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# C9 SOFWARE OPTIMIZATION OF A TECHNOLOGICAL SOLUTION FOR WATERPROOFING REHABILITATION OF RISING DAMP AFFECTED WALLS

BY

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**Abstract.** The drainage practice of buildings affected by capillary moisture represents a complex issue and allows a technical approach from multiple points of view. In old buildings (such as castles, cathedrals, churches) was found in many cases an increase of capillary moisture at basement and foundations level, with consequences in degradation of finishes, plaster and even walls. Several causes that have led to these deficiencies are: heating some areas that were design to work unheated, different construction works that created barriers to the moisture movement, the raise of water table or inadequate work for rainwater capture and removal process. The aim of this article is, on the one hand, to present a brief technological description of a system which allows the complete removal of rising damp phenomenon in walls, and on the other hand, to provide users with a software application in order to facilitate the analysis from theoretical point of view of multiple choices for method implementation, as well as practical approach, in terms of expressing the cost of intervention.

**Key words:** anchoring wedges, rising damp, price, insulation sheet, moisture.

## 1. Introduction

For buildings waterproofing rehabilitation domain one of the hardest aspects to control is the correlation, from a technical point of view, between the causes that give rise to dampness (with the multitude of forms in which this can occur) and specific methods adopted for correcting these defects.

In this article we present some aspects related to Comer technological solution and few of the results obtained from developing a software application in order to optimize the intervention process.

## 2. Method basis and technological approach

Comer Technology has two systems that can be applied depending on the particularities of each work: Isolcomer and Igrostop. Some of these

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specifications are presented as follows.

The Isolcomer building improvement system, as part of Comer technology for rising dump treatment can be used for buildings with a maximum of 2-3 floors with walls made of homogeneous materials (of the same shape and type), bricks, tuff blocks, etc. [1].

In essence there are five stages to follow, in this order:

- Cut: consists of cutting the wall with special machines that use diamond chains. The cutting is done on the load-bearing walls (perimeter and internal) that sit directly on the foundations, as these are the ones where the humidity rises due to the capillary effect.

When finished the wall is ready for the second phase of the work.

- Insert insulation sheets: this is the most important phase of the procedure, and consists of inserting the waterproofing sheet in the cut made in the wall. This sheet prevents humidity rising and creates a water-resistant barrier against rising damp.

Correct mode of intervention is illustrated in Figure 1 [2]:

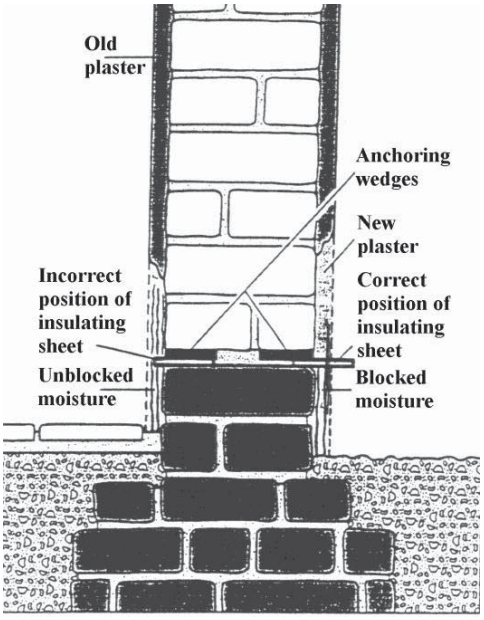


Fig. 1 – Correct mode to use insulating sheets.

Insulating sheet can be sandblasted on one side or both sides (the latter can be used in areas with significant seismic applications, which have provided better grip in the cut).

The sheet comes in rolls and can be cut to desired size either manually or mechanically using a cutting bench.

- Insert anchoring wedges: in this point plastic anchoring wedges will be inserted in the cut under pressure.

These wedges have holes with channels for inserting the mortar and therefore have the threefold function of compressing it, blocking the insulating sheet in place in the cut and providing momentary stability to the walls while the mortar dries.

Anchoring wedges are of three types, as can be seen in Figure 2 [3].

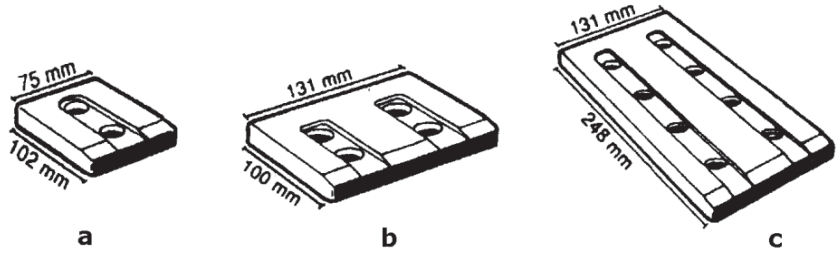


Fig. 2 – Anchoring wedges: a – small; b – medium; c – large.

- Seal: the sheet of insulating material is loaded with premixed anti-shrinkage cement mortar to completely saturate the cut.

The mortar must be inserted on both sides of the insulation (over and under). The mortar can be inserted in the cut using an injection system. This consists of the forced injection of the mortar in the cut.

- Final sealing: the plaster above the cut must be sealed with mortars that let the walls breath thanks to the osmotic process (aerated plaster) [3].

Igrostop system is preferred in the following cases: buildings located in seismic areas, walls made of homogeneous material and having a thickness greater than 50 cm; buildings with more than two levels.

The main difference compare to Isolcomer method is that the waterproof barrier is achieved by inserting insulation metal sheets into the cut made at the bottom of the wall.

### 3. Software application for optimizing Comer technology

The input data of the developed software application includes materials (anchoring wedges, insulation sheets, sealing mortar) and costs. Some theoretical considerations drawn from early analysis of the system are as follows.

It is important to note that explicit graphic presented are reported at 1 m length of wall (straight or curved).

Thus, in Figure 3 we can observe an almost linear variation of the horizontal surface occupied by the anchoring wedges, relative to different thicknesses of wall.

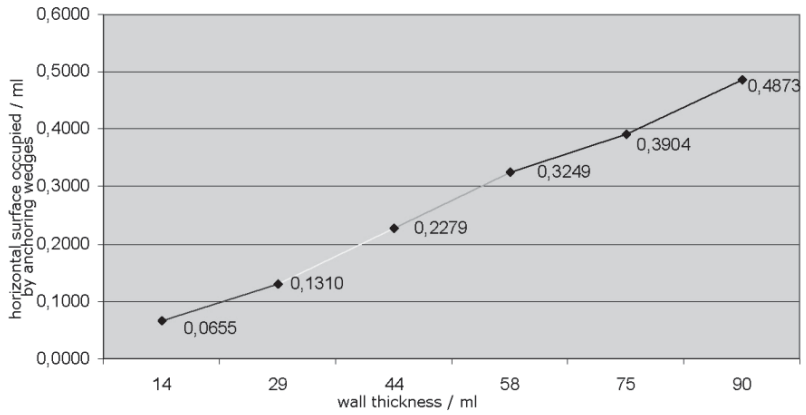


Fig. 3 – Horizontal surface area of anchoring wedges for different wall thicknesses.

Figure 4 shows the percentage of anchorage wedges for different wall thicknesses. It can be seen that the values fluctuate around 50 %, the difference up to 100 % being taken by sealing mortar.

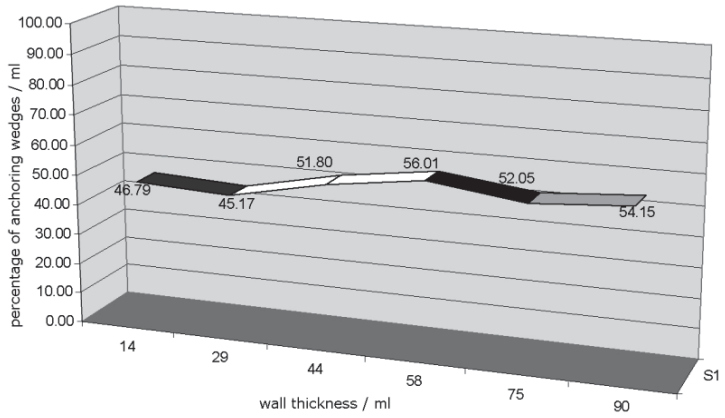


Fig. 4 – Percentage of anchoring wedges for different wall thicknesses.

The optimization calculation of Comer technological solutions considered also the right arrangement of the anchoring wedges, extrapolating the technical data up to 120 cm value of wall thickness and, respectively, the type of insulation sheet used in straight or curved walls. Application presents on a single sheet the whole picture related to the costs of applied method (Fig. 5), price variation of those two solutions (Isolcomer and Igrostop), for walls with identical lengths and 14 cm thickness being according to Figure 6.

**Calculation for Optimizing Waterproofing Rehabilitation by Using Comer Technology**

**1. Input data**

The height of the building => building with more than 2 levels

| Wall thickness[cm] | 14 | 29 | 44 | 58 | 75 | 90 | 105 | 120 |
|---|---|---|---|---|---|---|---|---|
| Lenght for straight wall [m] | 10.00 | | 10.00 | | | 25.00 | | |
| Lenght for curved wall [m] | 5.00 | | 5.00 | | | 7.00 | | |

Type of insulation for straight walls => Igrostop EVET 0201sheet15x200 cm

Type of insulation for curved walls => Igrostop EVET 0201sheet15x200 cm

**2. Calculation of materials**

Igrostop insulation sheet EVET 0201 sheet 15x200 cm = 41.22 $m^2$

**3. Materials price calculation**

| Insulation sheet price Igrostop EVET 0201 sheet 15x200 cm = | 1617.7 euro |
|---|---|
| **TOTAL - Euro** | **1,617.75 €** |

Fig. 5 – The summary results of the Igrostop system, for different walls thicknesses and length (straight or curved).

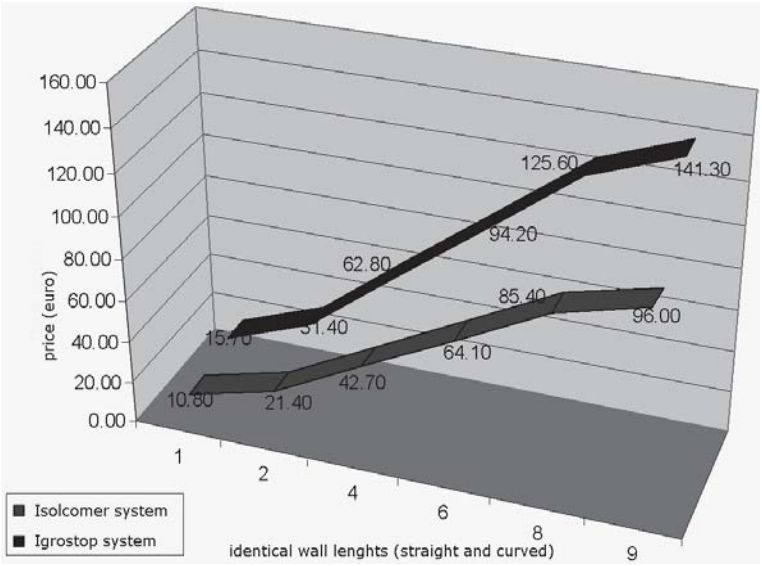


Fig. 6 – Price variation of Isolcomer and Igrostop systems, for 14 cm wall thicknesses and same lengths.

## 4. Conclusions

Comer method is a radical one used for removing capillary moisture from affected brick walls. Applied according to the technological specifications and technical expertise specific to each case, it leads to the desired and certified results.

The software application developed is intended as an easy tool for theoretical analysis and practical optimization of the method described. Therefore it is possible, in a very short time, that we can evaluate the optimal variant to apply, according to the specific on-site work as well as to provide the cost of intervention. The availability for updating real-time databases and their correlation with the manufacturer prices is also an objective achieved by this software.

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