

**SPECIALIZED TECHNIQUES PROVIDE AESTHETIC DESIGN
CAPABILITIES FOR PRECAST CONCRETE PANELS**

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ABSTRACT

Stencil-finished precast concrete is a cost-effective, innovative method to achieve decorative concrete finishes with the look and texture of brick or stone masonry on tilt-up and precast concrete, without the labor required for inlaid thin brick. Different finishes, colors, and patterns are available without incurring additional costs. No special tools are required and the process requires no training beyond that of a qualified concrete finisher. Cured precast concrete panels can achieve the appearance of masonry by applying stucco or a polymer-modified cement coating over adhered stencils. The process is well suited to mass production of precast concrete panels.

Keywords: Stencil-finished precast concrete, Tilt-up concrete, Precast concrete, Decorative concrete, Textured concrete, Colored concrete.

INTRODUCTION

Stencil-finished precast concrete is an innovative, cost effective method of achieving realistic-looking masonry textures, virtually indistinguishable from inlaid thin-masonry units. Additional patterns, sizes, and textures are possible with stencil-finished precast concrete than are available with thin-masonry units. Multiple designs, colors, and finish options, with custom colors and patterns, are also possible. Finishes, colors, and patterns can be varied without incurring additional costs.

Stencil-finished precast concrete costs about one dollar per square foot for materials, including stencils, dry-shake color hardener, and release agent. The speed of the process can achieve results of up to 30 precast panels in sizes of 11-by-30-feet, completed in one ten-hour day, improving project schedules.

No special tools are required to achieve stencil-finished precast concrete. A qualified concrete finisher can do the process. Since the top surface is receiving the decorative finish, the risk of a mistake is minimized, eliminating panel rejection. Any aggregate size can be used. The resulting finish is low maintenance and ultraviolet stable.

Stencil-finishes can be applied to cured precast concrete panels through the use of stucco or polymer-modified cement coatings.

The stencil-manufacturing process can add to the sustainability of the construction project because the excess paper scraps left over from the manufacturing process are recycled.

PRODUCTS REQUIRED FOR STENCIL-FINISHED PRECAST CONCRETE

The products required for application of stencil-finished precast concrete are readily available decorative concrete materials, and include the following:

STENCILS

Stencils (Fig. 1) are manufactured of 22-mil-thick, moisture-resistant fiberboard with a plastic coating, in non-adhesive form or in an adhesive-backed form for stucco or polymer-modified cement coating applications. Stencils rolls are available in several sizes, and in adhesive and non-adhesive versions.



Fig. 1. Stencils are available in large rolls to facilitate mass production of precast concrete

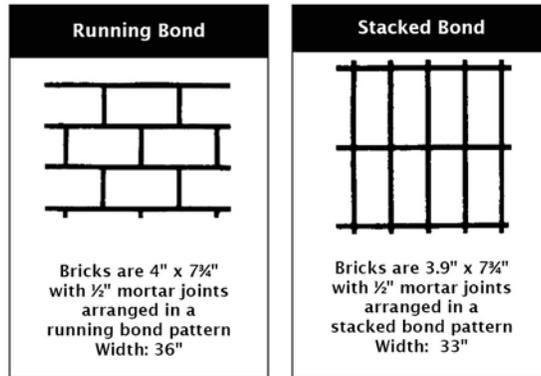


Fig. 2. Stencils are available in a wide variety of patterns, shapes, and sizes.

COLOR HARDENER

Color hardener (Fig. 3) is a ready-to-use dry shake material, factory-formulated of graded mineral aggregates, inorganic nonfading pigments, portland cement, surface conditioners, and dispersing agents, specifically designed for use with stencils, for coloring, hardening, and finishing precast concrete. Aggregates are selected for hardness and purity, and carefully graded through a wide particle size range to produce a dense, wear-resistant surface. Color hardener is available in many standard colors. Custom colors are also available.



Fig. 3. Color hardener (left) and powder release agent (right) are available in 50- and 35-pound containers, respectively

RELEASE AGENT

Release agent (Fig. 3) prevents concrete from sticking to texturing tools and can add a contrasting color to the completed precast panel. Release agent is a factory-formulated dry combination of surface conditioning and dispersing agents interground with coloring pigments that facilitates release of texture rollers and mats. Release agent is available in up to 6 colors. Liquid release agent is a clear, evaporating formulation that facilitates release of texture rollers and mats where no additional accent color is required.

TEXTURE ROLLERS AND MATS

Texture rollers (Fig. 4) are manually controlled abrasion-resistant polyurethane rollers with projecting ridges on drums capable of imprinting texture to plastic concrete. They are used with the release agent to add texture to the precast panel. Rollers are available in widths matching that of the precast concrete panels. Rollers of 22-1/2-inch width and 6-inch-wide are used to imprint continuous texture and for cutting-in small areas. Texture rollers are available in 14 textures. Large expanses of concrete can normally be textured without walking onto the concrete using these rollers and extension handles.

Occasionally, small areas may not be accessible to a roller. For these occasions, 24-inch-square semi-rigid polyurethane texture mats with a projecting textured and ridged underside are available in the same textures as the rollers, which facilitates walking onto the concrete and texturing small areas. This texturing technique is effective for use on freshly poured concrete surfaces of stencil-finished precast concrete. Texture mats are available in up to 9 textures.

Using these tools together with a powdered release agent containing appropriately contrasting pigment, creates an extremely authentic appearance of certain brick, stone, and slate patterns. Wherever the roller creates a depression in the surface, the pigment is transferred to the concrete leaving shadowed depressions, similar to those in nature. These

rollers also work well with clear liquid release agents and can be followed by liquid antiquing agents for an even greater three dimensionality.



Fig. 4. Texture rollers and mats are available in various sizes

SEALER

Non-toxic, non-flammable, non-solvent sealer (Fig. 5) is a clear, acrylic, copolymer that cures, seals, dustproofs, and hardens freshly cast concrete. It is a high gloss film that provides maximum protection against common staining materials.



Fig. 5. Sealers are used to protect the precast concrete from staining

APPLICATION OF STENCIL FINISH TO PRECAST CONCRETE PANELS

It is recommended that a mockup panel be prepared for approval, utilizing the same workers, finishing techniques, and materials used for the actual work, prior to application of stencil-finished precast concrete.

A three-step process achieves realistic-looking textures:

STENCIL PLACEMENT

Precast concrete panels are formed, reinforced, poured, and struck off conventionally. If desired, integral color pigment can be added to the face and/or back-up mixes to achieve colored grout lines, or a color on the backside of the precast concrete panel.

Stencils are placed on the freshly floated concrete surface (Fig. 6), with seams lapped (Fig. 7), and edges cut-to-fit with scissors (Fig. 8). The depth of stencil embedment is controlled by the number of passes with the float or roller (Fig. 9). This causes the portion of the surface that will become the "bricks" to be raised in relief (Fig. 10).



Fig. 6. Stencils are placed across the width of the precast concrete panel



Fig. 7. Stencils are overlapped for pattern continuity



Fig. 8. Stencils are cut to fit along edges



Fig. 9. A texture roller is used to embed stencils



Fig. 10. Stencils are embedded flush with the concrete surface

COLORING

When excess surface moisture has evaporated, dry shake color hardener is broadcast evenly over the surface (Fig. 11). Approximately two-thirds of the recommended quantity (50 to 60 pounds per 100 sq. ft.) is applied in the initial shake and floated into the surface (Fig. 12). The remaining one-third of the color hardener is then applied and floated again. This floating further embeds the stencils that become the grout joints and leaves the pattern raised in relief. For multiple-color designs, a shield is used to prevent the accent color from contaminating the field area.



Fig. 11. Color hardener is broadcast onto concrete



Fig. 12. Color hardener is floated over stencils



Fig. 13. Edges are floated and tooled by hand

Texturing

The desired finish texture is next applied. Release agent containing pigment of a complimentary color is broadcast onto the surface. Only a thin coat is required. Alternatively, clear release agent can be applied. A texture roller is rolled over the surface to obtain the desired texture (Fig. 14). Timing of this step is important. The roller should be applied while the surface is plastic enough to accept the texture, but stiff enough to prevent the roller from sinking into the surface too deeply. If the surface is too soft, additional time is allowed for the concrete to stiffen. If the surface is too stiff, weight is added to the roller by slipping a section of heavy pipe over the roller handle.



Fig. 14. A long roller applies texture across the entire panel width

STENCIL REMOVAL

When the concrete has set sufficiently to bear weight, the stencil is removed (Figs. 15 and 16). Since the areas between the "bricks" were covered during the coloring process, they remain uncolored, resembling grout joints.



Fig. 15. Checking stencil release before removal



Fig. 16. Stencils being removed, exposing the pattern

Release Agent Removal

After 24 to 48 hours has elapsed, the excess release agent and debris are removed. This process begins by flooding the precast panel with a low-pressure water hose, removing most of the release agent without creating excessive dust. If more accent color remains than is desired, a high-pressure washer can be used to remove additional release agent. It may be necessary to scrub the precast panel with a stiff bristle brush. In general, the recessed areas created by the textured roller will be highlighted by the accent color of the release agent, while the remaining areas show the base color. When sufficient accent color and release agent has been removed to give the desired affect, the surface is allowed to dry. A mechanical blower is used to remove any remaining debris from the surface.



Fig. 17. Completed stencil-finished precast concrete panels

SEALER

Sealer and curing compound is spray-applied to the surface to aid in proper curing, and to minimize staining and maintenance. Sealer is applied according to the manufacturer's instructions.



Fig. 18. Stencil-finished precast concrete panel texture

APPLICATION OF STENCIL FINISH TO CURED PRECAST CONCRETE

Stencil finishes can also be applied to cured tilt-up and precast concrete panels, adding decorative patterns, textures, and colors. Stucco or polymer-modified cement coatings are applied over adhesive-backed stencils that have been adhered to the cured precast concrete panels. The stucco or polymer-modified cement coating is mixed according to the manufacturer's instructions, and then applied by trowel to the surface in a uniform finish of color and texture. When the coating is nearly cured, the stencils are removed, exposing the

grout joints in the surface color of the underlying precast concrete, while the stencil's masonry pattern imparts color, pattern, and texture.

CONCLUSIONS

Stencil-finished precast is a cost-effective method of creating the look and feel of masonry units without the expense of hand-placing thin-brick units into forms. The process allows for application of the decorative products on the top side of the precast panel, which permits direct observation of the application, reducing rejected panels and allowing the underside to be a smooth, finished surface, ready for decorating, if required. Stencil-finished precast concrete is an ideal application for a wide variety of building types, including schools, warehouses, retail malls, office buildings, housing, and sound-barrier walls (Fig. 19).



Fig. 19. Example project utilizing stencil-finished precast concrete panels



Fig. 20. Example of a building project in Belgium utilizing stencil-finished precast concrete panels



Fig. 21. Example of a communications building utilizing stencil-finished precast concrete panels



Fig. 22. Example of a parking garage utilizing stencil-finished precast concrete panels