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COMPOSITE MATERIALS AND MODERN TECHNOLOGIES TO WATERPROOFING REHABILITATION

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Abstract: *The emergence and development of composite materials enabled their successful use in civil engineering domain. The aim of this article is to present some of the materials and technologies used to waterproofing rehabilitation for building infrastructure. Therefore, there are indicated the technical characteristics of the finished product as long with technologies with certified results over time.*
Keywords: *HDPE, brick walls, insulation sheet, waterproofing, bicomponent solution*

1. INTRODUCTION

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 [1]. To remedy these deficiencies different materials and technologies are used. In terms of materials, they have developed with the evolution of composites field.

2. COMPOSITE MATERIALS

Waterproofing rehabilitation for building infrastructure involve different composite materials which appear as liquid solutions, gels, sheet or plastic materials. Some of them will be mentioned as follows.

2.1. Liquid solutions

One of the methods most applied in order to remove capillary moisture from old buildings brick walls is DryKit. Its efficiency has been proven over time, as a result of numerous objectives rehabilitated using mentioned technology. This system acts on masonry through the formation of a chemical barrier which is guaranteed and unalterable in time and can be obtained by use of different formulas (solutions), as described bellow:
- TRE 128 - specifically formulated siloxane microemulsion-based solvents in heteropolar hydrolysates for walls of any type of material or thickness to be applied by insertion of diffuser tube shaped made from pressed cellulose at a series of holes passing near, prepared at 15 cm from the floor.
- TRS 114 - formulated specifically based on polysiloxanes in aliphatic solvent, for walls of any material or thickness to be applied by insertion of diffuser tube shaped made from pressed cellulose at a series of holes passing near, prepared at 15 cm from the floor.
- TRX 118 - monomeric silane component formulation with high penetration of any masonry material or thickness to be applied as mentioned above.
- TRA 115 - silicone formulated in deionized water suitable for masonry or stone, for compact brick masonry with a thickness greater than 40-50 cm, to be applied as mentioned above.

- TRF 135 - formulated specifically based on modified polysiloxane solvents super rectified, for the treatment of frescoed walls, to be applied by insertion of speakers tubopress of cells at a series of holes almost loops, drawn 15 cm from the floor share [2].

2.2. Sheets and plastic materials

The other method which is subject for this article is Comer. This technology has two systems that can be applied depending on the particularities of each work: Isolcomer and Igrostop. The first one, Isolcomer, uses the following composite materials:
- Insulation sheets (fig. 1a), made of compound resin-polyester plastics reinforced with fiberglass or pure polyethylene type plastics and specifically designed for use as insulation against rising damp [3]. They 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).
- Anchoring wedges (fig. 1b), produced with differentiated thickness by using thermal hardening resins and have a high resistance to traction, shocks, pressure and compression.

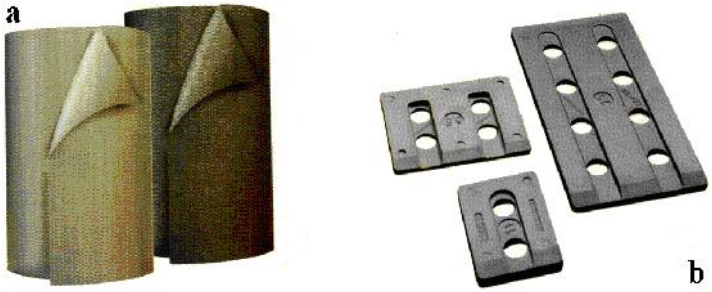

Figure 1: Insulation sheets (a) and anchoring wedges (b)

In order to solve the rising damp problem for good, different measures are adopted. These are conducted in three directions: the implementation of a barrier at floor level at the entire section of the wall with effect in breaking the rising moisture; ventilation works on the exterior foundation, using high-end products such as high-density polyethylene (HDPE) and ventilation works on the interior side of floor and foundation. The material used in some case studies mentioned in this article is the Tefond (fig. 2) high-density polyethylene waterproofing sheet, well known for its strength to impact and corrosion [4].

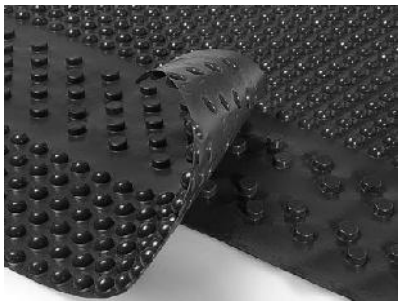

Figure 2: Tefond high-density polyethylene waterproofing sheet

3. CASE STUDIES

Some of the main objectives where modern methods and materials were used for waterproofing building infrastructure are presented as follows. It is about constructions with a great value for our national historical heritage, such as churches, medieval castles or memorial houses.

3.1. Waterproofing brick walls of „Buna Vestire" church from Jina village, Sibiu County

Jina village is located in the southwestern county of Sibiu, on the boundary with the Alba County and part of the famous folkloric area The Edge of Sibiu, being representative of ports and related traditional grazing habits. The church was built in 1782 and painted by Vasile Munteanu of Laz in 1802. According to the technical expertise [5], measures of intervention on interior and exterior walls, in order to eliminate capillary moisture, were established. The rising damp barrier was obtained by using DryKit technology throughout liquid components

mentioned above in the article. Were also executed works in order to eliminate the floor effect and to ventilate foundations both interior and exterior side of the church. Few images after implementing specific measures are presented below (fig. 3; fig. 4).

Figure 3: Using Tefond high-density polyethylene sheet to ventilate foundations

Figure 4: Positive effect to the wall, after applying DryKit technology

3.2. „Ilie Birt" memorial house, Brasov

At the „Ilie Birt" memorial house from Brasov [6], DryKit system was also applied for creating the horizontal chemical barrier into the walls. Some images that illustrate this technology and its way to applied at exterior and interior walls are presented in figure 5 and figure 6.

Figure 5: Applying DryKit technology to an exterior wall

Figure 6: Introducing DryKit bicomponent formula into the wall

3.3. Rising damp treatment at Karolyi castle from Carei, Satu Mare department

At Karolyi castle, 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 high rate of success. Work began in late 2009 and the implementation of insulating sheets along with anchoring wedges is according to figure 7.

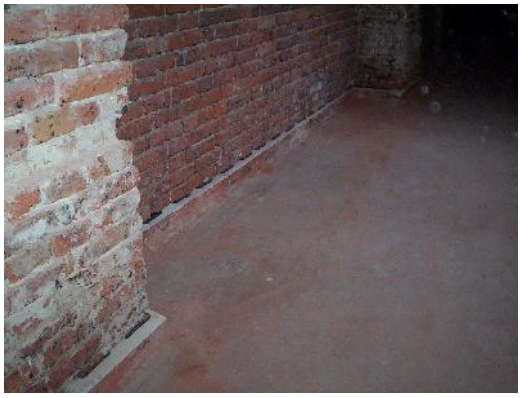

Figure 6: Introducing DryKit bicomponent formula into the wall

4. CONCLUSION

Modern methods and materials used to waterproofing rehabilitation for building infrastructure shows that applied according to the technological specifications and technical expertise specific to each case, it can lead to the desired and certified results.

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