CASE IN POINT

Avoiding Classic Cracks

by William Lotz

We recently saw a condo project in the Lakes Region of New Hampshire, where the foundations were poured with no reinforcement on uncompacted fill. And they asked why the foundation had settlement cracks!

The condos were set back 75 feet from the lake on a slope. The lake side of the foundation was poured on the fill removed from the street side. The result was that the rear half of the foundation was on undisturbed soil and the front half was on non-compacted fill. In some buildings, the concrete foundations were poured on frozen soil. This, in itself, is rather stupid.

Lawsuits worth about $500,000 are ending against the builder of the condos for a variety of inadequate construction practices. One aspect of the suit is the lack of reinforcing steel in any of the concrete. Another involves a lack of tie-downs or J-bolts fastening the buildings to the foundations.

There are several decks on the lake side. Due to the slope, the decks are supported on 4x4 posts, 10 to 14 feet long. And the posts rest on Sonotube-formed concrete piers. The tops of the 4x4s are merely toe-nailed to the beam, and the bottoms just rest on the concrete. I can imagine a good gust of wind lifting up the deck, the 12-foot post kicking out, and the deck dropping 10 or so feet to the ground. At our recommendation, the support for the decks is being rebuilt.

Needless to say, the foundation walls and floors are cracked with the classic settlement cracks. To repair these, we have recommended re-excavation around the cracked areas, chipping out the cracks one inch deep, and filling both sides with epoxy grout.

In a second project we looked at recently, a two-car garage was built on a thickened slab. The builder put no steel in the foundation and no ladder-type horizontal reinforcing in the block. The slab settled, severely split, and the walls cracked to the point that the building had to be torn down and rebuilt. Cracks were up to an inch wide. The contractor blamed the problems on poor soil conditions. But for the price of rebar, the contractor could have saved a lot of anguish and money.

Good Concrete Practices

A good foundation is the start of a good building. To start with, the concrete forms should be set on undisturbed soil or compacted fill and *never* on frozen soil. We recommend using 3,000 psi concrete and vibrating it to prevent honeycombing during pouring.

Slump should run from 3 to 6 inches. Concrete that is too wet (high slump) will have reduced strength. Concrete that is too dry (low slump) is hard to place. If the weather is below freezing, insulation blankets should be used to prevent the concrete from freezing. The forms should be left in place for seven days in cold weather and for three days in warm weather. Premature form stripping can compromise concrete strength. Pouring concrete when the temperature will drop below 35°F must be done with an understanding of the potential hazards of cold-weather concrete work. After the forms are stripped, the form ties should be broken off and patched with a rich mortar to prevent corrosion stains.

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Remember that concrete has good compressive strength but not much tensile strength. Rebar should be added for both tensile and flexural strength. Also, keep all steel reinforcing an inch or more away from the surface of the concrete to prevent corrosion.

Rebars should be properly spaced in the forms, not haphazardly. Rebar should be clean. Where it needs to be bent, follow the specifications of the Concrete Reinforcing Steel Institute (933 N. Plum Grove Rd., Schaumburg, IL 60173). Where splices are needed, make them at least the length of 24 bar diameters, and wire them together tightly. Welding of rebar in the field is not recommended.

When pouring the foundation footing, cast in a 2x4 on its side to provide a key for the foundation wall. Also install J-bolts to tie the sill plate to the foundation. In the next hurricane that hits Maine, there will be many buildings blowing off their foundations because they are not tied to the foundation with J-bolts.

The backfilling operation is also critical. Don't backfill until the foundation is supported by the first-floor deck. Use a sandy, coarse-grain material and make sure the backfill does not include clay or boulders.

If you abide by common sense and good construction practices, you shouldn't have to learn about cracked foundations and slabs the hard way. ■

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The basics:
Some key points to remember about foundation design.