

APPENDIX C

Proof of Concept Scheme

PROJECT SUMMARY

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| Project Leader Name: Oliver Thomas | |
| Address: 79b Avenue des Marsouins, Morcellement de Chazal, Albioin | The information on this form may be made public. |
| Enterprise / Company / Institution: Green Block Sustainable Manufacturing Ltd | |
| Project Title: Investigating the use of PET Plastic Chips in Concrete Blocks | |
| TECHNICAL ABSTRACT (200 words or less) | Include Potential Commercial Applications |
| <p>The use of concrete blocks in Mauritius has made a strong hold due to its resistance to cyclonic conditions while providing aesthetic designs which the local construction industry has become well versed in. However, concrete blocks and concrete products in general carry a negative environmental index due to the extensive use of imported ingredients, which themselves are produced using non-environmental friendly processes, e.g. energy intensive processes to thermally decompose calcium carbonate into lime and carbon dioxide. Past research work has investigated the impact of replacing sand in the concrete mix, and in our local context, this can be likened to the substitution of either rocksand or 3/8 aggregate which are used in the fabrication of concrete blocks in Mauritius. The production of both rocksand and 3/8 aggregate involves energy intensive processes to break basalt stones. The transportation of the cement to Mauritius adds a further embodied energy component that worsens its environmental index. The potential to use plastic to reinforce concrete has been investigated to achieve different goals, e.g. to improve compressive strength, toughness and crack resistance. The incorporation of plastic into the concrete mix brings another advantage in terms of reduction in the percentage of the raw materials overall, and makes the end product more environmental-friendly provided the reinforcement materials themselves have a good environmental index. For example, use of glass reinforcement in concrete can be shown to be beneficial, but production of glass fibres themselves may not be environmental-friendly. This project aims to build on the findings in literature on the use of chips generated from waste plastic bottles in concrete blocks for the local market. The use of waste PET plastic bottles to produce chips is a low energy process (compared to rocksand and 3/8 aggregate production) and also helps in diverting plastic bottles from landfills. The need to research into the appropriate percentage of plastic chips in the concrete mix stems from the specificity of the concrete block mix for Mauritius as well as the influence of the concrete grade and plastic fibre fabrication method on the mechanical properties of the resulting product. This research aims to use existing test methods such as tensile and compressive strength to systematically devise experiments which will allow setting the parameters for various grades of concrete blocks with accompanying characteristics.</p> | |
| Key Words to Identify Research (8 maximum) | |
| Plastic chip integrated concrete blocks, Environmental index, sustainable construction, recycled materials. | |

The use of reinforcing chips in concrete is an active area of research, with the primary goal to customise the characteristics of the end product for specific conditions, e.g. reduction of cracks, better resistance to earthquakes and higher compressive strength. Recognising the ubiquitous use of concrete in the local construction industry and the significant use of plastic bottles in Mauritius, this project aims to apply proven test methods described in literature and in standards to investigate the suitability of including plastic chips into the aggregate mix for producing concrete blocks. The need for investigative research stems from the local specificity of the concrete mix used in Mauritius, and the second important factor being the fabrication method of the plastic chips as the size and morphology of the latter is a determining factor for the mechanical properties of the concrete block. The influence of other design parameters such as chip size and homogeneity of the plastic chip composition will also be investigated. The properties of interest will be the compressive strength of the concrete block, and whether it meets the minimum specifications needed by industry. The range of plastic chips used as a reinforcing material in the existing literature will be used as a baseline for the proposed experimental work of this project so as to limit the scope of the research to a level which can be completed within the time period and budget set, while leaving scope for future research works to refine the results. To the best of our knowledge, this is the first attempt of this type in the Mauritian context, and the research will provide useful outcomes to enable commercialization of such products with better environmental index and mechanical/thermal properties.