



# CONCRETE SOLUTIONS

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# Can Concrete Patches REALLY LAST?

By Floyd Dimmick, Sr.

**P**atching concrete on horizontal, vertical or overhead surfaces requires a combination of science and experience. Patching technology is not that complicated, but all the procedures must be followed to achieve the end results of a lasting patch that is compatible with existing concrete.

Let's start at the beginning of a patching project and walk through the decision-making process of how to prepare the concrete surface, how to select the product, and how to place it.

## EVALUATION

Sound the concrete by chain dragging or hammering the surface to determine the areas of removal. You'll have a recognizable sound on the good concrete and a duller sound where the concrete is deteriorating.

Mark the outer edges of the deteriorated concrete to be patched. Evaluation of the project conditions is one of the keys to selecting the right material and system to patch the concrete.

Ask yourself these questions:

- What caused the deterioration?
- Has the cause of the deterioration stopped or is it still active?
- Will a continuing problem affect my new patch?
- Are there other problems with the structure? Such problems

could include corrosion to the reinforcement steel and spalling of adjacent concrete surfaces. Could there also be crack and joint water or chemical-proofing issues?

- Has the deterioration compromised the integrity of the structure? And if it has or you are not sure, is it advisable to request that a structural engineer be retained to make the final evaluation?

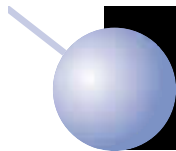
## SURFACE PREPARATION

After the evaluation process, the surface preparation method must carefully be considered. The misuse of tools or equipment could cause bruising of the cleaned concrete surface, microfissures to the concrete substrate, or cement paste separation from the reinforcement steel. Any of these can set up failure for your patching project.

Careful selection of tools and techniques are critical to the success of the patch life cycle. It is advisable to train employees in the proper use of tools and equipment rather than assume they understand the art of successful concrete removal.

## PATCH SHAPE

In general, all patches should be saw-cut in straight lines in the



# SOLUTIONS FOR CONCRETE REPAIRS

shape of a square or rectangle to prevent corner cracking.

To maintain the patch shape, saw-cut into the non-deteriorated concrete adjacent to the damaged area at a minimum depth of 1/4 inch (6 mm) to define the area of removal. This method also assists in the finishing process of placement of the patching material by using the adjacent concrete surfaces as a guide to determine height and leveling with a straight line of transition.

Mark the saw cut approximately one inch (25 mm) from the closest area of deterioration. Cutting too close to the failed concrete edge will encourage edge spalling and early patch failure.

## REMOVAL DANGERS

Use light-impact chipping hammers with less than 30 pounds of force. This is important to prevent damaging the good concrete. Start the chipping process away from the saw-cut concrete edge and work toward the saw-cut edge without damaging it. Be very careful not to hammer excessively on the reinforcement steel as this could break the paste away from the steel in good concrete areas.

Often, when engineers find the paste broken away from the steel they will have the contractor enlarge the hole until the paste is intact again with the steel.

This extra work will most likely be your financial contribution to the repair project. According to ACI 546 repair documents, if the paste is separated from the rebar or more than 50 percent of the rebar is exposed, it will be necessary to chip at least 3/4 inch (19 mm) deeper than the steel to assure a large enough open area to encapsulate the steel with the patch material.

Just prior to placing the patch material, abrasive blast to the concrete surface to remove all loose chips, contaminants and dust. Blast the steel to white or gray metal according to the polymer manufacturer's direction, and patch before flash rusting develops.

If the patching process is to be delayed after cleaning the excavated areas, immediately prime the non-rusted steel rebar with the neat (no aggregate) mixed polymer used as the polymer concrete adhesive. This will prevent flash rusting on the steel. Protect the excavated hole with a cover of plastic sheeting or other protective material from contaminants such as dust, water, ice, snow or chemicals.

## POLYMER CONCRETE

The chemical difference between portland cement concrete and polymer concrete is that polymer concrete contains no portland cement. The cement has been substituted with a polymer such as methylmethacrylate or epoxy.

The mixed polymer is blended with dry, clean silica sands for thinner applications. Thicker placements will have larger aggregate up to 3/4 inch (19 mm) in diameter added into the sand mixture. The addition of larger aggregate typically will reduce the unit cost of the polymer by 30 to 50 percent.

Remember, no formula is a cure-all and there is no magic in patching concrete. Consult with your polymer manufacturer for assistance on product usage.

## PLACEMENT

In general, the mixing equipment and the preconditioning of the product before mixing is very similar for each polymer type. It is important to read the instructions, and perhaps talk with the manufacturer.

During the mixing of the polymer concrete, prime both the clean hole and the steel with the neat (no aggregate) mixed polymer to assure a better bond and the sealing of micro-fissures not observed by the workman.

Place the mixed polymer concrete in the hole higher than the concrete edges and consolidate to remove the air trapped in the uncured polymer concrete. Strike off the excess polymer concrete with a screed tool using the upper adjacent concrete surfaces as the guide.

By selecting a polymer concrete mixture that will not shrink or swell, it is easy to provide a smooth and even transition from the concrete to the patch and off again on the other side.

## FINISHING AND CURING

Polymer concrete patches should be finished similarly to the texture of the adjacent concrete surfaces, avoiding low or high areas. This will prevent excessive wear and stresses to the patch or concrete, especially when used by vehicular traffic.

At substrate temperatures above 39°F (4°C), most polymer concretes achieve initial cure known as the "tack-free stage" in a few hours after placement. Special formulas are available that will cure down to 0°F (-18°C).

Polymer concretes typically achieve 70-80 percent of their physical strength properties at the tack-free stage and are immediately usable for vehicular traffic.

As I shared with my contractor customer, "Properly designed and placed epoxy polymer concrete patched should last longer than the adjacent concrete surfaces." CP

*Floyd Dimmick Sr. is co-founder and the Technical Director of Crown Polymers, LLC, Hampshire, IL. His professional career is devoted to the performance of concrete preservation and repair with polymers. Crown Polymers manufactures concrete repair products as well as industrial and commercial floor systems. Dimmick has designed and applied polymer products for over 38 years and holds patents in the USA and Canada. He teaches classes for contractors and has published extensively on concrete repair with polymers. He is chairman of the Polymer Concrete Committee for ASTM, and active with ACI and TRB. Floyd Dimmick may be reached by e-mail: floyd@crownpolymers.com.*

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## THE FAVORED MATERIAL FOR PATCHING

Internationally, epoxy polymer concretes are the most widely used material for concrete patching for several reasons:

- Less or no odor during application
- Safety during placement
- Ease of placement
- Placement methods include pouring, pumping, power troweling, screeding, hand troweling and hand packing
- Fast cure times
- Capable of being applied on dry, damp or underwater surfaces
- Placeable and curable on substrate temperatures of -18°C to 49°C (0°F to 120°F)
- Cured temperature exposure range from -60°C to 232°C (-76°F to 450°F)
- No shrinkage



**For more information call toll-free 1-888-732-1270.**

**CROWN POLYMERS, LLC.**

**11111 Kiley Drive Huntley, IL 60142 USA**

**Fax: 847-659-0310 [www.crownpolymers.com](http://www.crownpolymers.com)**

**e-mail: [info@crownpolymers.com](mailto:info@crownpolymers.com)**