

**UTILIZATION OF TEXTILE WASTE IN THE
MANUFACTURING OF PAVING BLOCKS
APPLICABLE FOR OUTDOOR SPORTS SURFACES**

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Degree of Master of Science

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Thesis submitted in partial fulfillment of the requirements for the degree
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DECLARATION

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Name of the Supervisor: Prof. S.M.A. Nanayakkara

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ABSTRACT

Synthetic fiber blended textile (polyester spandex) offcuts generated from apparel industry is considered as a waste; currently it is incinerated as fuel in the cement manufacturing process and remainder ends up in illegal dumps. In this study, use of textile waste especially polyester spandex as a raw material in building products was studied to help the apparel industry to manage textile waste in environmental friendly manner.

Accordingly, this research was focused on developing fabric embedded paving blocks applicable for foot paths and outdoor sports surfaces with improved shock absorption and water permeable characteristics.

In this study, optimum shredded fabric size and content was determined by testing cement paste specimens with shredded fabric for flexural and compressive strength. It was found that the shredded fabric pieces up to 10 mm in size enhanced the flexural and compressive strength due to reinforcing effect of fibers in the cement matrix and the optimum volume of fibers found to be about 26%. During the casting process of fabric-cement composites, it was found that use a viscosity modifying admixture helped to prevent segregation of fabric pieces. Furthermore a superplasticizer was used to improve the workability of mixes with low water/cement ratios. Paving blocks were produced with crushed rock fines as the filler material in fabric-cement composites.

Cast paving blocks with different mix proportions were tested for compressive strength, tensile splitting strength, abrasion resistance, skid resistance, water permeability, shock absorption capability and durability to evaluate its performance with requirements specified in SLS 1425, BSEN 1338 and BSEN 15330-1 to select the most suitable mixture. Based on test results, the optimum mix proportion was found to be: 26% of fabric, 25% of fine aggregate and 49% of cement by volume at 0.6 water/cement ratio with 0.3% of viscosity modifying agent (Mecellose) and 0.6% of superplasticizer (Hypercrete) by weight of cement.

Polyester spandex fabric embedded paving blocks complied with the requirements specified in BSEN 1338: 2003, (Concrete paving blocks- Requirements and test methods) As additional features, the developed paving block has the ability to reduce impact force by 20% which satisfying the requirement for outdoor sports surfaces for better foot comfort. Therefore, fabric embedded paving blocks can be recommended for outdoor sports surfaces. Furthermore, water infiltration capability of developed fabric embedded paving blocks is 100 times higher than that of conventional concrete paving blocks that can significantly lower the surface runoff during heavy rains.

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LIST OF ABBREVIATIONS

AAA	Artificial Athlete Apparatus
ABC	Aggregate Base Course
C	Cellulose based viscosity modifier
FV	Fabric content by volume
GDP	Gross Domestic Product
GSM	Grams per square meter
H	Poly-carboxylic ether based superplasticizer
MS	Manufactured Sand
USRV	Unpolished Slip Resistance Value
W/C	Water: Cement ratio