15. Bond Beam, Cell, and Lintel Details

House Skeleton

The bond-beam and wall cells are the skeletons of the house structure. They work in conjunction with the foundation and the roof diaphragm to provide overall building strength. They reinforce the walls just like your bones reinforce your extremities. The word lintel has numerous meanings in the block construction trade. A lintel can be the header for a window opening in a block wall. A lintel can be the top of a block wall. A lintel can also be a concrete block that is unique and designed to hold the bond-beam rebar in position while the bond-beam concrete is poured.

Foundation, Walls, and Roof

The foundation or monolithic slab provides for the lower diaphragm of the house walls. The term diaphragm here refers to a rigid structure in a horizontal plane. In simpler words, the foundation locks the bottom of the house walls into place. The roof diaphragm does the same thing at the top of the walls. The roof diaphragm includes the trusses, roof sheathing, and ceiling sheetrock sheathing. This roof diaphragm adds strength to prevent the top of the walls from flexing out of square.

Of course the entire roof diaphragm could be pushed sideways if the walls were weak and could not prevent their being bent in the vertical plane. So the roof diaphragm and the walls work in unison with the foundation to keep the structure from flexing or bending during high winds.

Figure 52. Roof trusses being installed.

Concrete Properties with Rebar

Concrete has two important properties that I will discuss here. Compressive strength is the concrete's ability to bear a direct load. The load itself tries to compress the concrete particles closer together but they cannot compress. Concrete is very strong in its compressive strength because the aggregate within the concrete mix locks all these particles into position so that they cannot compress.

The other property of concrete is flexural strength. This is concrete's Achilles' Heal so to speak. Concrete is very weak in flexural strength because the flexural action tries to pull the concrete particles apart. Wall openings and lateral forces upon a wall both contribute flexural forces on the concrete within that wall. Steel rebar embedded within concrete compensates for the flexural weakness of concrete. When the rebar has adequate diameter, it can't be stretched from the flexural forces.

If the rebar were too small in diameter, then it could be stretched and the concrete would crack from the flexural forces and the stretched rebar. Just as a side note, it takes 80,000-pounds of force to stretch a bar that has a cross-sectional area of one square inch. #5 rebar is 5/8-inch in diameter and has a cross-sectional area of about 0.4 square inches. So we're looking at 32,000-pounds of force to stretch 1 each #5 rebar. So a foundation with two #5 rebars would require 64,000-pounds of flexural force to crack the foundation.

Rebar in Foundations

Let us examine a flexural reinforcement example of a foundation. Let us say that this foundation is under the garage door, and a 4000-pound vehicle is parked above this foundation. The force of the vehicle weight will push down on the foundation trying to rip apart the lower portion of the foundation. This