

DEVELOPMENT OF A NEW CONCEPT IN THE BRAZILIAN INDUSTRY: CLAY PAVERS

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1. INTRODUCTION

Brazil is currently experiencing growing interest in public policies for more products that meet quality standards, and customers are becoming increasingly demanding in their search for new products.

In view of this situation and the available know-how of Brazilian manufacturers of ceramic blocks and roof tiles, these manufacturers have directed their attention to the development of clay pavers. There is growing demand for paving and interlocking pavers and, in certain municipalities, laws and projects for improving conditions in pedestrian traffic on the pavements foresee the use of these products as an effective solution to the problems affecting three basic principles in public thoroughfares: smooth flow, comfort, and safety.

It has further been recognised that paving with interlocking pavers exhibits technical, aesthetic, and practical qualities, in addition to a balance between environmental and economic factors, which enhance their possible use in areas with high-volume and/or high-weight traffic ^[1]:

- Such interlocking pavers allow immediate use of the paving after installation;
- They keep the paving sequence;
- Owing to paver thickness (ranging from 5 to 8 cm), pavers have high compressive strength, which is appropriate for areas with high-volume and/or high-weight traffic, such as roads and building parking lots;
- They allow easy repair, as well as ready access to underground facilities, without any apparent marking and enable the pavers to be reused, since in the installation process just requires preparation of an intermediate sand layer on the compacted substrate, using fine sand, requiring no skilled labour or special equipment;
- The paving bedding process makes the pavement more permeable, providing micro-drainage of the rainwater, thus helping to address the problems of flooding and water build-up, so common in big cities;
- As a ceramic product is involved, its use outdoors is very satisfactory owing to the inherent thermal comfort of the material

A further significant factor in paver development is paver aesthetics: depending on the production process, many different shapes and colours can be developed and, in comparison with similar cement products, there is no change in paver colour on exposure to the sun, while their natural wear only enhances the beauty of these ceramic products ^[2].

2. MATERIALS AND METHODS

In the performance of this work, a study was conducted focusing particularly on incorporating ceramic fragments and scrap produced during the manufacture of traditional ceramic products into the formulations of the bodies.

A 5% addition by volume was incorporated of fragments from the ceramics manufacturing process (#8, #40, and #200) into two different body formulations.

The samples were pressed and fired at temperatures of 900 °C, 950 °C, and 1000 °C.

The samples were characterized in terms of water absorption (WA), linear shrinkage (LS), and mechanical strength (MS).

A study was also carried out of new designs for Brazilian pavers ^[3].

3. RESULTS AND DISCUSSION

The results obtained from the incorporation of fragments of the ceramics manufacturing process into the two body formulations are detailed in Tables 1 and 2.

Temperature (°C)	DF											
	Without incorporation			# 8			# 40			# 200		
	WA (%)	LS (%)	MS (N/ mm ²)	WA (%)	LS (%)	MS (N/ mm ²)	WA (%)	LS (%)	MS (N/ mm ²)	WA (%)	LS (%)	MS (N/ mm ²)
900	15.2 ± 0.1	0.68 ± 0.07	11.75 ± 0.94	17.2 ± 0.2	0.66 ± 0.04	8.67 ± 1.11	17.0 ± 0.2	0.66 ± 0.06	9.71 ± 0.71	17.4 ± 0.2	0.73 ± 0.08	8.88 ± 0.43
950	14.0 ± 0.1	1.55 ± 0.10	17.21 ± 1.01	16.1 ± 1.8	1.61 ± 0.55	9.75 ± 0.84	15.9 ± 0.2	1.25 ± 0.06	10.60 ± 1.24	16.2 ± 0.2	1.31 ± 0.06	9.99 ± 0.60
1000	11.9 ± 0.1	2.90 ± 0.04	18.19 ± 2.70	14.0 ± 0.2	2.28 ± 0.18	17.56 ± 0.64	14.0 ± 0.2	2.41 ± 0.30	12.89 ± 0.91	14.2 ± 0.2	2.58 ± 0.11	12.13 ± 0.27

Table 1. Results of water absorption, linear shrinkage, and mechanical strength for formulation DF.

Temperature (°C)	BA											
	Without incorporation			# 8			# 40			# 200		
	WA (%)	LS (%)	MS (N/mm ²)	WA (%)	LS (%)	MS (N/mm ²)	WA (%)	LS (%)	MS (N/mm ²)	WA (%)	LS (%)	MS (N/mm ²)
900	20.0 ± 0.1	1.22 ± 0.03	7.31 ± 1.41	19.1 ± 0.8	1.79 ± 0.49	10.34 ± 1.42	19.1 ± 0.1	1.41 ± 0.10	10.84 ± 0.95	19.0 ± 0.1	1.43 ± 0.04	10.39 ± 1.75
950	19.6 ± 0.1	1.81 ± 0.02	8.02 ± 0.77	17.6 ± 0.2	2.23 ± 0.12	11.40 ± 1.10	13.0 ± 0.3	4.88 ± 0.13	13.14 ± 2.14	13.0 ± 0.3	4.62 ± 0.18	13.65 ± 1.65
1000	18.5 ± 0.1	2.47 ± 0.06	10.57 ± 1.60	15.0 ± 0.3	3.65 ± 0.12	13.82 ± 0.56	16.2 ± 0.6	3.38 ± 0.19	8.76 ± 2.43	16.0 ± 0.6	3.47 ± 0.23	8.08 ± 2.13

Table 2. Results of water absorption, linear shrinkage, and mechanical strength for formulation BA.

The new designs for Brazilian pavers are shown in Figure 1.

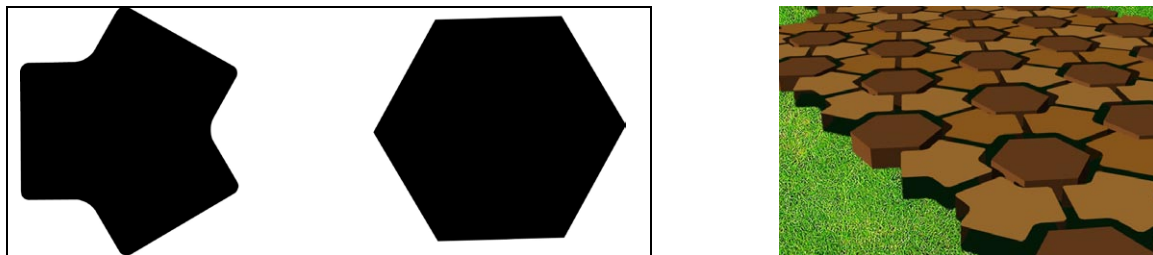


Figure 1. New designs for Brazilian pavers.

4. CONCLUSION

The results to date have been obtained on a laboratory scale. The following step in this study is semi-industrial production, based on the experimental results.

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