

## **Durability Assessment of Gypsum Boards with Glass Mat Reinforcement Used in Light Facade Systems**

**Mauricio M. Resende<sup>1</sup>, Douglas C. Meirelles<sup>2</sup>,  
Gustavo R. Boriolo<sup>3</sup> and Luciana A. Oliveira<sup>4</sup>**

<sup>1</sup>Institute of Technological Research of State of São Paulo – IPT, Building Technological Center – CETAC, and São Judas University, mresende@ipt.br

<sup>2</sup>Saint-Gobain Brasil, douglas.meirelles@saint-gobain.com

<sup>3</sup>Saint-Gobain Research Brasil, gustavo.boriolo@saint-gobain.com

<sup>4</sup>Institute of Technological Research of State of São Paulo – IPT, Building Technological Center – CETAC, luciana@ipt.br

**Keywords:** *Gypsum Boards with Glass Mat Reinforcement, Durability, Performance, Aging.*

### **1 Introduction**

Gypsum boards with glass mat reinforcement<sup>1</sup> were recently brought to the Brazilian market and it has been used in light weight facade systems. There are no Brazilian standards concerning these boards, however, there are American and also European standards, and some publications relating to moisture resistance (CMHC, 2007; Randall *et al.*, 2016). Although, these standards and publications, there are few studies and little practical knowledge of the performance of these boards over time in Brazil, mainly concerning to durability requirements. The use of the glass mat gypsum boards in external facades is recommended only as a substrate to a coating system. Glass mat board manufacturers set that these boards cannot stay apparent, during their entire service life. However, they may be exposed to natural conditions during the construction site period during one year at most. In this context, the aim of this paper is to show the approach settled to evaluate the durability of the gypsum board with glass mat reinforcement for use in facades of multi-story building in Brazil, and also show the test results.

### **2 Research Method and Experimental Work**

The durability approach settled here is according to ISO 15686-2 (2012) concepts, mainly considering short-term exposure (aging test) and long-term exposure (field evaluation). The mechanical and physical tests were done in steady state, saturated and after aging in cycles of immersion in water and drying, since the water is the most important aging agent for these boards. In additional, a field exposure is carrying on since four gypsum boards were assembled on exposed walls it has been twelve months. These walls are in São Paulo city. The test in normal condition, steady state, means keeping the samples for three days to (23±2)°C and (50±5)% of relative humidity. Two kinds of short aging exposure were carried on: one

---

<sup>1</sup> Gypsum boards with mat reinforcement are composed of set gypsum plaster core reinforced with inorganic fibres which are arranged in a woven or non-woven mat to form flat rectangular boards.

adopting the fiber cement standard (ABNT NBR 15498, 2016) and the other adopting the OSB board standard (BS EN 321, 2002).

## 2.1. Results and Discussion

- Short term exposure (aging test): The variation among the results of the physical characteristic of gypsum board mat reinforcement in steady state and after aging exposure is under 20%; density is almost zero, water absorption is around 18% and dimensional changes is around 0,08%. Relating to bending strength, in the average, the results in the saturated state is greater than 50% of the results in the steady state.
- Long-term exposure (field evaluation): Gypsum boards were installed in two walls structured by steel frame. After 12 months of exposure, no significant occurrences were found (cracks or detachments).

## 3 Conclusions

This paper shows an approach to evaluate the durability of gypsum boards mat reinforcement used in facade, considering water as the main aging agent, since the board may have contact with rainwater and solubilize the plaster. Then, tests were made to evaluate the physical and mechanical characteristics of these boards under normal conditions (steady state) and after aging in immersion in water and drying. The tests results show that the difference between physical characteristics before and after aging is less than 20%. Regarding to the mechanical characteristics, the bending strength loss after aging is less than 50%. Concerning the natural exposure, the boards have been providing good results, even though the follow-up still needs to be maintained longer.

### ORCID

Maurício Marques Resende: <https://orcid.org/0000-0001-6496-0762>

Douglas Meirelles: <https://orcid.org/0000-0001-5203-0365>

Gustavo Boriolo: <https://orcid.org/0000-0001-5201-2191>

Luciana Oliveira: <http://orcid.org/0000-0001-6772-3252>

### References

- ABNT. (2016). *NBR 15498 (Placa de fibrocimento sem amianto - Requisitos e métodos de ensaios. Associação Brasileira de Normas Técnicas, Brasil.*
- BSI. (2002b). *BS EN 321 (Wood-based panels - Determination of moisture resistance under cyclic test conditions). British Standards Institution, UK.*
- Canada Mortgage and Housing Corporation – CMHC. ( 2007). *Technical Series 07-100. Relationship Between Moisture Content and Mechanical Properties of Gypsum Sheathing. Montreal.*
- ISO. (2016). *ISO 15686-2 (Buildings and constructer assets - Service life planning - Part 2: Service life prediction procedures). International Standard Organization.*
- Randall, B.G. and Goodman, T. (2016). *Use of Glass Mat Gypsum Sheathing as a Substrate for Exterior Insulation and Finish Systems (EIFS). ASTM Symposium on Exterior Insulation and Finish Systems (EIFS): Performance, Progress, and Innovation. .ASTM - STP 1585. Available online at www.astm.org / doi: 10.1520/STP158520140110.*