

STUDY OF THE DIFFERENT TEST METHODS FOR DETERMINING THE SLIP RESISTANCE OF BRAZILIAN CERAMIC TILES

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The risk of accidents and slip-falls in public places and homes is a problem of increasing concern for authorities, engineers, and architects, particularly in Brazil, where the ageing population is growing rapidly. This risk can be mitigated by appropriate specification of the flooring, use of suitable footwear, appropriate signs, use of railings, maintenance, and use of appropriate household chemicals. Slipping involves a significant reduction in the coefficient of friction between a body in motion and the supporting surface, occurring quite quickly. The coefficient of friction is defined as an intrinsic property of the interface of the materials that are in contact with each other. This in turn will depend on factors relating both to human movement and to the environment and contact surface conditions. Three test methods are currently under discussion at ISO / TC 189, but there is no consensus among the countries on which methodology will provide greater reliability and repeatability in the measurement of the coefficient of friction. At present, Brazil has adopted the dynamic slider (Tortus) method, as Annex N of NBR 13818 - Ceramic tiles - Specifications and test methods. This study was undertaken to compare the results of different test methods for determining slip resistance in different types of Brazilian ceramic tiles. Seventy Brazilian tiles were tested, divided into 11 categories as a function of their surface finish (glazed or unglazed), the presence or absence of relief and texture (polished, unpolished, gloss, matt, wood, stone, and others), as shown in Figure 1.

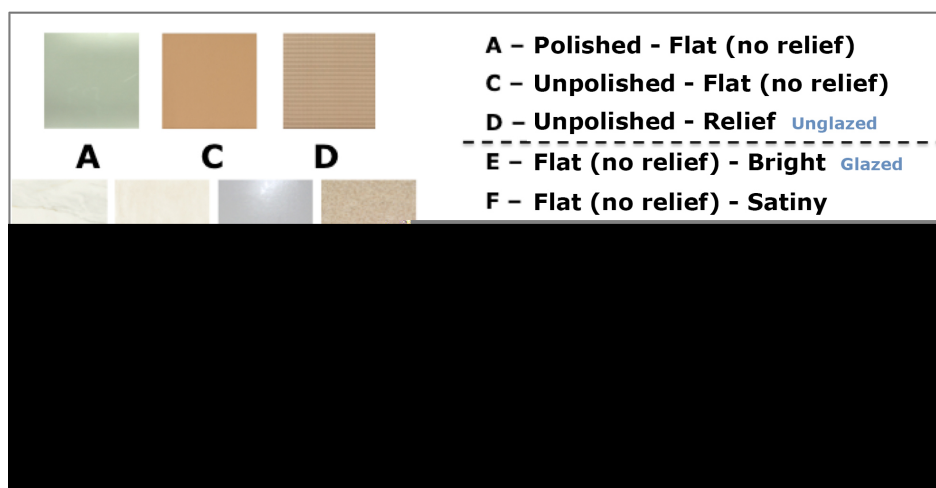


Figure 1: Tested product types.

The following test methods were studied: NBR 13818: 1997 - Annex N (DIS 10545 - Parte 17), ANSI 137-1-2012, and UNE ENV 12633: 2003 (Figure 2). The repeatability and reproducibility of the test methods and the correlation between them were also evaluated. Figure 3 shows the results for the different types of tile and the test methods.



Figure 2: Devices used in the studied test methods: (a) Tortus, (b) BOT 3000, and (c) Friction pendulum.

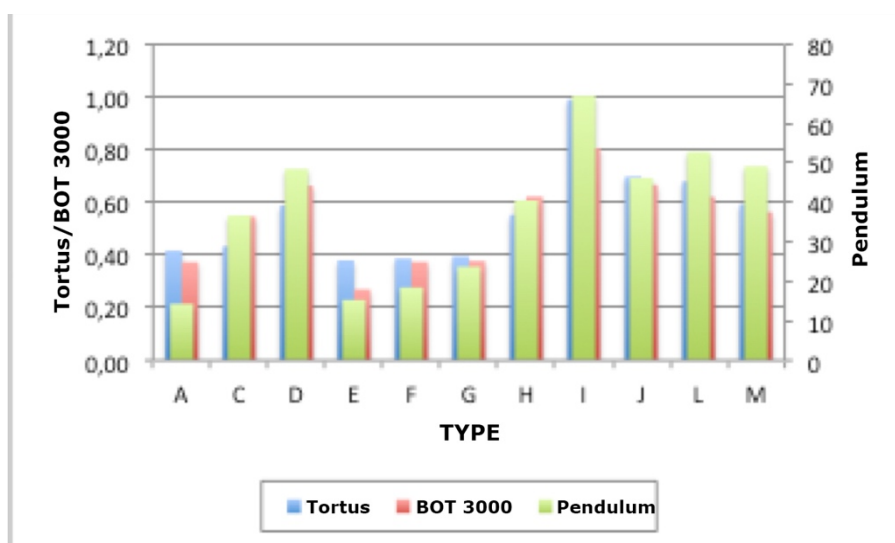


Figure 3: Results of the different tile types and test methods.

All the test methods exhibited the same behaviour for the different types of tile. It may be observed that the results of the BOT 3000 method were lower than those of the Tortus for the same type of product. For the Friction pendulum, the results also showed a correlation between the test methods.

For measurement reliability and repeatability, the following conditions were used:

- Three test methods (Tortus, 3000 BOT, and Friction pendulum);
- Two operators: A and B;
- Two products: unprofiled and glossy and with screen printing on a very rough relief
- Two surface conditions: dry and wet

For the BOT 3000 and Friction pendulum test methods, the results exhibited reliability and repeatability under all test conditions. The Tortus method displayed differences in the results between the operators with relation to the type of product (non-profiled and glossy), depending on the surface (wet).