

## Application of Electrical Insulator Porcelain Waste in manufacturing concrete pieces for pavement.

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### Abstract

This research project has analysed the technical and economical viability for concrete's pieces for pavement (pavers), with substitution of sand (30%, 50% and 70%) and cement (15%, 20% and 50%) for material of porcelain's electrical insulator (PEI). The results indicated that pavers with RIP like sand in all levels, and pavers with RIP like cement for the level 15%, can be indicated for fabrication, if compared with the reference and considering the results of the tests.

*Key words: solid waste, environmental impact, sustainability.*

### Introduction

Reuse and recycle are important alternatives to sustainable practices, once this actions can reduce the ambiental impacts caused by the inadequate disposal of waste material and save energy and non-renewable natural resources.

The purpose of this research project was verify the mechanical and economical performance of concrete's pieces for pavement (pavers) with parcial substitution of sand and Portland cement for porcelain's electrical isolator (RIP). Thus, the pavers were maded according to NBR 9781:2013, for the age of 28. Those pavers were submitted to porosimetry for mercury intrusion test and the economical viability was proposed from current market values.

The compression strength was higher for all substitutions except for 20% PEI for cement and 50% PEI for sand. This has happened because in such contents there was an excessive reduction of the main binder so that impairing the formation of chemical compounds essential for the mechanical performance. Moreover, there was an increase of the s/l relation (sand/lime), which also impaired the mechanical performance of cementitious matrices.

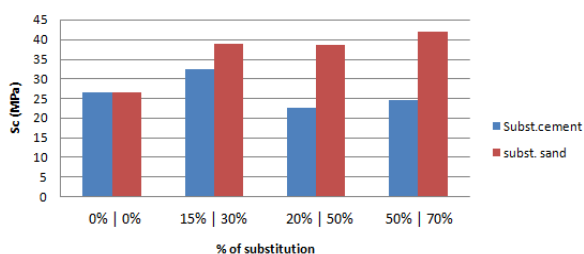
**Table 2.** Paver's unitary cost and the % of increase.

Substitution	Cost/unit (R\$)	% Higher
Reference	0,88	-
15% RIP cement	0,92	4,35
20% RIP cement	0,94	2,13
50% RIP cement	1,02	7,84
30% RIP sand	1,3	21,54
50% RIP sand	1,58	17,72
70% RIP sand	1,87	15,51

### Results and Discussion

The figure 1 and table 1 shows the results of compression test and porosimetry.

**Compression resistance for all substitutions**



**Figure 1.** Compression resistance in the age of 28 days for sands and cement's substitutions.

**Table 1.** Results of porosimetry for mercury intrusion test.

Substitution	% Pores
Reference	8,47
15% RIP cement	4,79
70% RIP sand	8,29

### Conclusions

All substitutions exhibited a higher manufacturing cost, however, this is due to the way of obtaining the porcelain as a residue. Nevertheless, the mechanical strength results were very satisfactory, particularly 70% PEI as sand.

This shows that it is really possible and feasible to manufacture pavers with reused material.

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<sup>1</sup>ASSOCIAÇÃO BRASILEIRA DE NORMAS TÉCNICAS. NBR 9781 – Peças de concreto para pavimentação – determinação da resistência à compressão. Método de ensaio. Rio de Janeiro, 3 p., 2013.