep the pressure of the concrete from pushing the bulkhead out during concrete placement. If the bulkhead is to be left in place, use a treated 2 x 12. Concrete nails, screws, or bolts should also be installed to extend into the wall cavity before placing concrete. Bulkheads and other custom areas may also need to be secured plumb, in two directions, using braces with turnbuckles.

45-Degree and Other Custom Corners

To miter cut Standard ICF™ straight forms to make 45-degree and various other acute and obtuse corners is not difficult. Layout two (2) straight forms with tongue side up and facing in the same direction. Make measurements on each form starting from the groove end but on opposite sides (reversing the cut) creating an axis that divides each form into two asymmetrical pieces. Mark the vertical lines on the sides of each form with a square and make vertical miter cuts with a carpenter's handsaw down the center of the lines.

Make the miter cut by cutting down through both panels at the same time. Proceeding slowly and following the lines on both sides of the form will insure an accurate miter. When both forms are cut, exchange the pieces to create a form with two (2) opposing corners with the same angle. Each corner form should have a tongue and a groove end and a short and a long leg. Fit pieces together and glue with foam-compatible contact cement and/or tape. See: Installation Guide.

All special cut corners will need to have temporary external wood or metal bracing/supports applied vertically on both sides of the wall assembly and tied together through the wall with wall ties made of wire. Miter cut corners and other custom areas may also need to be secured plumb, in two directions, using braces with turnbuckles.

Rim Joists and Ledgers

The framing of floors and ceilings are often attached to rim joists or ledgers. To attach rim joists and ledgers (joist/ledgers) to the side of an ICF wall, a structural side

attachment is required using a series of anchor bolts or a ledger connector system. Only when concrete has had time to cure properly should structural framing be attached to the joist/ledgers that have been installed with anchor bolts or ledger connectors.

To use the anchor bolt method, multiple sections of foam panel will need to be removed from the side of the wall assembly between the stud wall-tie brackets and within the area to be covered by the joist/ledger. The joist/ledger is then secured in place over the series of openings that have been cut in the side of the wall assembly by attaching it to the wall surface with course thread screws to the stud flanges. Holes are then drilled through the joist/ledger to receive the required size and spacing of anchor bolts as designated by architectural and/or engineering design. When concrete is pumped into the wall cavity it will flow into the open spaces in the foam panels and surround the ends of the anchor bolts embedding them securely in concrete.

The ledger connector method is simply done by making a series of single vertical cuts through the foam panels in the location where the joist/ledger is to be located in the wall assembly. The ledger connectors are then pushed into the cuts and friction fit in place. When the concrete is pumped into the wall cavity it securely embeds the ends of the connectors. An ICF Ledger Connector System manufactured by Simpson Strong-Tie is available through ICF Building Products: www.icfbp.com.

Beam and Girder Pockets

To accommodate for the end of a beam, girder, or truss that will carry the total loads associated with the interior structure of the building, a beam packet will need to be formed in the ICF wall assembly before concrete is put in place. To do this, a piece of the interior foam panel and/or parts of stud wall-tie brackets will need to be removed.

Once removed, the open area will need to be blocked-out with pieces of wood or a slab of foam inserted into the wall cavity and secured in place to create a void. The block-out pieces should be made so they can be easily removed once the concrete has cured. The bottom of the block-out should be located at the elevation designated as the bottom of the beam/girder/truss.

It is important to make these pieces slightly larger than the beam/girder/truss so the end of these structural members can be inserted easily and the correct elevation can be adjusted with non-shrink grout, or wood or metal shims, when the beam/girder/truss is put in place. It is also important that there is enough concrete support under the beam pocket to carry the anticipated total load. To accomplish this, a larger amount of foam panel may need to be removed to allow for a concrete corbel to be formed. Exterior bracing may need to be provided when forming a beam pocked so as to withstand the pressures of concrete.

Brick Ledge

Forming a brick ledge to use for installing veneer brick and stone can be accomplished by using a simple wood or metal form attached to the side of the wall assembly at any desired elevation. Once the elevation is established, sections of foam are removed from

between the stud flanges and from between the top and bottom of the brick ledge form allowing concrete to flow into the brick ledge form. Re-bar is also required in the construction the brick ledge.

Engineering and architectural specifications and drawings will determine the size, grade, and the position of the steel reinforcing bars. The placement and design of steel reinforcing shall be in accordance with local standards and regulations, and in conformance with ACI 318-95 Building Code Regulations for Structural Concrete.

Utility, Mechanical, and Service Penetrations

Openings will need to be provided in walls for all utilities, mechanical systems, and service entrances. Such items include, but are not limited to, electrical, telephone and television cables, water supply pipes, gas lines, air supply and exhaust pipes, ducts, vents, sewer drain pipes, beam pockets, and access doors or panels. Penetrations are made so that the installation of these essential components can be installed after the concrete is in place, with less effort and cost. In addition, penetrations for the installation of a Heat Recovery Ventilator (HRV), also known as an Air-to-Air Heat Exchanger, should be considered before concrete placement as well. *See: Important Notice below.*

A penetration is easily accomplished by sawing a hole in the desired location through both panels of the form to allow for the installation of a sleeve or chase (pipe or frame) through the wall. The sleeve or chase should be slightly larger than the actual utility or service penetration being installed. Large access openings are made in the same way as window openings.

Foam adhesive can be use to secure sleeves and chases in place, and to seal around the penetration once it is installed. It is less costly to plan ahead and imagine the need and possibility of future or additional openings for penetrations at this time. Extra or unused holes can be easily filled and covered over for future use when needed.

Important notice: *Because new buildings are built far more air-tight than those built in the past, the need for providing clean, fresh, unpolluted, and balanced indoor air in buildings has become very important. The need for improved indoor air quality in ICF buildings is no different. Most all new buildings need mechanical ventilation to keep the air inside fresh and prevent the build –up of indoor air pollutants such as excess moisture, carbon dioxide, formaldehyde and various volatile organic compounds found in building materials, paints, furnishings, cleaning products and smoke. For these reasons it is important to consider the installation of a Heat Recovery Ventilator (HRV), also known as an Air-to-Air Heat Exchanger as part of any Heating, Ventilating and Air Conditioning (HVAC) system in the building at this time. Consult with your HVAC contractor or consultant concerning the need for these mechanical devices and the size and location of any wall penetrations that it will be required for their installation.*

Scaffolding and Bracing Bucks

It is important to keep the wall assembly straight, plumb, and square during wall assembly when concrete is being placed, and while the concrete is curing. Withstanding

the pressures of wind speeds (including unexpected storms) during the construction process should be a consideration.

It is also important to provide a safe, adequate, portable, and temporary working platform so that walls as high as 12-feet can be constructed. For these reasons it is very important that the vertical legs of the scaffolding and bracing system be attached securely to the wall assembly at every form course, and that the vertical leg be supported securely by a diagonal brace (kicker) with a turnbuckle and be securely fastened to the ground or floor deck.

Scaffolding and bracing bucks should be installed on the inside of the building, starting 2-feet from corners and at 6-foot intervals along the length of each wall. The layout of the scaffolding and bracing system can vary depending on the location of window and door openings, and other building details. The regular 6-foot spacing helps in keeping the wall straight and stable, while creating a solid base for attaching walk planks and guardrails where required. The distance between supports for walk planks and guardrails should not exceed 6-foot. See: Installation Guide.

Using a level or a plumb bob to check corners for plumb, use a string line stretched between corners in combination with bracing bucks and adjustable turnbuckles to straighten walls prior to and soon after concrete placement.

Walls higher than 12-feet will need to be constructed in more than one installation. Example: A 16-foot high wall can be built in two separate 8-foot high installations. Special scaffolding and bracing considerations need to be made when constructing walls higher than 12-foot.

Standard ICF™ Corporation does not manufacture a scaffolding and bracing system. You can build your own system using wood, or you can build an inexpensive, durable, adjustable, and reusable system using standard structural grade steel studs manufactured by Dietrich Industries. The component parts are available through ICF Building Products: www.icfbp.com. Or, there are several commercially available ICF scaffolding and bracing systems available through Reech-Craft: www.reechcraft.com, and Sea Systems: www.sea-sys.com.

It is very important that all scaffolding and bracing used to construct walls using Standard Insulating Concrete Forms conform to, and be in accordance with, Local and State authority, and Federal OSHA regulations, requirements, and guidelines set forth in 29 CFR 1926.450 thru 453. Safety First!

Before Concrete Checklist

Prior to placing concrete into the wall forms, check the entire wall assembly for plumb, straight, and square, making any needed adjustments using the turnbuckles on the bracing system. *Note: Keep in mind that once concrete has been placed in the wall, a wall tilted slightly inward can be plumbed easier by pushing (rather than pulling) using the turnbuckles on the bracing system.*

Check to make sure that provisions have been made for all penetrations through the wall. See: Utility, Mechanical, and Service Penetrations. Make sure that all window and door frames (bucks) are flanged and braced properly and that mechanical fasteners have been installed to anchor the frames to the concrete. Check that all re-bars are installed and/or wired in place properly with special attention given to lentils over windows and door openings. Check to make sure that anchor bolts and ledger connectors for attaching band joist or ledgers to the wall are in place. Check to see also, that all other connecting devices that are to be place into the fresh concrete are on hand. Fill all gaps with minimum expanding foam adhesive on both sides of cut forms and openings where concrete leakage could occur. And check to see that all wall areas and cut forms that require spices have had spice pieces added to both side of each form.

Ensure that the scaffolding and bracing system is built to the manufacture's specifications and anchored securely while at the same time straightening and plumbing the walls using a string line. Make sure that scaffolding provides an adequate working platform, and is installed with proper safety precautions and in compliance with the proper governing authority for health and safety.

Instruct workers and crewmembers about the importance of safe working procedures and conditions. Have an adequate supply of materials and tools on hand to deal with mishaps such as spills, blowouts, and other unforeseen problems. For reasons of safety and convenience, it is a good idea to have both running water and a telephone on the job.

This is a partial list. Over time you will develop a checklist of your own--one that relates to your projects, to your system and method of building, and one that will become familiar to your crew. Remember the new adage "do not order the concrete until you are ready".

Concrete Placement

Standard Insulation Concrete Forms™ (ICFs) are designed to resist the pressure of concrete being place (pumped) in accordance with Standard ICF Corporation specifications and American Concrete Institute (ACI) 318.

Although there are several ways to place concrete into ICFs, years of experience in the field have shown that the easiest way is with a concrete pump. Both line pumps and boom pumps can be used. However, it is not practical to use a line pump with a hose diameter larger than 2-inches because the weight of the hose makes it difficult to manually handle it around the job site during a continuous concrete pour.

When using a boom pump, we highly recommend reducing the size of concrete hose to 3-inches and then add two 90-degree elbows (a dog leg) or a Lamberts Loop™ to slow the flow rate of the concrete as it is pumped into the forms. It is also important to add an 8 to 10-foot length of flexible hose (an elephant trunk) at the end of the pump line to make it easy to maneuver the hose and direct the flow of concrete. This is especially important when lowering the hose along the wall assembly to fill under window and door frames

and other difficult areas of the wall. Although the pump operator will move the boom along the wall, it is important for the worker at the end of the hose to have accurate control of where the concrete is being place. The elephant trunk will allow the worker to move the hose short distances quickly when necessary. See: Installation Guide.

The placement of concrete has many variables that must be considered before pumping begins. The overall size of the project, the height of the walls, the temperature and humidity, the concrete mix design, the use of concrete additives, the concrete slump, the rate (height of each lift) at which the concrete should be placed, and, if needed, the method of consolidating the concrete. It will also be necessary to have materials on hand to make repairs if an unexpected blowout should occur, and to have enough workers on the job to perform all the tasks required to accomplish a quality installation, in a reasonable length of time, and in a safe manner. ***Safety First!*** In addition, the placement of concrete should follow guidelines and recommendations of the American Concrete Institute (ACI).

The environmental factors that will influence the design of the concrete and that will affect the rate at which the wall cavity should be filled are temperature, humidity, wind, and direct or indirect sunlight. Concrete placed in insulating concrete forms (ICFs) generates heat during its curing process (hydration) and is retained within the forms. This eliminates the need for additional insulation or additives during cold weather applications. ICFs can also provide a better quality concrete in warmer climatic conditions. It should also be noted that concrete could gain up to 50% more compressive strength during a 28-day moist-cure environment when placed in ICFs.

Environmental factors can also affect the rate of flow at which concrete should be placed into Standard ICFs™. Concrete should be placed in the wall cavity at a continuous, moderate, and even flow rate using several lift heights to gain the desired total wall height.

As a general rule, it is not advisable to place concrete in lifts higher than 4-foot each. Experience has shown that the consolidation of the concrete during the placement process may require a final pass to ensure an adequate amount of concrete at the top of the wall. Worker judgment will be required to determine the safe rate of placement and the number passes required. It is always best to "lean on the side of caution" to ensure a quality installation.

Concrete Placement Rate Table

Temperature, degrees F	Feet per Hour
40	2.2 (2 ft, 2 ½ in)
50	2.75 (2 ft, 9 in)
60	3.03 (3 ft, ½ in)
70	3.85 (3 ft, 10 ¼ in)
80	4.4 (4 ft, 4 ¾ in)
90	4.95 (4 ft, 11 ½ in)

It is advisable to have a designated worker(s) to watch the walls during concrete placement to ensure that pressure from the placement of the concrete is not deforming the wall and to ensure that the concrete is flowing and being consolidated within the wall cavity properly. It is also important to ensure that all structural components, connectors, and re-bar are properly aligned.

Concrete strength should meet or exceed that required by the building design and shall not be less than 3000 psi @ 28 days curing time. The key to good concrete flow and consolidation is maintaining a proper slump. A 6-inch slump is best for most applications.

Working together with your concrete supplier to develop a delivery plan and a concrete mix design that will work well using the components available in your area is recommended. Arranging to have ready-mixed concrete trucks arrive every 45 minutes is a good rule of thumb. Concrete admixtures, used in accordance with the manufacturer's recommendations, can be used in formulating a concrete mix design to accomplish the desired workability and results. The concrete supplier and the pumping service will have a lot of experience. Tell them exactly what you are doing, and don't hesitate to ask them for help or suggestions when you need it.

Having a designated worker on the job, other than the pump operator, to keep an eye on the concrete consistency and slump is good insurance against problems developing. Examples are: On a hot day the concrete can loose 1-inch of the slump going from the ready-mixed truck to end of the pump hose. The segregation of concrete components caused by dropping concrete may require changes in the concrete mix design.

Engineering and architectural specifications and drawings will determine the required compressive strength of concrete, as well as the size, grade, and the position of the steel reinforcing bars. The placement of concrete and design of steel reinforcing shall be in accordance with local standards and regulations, and in accordance with ACI 318.

Blowouts

Standard ICFs™ are designed to withstand the pressure of concrete placement when installed in accordance with the guidelines set forth in this manual, and when using generally accepted building practices and common sense. The term "blowout" is used to describe the *rare* instance when a small area involving a portion of one or two forms, fails during concrete placement. Blowouts usually occur where a damaged form has been installed, or where exterior bracing is inadequate. These situations can further be aggravated when improper concrete placement occurs. See: Before Concrete Checklist, and Concrete Placement.

One should not be overly concerned about blowouts, spills, bulges, or other mishaps because such unforeseen problems can be easily corrected. Do not panic. Be prepared. Always have an adequate supply of materials and tools on hand so that you can deal with

the situation immediately. While the problem area is being repaired, concrete pumping can continue in other areas of the wall.

A repair can be made by allowing concrete to flow out of the damaged area relieving enough pressure to push the form back together. The area should then be reinforced using screws to secure pieces of wood to the stud flanges. The area may need to be reinforced on both sides of the form. In this case, a piece of ¾-inch plywood placed on both sides of the wall, connected with a length of all-tread rod, and secured together with large washers and nuts may be helpful.

Since each situation is different, there will be times when you may need to improvise and be creative when solving a problem. To insure quality installations, remember: 1) do not order the concrete until you are ready, and 2) maintain a proper concrete slump during placement.

Concrete Consolidation

The placement of each lift of concrete must be consolidated to ensure that all steel reinforcing bar (re-bar) are fully embedded and that no voids occur in the concrete. This is especially important in areas around window and door openings, and in lintels where the positioning of re-bar may inhibit concrete flow. For this reason it is always best not to place any concrete into lintels until the elevation of the concrete lift being placed can fill the wall and lintel cavities and can be consolidated into a continuous monolithic pour.

Several different ways to consolidate concrete in Standard ICFs™ are: **(1)** Pushing and pulling up and down, and/or shaking a length of re-bar in the freshly placed concrete known as "rodding". This is an old but effective way to get concrete to move and consolidate. **(2)** Tapping with a carpenter's hammer on a 16-inch length of 2x4 placed over the vertical stud locations marked on the external surface of the forms. Tapping on the sides of the wood window and door bucks and bulkheads can help to consolidate concrete. This method is easy to accomplish and very effective in consolidating concrete within the wall cavity. **(3)** Using an internal "pencil" vibrator (1-inch diameter or less) can also be used, but with caution. These vibrators, unless used with some skill and training, should not be used for consolidating concrete in Standard ICFs™. Internal vibrators are best used conservatively, and in areas such as lintels where steel re-bar can constrict the flow of concrete. The use of internal vibrators can cause extreme and unnecessary pressure to be placed on the ICFs.

The key to good concrete flow and consolidation is maintaining a proper slump. A 6-inch slump is best for most application.

After Concrete Placement

Before concrete placement the walls should be checked for plumb and straight. This should also be done at the end of the pour by adjusting the turnbuckle on the bracing. A string line pulled between corners is the best method for checking the wall for straightness.

At the same time, anchor bolts or structural connectors can be used to check for alignment. They can also be installed at the top of the wall. If an additional story is to be built above the finished surface, the concrete should be kept slightly below the top of the forms so the tongue and grooves can be kept clean of concrete to allow for a good connection. If there are no additional stories, the surface should be troweled level with the top of the wall.

Concrete Curing and Removal of Bracing

If the walls are below grade and are to be backfilled, remove the bracing after the wall has developed adequate strength and is supported laterally at the top by the floor or roof, and at the bottom by the floor. Above grade walls should also be allowed to cure properly to obtain adequate strength. Bracing should be kept in place as long as required for structural integrity and safety. Normal building steps and procedures usually allow enough time for adequate concrete strength to develop, however it is best not to rush the process.

Environmental factors (temperature, humidity, wind, and direct or indirect sunlight) will influence the rate of the strengthening process during curing. Low temperatures and/or high humidity will slow the concrete curing rate but allow for increased strength to develop. High temperatures and/or low humidity will speed up concrete curing but lower strength development.

Because ICFs are insulated, the heat generated during the curing of the concrete is retained within the forms eliminating the need for additional insulation or additives during cold weather applications. ICFs also provide a better quality concrete in warmer climatic conditions because ICFs are sealed containers that inhibit the loss of moisture, creating a moist-cure environment. It should also be noted that concrete could gain up to 50% more compressive strength during a 180-day moist-cure environment provided in ICFs.

Electrical

Start by marking (w/ magic marker) the route of all the planned electrical wiring or conduit and the location of device boxes on the surface of the walls. Then, by using a router, with an appropriate size and shape bit, make a 1 ½-inch deep groove through the foam and the hard plastic stud flanges. This groove will allow the wire or conduit to be buried below the surface of the finished wall, which is sufficient in avoiding the reach of screws used for attaching furnishings and wall coverings. The electrical wire or conduit can be friction fit or held in place with spots of foam adhesive.

Electrical device boxes with surface mounting side ears are installed similarly by removing a piece of foam next to a stud flange and using course thread screws secured to the flange. Device boxes can be held in place with foam adhesive, or can be anchored to the concrete wall.

Hot wire knives can be used to make grooves and to remove pieces of foam for installing wiring, conduit and device boxes. They work with speed and make no dust in the

process. Hot knives will not, however, cut through the hard plastic flanges, which will need to be cut and removed with a saw or router. Hot knives are available from ICF Building Products: www.icfbp.com, Windlock Select: www.windlockselect.com, and Demand Products: www.demandproduct.com.

Standard ICFs™ have a designated electrical wire and conduit chase, making for easy cuts with a saw or router while avoiding wall-ties. Standard ICFs™ also provide a place in the stud flange for installing 4-inch device boxes where necessary without encountering the wall-ties in the bracket.

All electrical wiring and device boxes must be installed in accordance with appropriate governing electrical authority and code.

Plumbing

Plumbing pipes are usually not located in exterior walls. The kitchen sink is commonly the only exception to the rule. In this case, with 2 3/8-inches of foam on the inside of the wall, there is enough room to make a channel of sufficient size to accept drain, vent, and water supply pipes.

Interior and Exterior Finishes

Standard ICFs™ eliminate the need for an interior vapor barrier or an airflow retarder because there is no air movement through the wall. There is also no need for exterior sheathings, weather barriers, or house wraps because the forms filled with concrete provide a good substrate (backing) and are already weather repellent.

All commonly used standard finishes (brick, stone, stucco, surface bonding cement and plaster, drywall, face brick, cultured stone, paneling, wood and vinyl siding, and metal siding) can be applied and secured to Standard ICFs™. Finish materials are attached with course thread screws to the stud flanges and the corner bracket or bonded directly to the foam surface. However, when attaching wood siding, it may be advisable to first add wood furring strips as recommended by the Wood Siding Industry to provide an air space that aids in stabilizing the wood. Furring may also be advisable for other siding or wall covering applications.

When attaching base molding, it may be helpful to add a strip of plywood below the drywall, behind where the base molding will be installed. This method will allow for the use of nails by finish carpenters, and can be used in other areas where attachment is a concern, such as behind cabinets. Stud surfaces are located every 12-inches throughout the wall assembly and at the corners. Care should always be taken not to strip the threads in the plastic studs and corner bracket when attaching any finish materials, and use only foam-compatible adhesives. It may be advisable to attach or anchor heavy objects to the concrete itself, which is 2 3/8-inches below the surface of the foam.

Always follow the recommendations and procedures provided by the manufacturer when applying materials to Standard ICFs™. It is common practice and advisable not to apply

materials that are impervious to water vapor to more than one side of the wall so that drying can take place. This is true of all exterior wall systems.

UV rays from sunlight cause oxidation on the forms' surface. For this reason, it is necessary to remove (by rasping) the accumulated dust before installing finishes that require bonding directly to the forms. It may sometimes be necessary to perform a test on a sample area or on a form prior to the actual full and final installation of a product.

Above Grade Walls

Above grade walls are built basically the same as those below grade, but because of dissimilar loading requirements, and because above grade walls usually contain more windows and door openings, steel reinforcing requirements may be different. Care should be taken to identify those areas of the wall with load points which will require special reinforcing design such as lintels over openings, beam pockets, floor and roof trusses, gable ends, and etc.

Waterproofing Below Grade

It is essential that all below grade walls be waterproofed, especially those involving a living space. A waterproofing material can help keep water out of the building and can also protect the integrity of the EPS foam over time. There are numerous types of commercially available waterproofing products. It is essential that waterproofing materials applied to Standard ICF™ wall surfaces be compatible with EPS foam plastic and that the installation of these products follow the manufacturer's recommendations and procedures.

In combination with the installation of a waterproofing system, we recommend the installation of a well-designed French drainage system. This will remove excess water from the footer and wall area. *Standard ICF™ walls alone are not to be considered waterproof and Standard ICF™ Corporation assumes no responsibility for the entry of water or the migration of moisture through the walls or the failure of any waterproofing system.*

There are a number of waterproofing systems. One type of waterproofing is rubberized asphalt compound waterproofing membrane system. This "peel-n-stick" membrane can be applied to concrete and foam surfaces with the use of a surface preparation or contact primer. These (compound and fabric) composite membranes are applied in vertical sheets 36 to 48-inches wide with overlapping compound-to-compound joints. Peel-n-stick membranes have become a standard for waterproofing ICFs below grade and can be easily applied by the wall installation crew.

The membranes are best applied during temperatures of 40-degrees and rising, because warming temperatures accelerate application. At low temperatures, the use of a hot air gun to warm the wall surface and the membrane will help ensure adhesion and bonding. When applying at the lower temperatures, it is best to store the membrane and primer materials in a warm environment prior to usage.

All waterproofing systems require a clean dry surface. Some waterproofing products or applications may require the use of a protection board and/or drainage board, depending on the type of backfill material and drainage system used. When backfilling, be careful not to damage the waterproofing material, and do not allow large or sharp pieces of backfill material to rest on or near the wall surface where settling may cause damage over time.

Rubberized asphalt "peel-n-stick" waterproofing membranes are available from ICF Building Product: *www.icfbp.com*.

Backfilling

For below grade walls requiring backfilling, remove the bracing after the wall has developed adequate strength and is supported laterally at the top by the floor or roof, and at the bottom by the floor. Normal building steps and procedures usually allow enough time for adequate concrete strength to develop, however it is best not to rush the process.

It is important to consider the design of the French drainage system and the type of waterproofing system when choosing the kind of backfill material. It is important to select a combination of materials that will work and remain effective over time. Materials such as sand, gravel, or sand and gravel, make very good backfill because they settle quickly and percolate water. Care should be taken so as not to damage the waterproofing material when backfilling. See: Concrete Curing and Removal of Bracing, and Waterproofing Below Grade.

Warranty

Standard ICF Corporation is committed to producing the highest quality products and warrants their products against substandard materials and manufacturing defects that do not conform to their own published specifications. The discovery of any product defects should be brought to the immediate attention of our business office by calling 800-424-9255. Standard ICF™ Corporation assumes no responsibility for product or system performance once installation has occurred. All material damaged during shipment is the responsibility of the transport company and all claims should be directed to them for compensation.

Ask an expert…our knowledgeable staff is ready to answer your questions.
800-424-WALL
800-925-FORM