Using Slag in Manufacturing Masonry Bricks and Paving Units

Yasser Korany[1] and Salah El-Haggar[2]

Abstract:

The iron and steel industry is, unfortunately, a notorious generator of waste. In Egypt, 136,000 imperial tons (600,000 metric tons) of Blast Furnace Slag (BFS), 68,000 imperial tons (300,000 metric tons) of Electrical Arc Furnace Slag (EAFS), and 45,000 imperial tons (200,000 metric tons) of Basic Oxygen Furnace Slag (BOFS) are generated annually. Such slag is not only hindering the use of land for more useful purposes, but it is also contaminating it.

This paper introduces green construction materials, whereby different slag types are proposed to replace coarse aggregates in producing cement masonry bricks and paving interlock units. Three different slag replacement levels were investigated, namely: 33%, 67%, and 100%. Masonry bricks were tested for bulk density, water absorption, compressive strength, and flexural strength. Paving interlock units were examined for bulk density, water absorption, compressive strength, and abrasion resistance. Heavy metals content and water leaching tests were also conducted for all slag types under investigation to assess the health impact of the proposed utilization.

The test results revealed that slag masonry bricks exhibited higher strength than the control group and fulfilled the ASTM strength requirements for both non load-bearing and load-bearing walls. All slag types resulted in paving interlock units having higher compressive strength than the control mix and much lower abrasion coefficient than the ASTM limit. The results of heavy metals content and water leaching tests showed that all slag types can be safely used in the proposed field of applications.

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[1] Ph.D. Candidate, Department of Civil Engineering, McMaster University, 1280 Main St. W., Hamilton, ON, Canada L8S4L7.
[2] Professor of Energy and Environment, Engineering Department, The American University of Cairo, Cairo, Egypt.