

INVESTIGATION OF THE IMPACT OF THE "TIME VARIABLE AFTER REHEATING" ON THE MOISTURE EXPANSION TEST OF CERAMIC TILES

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1. INTRODUCTION

The moisture expansion determination test evaluates the hygroscopic expansion of ceramic tiles after boiling in water for 24 hours. The test method available in ISO 10545-10 has some limitations. Among them is the resolution of the equipment, the lack of specification of the measuring device and the lack of definition of the size of the test specimens, increasing the variability and measurement uncertainty of the results obtained in this test between different laboratories. Another limitation of the method is the time to complete the test, which takes around 6 or 7 working days. The present work aimed to evaluate and validate the applicability of modifications to the test variable "time for sample measurement after reheating", enabling its optimization, without impairing reliability of the results.

2. MATERIALS AND METHODS

In this study, 5 specimens of each sample were used: 2 samples with AIb water absorption group, 2 BIa samples, 2 BIIa samples and 10 BIIb samples. The specimens were cut to size (5x15)cm, rectified and all measurements were carried out on a standard device with a resolution of 0.0005 mm (Figure 1). Each sample was tested in accordance with three methods: (I) following all the requirements of ISO 10545 – Part 10 standard. (II) Removing the samples from the oven at a temperature of 100 °C, allowing them to cool to room temperature outside the desiccator and taking measurements of the specimens after they reach thermal stability. (III) Measuring the specimens after removal from the oven upon reaching thermal stability.

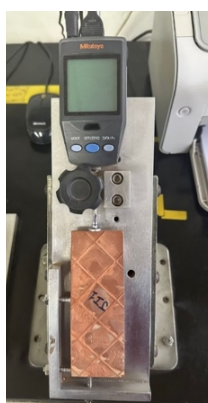


Figure 1: Measurement device

3. RESULTS AND DISCUSSIONS

The results were expressed in mm/m and analyzed using the normalized error statistical tool, which is used to evaluate the quality or precision of a model/estimate in relation to observed/true values. This tool presents a way of quantifying how close or far the estimated values are from the real values. In this context, the results of the moisture expansion test carried out according to procedure I, which is the procedure indicated in ISO 10545 – Part 10 standard, were considered as real values and the results of procedures II and III were considered as estimated values, which are the methods studied.

Based on the results presented in Table 1, it can be noted that the normalized error values were less than or equal to 1. As a result, it may be stated that the methods proposed in the study are compatible with the results obtained following the standard test method.

Sample	Moisture Expansion – Average value (mm/m)			Normalized error	
	Method I	Method II	Method III	Method II	Method III
AI	0.07	0.07	0.05	0.00	0.30
AI	0.01	0.00	0.03	0.10	0.30
Porcelain	0.00	0.00	0.01	0.00	0.20
Porcelain	0.00	0.00	0.00	0.00	0.00
Porcelain	0.00	0.00	0.00	0.00	0.00
Porcelain	0.00	0.00	0.00	0.00	0.00
BIIb	0.13	0.12	0.17	0.10	0.50
BIIb	0.37	0.34	0.36	0.40	0.20
BIIb	0.28	0.24	0.29	0.50	0.20
BIIb	0.16	0.10	0.14	0.80	0.20
BIIb	0.13	0.15	0.10	0.30	0.30
BIIb	0.03	0.01	0.05	0.30	0.30
BIIb	0.46	0.38	0.43	1.00	0.30
BIIb	0.15	0.07	0.16	1.00	0.20
BIIb	0.25	0.20	0.23	0.70	0.30
BIIb	0.19	0.13	0.18	0.80	0.10
BIIa	0.12	0.08	0.14	0.50	0.30
BIIa	0.00	0.01	0.02	0.10	0.20

Table 1 – Results of the Moisture Expansion and normalized error.

4. CONCLUSION

Based on the results presented, it was concluded that the methods studied demonstrate compatibility with the standard method. The specimens can be removed from the muffle after reheating, provided muffle temperature is below 100°C. The measurement of the test specimens can be carried out when they reach room temperature. The measurement after boiling the specimens can only be carried out once and must occur within a maximum period of one hour after they reach room temperature outside the desiccator.

5. REFERENCES

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