Technical Bulletin

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PAINTING NEW CONCRETE TILT-UP

Tilt-up concrete is a construction method where large wall panels are cast horizontally on-site and then lifted into place with cranes. It is widely used for commercial buildings such as warehouses, distribution centers, manufacturing facilities, and retail shells because it offers fast schedules, durable walls, and cost-effective construction. However, jobsite casting conditions, curing variability, form-release materials, and moving panel joints can create surface conditions that affect coating adhesion and appearance, so proper evaluation and preparation are critical before painting.

Tilt-Up Is Not "Uniform Concrete"

Concrete tilt-up panels rarely behave as a single, consistent substrate. Even within the same project, panels can vary due to differences in curing conditions (sun versus shade exposure, wind, and moisture retention), the presence of form-release agents or curing compounds, mix design and admixture variations, and differences in consolidation or finishing that affect surface porosity. These variables can lead to uneven absorption, inconsistent film build, and visible color or texture variation if the surface is not thoroughly evaluated and prepared using a consistent approach across all panels.

Surface Alkalinity

Fresh concrete and concrete affected by ongoing moisture movement can exhibit elevated alkalinity (high pH). High pH conditions can interfere with coating cure and adhesion and may attack certain binders or pigments, leading to early film breakdown. Symptoms commonly include a soft, chalky, or powdery coating surface, premature blistering or peeling, and efflorescence—white crystalline deposits—either beneath the coating or migrating through it. These conditions are most often driven by concrete that has not cured or dried sufficiently, moisture transport through the panel (including capillary moisture, leaks, or vapor drive), and soluble alkali salts migrating to the surface. Best practice is to verify that the concrete has adequate cure time (minimum of 30 days) with longer periods needed in cool or damp weather—then confirm the surface pH using pH paper or solution on a dampened surface (or the coating manufacturer’s recommended method). Many architectural coating systems require the surface pH to be within an acceptable range, typically at or below pH 10, but the actual limit should be confirmed per the selected system. Long-term success also depends on controlling moisture sources such as leaks, poor drainage, and missing caps or flashings, and selecting primers designed for concrete and masonry, including those formulated to tolerate higher pH when needed.

Form-Release Agents, Bond Breakers, and Surface Contamination

Tilt-up construction involves form-release agents, curing membranes, and bond breakers that can remain on the concrete surface and interfere with coating adhesion. Indicators often include glossy or oily-looking areas that repel water or paint and crawling during coating application (Figure 1a). A practical field check is the water-break test, where clean water should sheet evenly across the surface; beading can indicate contamination.

There are also commercially available cleaners formulated to break down bond breaker residues, including products such as PROSOCO Sure Klean® Tilt-Up Klean, Dumond® Tilt Wash / Tilt Wash PRO, and similar bond-breaker removal detergents used in tilt-up construction. However, because bond breakers vary widely in chemistry (reactive vs. barrier-type, water-based vs. solvent-based), cleaner performance can be inconsistent from project to project. For that reason, mechanical removal may still be the most effective and reliable approach, particularly where residues are heavy, persistent, or critical to coating performance.

Reliable removal often requires mechanical methods such as abrasive blasting or grinding, depending on the project requirements and allowed methods.

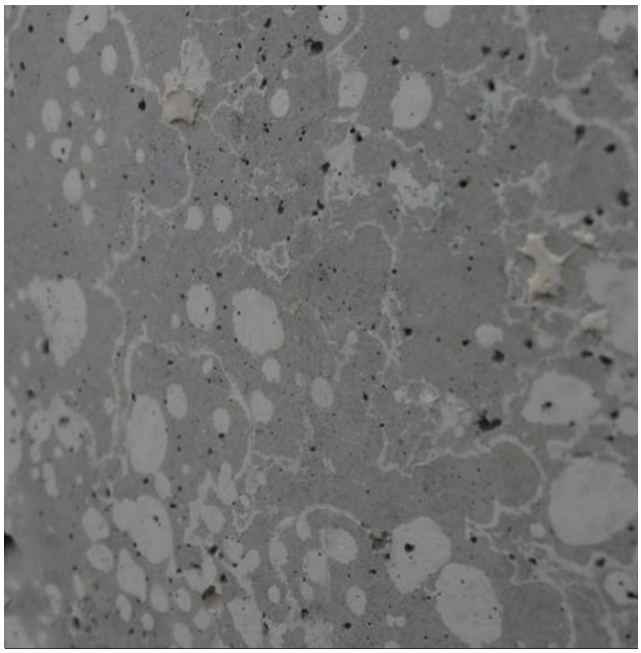

Figure 1a

Figure 1b

In addition to chemical contamination, tilt-up panels can also have localized areas where fine sand or aggregate is exposed at the surface, either from casting-bed conditions, minor surface “pull” during panel lift, or surface erosion during cleaning/prep (Figure 1b). This can create a different surface profile than surrounding areas, even if the wall appears uniform prior to painting. Once paint is applied—especially primers and higher-sheen finishes—the coating can telegraph that texture difference, making the sandier areas appear rougher, darker/lighter, or more “open” due to increased surface area and localized absorption. When this condition is present, the sandier areas typically need to be abraded or sanded to remove loose particles and blend the surface profile with adjacent concrete before priming and topcoating.

Expansion Joints, Panel Joints, and Moving Cracks

Tilt-up walls experience movement from thermal cycling, drying shrinkage, and building movement, with stress often concentrated at panel joints and cracks. Coatings are not substitutes for proper joint design and typically cannot accommodate the movement of true expansion or control joints without appropriate joint preparation and treatment. Common symptoms include cracks telegraphing through the coating, splitting or peeling along joint edges, and recurring cracks that reappear after patching and painting. These problems are commonly caused by joint movement beyond the coating's elongation capability, improper sealant selection or installation, or coating applied across moving joints without correct joint treatment. Sealants used in tilt-up expansion joints vary widely by formulation (for example, 2K polyurethane, single component polyurethane, hybrid, and others), and there are many brands and joint systems in common use—so performance and primer/paint compatibility can differ significantly from one project to the next. Best practice is to allow the sealant to cure per the manufacturer's recommendations, and primer compatibility over the sealant should be confirmed before application.

Surface Voids, Sacking, and Repairs

Tilt-up panels commonly contain bugholes, surface voids, and areas of variable porosity, and repairs often introduce additional differences in texture and absorption compared to surrounding concrete. If these conditions are not addressed, coatings can bridge over voids and absorb unevenly across patched and unpatched areas, resulting in pinholes, stippled or uneven sheen/texture, localized holidays, and visible "picture framing" where repair outlines telegraph through the finish. These issues are typically driven by air entrapment during placement and vibration, form liners and release agents, surface laitance, and patch materials that cure and absorb differently than the original panel.

Figure 2

Best practice is to remove laitance and weak surface material using approved abrasive methods, then fill bugholes and voids with compatible patching compounds or sack coat mixtures (Figure 2) accepted by the specification and coating manufacturer. Repairs should be properly cured, feathered, and profiled, with unsound edges removed to avoid premature failure at transitions. Some sack-coat and patching compounds can leave a powdery or chalky surface after curing, which can interfere with primer wetting and adhesion if not removed. Before priming, the surface should be inspected and, where needed, lightly abraded and cleaned to remove loose or friable residue. It is also important to recognize that some cementitious sacking materials can have elevated pH; they should be allowed to cure adequately (typically at least 7 days, or per the manufacturer) before coating to reduce the risk of alkaline-related issues. Products such as Rapid Set WunderFixx are often good options for sacking because they typically do not exhibit the same chalky residue or high-pH concerns associated with some traditional mixes, helping improve coating compatibility. Priming is critical to equalize porosity to reduce pinholing and

patch show-through. Jobsite mockups that include typical voiding, repairs, and the full coating system are strongly recommended to confirm both performance and final appearance before full production.

Application Conditions

Environmental conditions can significantly affect both appearance and performance of coatings applied to tilt-up concrete. Temperature, humidity, wind, and direct sunlight can accelerate water loss, disrupt film formation, and contribute to lap marks, roller patterning, or sheen striping, while cool or damp conditions can slow cure and increase the risk of wash-off or early water sensitivity. High-build coatings may also be prone to mud cracking when applied too heavily or under unfavorable conditions. Apply coatings only within stated temperature and humidity limits, avoid coating in direct hot sun when possible by working with the shade line, and maintain a wet edge by staging labor and sequencing appropriately. Rain, dew, and overnight moisture restrictions must be observed, and adequate cure windows should be built into the schedule based on both product requirements and expected jobsite conditions.

Key Takeaways

Tilt-up concrete can deliver excellent long-term coating performance, but only when surface conditions are verified and addressed before paint is applied. Confirm moisture and pH are acceptable, remove contaminants, repair and prime to equalize porosity, and detail joints for movement rather than trying to coat over them. A small investment in testing, prep, and a jobsite mockup upfront is the most reliable way to prevent costly adhesion failures, appearance complaints, and rework after the building is in service.