

Blind-side and one-sided forming

By Bruce A. Suprenant

Sometimes contractors must place new concrete walls against existing concrete walls, earth banks, and steel or timber shoring that protects property lines. These situations often require the use of one-sided forms, and the form installation may have to be done without conventional form ties to help resist lateral concrete pressures. To avoid bulges, blowouts, and out-of-tolerance walls, contractors can use bracing, specialty accessories, or prefabricated form-work components.

Even very short walls will bulge if not adequately braced or tied. On the project shown in Figure 1, workers felt the bracing was sufficient, but it wasn't and the wall bulged. To correct the bulge, they removed concrete from the forms, added more braces, then shoveled the concrete back into the forms. This was expensive, time-consuming, and messy. On another one-sided forming project, vibrating the concrete during placement caused the wall to move. The workers stopped vibrating and used a rebar to consolidate the concrete. But the 1-inch bulge at the bottom of the wall remained. Even when braces are sufficient, the stakes holding the braces may be too weak, permitting form movement. Anchoring stakes to a concrete deadman may be necessary.

Specialty accessories

To avoid the problems associated with making timber bracing strong enough to support the lateral pressure of fresh concrete, contractors can choose from a number of specialty accessories that allow the use of ties with most one-sided forms. They can

use these specialty items to anchor ties to existing concrete walls, rock cliffs, steel soldier piles or sheet piling, wood lagging, rebar, and other ties. Ties are connected to these members by welds, screws, and couplers (see box). These accessories allow the ties to resist the lateral pressures of the fresh concrete. Then lateral bracing only needs to resist wind or other lateral loads created during concrete placement.

A waterproof grease should be used on embedded items that are to be

reused or removed. Grease the part of the tie or bolt that will be embedded in the fresh concrete. If this step is skipped, the accessories can't be reused.

Prefabricated form components

When specifications or site conditions prohibit the use of ties, contractors can avoid using a lot of lumber bracing by selecting prefabricated form components. Attach vertical wales or strongbacks to a form panel. Then add a horizontal and diagonal wale to the vertical wale to form triangular waler frames that resist the pressure of fresh concrete (Figure 2). This type of one-sided form can be readily ganged and moved by crane.

Securely attach the triangular frame to the footing or slab to resist the force generated by the lateral pressure of the concrete. Drill in anchors and place anchor bolts to secure the waler frame to the concrete. Even with strong panel forms and 5- to 8-inch steel wales, don't space the triangular wale braces more than 3 to 4 feet apart.

Blind-side forming

When forming against an existing foundation wall, it's sometimes possible to use two-sided forms if space allows. The back-side form, or blind-side, between the old and new wall can be formed with specialty devices similar to those used for one-sided forming. The trick to using ties with blind-side forming is to get them into place and anchored. Figure 3 shows three different methods of blind-side forming that require 1 to 4 inches of clearance. Because there usually isn't adequate work space, the



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Figure 1. Without ties, one-sided wall forming can lead to bulges and blow-outs. Even on this short wall, the concrete pressure was sufficient to move the form. Here workers are removing concrete and adding braces to stop the form from moving. Manufacturers provide specialty form accessories to make the job easier and prevent bulging walls.

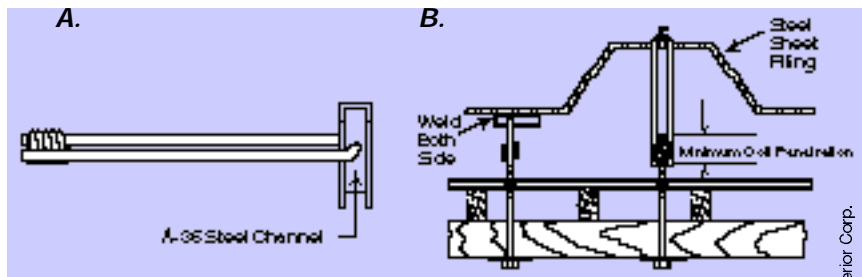
SPECIALTY ACCESSORIES MAKE TIES WORK

Accessory

Application

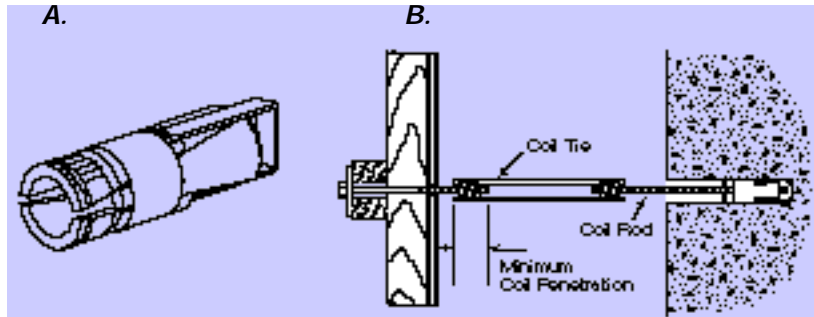
A. Coil tie attached to steel channel. The tie can hold as much as 3,750 pounds with a safety factor of 2. Actual working load depends on the strength of the field weld.

B. Weld channel to steel or drill hole through steel, slip channel through, pull back tie to use channel as a bearing anchor.



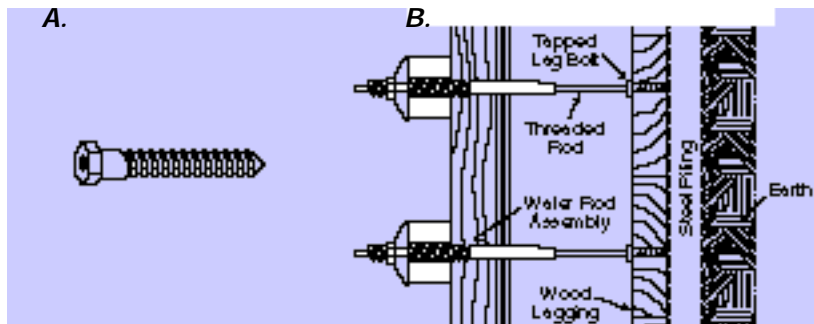
A. Expansion anchors are available in varied sizes and allowable working loads. The actual anchorage capacity is usually governed by the strength of the rock or concrete to which it's anchored.

B. Drill a hole perpendicular to the concrete or rock surface. Insert and set anchor, screw in coil rod, and attach coil tie to the threaded rod. Typical hole length is 6 to 10 inches. Hole diameters vary from 1 to 2 inches.



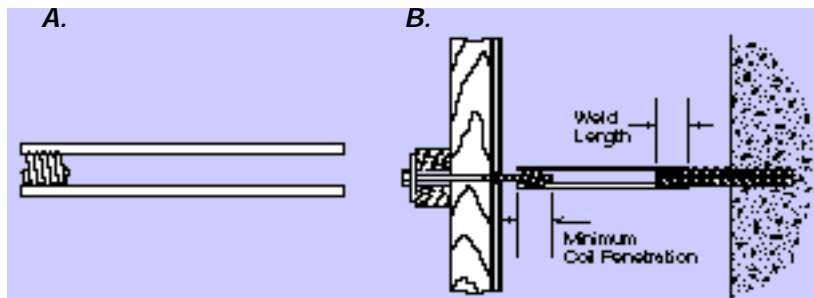
A. Use a lag bolt with a tapped end to accept a threaded rod. Typical lag bolt size is 5 inches long and 3/4 inch in diameter. Ends are tapped to accept 1/2-inch threaded rod. Safe working load of the bolt varies from 1,000 to 3,000 pounds but the quality of the wood could lower the working load.

B. Drill a pilot hole in the wood, screw in lag bolt, and install threaded rod and waler assembly.



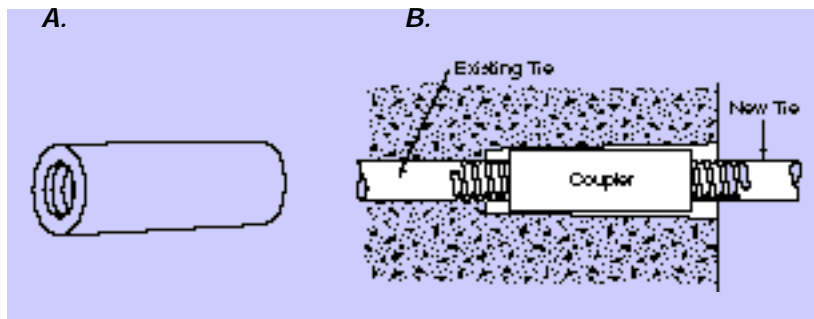
A. The coil tie can safely support loads from 3,750 to 13,500 pounds. The quality of the weld governs the allowable loading. This tie, ranging from 3 to 5 inches long, is available to fit #6, #9, or #11 rebar.

B. Weld the modified coil tie to rebar (or other firmly anchored steel item). Minimum field weld size varies from 1 to 2 inches.



A. Steel couplers vary in size from 2 to 4 inches long and 3/4 to 1 1/2 inches in diameter. They come in sizes to fit 1/2-, 3/4-, and 1-inch-diameter threaded rods. Both ends can accept threaded rod.

B. Place coupler into cavity left by a she-bolt, screwing it onto the threaded rod. Screw new tie into coupler. Concrete may need to be chipped from the cavity to make the connection. Make sure both rods screw full-depth into coupler.

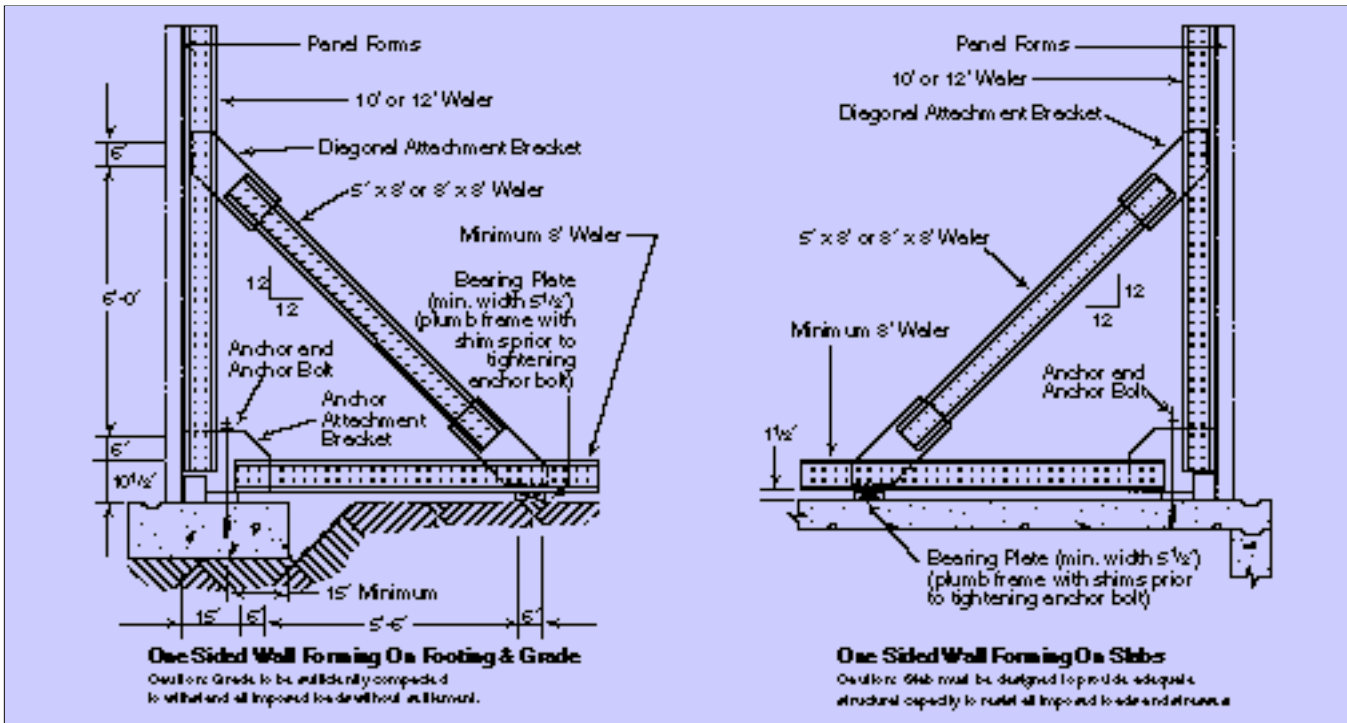


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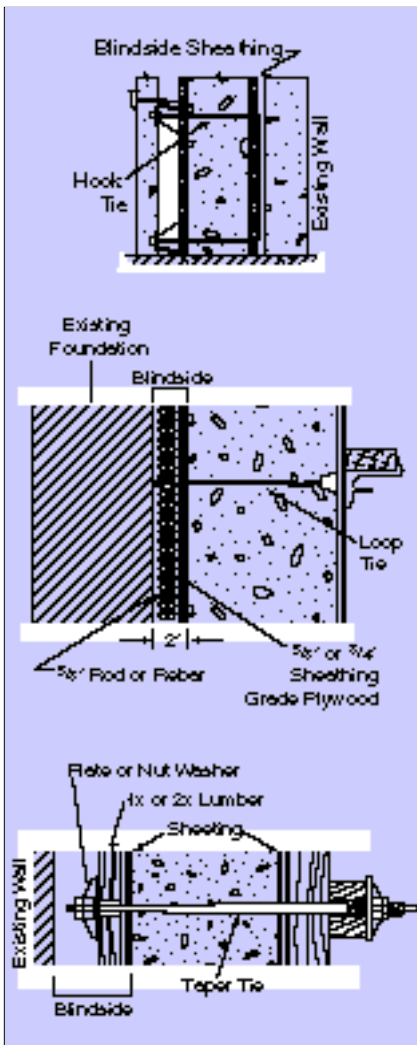
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Figure 2. One-sided forming can be successful without ties. Form panels are braced with a triangular wale system that is anchored to hardened concrete, keeping the wall vertical. This system can be ganged for crane handling.

blind-side form is typically left in place.

One method of blind-side forming uses ties hooked around the form sheathing. The sheathing and tie can be as thin as 1 inch. But the tie spacing is fairly close and the allowable tie load is low (about 1,500 pounds). To stiffen the form sheathing, use flat 1x and 2x material. Then the allowable tie load controls tie spacing. Another method uses a loop tie that is slipped through holes drilled in plywood, then hooked around rebar or rods.

The blind-side form for both of these systems must be left in place. For blind-side forms that need to be stripped, use taper ties and a back-side form of plywood sheathing with flat vertical studs attached. Drill a hole for the tie through the plywood and vertical stud. Nail a nut or plate washer over the tie hole. Set the



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blind-side form in place, slide the tapered tie through both forms, then screw the tie into the washer on the blind side. This system requires about 3 inches of clearance. For smaller clearances, don't use vertical studs.

After placing concrete, unscrew the taper tie from the washer and slide the tie out of the wall. The blind-side can then be removed. Because of the tight clearance, however, it's difficult to use a bar to pry the forms from the concrete.

Be creative

Learning how to use specialty accessories for one-sided and blind-sided forming can make the job easier and prevent bulges. Some contractors develop their own forms using metal stay-in-place forms with ties welded to them or ties slipped through holes then hooked on rods behind the metal forms. But whatever system is used, make sure the ties are adequately anchored. If using one-sided forms without ties, use plenty of bracing.

Figure 3. Blind-side wall forming is tricky. Here are three methods that work. Some contractors use metal stay-in-place forms instead of wood as the blind side.