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THE IMPORTANCE OF TEMPORARY STRUCTURES AND CONSOLIDATION IN THE PRESERVATION OF OLD BUILDINGS

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Abstract

In this paper I want to put forward the importance of temporary structures for the preservation of old buildings. I have described the steps to follow in order to be able to plan the shoring, from the preliminary studies to the project. I have also pointed out the importance of continuous use of the building and the observance of safety measures.

Keywords: shoring, monument, support

1. Introduction

For some time now we have seen a slowdown in the activity concerning the restoration of monuments. This is not a new situation in Romania, but it tends to worsen now because of the global economic crisis. Many monuments are waiting for work to be done, others are abandoned due to lack of funds and for some the restoration has lasted for more than a decade.

In such situations, in order to avoid the worsening of the disorders and to prevent the ruin of the monument, it is recommended to use light structures of wood or metal, to provide support for the building. Their purpose is to provide a new stability, even if artificial, in order to ensure additional time to do the preliminary studies and find the necessary funds for the consolidation and restoration of the building [1].

The design of these structures is very important because they not only have a functional role, but they must meet the criteria of safety for users and also aesthetic criteria. If a good design is done, they may even allow partial use of the building, which is important, particularly in places of worship (Figure 1).

As a graduate student of the Centre des Hautes Etudes de Chaillot, Paris and member of the Association des Architectes du Patrimoine, I had the occasion to learn how to plan a shoring when necessary (Figure 2) and observe its utilisation in France. Working in Romania I had the surprise to discover that it is rarely used and the carpenters barely have the knowledge to build them.

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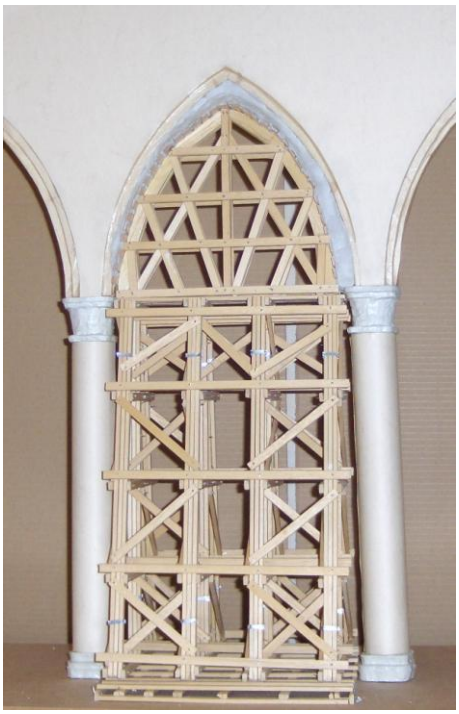

Figure 1. Shoring model done by the author at Centre des hauts etudes de Chaillot.

Figure 2. Examples of shorings – photos taken in the basement of the Saint Victor Abbey, in Marseille, France.

2. The shoring

2.1. The preliminary studies

The first thing to do when restoring a monument is to get an overall understanding of how it was designed and built. Afterwards, we will search for the structural problems that have appeared in time and try to find their origin. The most important rule when restoring is treating the cause first and after that the effects. Therefore, light temporary structures (shoring) are needed to support the building in order to ensure a safe intervention.

The approach in each case is different, and there is no miracle solution. The architect must find and use the best one, according to his or her knowledge and the available means.

It is very important not to confuse shoring and scaffolding, because they are quite similar, but their role is not the same. The first is used to support the building and lighten its load; the second is a tool that we use to reach the highest parts of an edifice. If we climb on the shoring, vibrations and shocks are transmitted to the building and this is what we want to avoid because it's causing additional disturbances.

There are some general rules that should be taken into account when planning the shoring [2]:

a) From the beginning we must realize that we cannot remove parts of the structure out of the way if they block the passage or in order to get the restoration done, so we must imagine how the restoration project will probably be (even if the architect that plans the shoring is not the one that does the restoration work);
b) When putting the structure in place, we must always support the edifice from the least affected to the most, and from the highest parts to the lowest;
c) We have to pay attention not to oversize a shoring because it will put additional pressure on the building and thus run the risk of causing further damage and we want to avoid that. But we also have to be careful not to undersize it, because it will not support the building as it should and consequently it will be useless. It is better to put the parts in place step by step, and even to keep in stock some spare pieces that might be required after a certain period of time. Once the shoring is installed, we must permanently monitor the building to see its behaviour.

In order to come up with a good design, we must take some time to devise it (about 30 days), and not rush things over. We have to keep in mind that the shoring may be in place for a long time and that we cannot modify it once it is set up.

2.2. The plan

The plan of the shoring is divided into several parts:

a) The study of the building and its problems, involving:
- soil analysis;
- natural risk assessment (past, present and future) if the building is in a risk zone;
- an analysis of the exact nature of the materials that are used, when possible. (Because it is a destructive method we must be careful when it is applied. If it is not possible to perform one, we must presume what the materials might be on the basis of similarities with other buildings constructed in the same period, traditional techniques, ancient documents if available, etc.);
- a structural analysis combining the classic method of the strength of materials and a static study (done by both an architect and an engineer);
- historical research of any events (earthquake, flood, fire etc.) that may have contributed to the disorders;
- research about past restoration work and the materials that were used;
- talking with people that actually use the building, because they might have noticed something without realizing it, or they might remember some events that are not mentioned otherwise.

b) Finding and choosing the best solution according to:
- the means that we have at our disposal, in terms of materials – wood or metal;
- companies that can set the shoring up;
- the costs.

c) Designing it (keeping in mind that the structure cannot be removed, even partially, and also that we may need to add some parts in time).

Exceptional cases may occur when we will have to intervene within twenty-four hours. In the case of events like earthquakes, floods, fire etc., if we support the building with simple means like wood beams or cables, we can stop the evolution of structural damage giving us some time to put in place some more permanent structures. Even in cases like these, we have to pay attention to the solution we use, because if the intervention is well done we might leave the pieces in place and use them in the final structure. While doing this, we have to protect the fragile and rare pieces like sculptures, stained glass and other remarkable objects. If we have to remove them, we have to store them in a safe and secure, well ventilated place.

2.3. The materials

Since ancient times, the shoring has been made of wood (pine and oak), and since the industrial era, some pieces are made of metal. Nowadays we combine both techniques. In addition to those, some other materials are used: bricks, plaster, lime mortar, sand and others [1, p. 147; 2, p. 3].

We have to be careful to place some kind of protection between the shoring and the building in order to avoid stains (rust or tannin). The wood used for the shoring must be well dried, the green one retracting in time, which would make our structure useless. We must also apply a treatment to the wood before using it because it could be infested and we don`t want to bring diseases in the building.

Once the structure is in place we must ensure a maintenance program. We have to be careful that the pieces placed inside are well ventilated and that the place is not overheated, and we must have a minimal weather protection for the ones outside. If we ensure this kind of maintenance the structure can last for a long time.

2.4. The importance of stable ground

These structures must be placed on stable ground and must have a regular basis. We have to be careful with this because the subsoil might be full of surprises. Even if we have a good soil analysis, it may only mean that the soil is good in the spot where the sample was taken. But we have to think that there might be some old cellars, drains, traces of old buildings or graves. This is why the historical research is important.

To overcome this problem we have to build a quasi-regular foundation, which will not only ensure a flat floor, but also will protect the existing soil. As for the shoring, before planning it, we must think of the fact that we cannot remove it if we have to do some underpinning. The materials used are sand, wood, protection and sometimes concrete [2].

If the structure is necessary to sustain the upper levels of a building, we must plan it in such way that the load will actually be evenly distributed until it reaches the lowest level (e.g. if we have a cave, we must install a shoring there even if the cave itself doesn't need one).

There is an exception to the rule in the choice between shoring and scaffolding. If the pieces that we support are in the highest part of the building (ceiling, vaults, etc.) where the work is to be done, we could use a thing called 'work floor'. It is a platform built on the shoring used as scaffolding. The pieces that support the load of the damaged areas will be placed on this platform as if they were placed on solid ground. This has a double advantage: we can use it to work on it and it doesn`t takes as much space as two structures would [2, p. 21; 3].

3. Utilization and security

Sometimes the building might still be in use when we use a shoring to sustain it. We will have to judge the situation in each case. The decision should be taken considering various parameters: the size of the structure that we install, the nature of the activity, the significance of the building for the community, etc. If the edifice is still in use its deterioration is less important, so we must do our

best to maintain an activity, even diminished. Sometimes this may not be possible so we must come up with some solution, after consultations with the owner/user of the building: either help him find another suitable place, or build a temporary one.

Our main concern is to ensure security, both for people and the building. We have to define clear safety zones and determine who is allowed to use them. The limits can be marked by using something as simple as a rope, or we can put in place fences to secure the most dangerous areas. We have to pay more attention to the shoring placed outside because it is harder to supervise than the one placed inside. We have to be careful that people don`t stumble on the structure, but also that they don`t climb on it, because they can fall, but also because this can be harmful for the building. But again, this is something that needs to be assessed in each situation, and there is no standard solution (see the Government decisions 300/2.03.2016 and 1091/16.08.2006) [4, 5].

4. Conclusions

The use of light structures made of wood or metal is important because it helps us diminish the aggravation of damage in a building. Unfortunately they are not used as often as they should be in Romania. Their purpose is not well understood by the building users and therefore the money necessary to build them is hard to find. Also, because there is a lack of 'savoir faire', people don`t know how to build them anymore and if we collaborate with companies from Italy or France, which bring their own material, the costs are much higher than they could be. And it is the role of construction professionals to draw attention to the fact that temporary consolidation and minimal protection of a building can significantly reduce the cost of future restoration. This is what preventive protection of historical monuments is about, which, unfortunately, is quite rare in Romania.

References

[1] Y.M. Froidevaux, Techniques de l`architecture ancienne. Construction et restauration, Mardaga, Liege, 1986, 145.
[2] B. Mouton, *Lecture notes*, Centre des hauts études de Chaillot, Paris, 2006, 2.
[3] G. Duval, Restauration et réutilisation des monuments anciens. Techniques contemporaines, Mardaga, Liege, 1990, 18.
[4] Monitorul Oficial al României, **252** (2006) 1-11.
[5] Monitorul Oficial al României, **739** (2006) 1.