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PII: S2352-7102(16)30276-5
DOI: http://dx.doi.org/10.1016/j.jobe.2017.05.015
Reference: JOBE274

To appear in: *Journal of Building Engineering*

Received date: 5 November 2016
Revised date: 17 May 2017
Accepted date: 22 May 2017

Cite this article as: Kateřina Nováková, Karel Šeps and Henri Achten Experimental Development of A Plastic Bottle Usable as a Construction Building Block Created Out of Polyethylene Terephthalate: testing PET(b)rick 1.0 *Journal of Building Engineering,* http://dx.doi.org/10.1016/j.jobe.2017.05.015

Experimental Development of A Plastic Bottle Usable as a Construction Building Block Created Out of Polyethylene Terephthalate: testing PET(b)rick 1.0

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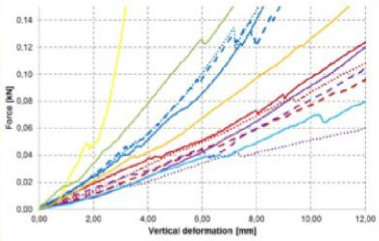
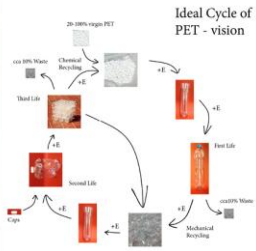
Abstract

Consumer goods PET (polyethylene terephthalate) bottles are usually thrown away after consumption. A huge number of them ends up somewhere in the environment. In many developing countries PET bottles are used in construction, mainly as fill-in material in concrete or adobe walls. Special purpose PET bottles have been designed and produced earlier that can be stacked in wall systems. In our research we produced a special PET bottle that fulfils the following conditions: (a) produced with blow-moulding technology; (b) good stacking features to eliminate or minimize binding medium between PET bottles; and (c) produced out of recycled PET. This special PET bottle resulted in a series produced and patented brick called PET(b)rick 1.0. We subjected the PET(b)ricks to various tests as done on regular building bricks: stress, pressure, and heat-freeze. PET(b)rick has reasonable resistance to stress greatly dependent on the filling medium, low resistance to pressure, and a small bandwidth of performance in heat-freeze. We have demonstrated stable and safe application of PET(b)ricks in small seating objects. PET(b)rick does not seem suitable as a self-standing wall, but can function as easily stackable fill-in material within a load-bearing structure.

Abstract



Keywords: PET(b)rick, reuse, polyethylene terephthalate*, recycling, architecture.*

1. Introduction

PET (Polyethylene terephthalate) is the source material for packaging, mainly for bottles with drinking consumables (water, milk, lemonades, and so on). From 2008 to 2013 there was an annual growth rate of plastic water bottle consumption of 6,2% According to [1], in 2013 PET takes up 39 billion units out of total 195 billion beverage packaging units sold in the US (20%) and only about 12% of it is being recycled. A large proportion of plastic bottles is discarded after first use. Recycling plastic still lags behind the production of plastic. In 2005 only 35% of all PET bottles in Europe were recovered [2]. According to the statistical data presented by Association of plastics manufacturers in Europe, there is a constant growth of production of plastics since 50 years. The world production of 299 million of tons was reported in 2013. According to same resource PET used for beverage containers represents 6,9% of plastic. [3]