

CLASSIFICATION OF WEAR RESISTANCE ACCORDING TO CONDITIONS OF INTENDED USE

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1. INTRODUCTION

The test methods described in the standards applicable to ceramic tiles for determining tile abrasion resistance do not allow evaluation of flooring durability because they do not reproduce actual service conditions. In addition, they produce deceptive results that penalise dark surfaces over light ones and may assign high wear resistance values to glossy surfaces that perform poorly under abrasion. A new test method was developed in previous studies^[1] of reproducing the changes in surface appearance generated in actual service conditions. The method is based on the abrasion apparatus described in standard UNE-EN ISO 10545-7^[2], in which the abrasive load is modified, however, as detailed in Table 1. The method also incorporates dirt retention and change in surface gloss as evaluation criteria.

After its evaluation by AEN CTN 138 “Ceramic tiles”, the method is currently being processed by AENOR for adoption as a UNE Report. The present study provides a comparative analysis of the results obtained with both test methods and their correlation to the sector’s experience in the use of ceramic floor tiles.

ABRASIVE LOAD	PEI METHOD	ITC METHOD
Counterbody	Steel balls	4S rubber
Abrasive element	Corundum (hardness 9) 100-300µ	Quartz (hardness 7) <200µ
Medium	Water	Air

Table 1. Comparison between the abrasive loads in the test methods used.

2. EXPERIMENTAL

Twenty samples were selected which encompassed a wide range of ceramic floor tiles, including glazed and unglazed tiles, with different textures, colours, and decorations. This product sample also covered a wide spectrum of ceramic tile applications, ranging from domestic housing to areas of outside flooring with high levels of pedestrian traffic.

The comparison between the results of both methods is feasible because the classification scale according to use of the new method (Table 2) has been defined in agreement with that established in standard UNE-EN 14411 (based on the PEI method), though it has been extended to level 6 to include very heavy traffic conditions and a great quantity of dirt, for which Annex N recommends the use of unglazed tiles of Group I.

TYPE OF USE	CLASS
Light intermittent traffic without any abrasive (e.g. bathrooms in domestic housing)	L1
Light traffic without direct outside access (e.g. dwellings in buildings, common-use areas)	L2
Light traffic with direct outside access (e.g. single-family housing, retail trade)	L3
Intermediate traffic with direct outside access (e.g. shops and areas with intermediate public traffic)	H4
Heavy traffic with direct outside access (e.g. publicly trafficked building areas, shopping centre sales areas)	H5
Continuous heavy traffic and constant presence of dirt (e.g. pedestrian walkways, urban furnishing)	H6

Table 2. Resistance class recommended according to intended use.

In order to define the level of performance recommended for each studied floor tile sample, an evaluation survey was conducted, in the framework of the GT1 "Test methods" meetings of AEN CTN 138, with a group of 24 experts (manufacturers of different types of ceramic tiles). These experts were shown a group of 20 untested, randomly ordered tiles, corresponding to the products being studied, and they were asked to assign the type of use (class L1 to H6) for which each product might be recommended, based on their experience.

3. RESULTS AND DISCUSSION

The results obtained with both test methods, and the average evaluation obtained from the assessment by the experts, are compared in Figure 1.

It may be observed that when the PEI method is used on glazed tiles, the glossy surfaces are overvalued in regard to the sector's experience of use, and it produces classifications that may be appreciably higher than those of low gloss surfaces. In addition, the dark-coloured tiles with a matt surface are undervalued and penalised, because a pronounced loss of colour occurs owing to the excessively vigorous effect of the abrasive load of steel balls and corundum.

In contrast, the results obtained with the new method on glossy surfaces agree quite well with the assessment by the experts. Analogously, the evaluation of both glazed and unglazed materials with a matt surface also exhibits a clear correlation in regard to the sector's evaluation, independently of whether the surface is a dark or light colour, and of texture or porosity in the case of unglazed tiles. Only the materials that obtain the highest classifications with the new method tend to lie above the assessment of the experts. When the results were analysed together with the experts at the GT1 meeting, it was concluded that this discrepancy was probably due to the simultaneous appraisal, during the evaluation of the samples, of other aspects that were unrelated to wear (thickness of the piece, type of substrate, slip resistance, etc.), but which had unconsciously limited the recommendation for use at the most demanding levels (H5 and H6).

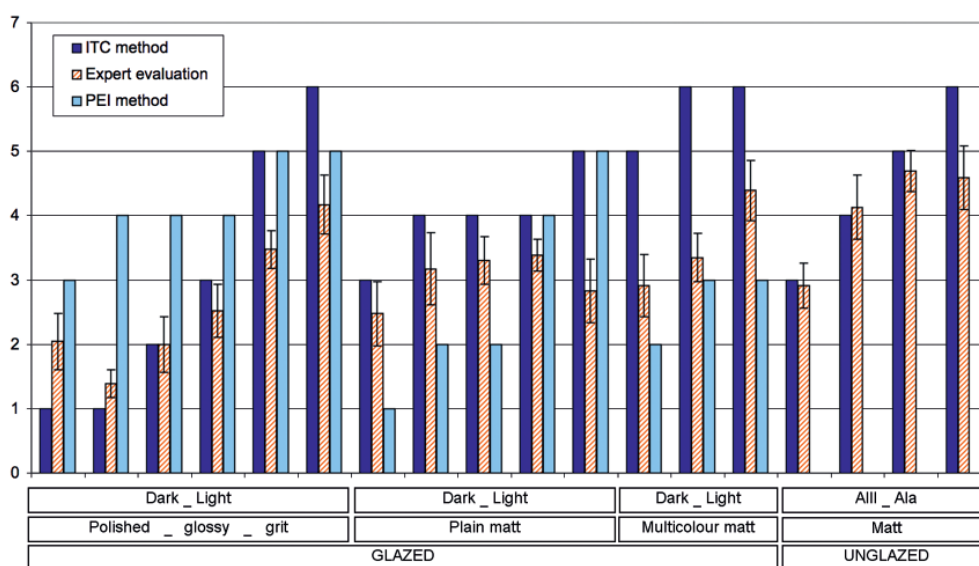


Figure 1. Comparison of the ITC Method, Expert Evaluation, and the PEI Method

4. CONCLUSIONS

The study confirms the lack of correlation between the results obtained with the PEI method and experience in actual use of ceramic floor tiles, as a result of the method's inappropriate evaluation criterion.

In contrast, the results of the newly developed method not only match the evaluation of the experts for the entire range of ceramic materials, but the method will also allow comparative references to be established between all types of ceramic tiles, both glazed and unglazed, and even in regard to other non-ceramic products, it having been verified that glazed tiles exist in the market with high levels of abrasion resistance, comparable to those of the best-performing unglazed products.

REFERENCES

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