

Damage Caused by Water Repellent Agents: Reasons and Counter-Measures*

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1 Introduction

During my activities in the last 15 years as an expert for damages a restoration of building materials, especially natural stones, I was often involved in cases with damages caused by the use of water repellent materials.

The paper will describe these cases and show the origins of their appearance. It will give informations on the possibilities of repairing the damages. There are particularly the tips of preventive avoiding, here, above all, the requirements on the work of architects and all the other experts which contribute to a decrease of these damages in the future.

*. This is a compact version of this contribution. The full length paper will be published in "Int. J. Restoration and Protection of Monuments"

2 Case studies

- On a castle in northern Germany different parts made of so called Baumberger Sandstone were treated with hydrophobic agents in the years between 1960 and 1980. We found that there were different materials used for treating the stone: agents on base of silicon resins as well as combinations of hydrophobic and strengthening products.

The damages appear in form of removing scales on the surface, mostly with 2 – 3 mm of thickness. The scales were detached always between the water repellent and the untreated zone. Together with these damages we find here a strong desintegration of the stone caused by the occurrence of water soluble salts.

- The façade of a school, made of red sandstone, was entirely impregnated with a hydrophobic product. Already 2 years after the work was finished, severe damages occurred in the surrounding of windows and doors.

First of all the administration of the school supposed, that the application of the materials has not been done the right way. But our first examinations proved that the surface was strongly water repellent. Here, like in the first example, the surface was lifted off the underground in form of thin scales. As the reason for the surface loss we found, that water could penetrate in very small fissures and cracks in the joints around the windows. The stone behind the water resistant layer was wet, strongly loosened up and enriched with water soluble salts in particular sulfates.

- The third example shows the steps of a sandstone staircase which was treated with a siloxan solution. The steps are situated near a street and had no isolation against the underground at all.

We found already in the first year serious damages on the surface which depended on the impregnation. On these steps, like in the previous examples, it was possible that water, sometimes with a certain content of thawing salt, could get into the stone, behind the impregnated zone. This caused strong desintegration on the surface.

3 Conclusions

In each of these cases, the water repellent agents were applied according to the orders of the planning architect. In none of these cases, people found it necessary to carry out the examinations to stone and building quality, that are needed to be sure of the success.

Particularly with regard to the properties of different types of stone, their porosity, contents of clay minerals etc., but also concerning the hydrophobic agents (penetration depth, solvents, kind of application, consumption) several investigations are needed to be sure that no damages are produced by the impregnation.

There was no quality control carried out during or after the application. From these facts we can derive quite a long list of demands - which we know since a long time - but in practice they are applied only by few people.

So it is, necessary to find new products with new properties for the different building materials. But it is also extremely important to guarantee the correct application by using a really working controlling system, which will be proposed in this paper.