TILT-UP CONCRETE ASSOCIATION

REACTIVE BONDBREAKERS UTILIZE CHEMISTRY TO EXTEND LIFTING TIMELINES

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Tilt-Up Concrete Association

Promoting growth and achievement in innovative tilt-up design and construction for over twenty-five years.

Founded in 1986, the Tilt-Up Concrete Association was created by a dedicated group of construction professionals interested in improving the quality and acceptance of tilt-up concrete construction.

Our mission is to expand and improve the use of tilt-up as the preferred building system by providing education and resources that enhance quality and performance.

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By Derick Rainey

UNDERSTANDING SCIENCE, APPLICATION TECHNIQUES, AND INTERACTIONS TO EASE THE ANXIETY OF UNPREDICTABLE TILT-UP CONSTRUCTION SCHEDULES

As anyone involved in any facet of construction can attest, rare is the occasion when a project proceeds from beginning to end without some sort of adjustment to the schedule. From weather-related interruptions to regulatory issues, any number of unforeseen, uncontrollable events can contribute to frustrating and costly delays.

This seems to be especially true for those of us in the world of tilt-up construction, where everyone is seemingly waiting on the answer to that one vital (and never-ending) question, "How soon can you get those panels in the air?"

But what if the question asked was different, "We need to shut this job site down, how long are we safe leaving these panels in place and be able to still come back and lift them safely without extra effort?" Now, in the midst of current global events, the impact at state and local levels have construction teams on site asking even more timeline questions than ever before. In the tilt-up world, we may find ourselves now asking entirely different questions-- "Will the panels still release from the slab properly and how long do we have until that is a concern?"

When using tilt-up bondbreakers today, there's a bit of good news. If your construction timetables have shifted with recent events closing job sites or for any schedule condition that causes a delay to the panel erection schedule, you can take comfort in the ability for a bit of chemistry to put time on your side. In past decades, bondbreakers were described by the term barrier. This meant that a coating was achieved across the slab surface that would prevent the cementitious matrix of the panel pour to enter into the exposed pores of the slab, thus bonding them together as in a construction joint. The misunderstanding today is that modern bondbreakers are still barrier films when, in fact, they are an application of a chemical that is reactive to the fresh concrete. Thanks to the technology built into chemically-reactive bondbreakers, your panels may remain on the slab until you're ready to lift them—whether this means a few extra days, months, or even longer.

To understand why this is the case, we have to first understand how chemically-reactive bondbreakers are formulated, how they work, and how they interact with both the casting slab and the panel concrete.

GETTING IT ON 'FILM': A CLOSER LOOK AT REACTIONS AND PREVENTIONS

Chemically-reactive bondbreakers were originally developed as an evolution towards superior reliability and ease of use when compared to the previous generation of membrane forming (or "barrier" type) products. These original bondbreakers left a tough membrane on the casting surface that effectively prevented the panel concrete from bonding to the slab. However, once the panels were lifted, this membrane proved to be difficult to remove from the slab. In addition, a residual material on the face of the panel that would need to be eliminated prior to painting or densifier application.

Thanks to the advent of chemically-reactive bondbreakers, the vast majority of the bondbreaker material is used up in the reaction process, and what little, if any, which remains, will wear off over time with traffic and UV exposure-- or is easily removed with readily-available strippers and cleaners per the manufacturer's specifications. For these reasons, the tilt-up industry has, by and large, migrated to the use of chemically-reactive bondbreakers.

When applied properly and allowed to dry adequately, a modern-day, chemically-reactive bondbreaker will leave a slight film of reactive material on the casting slab. When fresh concrete is then placed on top of this film, a chemical reaction takes place between the reactive components contained within the bondbreaker and the calcium hydroxide (lime) created in the fresh concrete by the hydration process.

This chemical reaction between the bondbreaker and the calcium hydroxide, in effect, prevents the panel concrete from coming in direct contact with the casting slab concrete. So, despite the name, what is occurring is actually more of a "bond prevention" than a "bond breaker."

After the calcium hydroxide and bondbreaker have reacted, the concrete in the panel begins to cure. Now, the casting slab and the tilt-up panel are completely separate entities, with one simply laying on top of the other. This scientifically-endorsed process means your panel may remain on the casting slab, un-lifted, for an extended amount of time (years, in fact) until lift day finally arrives without concern for sticking issues.

APPLIED SCIENCE: PROPER TECHNIQUES ENSURE TILT-UP SCIENCE WORKS FOR YOU

With this understanding of how chemically-reactive bondbreakers function, it is important to also note that proper application techniques and adherence to recommended coverage rates are

extremely important.

And, while anyone involved in tilt-up construction is acutely aware of the repercussions involved with the under-application of bondbreaker, special care should still be taken to follow the manufacturer's recommended application procedures and coverage rates. This allows maximum performance in direct adherence to the way the specific product you are using has been formulated and tested.

In the world of reactive bondbreakers, it is also important to keep in mind that, quite often, more is not always better. Bondbreaker over-application presents its own set of potential problems when looked at through the lens of reactivity.

If the product is grossly overapplied, this calcium hydroxide/bondbreaker reaction can continue to take place, and, in some cases, can result in retardation of the panel face. Some tell-tale signs of bondbreaker over-application include a dusty/inconsistent finish. If severe enough, this could require patching before subsequent coatings.

WATER INSPECTION, WEDGES GIVE WAY TO EASY SEPARATION

While you can count on the chemical reaction of calcium hydroxide and reactive bondbreaker to keep your panel and the casting slab separate, it is still important to take into consideration that, over time, water can still have a tendency to work its way in between the panel face and the slab. This phenomenon can be caused by a variety of factors, including rain accumulation, humidity variations, and temperature changes during the delay period. However, two factors that remain constant (and contribute most significantly) to the accumulation of moisture between the slab and the panel are the cement hydration process and vapor migration up and out of the slab. In areas of the slab not covered by freshly-poured panels, this water vapor simply evaporates into

the air and is of no concern. Conversely, when the vapor tries to escape the slab, only to be met with another "slab" which is also early in the hydration process and moisture-laden, the vapor returns to liquid form and settles in the miniscule void between them. (Think of this like the effect which takes place when you try to pull apart two flat pieces of glass with water between them.)

In order to eliminate this issue, it may be necessary at the time of lifting to use wedges in between the panel and the slab in order to break this surface tension, thus allowing the panel to be lifted easily and safely. As the panel cures, the corners can have a tendency curl slightly, leaving only the center of the panel in direct contact with the slab, and, as a result, lessening the suction effect. Although curling is generally something we try to avoid, in this instance, it might instead work in your favor.

In a time filled with great uncertainty and ever-changing timelines, it's good to know that, with a high-quality, reactive bondbreaker, proper application techniques and a bit of scientific knowledge, your panels will be ready for you to lift—whenever that may be.