The intractable problem of leakage through stone arches

A Collegiate Gothic building at a well-known university experienced chronic leakage through the limestone arches over a series of seminar rooms. We water tested and found several problems, including a severely rusted steel beam that caused a crack through the masonry, and the absence of flashing over the arches. But even after correcting these issues, and pointing the mortar joints, there was residual leakage directly through the radial joints of the arches.

Water testing before and after the repair helps verify that the solution is working.

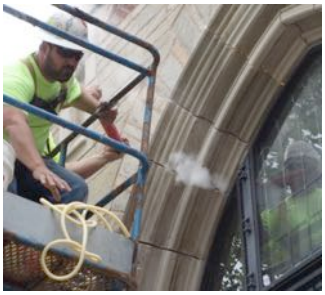
Chronic water damage came from water seeping through joints in the arches, even after the masonry had been re-built with a water barrier under the veneer, and new flashings over the arches. We knew from experience that the mortar joints in arches usually have gaps in the mortar. It is very hard to pack these sloped joints full when setting the massive stones of the arch.

First we addressed severe rusting in a beam that was cracking the masonry

Granite facing was reinstalled over a new membrane and copper flashings.

Example of an arch where the face of was cut away, to reveal joints where the mortar had slumped down and left a gap.

Drilling through the mortar joint to inject flowable grout



Pumping air into the joint makes a puff that shows a void extends through the arch.

Water seeping straight through mortar joints, even after installing the flashings and water barriers.

The solution was not merely to point the mortar joints, but to drill deep and inject the voids with flowable grout to the full depth of the joint. Although it's not possible to fill every part of the mortar joints reliably, water testing showed that this reduced the leakage to negligible levels compared with the original conditions.