



Scientific Note

Gypsum Nails as a Solution for Efficient Strengthening and Maintaining of Historical Architectural Decorations



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With regard to the dry climatic conditions of Iran, cob and gypsum mortars were used in architectural arrays of many regions of Iran, to create the scratch coat (Arriccio) and fine coat (Intonaco) in the historical periods. The thickness of the fine coat was often very low (one-two mm). In this regard, one of the examples is the City of Yazd. One of the buildings made in the eighth century (Islamic calendar) with the mentioned properties in its scratch and fine coats in architectural arrays is the mausoleum of Rokn al-Din in Yazd (1946), which has several architectural arrays, such as: embossed gypsum, mold, painting inscriptions, decorative paintings, gilding arrays and tiling. The most important issue observed in the arrays of this type of buildings is when the straws and vegetable fibers found in cob are consumed by termites, which is recognized as one of the common damages to the buildings in the country center. This phenomenon leads to loss of coherence in the scratch coat, turning it into a weak powder. This damage to the scratch coat is associated with detachment of the underlying layers in the architectural array. There is an extremely thin layer of fine coat, which is completely detached from many parts of the underlying layer. In such conditions, other array holders are gypsum and gilding arrays and wall paintings. In general, it is significantly difficult to maintain this type of architectural arrays. One of the issues that makes restoration more difficult and limits the use of materials and methods to restore a building, is the white background of architectural arrays in these buildings, which makes it impossible to use any strengthening method in these buildings since it leads to the formation of a yellow and dark color on a white background. In addition, filling the empty space behind the gypsum fine coat (without considering the fact that this layer is significantly thin) leads to the separation and collapse of the fine coat and the implemented arrays on the layer (with regard to the gravitational force of the earth). The thin gypsum layer, which is similar to egg shell and is separated from the scratch coat, can be crushed with minimum pressure of the hand. Moreover, the significantly weak attachment of many mold gypsum arrays to the fine coat, the smallest collision, and vibration in that area leads to the separation and collapse of the decorative layer. To eliminate these problems, the soil in the empty space between the fine coat and support was cleaned at first, followed by fixing the upper and lower surface of the fine coat. The sample was created to select the proper material and method, at the end of which the following material and method were selected: fixing the surface with the solution of 6% Acryloid B-72 in ethanol and injecting the mentioned solution to the back of the fine coat. In the next stage, a cavity with the depth of about eight cm was created in parts of the support that experienced breaking or collapsing (brick wall or ceiling). It should be noted that the diameter of the cavity was small on the surface of the support (about two cm), and the more the depth increased, the more the cavity diameter was enlarged. The next phase involved the injection

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and implementation of gypsum mortar to the lower layers. To this end, the local gypsum of Yazd and eremurus powder were exploited. Injection of the mortar will take a relatively long time and will be carried out in several stages. In each stage, a small amount of mortar is injected into the back of the fine coat and inside the cavity made in the support layer. After each injection phase, two hours is required for complete hardening of gypsum and initiation of the next injection operation. The cavities, along with 10 cm from around the cavity and between the scratch and fine coats, are completely filled with gypsum, which results in the attachment of layers to each other. In addition, this mortar acts like a nail, attaching the gypsum fine coat to the lower layers. In this experiment, the described strengthening method was called gypsum nail. Implementation of gypsum nails with relatively specific distances from each other (50-100 cm) will lead to the fixing of the fine coat and layers attached to its surface without putting pressure on the thin gypsum fine coat.

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