

Practical Sandstone Restoration

by John Harry

Excerpted from Restoration & Renovation '99 Session MM4: Sandstone Restoration, January 29, 1999; John Harry is an independent Restoration Consultant in Allentown, Pennsylvania. He is currently directing sandstone restoration work at Packer Chapel on the campus of Lehigh University. Edison Custom SYSTEM 45 sandstone repair mortars in 4 different colors are being used. Work is being performed by Masonry Preservation Group of Merchantville, New Jersey. On-Site Technical and Training services were provided by Edison Coatings, Inc.

What can you expect in dealing with sandstone? Permanency? Perfection? I'm afraid not. Sandstone is a material that *wants* to deteriorate and will deteriorate, plus there is usually a problem -- **BUDGET**. In the everyday real world of financially inhibited clients, sandstone repairs are not the only needs of the building that you have to deal with in the face of limited budgets.

So, I'd like to talk about 8 realistic goals of what can be done in the way of sandstone repair:

1. **Slow down the deterioration of the building.**
2. **Protect the building from serious structural problems.**
3. **Protect the public.**
4. **Do repairs at a reasonable cost.**
5. **Reversibility.** I love to do things in a way that can be undone by future generations... or maybe I'll have to undo them in a few years. You don't want to do things that burn your bridges behind you, that make permanent, irreversible changes to the building.
6. **Do minimum intrusion into the historic fabric of the building.** That is, to leave as much as possible of the building intact, and only do as much as is necessary.
7. **Enhance the appearance of the building.** This is very important to most clients.
8. **The overriding goal: Don't make things worse.**

Solving the Underlying Problems

In looking at a building, the first question we need to answer is "**Why is the deterioration occurring?**" Typically sandstone deterioration has something to do with water. Either direct rainwater that's hitting the building, or commonly, roof leaks, gutter and downspout leaks. You have to look for those obvious situations. If there's an area with concentrated deterioration, find out where the water is getting in.

A second major reason for deterioration is **actions by Man** -- inappropriate previous repairs. Hard cement pointing and repair mortars are very, very damaging. Most sandstone buildings were built during a time when mortars contained either all lime and no cement or

mostly lime and very little cement. Those mortars are very plastic, they're very porous, they breathe a lot, they take up stresses. Repointing buildings with hard cement mortar traps moisture and salts right below the hard pointing and creates problems. Look for bad patches -- patches that didn't breathe, trapped moisture or trapped salts and caused deterioration around that area in the sandstone.

The third reason you can have deterioration of sandstone is just the ***natural occurrence of weathering***, and that's the one that you really can't do anything about.

Repair Priorities

In some of the buildings I look at, I go through those first 3 stages, I find roof problems, leaking gutters and downspouts. I make recommendations to the owners and the entire budget goes to the roof repairs... we don't get to do the sandstone repairs. That is not necessarily a bad thing. You have to get those sources of water intrusion... you have to correct those problems before you even think about repairing the sandstone.

The next thing I look at is ***"How bad is the problem?"*** What is the extent of the problem and where is it occurring? I would argue that this cannot be effectively done from the ground. You can stand there with high-power binoculars, you cannot see what's going on in detail up high. Spend a little bit of money, get up high, dangle from a crane... so you can touch it, you can feel it, you can probe a little bit. It is very, very revealing.

Repair Approaches

There are 4 major repair approaches:

1. Major replacement with new sandstone...

Either replace the entire block or take out part and do what are called Dutchman repairs. Problems with major stone replacements are first that you have to find matching stone. In many cases the quarries are closed, the stone is not available. You may be able to find salvage stone but you have to be very careful. You have to find perfect matches. If you're off just a little bit, all those repair areas are going to really stand out. You need to find workmen who are able to do this type of thing-- to actually take the stone, cut the stone, dress the stone and install the stone. That is not easy and it is also very expensive. Major replacement of stone is not reversible. Once you've taken the stone out and thrown it away, it's gone forever. It's also very intrusive. You're going to end up taking large pieces of the building out. You have to be very careful that you're not disrupting the structure of the building. Finally it's also very expensive. Sometimes, if you have a big budget and you have stone you can get, this can be a viable alternative.

2. Retool the surfaces.

Take away some delaminated material and retool the surface to make it look like what it was originally. It's not always feasible to do this, in fact in most cases it's probably not feasible to do this. The amount of deterioration may vary and you may have to remove tremendous amounts of stone to retool the surface... It is a very intrusive process. You're

going to end up removing stone from surfaces that are in perfectly good shape to bring everything back to a similar plane, and I object to removing any good stone. It is not reversible, you remove that stone and it's gone forever. The deterioration processes that were going on will continue, whether you retool the surface and move it back a little or whether you leave it where it was. It also requires consummate skill and therefore it is expensive.

3. Scaling off the loose pieces.

It's inexpensive, you don't need skilled labor to do it. It increases the safety factor. It can be combined with patching. Scaling happens inevitably. If there's a piece that's hanging there and it's going to come off sooner or later..we're just making it a little bit sooner.

4. Patching.

Patching can be effective at a reasonable cost. In general, patching is reversible. If the patch does not hold up well, 20 years from now somebody can take that patch out and redo it. It involves minimal intrusion into the building fabric. You can usually avoid removing more stone than is badly damaged.

In general I've been very surprised at how effective patching can be at slowing deterioration. In some of the buildings that I've been involved with over a period of years where it looked as though the deterioration was occurring at a very rapid rate, and that it was going to continue at a rapid rate even with the patching, we found that by patching areas where the water was getting in, where there was soft stone or high weathering, that we prevented a lot of moisture from entering the rest of the stone and places that I would have expected to see deteriorate, didn't deteriorate. To get those bad areas repaired to prevent water from entering apparently is important. If done properly, or reasonably well, it can also enhance the appearance of the building. And generally, if you do things right, you probably will not make things worse. And that's one of the prime criteria in dealing with old masonry.

Patching Materials

The patching material you use must match the color and texture of the existing material. It must adhere well, it must be breathable, it must have similar thermal expansion characteristics, and it must weather well. You don't want to do a patch that's going to deteriorate in 5 years. That's not cost effective for the client. I would advise keeping patching as minimal as possible. Do those things that really must be done for structural purposes and to prevent water intrusion and for appearance sake, but don't go crazy. It's very easy to look at a sandstone building and say "we can patch this, this, this and this, almost everything there". Try to keep it minimal. *Minimal intrusion.*

Helpful Hints for Patching

1. Avoid feather edges.

If you feather edge a repair the feather edges will deteriorate rapidly. I like to cut, as opposed to chisel, the areas where the repair is going to be done. Chiseling tends to

fracture the surface, you don't get a nice even cut and you're also banging hard on a very fragile material and you can cause more damage with that. A little 4" high speed grinder with a thin diamond wheel can be really effective at cutting out the area that you're going to repair and you can even undercut the repair, that is cut back at a slope from the surface so that you dovetail the area. A diamond grinder is quick, it's easy, it doesn't damage the surface at all.

2. Avoid thin repairs.

3. Color matching.

I have a philosophy that no color match will be exact. So if you can't be exact and you're going to be wrong, be wrong several times. Let me explain that.

If you use one color for all the patches on a building, when someone stands back they're going to be able to pick out all those areas, because the color is just a little bit off. But if you use several different colors, maybe one that's real close, maybe one that's just a little bit too dark, and you start intermixing those -- do a repair here with the darker one, do a repair here with the one that you think is just right, intermix them and patch a stone here -- when someone looks at the building, even though each repair may not be exact, the overall effect will be that you won't pick out that there are a whole bunch of repaired areas. My other rule about color is that it's always better to be a little bit too dark than too light. If you're too light, the repairs will stand out really obviously, but if it's a little too dark, most people's minds go "Oh, there's a little variation in the stone or maybe there's a little dirt on it". You don't pick it out as an obvious bad repair.

4. The surface texture is critical.

If you get the color right, the next thing you have to do is get the surface texture right. It doesn't have to be real exact, but if the surface of the stone is rough in the area that you're patching, don't do a really smooth repair. It'll stand out like a sore thumb.

The accuracy of the shape is important is important, but surprisingly, for overall appearance, from what I've seen, the shape of the repair, how closely you match the profile of the original stone, is probably less important than a good color match and a good texture match. You can be off a little bit, you can have relative amateurs doing some of these repairs and they don't get it exactly right. They're repairing a window sill, it's got a little dip in it, repairing an ornament and it's not quite right, but that is much less important in terms of the overall appearance than getting the color and the texture correct.