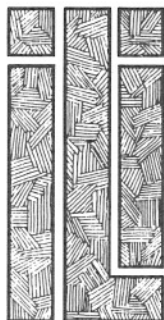
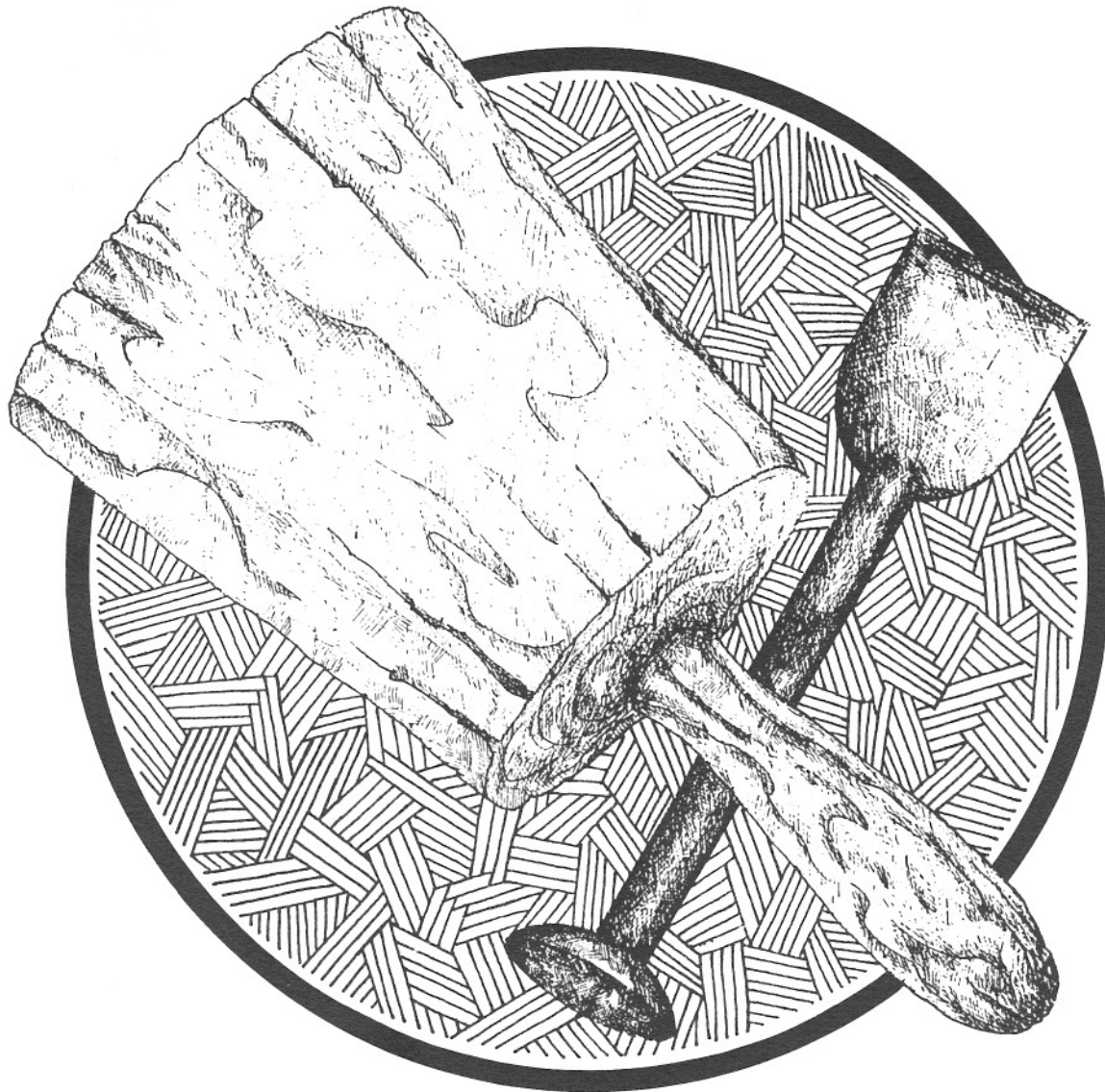


Repairing Damage to Indiana Limestone

A Basic Guide

2nd Edition



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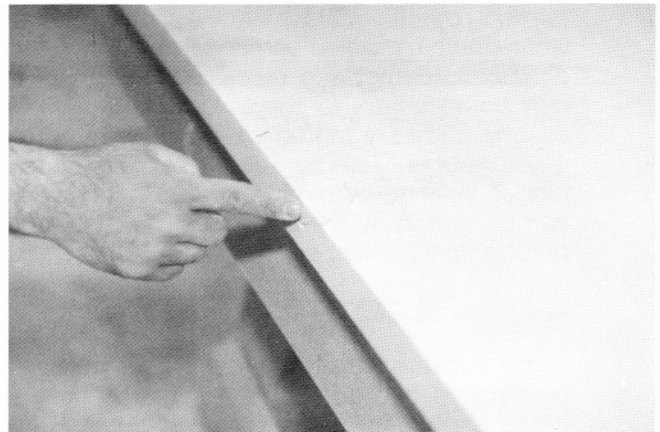
A Basic Guide

FOREWORD

Indiana Limestone is a forgiving material. It will take surprisingly hard knocks and rough treatment without damage. However, breakage occurs from time to time and usually it can be repaired easily with a little know-how and the right tools.

This booklet illustrates basic procedures for repair of the most common types of damage. Still, no manual can supplant competent personnel in repairing damage.

The best treatment is prevention. Careful handling in all stages—loading, transport, unloading, stacking and handling and erection—will avoid most damage and will produce the quality installation associated with Indiana Limestone.



Save the chip. Small chips can often be replaced using airplane cement (Duco or similar). Fill voids with glue mixed with stone dust. Sand smooth.

Repairing Damage to Indiana Limestone

Minor Chips

Damage in the form of chipped edges is the most common type, and is the easiest to repair. If the chips are minor, and occur on stones not in prominent sight in the building, it may be best to leave them untouched.

Often, such small chips may be sanded away by rounding the arris, or edge, of the stone. This procedure may require architect's approval.

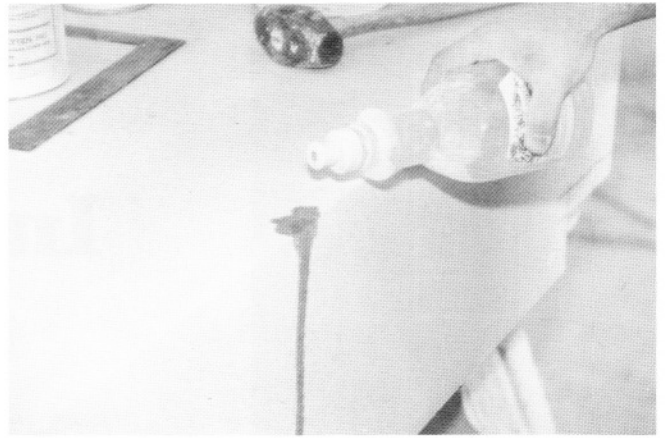
When chips can be saved in one or two pieces, they can be glued into place successfully using a high-strength waterproof adhesive. While epoxy or other two-part adhesives are usually employed for this purpose, small chips can be held in place by common waterproof white glue. Whatever material is used, take care that the joint line is as tight as possible and that no adhesive material is smeared on the adjoining faces. After glue dries, touch up with the following procedure and a light sanding to complete the repair.

Patching: Cement-based Compounds

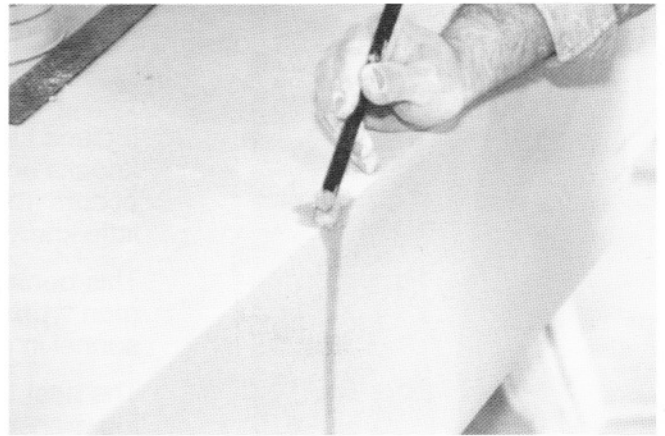
The procedure illustrated here may be used to repair objectionable chips. Most stone suppliers will furnish the basic ingredients for a cement-based repair material on request. This procedure, termed "patching," is an accepted practice, and when made by skilled personnel, such patches are difficult to detect and reasonably long-lasting. It may be necessary to add coloring to match stone exactly. Ordinary mortar colors may be added in tiny amounts. Test samples must be made and judged prior to placing colored patches. Texture can be added by gently tapping the nearly cured patch with a bristle brush.

Large Chips

Large chips or broken corners and edges can also be repaired by the patching method. These large areas should be built up in successive layers. Allow each layer to dry for several hours.



- 1** Wet the area to be repaired.



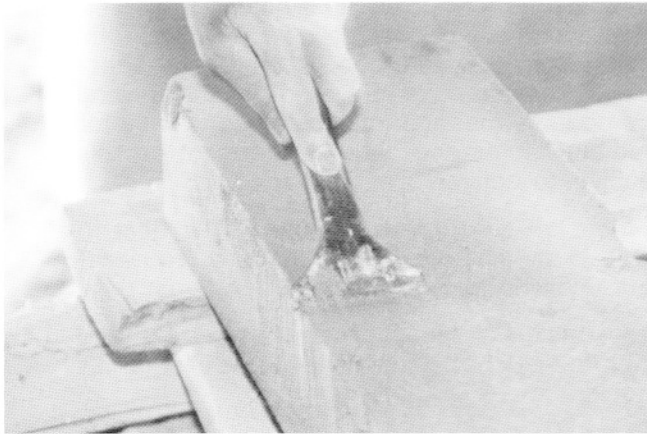
- 3** Place patch material carefully to slightly above finished surface. Avoid smearing material onto adjacent undamaged surfaces.



- 5** Lightly sand repaired, dried, patch and the adjacent surface.



- 2** Mix patch in a clean container. Mix no more material than can be used immediately.



- 4** Scrape semi-hardened material to finished level.



- 6** Finished patch.

Scratches and Gouges

Surface damage can usually be handled without repair materials. Minor damage such as light scratches is usually best left alone. These white streaks will disappear, usually in a short time. Brushing the affected area with a wet bristle brush will help.

Deeper scratches and gouges on smooth finishes can usually be relieved by sanding. Deep scratches require coarser sandpaper, so keep in mind that the more stock removed by sanding, the wider the area to be covered in order to avoid a wavy surface. All finished work should be fine-sanded to the original texture. On the ultrasmooth finishes this will require the finest grit sandpaper or emery cloth.

Surface repair using cementitious materials has drawbacks similar to surface repairs in concrete: feather-edges usually don't hold well. Avoid using cementitious patch materials on other than stone corners and edges unless the area to be repaired has shoulders or other "stop" edges.

Epoxy repair materials will perform only marginally better on surface repairs. Epoxy repair materials tend to be longer-lasting than cementitious materials. While their adhesion is superior, they have the disadvantage of lesser absorption than either the stone or the cementitious repair. This may cause a color difference in the repaired area compared to rest of the stone when wet. To some extent this can be avoided by dusting the surface repair with stone dust before the repair takes its first set.

Surface damage to textured finishes is difficult to repair. The deeper textural finishes will by nature exhibit some plucked-out areas, where surface is lost to "dishing." Such conditions are best left alone.

Note that Indiana Limestone, like all building stones, contains some areas of streaks, grain changes, voids, reedy or travertine-like areas. These natural characteristics are best left alone; repair efforts are typically unsuccessful.

Major Damage

Architect's approval may be required for extensive repairs. It is usually cheaper to order replacements for severely damaged stones rather than to repair and install them. Rejection in the wall is expensive.

However, if repair of broken stones is an option, there are tools which can help. Repairs using high-strength adhesives (usually epoxy resins) are typically the structural equal of unbroken stone. Epoxy repair technology has a thirty-year history of success. These "part-A-part-B" mixes are most typically used to form the "dutchman."

Epoxy Repairs— The Dutchman

The "dutchman" patch is typically used where larger repairs are required. The process involves squaring or otherwise shaping the area to be filled to receive a stone plug or section of the same or similar stock. Thermo-setting resin adhesive is typically used to "glue" the dutchman in place. The dutchman should be sized to fit closely, allowing for the smallest possible glue-line.

Broken corners can be repaired without additional shaping if the separated piece is intact, or by smoothing and squaring the break and sizing a dutchman to the evened planes of the broken area.

The dutchman is particularly effective where the stone surface is a textured one. Properly cut and sized, the dutchman can duplicate exactly most textured surface, except those with random textures such as shot-sawed.

Excess adhesive should be removed after it becomes tacky, but before it takes a final set.

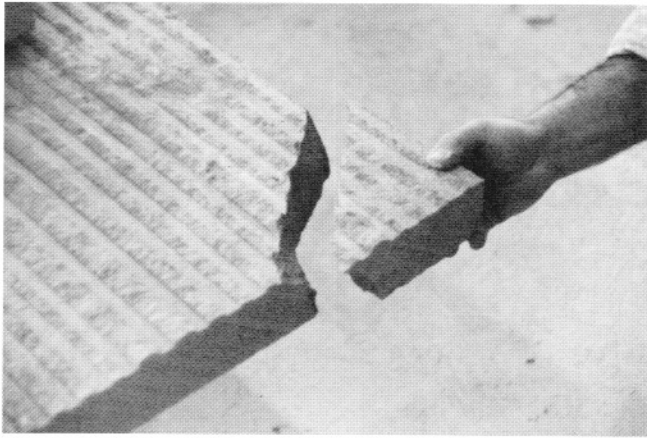
The dutchman is also useful on damage to ornamental or molded work. Shaping to organic profiles can be accomplished with a rasp and sandpaper after the roughly formed repair piece is set and bonded.

Where the dutchman will be unsupported, as in the lower portions of overhanging ashlar, or in soffit stones, "stitching" by the use of stainless steel all-thread rod can help secure the new stone section into place.

In general, stone should be clean, dry, and free of dust for best adhesion. The proper mix and temperature for epoxies and other thermo-setting resins are critical; follow manufacturers' instructions to insure good strength and adhesion. Glue-line color is also important. Several companies manufacture resins especially for Indiana Limestone. ILI will comment on this subject to inquirers.

Where off-color glues are used, it is best to spread the glue carefully so that any "squeeze-out" remains below the surface.

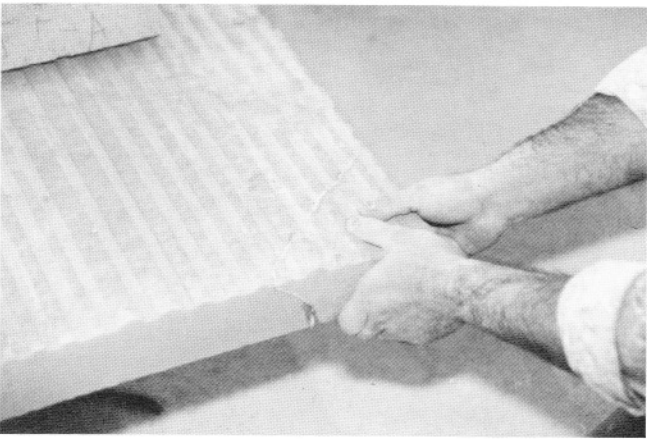
The small joint line which remains can be filled with the patch material described earlier in this book.



- 1** Match the broken faces.



- 2** Mixed epoxy glue is spread thinly on both faces. Keep glue away from face edges as much as possible to avoid squeeze-out.



- 3** Press broken faces together.



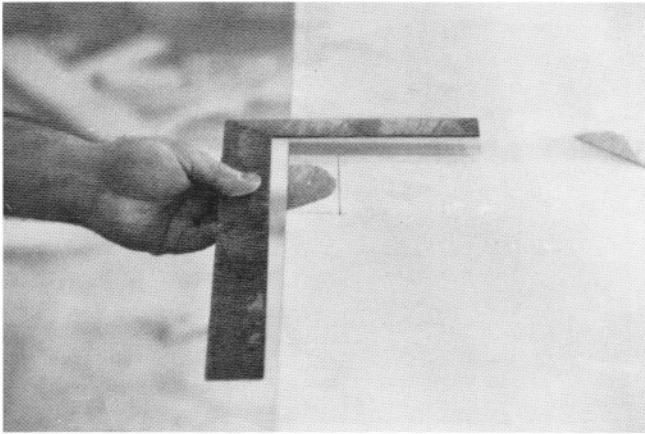
- 4** Excess glue at glue-line can be peeled away after mix takes its initial set—from five to fifteen minutes depending on temperature.



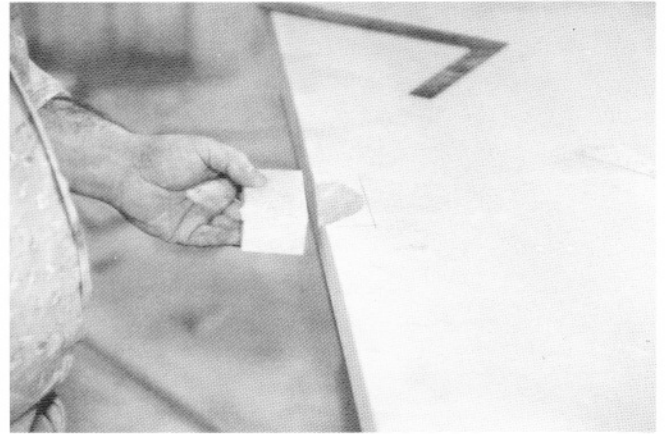
- 5** Minor "pluckouts" at glue-line can be covered with cementitious material.

Repairing Chips with the Dutchman

Although the dutchman repair is more time-consuming, it may be better suited to the larger variety of chips. No definition of "large" will fit every condition, and chips which should be repaired at an entrance feature are best left alone on the fortieth floor. Still, as chip size increases, consideration of the dutchman option becomes advisable.



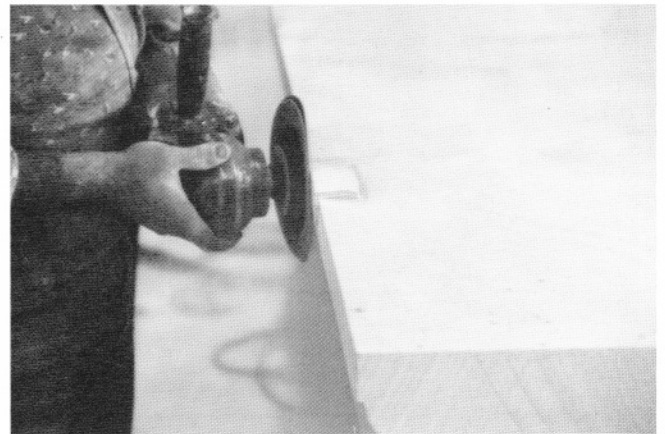
- 1** Scribe a square or rectangle around the chipped area.



- 2** Cut a stone of similar color and texture to slightly larger dimensions.



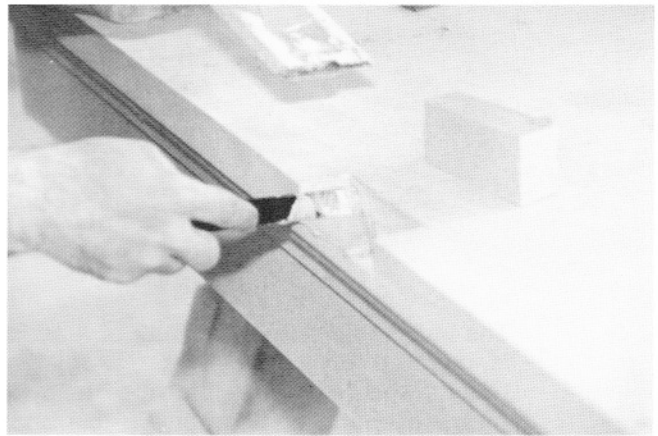
- 5** Press the previously fitted stone into place.



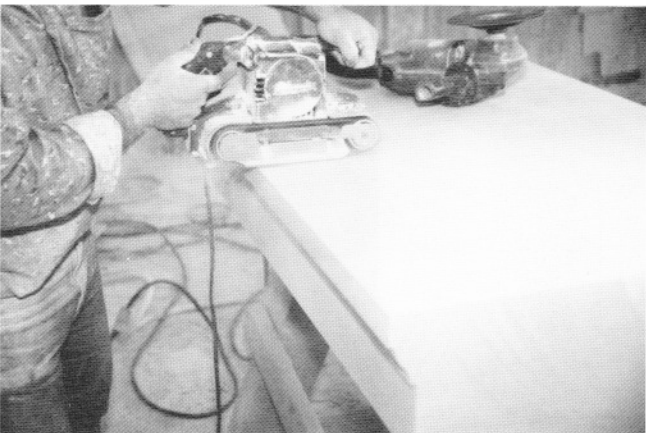
- 6** Grind or sand any excess repair stone to the main surface.



3 Square up the chipped area into a regular slot.



4 Make certain that the contact surfaces of repair stone will fit the slot. Then, butter the squared hole with epoxy mixed for the purpose.



7 Use finer abrasive at main surface.



8 The completed repair will be nearly invisible.

As mentioned in the FOREWORD, these procedures are generally helpful in repair of damage; however, prevention is the best cure, and proper handling is less expensive than repairs or replacements.

Another booklet discusses the treatment of stains. Entitled "How to Avoid Small Area Stains and Blemishes"; it may be obtained through Indiana Limestone Institute or any member company.

The Indiana Limestone Institute of America, Inc. is indebted to William M. Ira, Gary Lyons, Glen Catlett, and Gary Howell for their help with the procedures and photography in this book, and to the Indiana Limestone Promotional Trust Fund which furnished the funds for its development and production.



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