



8960 W. Larkspur Drive, Ste 105, Peoria, AZ 85381 Ph: 888.623.4223 info@theprecblock.com



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The Perfect Block™



For additional ICCF construction information using The Perfect Block™ systems or questions concerning the EBS ICCF Grouting Guide contact Rick Tindal/EBS Senior Draftsman, M-F, 8am-5pm, @ 623-271-1173 or 888.623.4223 EXT. 2.

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EBS GROUTING GUIDE

**THE "DO's" AND "DON'T 's"
OF GROUTING ICCF WALLS**

GROUTING

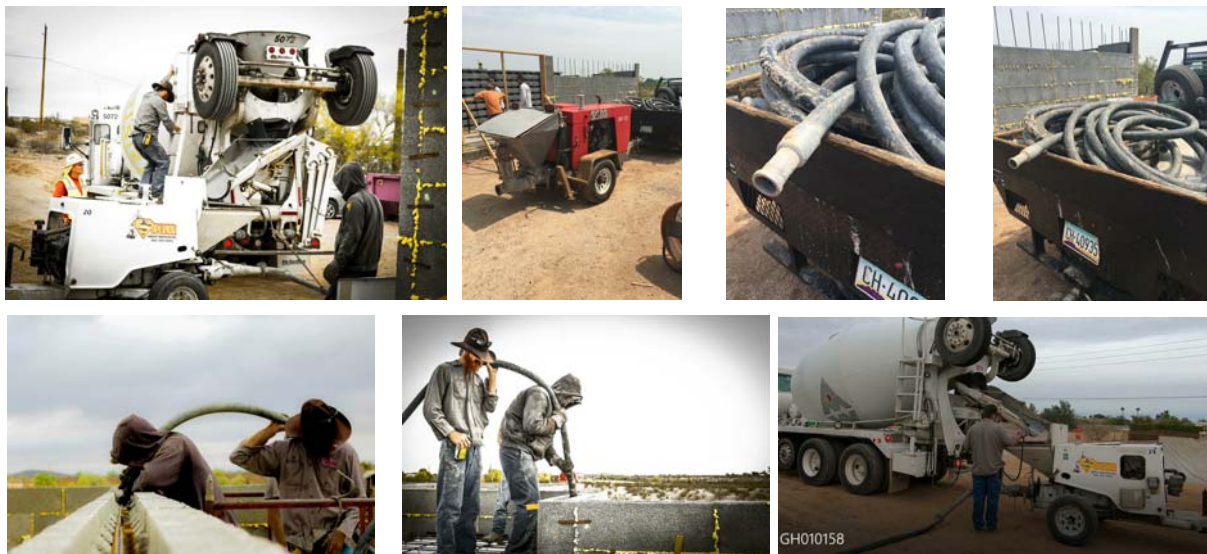
Grouting

Grouting is filling the internal cores of an erected wall of ICCF block with concrete. Concrete used in this fashion is commonly called "grout". In over two decades of grouting experience, we have learned the lessons of what works well and what does not and we will share those with you in this section. We use grouting techniques that make grouting a simple task. The key to a successful grout is good preparation. Definitely use the checklist included in this section. It can be a great reminder of things to do before that concrete truck comes up the drive. With proper building techniques accompanied with good preparation, grouting means the erection of your walls is nearly complete and ready to finish.

Following the Pre-Grouting Checklist provided on the next pages will minimize some of the more common mistakes committed on "Grout Day" and EBS highly recommends its use. Please review the checklist and prepare for grouting. Add any additional steps that you think may be required for your unique design or jobsite.

The following is a suggested method for grouting a typical house design:

Before "Grout Day", the decision to grout from the top of the erected wall or at an intermediate level or levels must be made. Typically, the height of the wall may determine your best grouting method. In a one day pour, to reduce the height that the pumped concrete must fall, walls, 10' tall or over, should be grouted in subsequent levels or "lifts" of 5' in height to prevent dropping heavy wet concrete 10' or more. Using a "boom" concrete pump truck is not recommended but can be used if that is the only equipment available. Special care must be taken when pumping concrete from a boom pump. The force created by falling concrete from excessive heights can put undue stress on the block forms and could cause unwanted "blowouts" and additionally weaken the concrete by separating the concrete aggregate from the mix as it impacts rebar as it falls. We recommend using a trailer mounted concrete line pump.



GROUTING

Grouting (Cont.)

Builder's Tip: We are aware that the available concrete pumping equipment varies significantly from one region of the country to the next. The use of a concrete line pump may not be common in your area, but they are used throughout North America so you are likely to find one. We have found that a line pump solves most of the grouting problems created by a boom truck. First, a line pump usually costs less than half what a boom truck costs to use. Second, the line pump allows you to pump in "lifts" and provides flexibility to your grouting methods that boom trucks do not. Third, a line pump hose is smaller, reducing the chance of pumping too much concrete, too fast. And fourth, you can have near instant control of concrete flow for a quick "shot" at a time that most boom pumps cannot provide.

Builder's Tip: A trailer mounted concrete line pump setup will usually come with 150' of 2" diameter hose. You will be able to grout with a 2" hose, but ask the line pumper to bring a 1 1/2" diameter stepdown hose (a "stinger") to attach to the 2" hose. There is almost double the volume of concrete and hence, double the weight you will have to control on your shoulder using a 2" hose compared to a 1 1/2" hose.

Grouting with a Line Pump:

With a line pump, grout a 10 - 12' or greater wall in levels, cut 4" - 5" holes on the interior side of the walls, aligned with a vertical core at every 3' or 4' in your wall at 5' high. Place the cut plug you remove from each cut hole near the hole and secure to wall with 16d nails for quick retrieval. The plug will be reinstalled and glued with ample foam adhesive immediately after filling the cores with grout to that hole level to ensure curing time before grouting from the top of the wall or the next lift. 16d nails temporarily toe nailed (can be pushed in by hand) into the plugs can give additional mechanical hold to the plug until the foam adhesive hardens (approximately 15-20 minutes).

Pre-Grout Photos



GROUTING

Pre-Grout Photos



This photo shows the block wall prior to grouting and prior to scraping the tack glue from the face of the wall. Notice the "fish plating" where we have identified areas of concern. The minimal exterior bracing is also a precaution. The top corner of the wall is blocking for a beam seat.



GROUTING

Grouting Photos



GROUTING

Grouting Photos (Cont.)



GROUTING

Grouting (Cont.)

Builder's Tip (Cont.)

Builder's Tip: In our construction experience pumping concrete in ICCF walls for decades, we **HIGHLY** recommend pumping your concrete in "lifts" in a circle around the house from the inside. Fill window sills first and a course or two of block cores on each side of door openings from the cut holes on the interior side of the walls of the first lift (5') on each side of the openings in your first circle around the perimeter. Then fill to 5' of wall height in another circle around the inside perimeter of the building, then from rolling scaffolding, fill 5' of wall height on each subsequent circle until filling from the top of your wall. The extra time and labor cutting intermediate holes in your walls to pump in 5' lifts is incredibly cheap insurance against having a "blowout" in your wall. In addition, it is inherently safer to pump in lifts rather than initially from the top of a wall. As you pump each lift, the concrete is beginning set, providing additional stability as you prepare to pour the next lift. These "lifts" are typically completed one after another on the same day until one floor of wall has been grouted (no cold joints).

The reason this tip is in RED is to emphasize the need to exercise good and proven technique when grouting. A "blowout" or even more than one will definitely ruin your day. "Blowouts" were a common and unwelcome experience years ago from other ICF and ICCF forms. Some of them attributable to weaknesses in the form but most from poor grouting technique. At EBS, when we grout, "blowouts" are a thing of the past. EBS ICCF forms are monolithic and strong, but you must identify and "shore up" weak areas (areas where you have cut the block) and grout smartly.

Expanding on the previous **Builder's Tip**, let's start the grouting sequence from the beginning, assuming that you have completed the pre-grout checklist and are ready:

First choose the grout start point and the direction you will proceed in a circle around the house on the inside of the house (clockwise or counterclockwise). Grout all openings (windows and doors) first. That will be the first level or lift you grout. For a clean sill pour, first grout (pump from hose) into the holes that are 5' high directly adjacent to the window opening, left and right side. Stop pumping when the level of grout is level with the sill. [Note: If you are using an open sill buck (no bottom board), be prepared with a 2x the width of the sill to stop overflow of concrete from sill if you pump too much with a high slump.] Then proceed to grouting the next openings. In the same circle, fill on each side of door openings the same way as window sills but only place enough concrete to fill a course or two, then proceed to the next opening until the circle is complete. A worker following behind you that will be plugging and gluing the holes you pumped into at the 5' intermediate lift, can also trowel the concrete smooth in the sill opening you just filled.

Builder's Tip: Tapping gently on the bucks with a rubber mallet just after grouting the openings, can help the concrete to settle and fill solidly behind the bucks.

Grouting (Cont.)

Builder's Tip: Most concrete pumpers initially fill their hoses with water before pumping concrete from the hopper to ease the flow of concrete at the start. To prevent pumping just water into your walls, keep the nozzle pointed out the window or in a bucket until concrete is pumping from the hose.

After filling the wall cores on each side of the openings and ensuring the window sills are grouted to level in your chosen direction, begin to grout from the cut holes at your 5' intermediate level in the same direction.

Have a worker trowel the sills and glue the hole plugs as you fill. (Note: The time it takes to pump concrete in a complete circle at each level should be long enough for the pumped concrete to set enough and the spray foam adhesive used to secure the hole plugs to harden enough to prevent popping a plug and pouring out a lower level.) The last level (assuming a 10' wall) to grout is from the top of the wall. Two to three tiers of scaffolding on wheels and several platform decks will definitely make the job go smoother and from our perspective, absolutely necessary for a safe and efficient grouting. As you pump concrete from the top of the wall, you can use the vertical rebar to help "hand vibrate" or "rod" the concrete to ensure better flow of the grout if necessary.

Builder's Tip: You should continually monitor the flow and consistency of the concrete you are pumping. If you think you need to "hand vibrate" the concrete to aid the flow then you should probably stop pumping and have the concrete truck driver add 5 to 10 gallons of water to the mix before resuming grout pumping to improve concrete flow.

Once you have grouted to the top of the wall, have a worker go behind you and trowel the grout smooth with the top of wall and have them place the code required anchor bolts in and aligned with the vertical cores at the proper spacing. Ensure the bolt threads exposed above the concrete surface allow for the top plate thickness and nut and washer thickness.



Builder's Tip: Before grouting, having a visible spray paint mark on the face of the wall at the top for proper placement of anchor bolts. This technique can save costly omission and placement mistakes. An anchor bolt must be placed within 12" of the end of each length of top plate board. Consider whether you will have butt or miter joints for your top plate boards at each of the corners and the length of the boards you will use and place your paint marks accordingly.

When the grouting is complete and if there is concrete remaining, it can be used for other preplanned uses such as doorstep pads or other useful projects (as described in the Pre-Grout Checklist) so no concrete is wasted.

Grouting (Cont.)

Post Grouting

As soon as possible after grouting, scrape or sweep the concrete that may have spilled onto your finished concrete floors or patios that were not covered. If the spots of spilled concrete are allowed to harden they could permanently mar your floor finish and be very difficult to remove. This is the time to break loose or remove any spilled concrete from anything, inside or outside the walls if you don't want the spilled concrete to become a permanent finish on your floors, tools, doorsteps, construction materials, etc.

Support blocking or bracing should remain in place for as long as possible to allow the grout concrete to harden to its maximum strength.

Alternative Grouting - With Safety in Mind

The grouting technique previously described is for grouting an entire wall in one "grout" day. We typically grout our walls this way but there are occasions where we have stopped building at the 6' or 7' level, placed vertical steel with the appropriate rebar lap splice for continuing the wall and then poured concrete to that height. In the following days, we build to the top of the wall and grout again.

The occasions that drive our decision to build and grout to an intermediate level and not to the top are almost always driven by "safety". If the wall is 12', 14', or 20' plus, it makes sense not to try and pump heavy wet concrete to such heights in one day pours unless you have years of grouting experience. An inexperienced crew or not having an abundance of extra hands on grout day would be a good reason to limit the height of your pour. Weather can drive that decision too. If the walls are tall, they are big targets for thunderstorms, microbursts, "monsoons", high winds, etc. They can destroy a week's work in a heartbeat. Having a solid wall to build on early in the wall construction adds a greater safety margin to all the remaining construction. Of course, one of the downsides is that you will have to pay for the concrete pumper more than once. There is no harm and no foul grouting to intermediate levels if you believe it makes good sense to you. Use good judgement when planning your grout day.

Specific Note to Grouting the Larger Cores of the 10-inch 6" X 6" Core The Perfect Block ICCF: For those builders building with the 10-inch 6"X6" core ICCF, as the manufacturer, Eco Building Systems Corp (EBS), recommends using special care as described in the previous paragraph and the grouting methods detailed on the previous four pages to ensure a safe and successful concrete grout pour. Because the larger (larger than the 4"X6" cores of TPB's 8" and 10" Asymmetric ICCF) internal cores of the 10-inch 6"X6" Core ICCF will consume 35 to 40% more concrete during the grout pour, the increased internal pressure exerted by the additional heavy,

Grouting (Cont.)

Alternative Grouting - With Safety in Mind (Cont.)

wet concrete may significantly increase the potential for a blowout. For this reason, EBS recommends pumping concrete slowly and stopping at intermediate levels of 4', 5', or 6'. Care should be taken to not pump concrete too fast, and to not drop concrete from heights greater than 4' or 5'.

Builder's Tip: When building an ICCF wall to an intermediate level and pouring concrete to that level in the manner described in the previous paragraphs, you will create the need for a "lap joint". You must have the proper overlap (lap splice) of vertical steel between the next level of wall that you build. Ensure the vertical steel that is placed in the first level, extends the proper length of lap splice beyond the top of the first intermediate level to be lapped with the vertical steel from the next level when it is built.

GROUTING

Pre-Grout Checklist

When your ICCF walls are erected to your design height and you are ready to grout the walls, use this suggested pre-grout checklist to ensure you have not overlooked something that can cause problems or delays.

- 1. Check wall design height against your plans (be sure to account for top plate thickness). Check all other height critical items such as top plate height changes and beam seat heights, sill heights, lintel heights, etc.
- 2. Check the top of each ICCF wall for level with a transit, water level, or laser level or from a "control line" if you used one. Trim the top of wall as necessary.
- 3. Check wall bracing for strength and security. Bracing can be used to bring a wall into plumb.
- 4. Inspect all openings for secure bucks and bracing and check squareness. Reinforce as necessary.
- 5. Ensure all window opening sill bucks (if used) have "sight" holes cut in them to see level of grout in the sill.
- 6. Review plans for all service penetrations (water, sewer, electrical, and gas) and check locations. Reinforce all modified areas as necessary.
- 7. Review plans for all design beam pockets and check locations and beam seat heights. Reinforce all pockets as necessary.
- 8. Search for any suspected weakness in wall construction (i.e. beam pockets, plumbing and electrical "rough-in" access cuts, openings with unsupported flanges, etc.) and scab or "fishplate" with plywood and threaded rod and/or brace as necessary.
- 9. Check all ledgers or ledger blocking to ensure they are installed at correct locations, level, and firmly secured and supported.
- 10. Check that your spray paint marks at the top of each wall for proper placement for top plate anchor bolts are clearly visible for quick bolt placement.
- 11. Check for proper vertical rebar placement and spacing. We recommended that you place a paint mark at the core location on the very first course of block where the vertical rebar comes out of the foundation. Ensure there is a floor height length of rebar in a vertical core placed from the top of the wall where there is a paint mark for foundation rebar.

GROUTING

Pre-Grout Checklist (Cont.)

- 12. Check top bond beam horizontal reinforcement steel and corner bars at the building corners for proper placement and overlap.
- 13. Stage necessary materials and tools (plywood, 2x4's, stakes, circular saw, hammer, and nails, spray foam gun and extra adhesive foam cans, etc.) nearby to repair possible blowouts, if necessary.
- 14. Check rolling scaffolding for security and stability and ease of movement. Ensure there are no obstacles on the slab that would interfere with the scaffolding.
- 15. Locate, count, and stage top plate anchor bolts for easy retrieval for placement when grouting is finished. Paint a placement mark for proper installation.
- 16. If the building corner end elements have been left off until just prior to grouting, ensure all horizontal rebar steel and corner rebar are all in place before completing wall corner construction.
- 17. After installing corner blocks. Inspect all corner end elements for proper construction and ensure they are securely glued, stapled, and braced for concrete pour.
- 18. Ensure your job site is accessible to concrete trucks, pump trucks, and/or trailer concrete pumps.
- 19. Determine beforehand, a wash out location for your concrete trucks and pumpers.
- 20. Prepare beforehand, framing for useful concrete pads or other useful things to utilize any concrete left over after wall grouting.
- 21. Calculate required concrete quantity with 5-10% overage for contingencies. One yard of concrete over is much better than being one half yard short.
- 22. When you are certain that you are ready to grout, schedule your concrete truck(s) with proper quantity, type, and slump of concrete and proper arrival timing of trucks (45 - 60 minutes apart).

GROUTING

Pre-Grout Checklist (Cont.)

- 23. When you contract for the concrete pump company, have them confirm that the concrete pump truck they are sending will be carrying a 1 1/2" hose to connect to the pump hose. Otherwise, you will have to be "Superman" to carry and control a hose of greater diameter filled with surging concrete.
- 24. Schedule your pump truck to arrive approximately 30 minutes prior to the concrete truck so there is ample time for the pump to be set up and hoses to be unrolled and placed before the concrete arrives. Establish with your concrete pump guy prior to concrete pumping, clearly understood voice and hand signals for starting and stopping the concrete flow.
- 25. Coordinate with the pump guy to have his pump equipment pump at its slowest rate for adequate flow of concrete. Concrete slump and length of hose will affect this pump setting, but pumping at a slow rate is safer and gives you more control at the hose nozzle.
- 26. Ensure the concrete company has detailed directions to your jobsite and phone numbers to reach you. For remote building sites, be prepared to meet the driver at nearby known cross streets and guide him to your site.
- 27. Clean and remove unnecessary materials and obstacles around the exterior. Cover and protect anything you don't want spotted by concrete during grouting.
- 28. Stage a reciprocating saw (without the blade) and a wall height 2x4 close by for wall vibration if necessary.
- 29. Ensure you have enough laborers ready and available for grout day and assign each person with their tasks and responsibilities during grouting.

GROUTING

Pre-Grout Checklist (Cont.)

Suggested minimum number of workers to have for "Grout Day" and their duties:

1. One person to hold the hose and direct the flow of concrete.
2. One person to follow close by and help control the hose
3. One person to move scaffolding, trowel sills, place anchor bolts, and man a bucket for concrete overflow from the hose.
4. One person to provide relief and swap duties with the above when needed and to be on hand in the unfortunate event of having a "blowout". This person will also plug and foam wall holes, clean spills, clear a path and move scaffolding, move concrete hose, and do everything else needed in a hurry.
5. The one extra person you are paying is the concrete pump guy. He will turn the concrete flow on and off at your command and help moving the hose for the pumping crew.

EBS Note: In our experience, good construction technique (pumping concrete in lifts), attention to detail when searching for weak areas, "fish plating" those weak areas with OSB plywood and threaded rod, and lots and lots of foam adhesive (cheap insurance) will reduce the likelihood of having a blowout" to near zero.

Look on YouTube

For more techniques, tips and information on grouting and building with The Perfect BlockTM wall systems. Please visit our You Tube channel:

"The Perfect Block TM Composite ICF/ICCF Block"