

C.6 STEEL REINFORCEMENT FOR WALLS

It is important to remember at all times that PolySteel is a forming system for **reinforced concrete walls**. Accordingly, the structural integrity of the entire system rests on the proper design and placement of reinforcing steel (rebar) in the wall cavity, as forms are being placed using the methods described in this Manual. This is critically important because, while concrete provides superior strength for loads placed directly on top of it (compressive strength), it requires supplemental reinforcement to support loads that are placed laterally on the wall by forces such as high winds or backfilled soil. Consequently, vertical steel reinforcement is critical to the overall performance of a PolySteel wall, while horizontal rebar provides supplemental crack control, additional support for lintels over doors and windows, and, in some cases, additional strength in high seismic conditions. The size and spacing of rebar in the walls is determined by the performance requirements engineered into the design.

The tables in the Design Section of this Manual will provide you with an engineered guideline that will apply to a majority of residential applications, in addition to many light commercial projects. The Prescriptive Method also provides design specifications which may also assist you in complying with the applicable codes in your area. The amount and placement of rebar may also be affected, and minimized, by the use of a steel and fiber reinforcement concrete additive (VertiForce®). Ask your PolySteel Dealer about this innovative alternative.

It is imperative that, if the design of your project falls outside of the specific parameters outlined in these tables, you engage a qualified engineer to provide you with a proper design in compliance with the applicable codes and standards, and comply with that design throughout the installation of your project. In all cases, understanding and adhering to the following guidelines throughout the installation process will help ensure a successful project, and a superior PolySteel structure that will withstand the tests of time, and the forces that man or nature may place upon it for centuries to come.

C.6.1 VERTICAL REINFORCEMENT.

The lateral loads expected to be placed on your PolySteel walls will determine the amount of vertical rebar that will be required in its design. **The minimum requirement for vertical rebar in a PolySteel wall is generally one #4 (1/2") vertical bar, with a minimum strength of 40,000 psi (Grade 40) placed in each corner of the building, every 48 inches on center along the wall, and within 12" of all window and door openings.** The tables in the Design Section of this Manual, however, should be consulted to determine the proper amount, placement, and bending (if applicable) of the rebar in your project. If the design criteria of your project fall outside of the parameters of these tables, you must consult with a professional engineer for the proper design, which must comply with ACI 318, the requirements of IRC 2000 (if applicable), or the Prescriptive Method. However the proper design is determined, the following steps must be taken to ensure that the rebar installation will perform as it was designed for your PolySteel wall:

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C.6.1 VERTICAL REINFORCEMENT (continued)

✓ **Use the Proper Grade.**

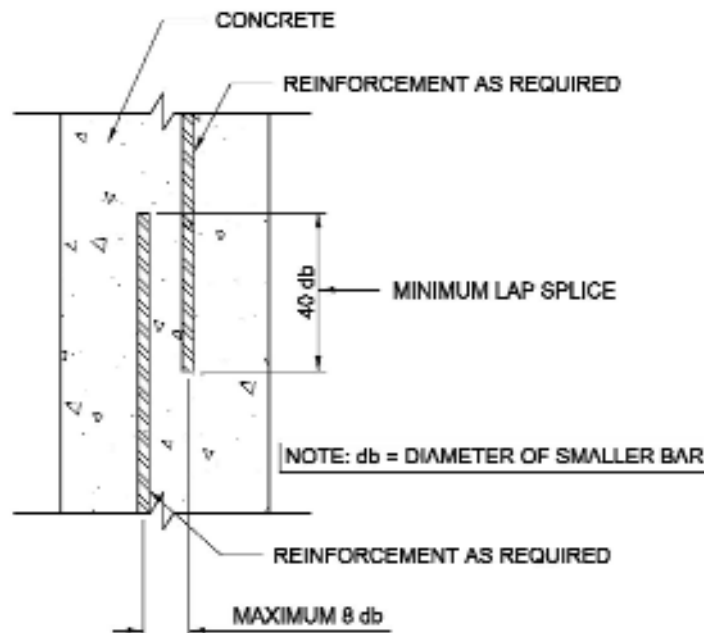
The proper grade of rebar must be used, as specified in the design. Rebar strength is typically graded at 40,000 psi (pounds per square inch required to deform) (Grade 40), or 60,000 psi (Grade 60). **Never use ungraded rebar in your project.**

✓ **Install in the Specified Location.**

Most of the tables used to specify rebar are based on the placement of rebar in the middle of the wall cavity. It is possible to obtain greater wall strength by placing rebar on the side of the wall opposite to the force being applied to it, however this requires a specific design, as outlined in some of the tables in Section E, and/or the approval of a professional engineer. It also requires additional care during installation.

✓ **Splices Must Have Proper Overlap.** Vertical bars that are spliced together must overlap each other by a minimum of 40 times the diameter of the bar (e.g., #4 bar is 1/2" in diameter, 40 times 1/2" is 20 inches). This can be achieved with a "contact" overlap, which means that the two bars are tied together, or a "non-contact" overlap, which means that a bar may be placed and secured next to the bar to be extended, as long as the proper overlap is achieved and the vertical center of the two bars are within 8 bar diameters (e.g., for #4 bar, 4 inches) of each other (See [Figure 3.3](#)).

Figure 3.3 VERTICAL LAP SPLICE REQUIREMENTS



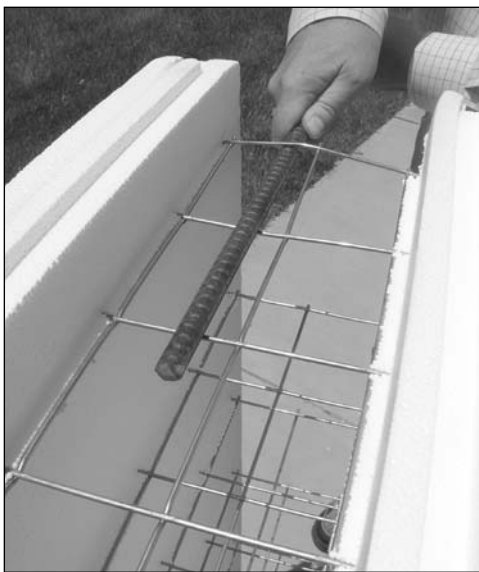
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C.6.1 VERTICAL REINFORCEMENT (continued)

✓ **Rebar Must Be Restrained During the Concrete Pour.** Proper restraint ensures that the rebar will be cast in place where it is required to provide the design strength of the wall. This can be achieved by:

- Tying the rebar together with wire, or
- Tying the rebar together with electrical “zip” ties, or
- Capturing the rebar within rebar saddles, the PolySteel Form tie and/or the horizontal rebar, or other methods that will prevent rebar movement during concrete placement.

You can secure the bottom of the vertical rebar by slightly bending out the bottom of the steel tie to create a slot for the rod, as illustrated below. This will ensure that the bar will not slip out of place at the bottom of the wall. The top of the vertical bar can be tied to the horizontal rebar at the top of the wall to hold the assembly in place during concrete placement. As illustrated below and in Figure 3.5, you may also secure the bottom of the vertical bar within a 1-1/2" tall “ring” of 1-1/2" (or larger, if required) PVC pipe collared over the dowel protruding from the footing, or slab. If there is no dowel that corresponds to the vertical bar being installed, you should create an impression in the footing (with a funnel or a piece of rebar) at the time it is poured, or drill a hole in the finished footing, which will allow the vertical bar to rest securely in place. By using rebar saddles, you can restrain the vertical rebar all the way down to the footing, holding it in place throughout the wall. When you tie the vertical rebar at the top, you have fully secured the rebar in compliance with the code.



BENT TIE SLOT



REBAR WITH PVC RINGS

As you follow the installation steps outlined in the remainder of the Manual, these vertical reinforcement guidelines should be followed as the reinforcement is installed.

C.6 STEEL REINFORCEMENT FOR WALLS (continued)

C.6.2 HORIZONTAL REINFORCEMENT.

Horizontal reinforcement is required to provide temperature control in the PolySteel wall, and, more importantly, to support the loads applied to the concrete lintels over doors and windows and other openings in the wall. There are specific tables for the design and placement of rebar in these lintels in the Design Section of this Manual, which must be followed to ensure that these critical structural elements are installed correctly. **The typical minimum requirement for horizontal rebar in a PolySteel wall is every 48" and at the top of the wall.** If the wall is installed on an un-reinforced footing, a horizontal bar must be placed on the first course of forms, and then every 48" thereafter. As with vertical rebar, the same important steps must be followed in the installation of horizontal rebar:

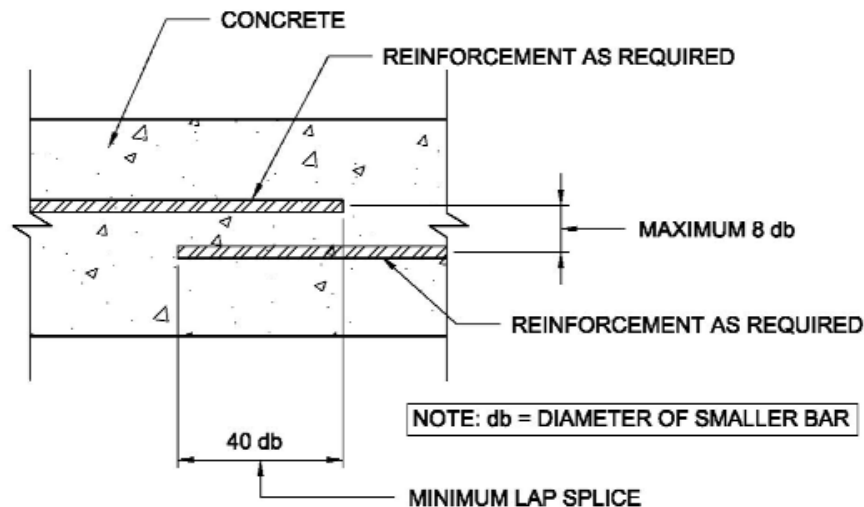
✓ **Use the Proper Grade.**

✓ **Install in the Specified Location.**

The horizontal rebar should be placed in the appropriate rebar saddle or secured to the center of the wall by tying the bar to the PolySteel Form tie.

✓ **Splices Must Have Proper Overlap.** The same overlap requirements apply to both vertical and horizontal rebar (40 times the diameter of the bar). Horizontal overlaps should be tied together, unless both bars are secured in place with the requirements of a non-contact splice.

Figure 3.4 HORIZONTAL LAP SPLICE REQUIREMENTS



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C.6.2 HORIZONTAL REINFORCEMENT (continued)

✓ Rebar Must Be Restrained During the Concrete Pour.

The code requires that rebar must be restrained during the placement of concrete to ensure that it is cast in place where it was designed to be, in order to provide the proper strength. As with vertical rebar, this is achieved by:

- Tying the rebar together with wire, or
- Tying the rebar together with electrical “zip” ties, or
- Capturing the rebar within rebar saddles, the PolySteel Form tie and/or the horizontal rebar.

As mentioned in Section C.6.1, the use of a rebar “saddle” eliminates the need to tie rebar together in the wall, saving many hours of labor installing your PolySteel Forms. The saddle is a pre-formed steel wire designed for the size of form you are using, and is also available in a design that allows for offsetting the vertical rebar from the center for additional strength, when specified by engineering design. The saddle provides sufficient space for the placement of two horizontal pieces of rebar side-by-side for proper overlap. The photograph below illustrates how the saddle is placed in the form at the proper location for the horizontal bar. The vertical bar is then placed through the opening and into the slot in the bent tie, PVC ring, or the impression you made earlier in the concrete footing with the funnel or rebar rod.



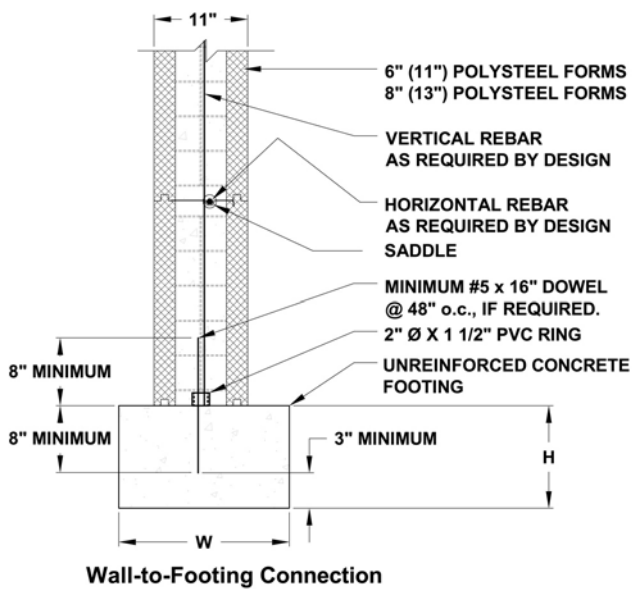
REBAR SPEED SADDLES

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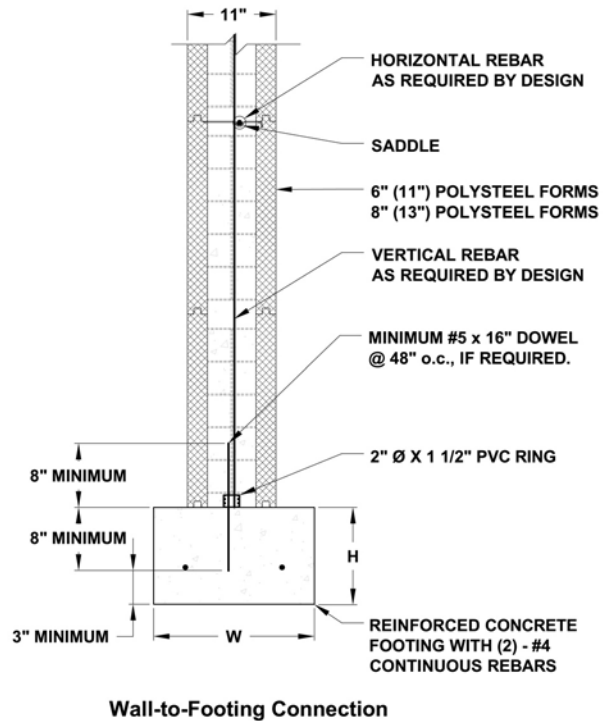
C.6.2 HORIZONTAL REINFORCEMENT (continued)

Figure 3.5 REINFORCED FOOTING AND WALL

Unreinforced Footing



Reinforced Footing



“REINFORCEMENT” is a key element in the ARC of Success. Proper design and installation of the rebar in your PolySteel wall is a cornerstone in the structural security of the entire system. Pay close attention to the design and installation guidelines provided by the drawings, tables, and other specifications of your project and you can be proud of the quality you can achieve.