

Sustainable Technology of Conservation of Wall Copings of Architectural Heritage Torso

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Abstract

Selection of appropriate methods of conservation of historical masonry constructions, made originally of stone, or brick materials opens a lot of questions, which have to be solved both from technical as also methodic point of view on the problem. Important decisions have to be made in conservation process of ruins of old castles, where several binders like lime, cement, resin etc. can be used - with different results. The paper deals with the results of a research, which is oriented towards the use of various building conservation technologies (techniques and procedures) for wall copings at architectural torso in Central Europe. It was undertaken by the Slovak University of Technology – the Faculty of Civil Engineering – Architectural Heritage Conservation Centre (with further partners). The output of mentioned research was evaluation of each of the reviewed techniques, used in its original conditions – at each of the building in its specific environment. The best conservation solution – especially from technical point of view – can be achieved by slowing of dilapidation process by combining of various techniques. This means not only conservation of constructions, but also their partial reconstruction, modernisation, revitalisation, including the assuring of partial use of the building, or its guarding and realisation of regular qualified maintenance, by repeating of technical conservational activities in some time intervals. The paper is supported by a couple of case studies and documentation of concrete situations, recorded during the research on several locations of ruined castles in Central Europe.

Keywords

Wall copings, Conservation, Architectural Torso, Technology, Conservation materials

1. Introduction

A serious problem at dealing with architectural torso is the issue of conservation of wall copings. There are several ways which can be used to do it – with different results. But first it is important to realize, that most of the buildings, or constructions in a stage of a torso are usually in a situation, which is for them not natural. They are already in a certain stage of their decay. Most of torsos, which are a matter of present conservation, were originally built as complete constructions (buildings, objects) and protected against negative influence of climate. Even fortification walls were usually covered by some bigger or smaller roofs. But to cover all rests of walls, preserved till nowadays at a ruined castle complex, is not a real topic to think about it today. It is unreal not only from the point of view of financing and maintaining a torso, but it is usually also not suitable from the point of view of presenting the architecture. Even the reconstructed, or built roofs would usually serve as the most suitable way of protection of torsos, such solutions can be used only sometimes. For example because of not enough data about the details of the original construction (or even of its lookout), because of a lack of financing and also because of the fact, that torsos – ruins – are an important part of the structure of our landscape where their “romantic

appearance” belongs to it. A long time conservation of ruins is in our climate (especially in Central Europe), which fastens the dilapidation of building constructions, impossible. But we can try to slower their dilapidation process significantly.



Figures 1, 2: Typical examples of wall copings of ruined architecture - left the castle of Spiš with not naturally looking straight line of copings (after the conservation) and the castle of Pajštún with natural curved copings of a “romantic appearance” (postcard, 19th century) – both in Slovakia.

Since the 1930’s a significant number of ruined buildings, registered in Slovakia as architectural heritage (mostly castles), were conserved, restored and even partially reconstructed – nowadays we can see results. This was the case of the research supported by the Ministry of Culture of the Slovak republic in 2005-2006 - conservation works that have been done on wall copings show a lot of positives, as well negative examples¹.

2. Technologies for Protection of Wall Copings

In this part of the research various technologies for dealing with wall copings were reviewed, especially from the point of view of their:

- technical protection of the walls,
- appearance,
- technology of realizing and maintenance.

Wall copings of torsos are usually protected by (Sokol, J. – Durdík, T. - Štulc, J., 1998) a layer of mortar (lime, or cement based), or concrete, by their fulfilling in a geometric shape in order to reach some straight line (with flat, or inclined top), by covering with plates (made of stones, concrete, etc.), covering by tinplates (usually of led), by vegetation carpet, or by a roof (of smaller, or larger construction).

¹ Note – examples showed in this article were collected not only from Slovakia (i.e. Central Europe), but also from a wider European area.



Figures 3, 4: An interesting example of conservation of the castle of Liptovský Hrádok (Slovakia) sometimes during the 30-ties (left). A layer of concrete was simply placed over the wall copings, which did not protected the wall below against the rainwater very effectively, but it has anyway saved the shape of the ruin for the following 80 years. Right a newly placed concrete (80-ties) over o top of a roman castle ruin in Gerulata (Bratislava, Slovakia) – cracks in concrete are already visible, which allow rainwater to penetrate the original masonry and the concrete cover is already separated from the original by a huge sheet breakaway.

Each of these solutions has positive, as well as negative sides. Very important characteristic of a technology is to help the rainwater to flow away from the top of a wall as soon as possible, as well as to isolate the coping against rainwater moisture, or even maybe more important - to let the wet wall copings to dry out as soon as possible. In the recent past in Slovakia especially the technology of covering of wall copings by the use of protected layer of mortar, or even more by concrete was used – connected usually with flattening of the top of the wall by adding extra masonry (usually into straight line like geometric shape). Nowadays usually a covering of the wall copings with vegetation carpet is recommended and used.

2.1 Protection by a Layer of Mortar or Concrete



Figures 5, 6: Left - an example of the use of mortar filled with some pieces of brocks on the wall coping of roman walls at Ostia (Italy) – the whole shape of the coping looks generally a little bit strange. Right straightly shaped wall coping of the castle of Likava (Slovakia), with the use of flat stones placed into concrete – not natural deformation of the shape of the walls is mostly visible only from a near look.

A layer from mortar or concrete is usually very easy to realize and does not acquire specific skills from the workers. The most important advantage of it is its ability to copy a curved - originally preserved -

shape of the wall. It was (even in Central European climate) quite successful, especially because its technical life is relatively long – specifically if the material is least absorptive, or it is placed on well ventilated constructions, which helps them to dry out quickly after rains. On the other hand, if the wall below the mortar or concrete cover is still watered it is then usually largely damaged by high erosion, even without any concern to a high technical life of its cover.



Figures 7, 8, 9: Examples of various technologies – use of lime mortar filled with pieces of bricks on the fortress of Brest (Belarus) does not protect the walls very much, as it mostly broke away already (left). Use of volcanic stone plates, placed into strong cement mortar did also not worked properly – castle of Vígľaš (Slovakia), 8 years after realization (center) and very artificially formed skyline of the ruin of Beckov by massive use of added stone masonry fitted by deep injection with expansive cement (right).

As a well suited solution a combination of such a cover with vegetation carpet can be introduced. Even reinforcing of the cover with fibers (especially plastic, glass, carbon based composites etc.), which higher its flexibility can be successful. A layer can also be anchored by the use of plastic, glass, or anticorrosive mash (not an usual one, made from corrosive steel), which can also serve as a kind of separation layer – this is important especially from the point of view of reversibility of the curing works. A mortar layer can also be filled by inlaying of small stones or pieces of bricks, or aged by the use of crashed stone material, from some dilapidated rests of the original construction.

2.2 Protection by Additional Masonry Formed into Straight Lines

The sense of this technology was to flatten the wall coping into straight (mostly horizontal) lines by adding additional layer (or more layers) of stone masonry to the original. The most important disadvantage lies in a principally changed skyline of the ruin, which is usually artificial (without any reference to the original look of the walls). On the other hand – in many cases this is one of the ways how to deal with needs of practical use of a torso in present times, where the straight lines are needed i.e. for creating (fulfilling) a closed barrier from original walls around the whole castle area, creating a kind of railing alongside of the walkways, or creating a barrier on lookout points, etc. From the technology point of view it works like the previously described technologies.



Figures 10, 11: Use of materials with very different physical characteristics in comparing to the original ones (both are examples of the city walls in Bratislava, Slovakia) – on the left the dilatibility of the wall coping made from brick on cement mortar is much different to that one of the stone masonry, on the right the use of materials with very different erosion resistance (very hard cement mortars combined with weak bricks) has lead to continuous degradation of the brick part of the coping, where only the cement mortar in joints could resist the erosion – very funny appearance of the wall coping was reached (unplanned).

2.3 Protection by Plates

Protecting plates are usually made from stones, ceramics, concrete etc. The most important criteria are to ensure the water non-absorptivity of the cover. Otherwise if the water ingress through the cover, the masonry below it slowly, but continuously corrodes. More appropriate is therefore to use rather lime then cement mortar for fixing the plates, as the cement mortar is of higher strength, but it is also of lower flexibility and porosity and therefore it is less erosion resistant. A precise realizing of the joints is also of high importance, especially their hydrophobization. A technical, life of such a technology can (in Central European condition) reach to approximately 30 years and more. An important disadvantage is the changed shape of the ruin, there stones, or plates of irregular shapes are better to use (i.e. from cleft stones).



Figures 12, 13: Covers made from concrete (left – on the castle of Vígľaš in Slovakia) and from stone plates (right the castle of Vítkův hrádek in Czechia) – both are giving the ruin a slightly artificial appearance and also their protection role is a bit far from being perfect.

2.4 Protection by Covering with Tinplates

A good way of protection of wall copings is the use of tinplates – especially from led tin, which can usually be anchored to the walls just by its forming around the stones. From this point of view it is a very soft technology towards conservation of original material of the walls, but then it can also be very easily dismantled. Therefore it can be used only in areas where is no risk of theft.



Figure 14: An example of use of tin plates for protection of walls (Borgholm castle, Öland, Sweden)

2.5 Protection by Vegetation Cover

Removal of natural regenerated vegetation from the constructions and areas of architectural torso is generally considered as right and useful. But removal of grasses, flowers, etc. from the top of wall copings does not have - more-less any - practical use. Vegetation growing on the top of the walls usually likes basic nature (alkaline) environment, which is also created by the rests of original lime mortar, used at constructing the walls in the past. At the use of cement - after some time (years) – the surface of the masonry is covered by moss, which indicated a change of the environment of the construction from alkaline to acid. This indicated an acceleration of a general decay of the material of the construction. Vegetative cover is usually (but not always!) developed by itself on the wall copings in a natural way. It is very important to remove any of trees, or bushes from it, as they destruct the masonry in a deep way by their roots. Another advantage of the vegetative cover (carpet) is that it strengthens a romantic appearance of an architectural torso in the countryside. During conservation works it the usually (of course not always) most easy to protect the existed, naturally developed cover on the wall copings, but if it has to be removed, it can also be reconstructed. One of the ways is to use some pieces of vegetation carpet, acquired from similar position in the surrounding countryside (Makýš, O., 2004). But before placing it on the top of the walls, it is usually important to strengthen the top of the masonry (i.e. using some of the appropriate methods as described above – but mainly based on lime mortars use).



Figures 15, 16: Unwanted vegetation – a small tree on the walls of the Sklabiňa Castle in Slovakia, which should be immediately removed, and a nicely planted grass and flowers cover on the top of a wall of the Brahehus ruin in Sweden – even such a type of the cover has some limits of its technical life, given by relative low erosion resistance of the sides of the “flower-pot”.

2.6 Protection by Roofs

The most traditional way how to protect walls was to cover them with roofs of various scales and shapes. It could be also nowadays the best possible way to preserve walls, but it is - alas - either from technological, or even more from methodic point of view only of a limited use. Roofs can easily be used on longer sections of straight lines of relatively little damaged walls, but it is nearby to impossible to use them on damaged walls with teeth like skyline. Another problem is that a roof must be maintained (and even watched), which means that it can be used in locations of permanent use - with persons, who care about them.



Figures 17, 18, 19: Three examples of newly built roof on fortifications – a reconstructed roof of a bastion of the town wall of Nürnberg (Germany, left), a very good example of a newly built roof on the tower of the castle of Stará Ľubovňa (Slovakia, right) and a largely damaged roof cover of the walls on a not maintained ruin of the fortified monastery of Bzovík (Slovakia, down).



3. Recommendations for Conservation

The most recommended technologies, which have proved themselves during the decades in our Central European climate are either covering of the wall copings with a layer of concrete (a bit older approach, with good results in technical life, but not satisfactory appearance), or planting (saving, replanting) of a vegetation cover - both technologies can be combined. The best solution lies in respecting the naturally curved shape of preserved masonry torso. Even more better is to strengthen some of the last roves of the masonry by the use of lime mortar. But it has to be mention, that any invasions into the original masonry

are changing its character, especially if stones are being removed from their original positions, because of the re-walling. The best results can be achieved, if each of the removed stones can be placed (fixed) in his position immediately after its removal from the wall. To protect an authentic original also a relatively thin layer of new masonry can be added to the top of the wall, which can serve as a kind of a sacrifice layer – but it has to be separated from the original for future displacement.

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