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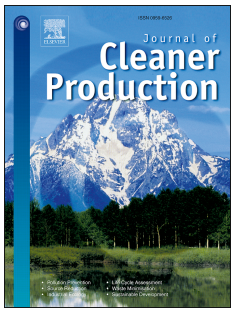

Maximum feasible use of recycled sand from construction and demolition waste for eco-mortar production - Part-I: ceramic masonry waste

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Maximum feasible use of recycled sand from construction and demolition waste for eco-mortar production - Part-I: ceramic masonry waste

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Abstract

Over half of all construction and demolition wastes generated in the European Union are classified as masonry waste, mainly composed of red ceramic brick and adhered mortar. The recycling of these types of masonry waste has been studied to a lesser extent than that of concrete waste. Currently a large quantity of masonry waste, or recycled aggregates from masonry waste, is stored in recycling plants with no recovery alternatives, especially that of the fine fraction. This paper analyses the maximum feasible replacement ratio of natural sand by recycled sand from masonry waste for mortar production. Cement CEM II/BL 32.5 N, commonly used in Spain for mortar production, in volumetric proportion cement-to-aggregate of 1:5, was used to manufacture an M-10 reference mortar. Five replacement levels were tested: 0 %, 25 %, 50 %, 75 % and 100 %. Both sands were sieved through a 4 mm sieve and used maintaining their original grading curves. The mortars were made with constant admixture content and the tap water content necessary to achieve a consistency of 175 ± 10 mm. The effect of recycled masonry aggregates on fresh and hardened mortars' properties was analysed. The evolution over time of mechanical strength and dry shrinkage was studied up to 180 and 203 days respectively. Trend lines were adjusted to better visualize the effect of the recycled sand on mortar properties and the results were compared with two previous works of the authors. In conclusion a maximum replacement ratio of 50 % can be achieved in mortar for indoor use, although specific studies to increase the workable life and decrease the shrinkage should be carried out before use.

Keywords: Construction and demolition waste; Fine recycled aggregates; Masonry mortar; Ceramic waste; Sustainable construction; Recycled aggregates.