Fire Engineering®

Concrete Falsework
Article and photos by Gregory Havel
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When concrete is poured in construction, it needs some type of form to provide its final shape. Freshly-mixed concrete weighs about 150 pounds (68.2 kg) per cubic foot, or 4,050 pounds per cubic yard (2,412 kg per cubic meter), and exerts pressure both downward and outward on its forms. These forms can be for footings bearing on undisturbed soil, floor slabs on compacted soil, foundation or bearing walls set on top of concrete footings, or poured-in-place structural slabs for floor and roof decks.

These forms and their temporary supports are often called “falsework,” and are removed after the concrete sets and cures to its design strength, which can take as long as four weeks. Falsework on construction job sites is a concern for firefighters because it uses a lot of wood and a form-release material that is often kerosene- or fuel-oil-based. The form-release material is sprayed on the forms to keep the concrete from sticking to it. After several uses, this combustible liquid can soak deeply into the lumber.

Photo 1 shows the nearly-completed forms and supports for a 16-inch-thick load-bearing wall for a factory. From footing to top of the form, this wall is 16 feet high. The concrete form panels are plywood set in steel frames that are pinned to the top of the concrete footing and connected to each other by “wedge-bolts." The panels are braced horizontally on both sides by doubled 2 × 6 lumber. They are braced diagonally to the ground on both sides by single and doubled 2 × 6 lumber attached to the forms with turnbuckles for level and plumb adjustments. These

diagonal braces are nailed to steel or wood stakes driven into the ground. The two sides of the form are connected by “form ties”—steel strapping that will keep the sides from separating when filled with concrete, and which will remain in place after the concrete is poured. The face of each panel was sprayed with a fuel-oil-based form-release material before the form was assembled to prevent the overspray from coating the reinforcing steel.

Photo 2 shows part of the completed forms and supports for the floor in an auditorium, with a sloped reinforced concrete floor and rows of seats on concrete steps that will be poured as part of the floor deck. The formboards are oil-treated plywood on wood beams, supported by adjustable steel columns. This is a variation on the traditional falsework which included wood formboards, beams, columns, and bracing.

Photo 3 shows the completed forms and supports for the extension of a second-floor terrace at a restaurant. The formboards are oil-treated plywood on crisscrossed extruded aluminum alloy beams, supported by adjustable columns and bracing of both steel and wood.

Regardless of whether the falsework supports the concrete forms for a wall, for a structural floor, or for a roof deck, firefighter concerns should be the same:

- The combustible nature of the wood used in part or all of the forms, beams, columns, and bracing; and of the oil-based form-release agent probably coating the wood that will be in contact with the concrete.
- The low failure temperatures of the steel (1,000^{o}F / 538^{o}C) and aluminum (450^{o}F/232^{o}C) parts that may not support the weight of the falsework and uncured concrete if there is a fire of ordinary temperatures (>900^{o}F/ >482^{o}C).
- The weight of the concrete and reinforcing steel supported by the falsework until the concrete is strong enough to support itself.

- The possible reaction (collapse) of falsework supporting uncured concrete to impacts, ground tremors, earthquakes, or to the failure of a single key component. Falsework is likely to have a smaller safety factor than permanent construction.
- The housekeeping and storage issues that are common to construction job sites. Falsework should never be permitted to be a storage area for combustible or flammable materials, liquid or gaseous fuels, or accumulated rubbish.
- The use of temporary heat in enclosed falsework to prevent freezing of the uncured concrete.

For more information from manufacturers, trade associations, and sample specifications, internet search for “form release agents”, “concrete forms”, “concrete form systems”, “shoring scaffold”, and “concrete falsework.”

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