INTERNATIONAL SCIENTIFIC CONFERENCE

CIBv 2010

12 – 13 November 2010, Braşov

MODERN METHODS FOR WATERPROOFING REHABILITATION OF EXISTING BUILDINGS

Florin-L. TĂMAŞ[*], Ioan TUNS[**], Tiberiu STREZA[***]

[*] Transylvania University of Brasov, Faculty of Engineering
[**] Transylvania University of Brasov, Faculty of Engineering
[***] S.C. Recon S.R.L. Cluj-Napoca

Corresponding author: Florin-L. TĂMAŞ, E-mail: florin.tamas@gmail.com

Abstract: In drainage practice of brick walls affected by capillary moisture various methods can be adopted, depending on each building. A solution that has proven effective over time is Comer. This involves the use of insulation sheets, anchoring wedges and cement mortar for closing joints from wall cutting operations. Characteristics of this method, technology implementation and a case study are presented below.

Key words: anchoring wedges, brick walls, insulation sheet, waterproofing.

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.

Different situations through which moisture can be observed in buildings give rise to dampness, manifested primarily by spots on different elements [1].

Some of the main causes for moisture appearance in construction are:

- Capillary rise caused by improperly insulated foundations;
- Capillary suction due to accidental actions (like major floods) or use of materials with poor physical and chemical characteristics;
- Repeated condensation caused by closing elements, like walls and / or roof, inadequate;
- Technological process specific for industrial buildings;
- Deficiencies related to design of the various elements of building or architectural incorrect details (cornices, balconies, loggias, terraces, leakage, etc.);
- Degradation of installations and water drainage elements (gutters, spouts, etc.);
- Impermeable pavement capable of presenting “false dampness” (local soaks).

2. METHOD BASIS AND TECHNOLOGY

2.1 General description

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. [2].

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.

Insulating sheet can be sandblasted on one side or both sides (the latter being mainly 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 1.

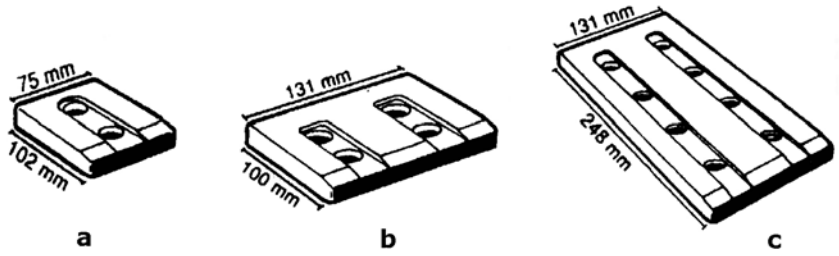

Fig. 1 Anchoring wedges: a – small; b – medium; c – large.

- 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).

2.2 Characteristics of method described

Anchorage wedges arrangement is based on the thickness of the wall to be treated, as is shown in figures bellow (for solid brick walls, with dimensions 29x14 cm, most common in older buildings).

The main condition that must be accomplished is that wedges inserted into the cut have the same thickness.

We also present the right arrangement of wedges on brick walls with varies thickness, from 14 cm to 44 cm.

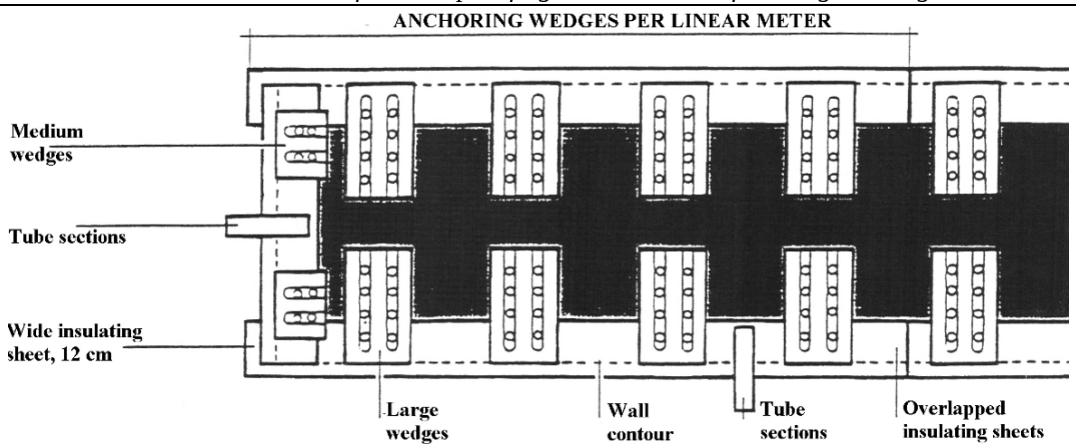

Fig. 2 Layout principle of anchoring wedges.

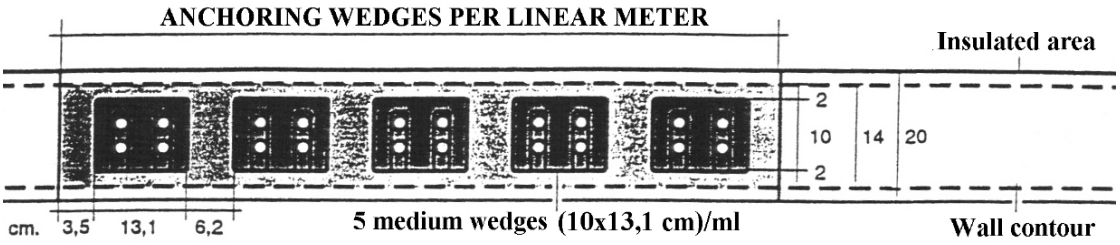

Fig. 3 Right arrangement of anchoring wedges for a 14 cm wall thickness.

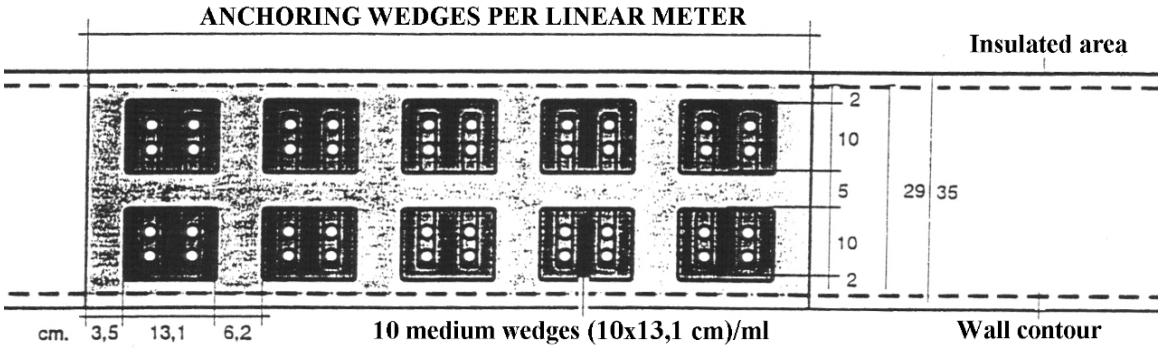

Fig. 4 Right arrangement of anchoring wedges for a 29 cm wall thickness.

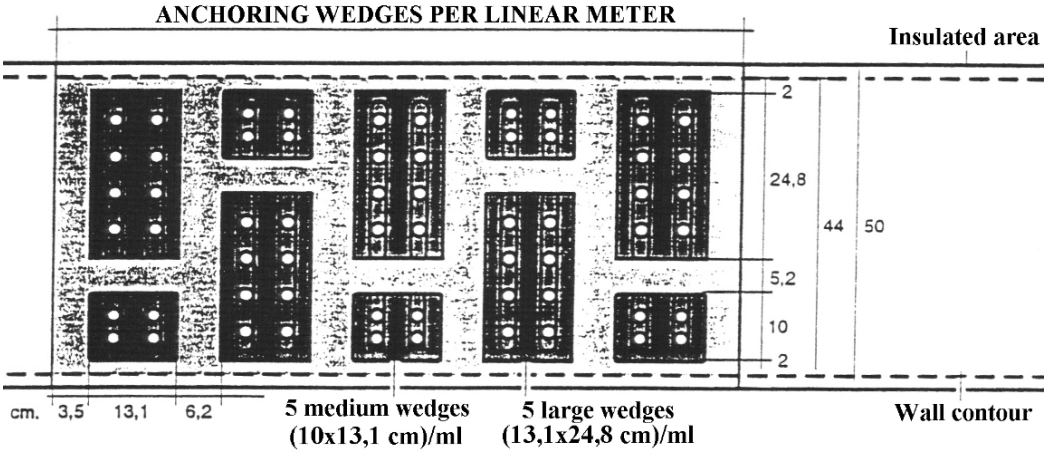

Fig. 5 Right arrangement of anchoring wedges for a 44 cm wall thickness.

3. CASE STUDY – RISING DUMP TREATMENT AT KAROLYI CASTLE FROM CAREI, SATU MARE DEPARTMENT

The history of this castle began in 1492, when Karolyi family founded a walled city in Carei.

Keeping the foundation and some walls, on the site of that city a quadrangle castle baroque stile was built between 1792-1794, with two floors which included 20 rooms downstairs, 21 upstairs and a chapel.

Following the earthquake of 1834, the castle was largely destroyed and the restoration is made only from 1894 to 1896. On this occasion the castle was heavily modified, adding another level to the front, three small and four large towers.

Fig. 6 Karolyi castle from Carei – general view.

Fig. 7 The tower of Karolyi castle from Carei.

Interventions aims to correct the problems of strength and stability, removing moisture from the capillary walls, cleaning basements, exterior and interior plaster, roof restoration, decorative items, etc. Related to drying up measures for building walls, Comer method was used based on its 100 % rate of success. Work began in late 2009 and some suggestive pictures during construction are listed below:

Fig. 8 Wall cutting equipment.

Fig. 9 Placing insulated sheet and wedges into an interior wall cut.

Fig. 10 Comer method applied at an interior column.

Fig. 11 Cement mortar injection into the cut.

Currently, the castle Karolyi stepped into a big rehabilitation process, under the project name which will perform the work as “Medieval fair circuit in Northern Transylvania”.

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 can lead to the desired and certified results.

REFERENCES

1. Moraru, D., Dimitriu-Vâlcea, E., *Moisture in constructions and its control*, Technical Publishing, Bucharest 1969
2. Comerspa specifications and instructions (www.comerspa.com).

Received September 20, 2010