Construction and Building Materials 121 (2016) 559–568

Contents lists available at ScienceDirect

Construction and Building Materials

journal homepage: www.elsevier.com/locate/conbuildmat

Review

Flexural tensile strength in mortar coating reinforced with different types of metal mesh: A statistical comparison

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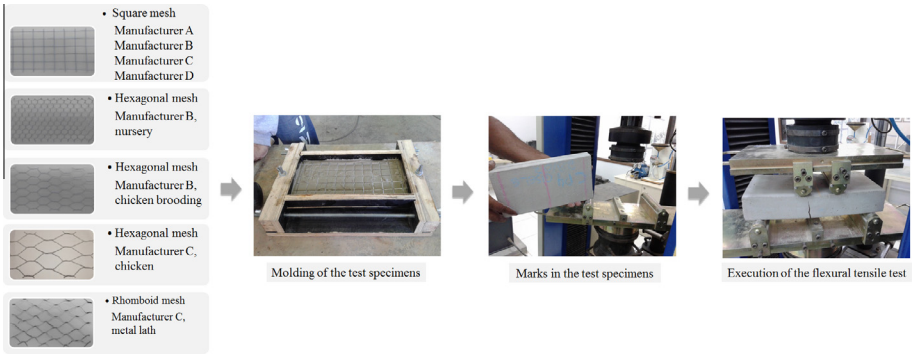
HIGHLIGHTS

- It describes the method for evaluation by 4-point tensile test in bending.
- Evaluated the influence of different types of wire mesh reinforcement in the mortar.
- The metal meshes that presented the worst performance were the small hexagonal mesh.
- The square meshes were the ones that contributed most to the mortar strength increase.

GRAPHICAL ABSTRACT



ARTICLE INFO

Article history:
Received 25 October 2015
Received in revised form 20 May 2016
Accepted 12 June 2016

Keywords:
Coating mortar performance
Flexural tensile strength
Reinforced mortar
Type of metal mesh

ABSTRACT

In Brazil's panorama, it is common the specification of metal mesh in facade coatings with the function of increasing the tensile strength of the mortar, avoid the formation of cracks visually perceptible and ensure system performance. However the requirement of metal mesh into mortar coating reinforcements is quite empirical. There is no consensus on what kind of metal mesh opening and form, as well as the thickness of the metal would be most suitable for this purpose. In this sense, the current study aims to verify the performance comparatively of some of the usual metal mesh types in reinforcing mortar coatings, through flexural tensile testing at 4 points. Accordingly, the current study was to verify the performance comparison of some of the usual metal mesh types in reinforcing mortar coatings nationally by 4-point tensile test in bending. For this, 36 prims with (15×30) cm^2 were molded of mortar reinforced, with mesh embedded in the tractioned third of layer with 5 cm of thickness. Being 4 specimens for each mesh typology used: galvanized electrowelded mesh, square mesh (25×25) mm diameter and metal 1.24 mm, 4 different manufacturers; metal mesh intertwined with hexagonal mesh and opening of 12 mm (known as nursery), 25 mm (treated as chicken brooding) and 50 mm (chicken called); metal lath known as deployer with rhomboid mesh, cord 0.18, knit 1″; beyond 4 no mesh specimens adopted as reference. The best performance results obtained on flexural tensile strength, were in mortar reinforced with metal mesh. The chicken screen, presented intermediate results of tensile strength in bending, compared to other tested metal screen natures, while it was considered inappropriate to apply hexagonal metal mesh type nursery and chicken brooding, when it aims increase of this type of strength in the composite.

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http://dx.doi.org/10.1016/j.conbuildmat.2016.06.033
0950-0618/

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1. Introduction

The current scenario construction has been characterized by the increasing use of new materials, components and construction technologies. Simultaneously, the adoption of new techniques rather than the little scientific approach and project failures, execution and project planning have contributed to the occurrence of pathological manifestations.

Unfortunately, as a consequence, there has been growing recurrence of loss of stability mortar coating applied on facades. This fact is a worrying indication of technical deficiency in this area of construction technology. Countries like Brazil, Portugal, France, England, Belgium, India are among those using coating system in mortar stuck in their buildings.

In these times where concern for the user is also a decisive factor when specifying materials and choice of construction techniques, it is essential to prevent the incidence of damage on the outer coatings of buildings. The coatings are the most noticeable part of the design and picture quality of buildings.

1.1. Context

It is known that the loading condition of a facade usually occurs through the combined action of intrinsic stresses to the physical and mechanical characteristics of constituents of the coating materials, masonry structure and external factors, whose manifestation can be through reversible or irreversible movements.

Since the beginning of its construction, a building is subject to several requests daily, are structural, thermal, or otherwise. These generate differential movement between the components of the coating system. This fact becomes crucial the ability to absorb deformations for all layers that make up the outer coating. As a determining factor to ensure performance of the building and provide users with reliability and comfort, it is the integration of all components of the building, not only the individual behavior of these.

In this sense, the external coating system plays an important role in the performance of the building, since it has the function of absorbing and relieving stresses arising from the deformation requests. On the other hand, it is known that the mortar is adhered as the main constituent cement which is a material having high rigidity. Cementitious matrices do not deform plastically, by contrast, stress relieving to overcome the tensile strength limit causes the fracture thereof.

The occurrence of cracks in the outer coating is an extremely serious pathological manifestation that it is a major cause of detachment and subsequent falling plaster [1].

Therefore adopting solutions to increase this resistance is extremely relevant. The metal mesh is one of the elements that can be used for this purpose, adding tensile strength to coating system. A coating on reinforced mortar combines the fragile characteristics of the mortar with the ductile characteristics that the metal mesh brings.

The metal mesh [2] is a component that, addition to complying the previously said function, acts as distributor of point stresses, and thus enables rather than the occurrence of large cracks, some harmful micro cracks to the coating and sometimes undetectable to the naked eye.

Initially the use of metal mesh in construction was limited to the replacement of the usual reinforcements reinforced concrete slabs [3]. The use of metal mesh, to the detriment of the steel bars, dispensed the reinforcement mounting procedure at the place of concreting, and thus optimized its construction process. For the same authors, the use of metal mesh as part of the coating is recent. This fact allows enables high-growth field, because even being employed in the works, the application of technology and characterization of mesh is not consolidated.

Another usual way of application the metal mesh is aiming to objective of improving the seismic safety of non-engineered housing constructions [4], in areas subject to earthquakes.

Expected to mortar reinforced with metal mesh a similar behavior to that found in composites reinforced with fibers. Depending on the stresses [5] transferred through the interface can be two types of adherence: shear and tensile. In one type of composite usual adherence can have greater importance than others, but in many cases both are present and interrelated. Another type of Adherence is a mechanical anchoring, which is a practical solution to compensate for the short anchoring lengths and low stresses adherence.

I. Shear adherence that is able to control the transfer of stresses parallel to the longitudinal axis of the reinforcement. In composites not cracked, shear adherence by transfer matrix of stresses for reinforcement. When the matrix cracking and charges are supported by the fibers that control the fissure, the shear adherence allows the load is transferred back to the matrix parts are not cracked.
   a) Tensile elastic shear: when such adhesion occurs at the interface and shear stress no exceeds the adhesive strength, the displacements of the fiber and the matrix remain compatible. The elastic adherence is the main mechanism to be considered for the prediction of yield limit and tension of the first crack of the composite.