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**“UTILIZATION OF GRANITE PROCESSED WASTE IN BUILDING
MATERIAL”**

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award of the degree of

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IN

ENVIRONMENTAL ENGINEERING

by

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ABSTRACT

The technological development and the increasing rate at which raw materials are continuously transformed into industrial products result in environmental aggressions and waste generation, which affect public health. Besides creating negative environmental impacts, the accumulation of industrial residues also opposes sustainable development. In the last decades the environmental considerations appeared as a main concern for most of the developed countries and efforts to reuse residues have been undertaken. At present, the business conscience of recycling stimulates both small and big enterprises to look for alternative solutions aiming at recycling and adding commercial value to the final products taking into consideration the environmental legislation. Granite mining and process industry are one of the most promising business areas of the mining sector, with a mean growth in the world production of approximately 6 % per year in the last 10 years. Although this industrial sector generates a large amount of wastes in the form of a mud, basically composed of SiO_2 , Al_2O_3 , Fe_2O_3 and CaO , due to the sawing and polishing processes. Deposition in surface landfills is the most current destiny of these residues. These materials can be deposited as dry particles with large particle size range or as fine particles in aqueous environment, generally deposited by sedimentation. It is also common to deposit filter-pressed sludges in surface landfill. Although not considered dangerous, incorrectly planned deposition of these residues can cause accidents and environmental impact like, for example, the increase of the turbidity of the courses of water, a fact that provokes the reduction of light penetration leading to a reduction of photosynthesis, reduction of the productivity of lively organisms, reduction of the nutritious ones, alteration of the food chain and loss of aesthetic value. The dried mud is easily dragged by the wind and becomes harmful to humans and animals through its inspiration or to plants when deposited on their leaves. Since the transport and deposition of waste in landfills involve significant costs, its incorporation in other industrial processes could lead to the reduction of costs and open new business opportunities, while reducing the volume of extraction of raw materials, preserving limited natural resources. Thus, recycling of waste emerges as an opportunity to transform a considerable expense into profit or, at least, in the reduction of the deposition costs. The construction industry is the most indicated

technological activity sector to absorb solid wastes, such as the wastes from the granite industry, due to the large quantity of raw materials used by the sector as well as by the large volume of final products in construction. The use of wastes as alternative raw materials in the building materials, which embodies part of the construction industry, can contribute to diversify the offer of raw materials in the production of cement concrete, bricks, tiles and reduce the costs in a building.

Sustainable development involves reducing natural resource consumption by appropriate recycling. To reduce the amount of waste going into landfill and to safeguard the environment, efforts are being made for recycling different wastes and utilize them in valuable application. Granite and marble sawing powder wastes is widespread by-product of sustainable development. Around Mysore city many granite processing industries are finding difficulties in disposing granite powder waste generated during cutting, polishing of granite stones. Hence, present study mainly focuses on the potentiality of usage of granite sludge powder as a substitute to cement in cement mortar and cement concrete. Granite powder waste was collected from an industry located in Nanjangud which is 20 Km away from Mysore. The chemical characteristics of granite sludge powder used in the present study have been analyzed for SiO_2 , CaO , MgO , Fe_2O_3 etc., the results of which indicate that major composition of granite sludge powder consist of SiO_2 (50.22 %) followed by CaO (14.65 %). Granite sludge waste was grinded to cement fineness and blended with cement mortar as well as cement concrete as a substitute to cement of 0 %, 10 %, 20 % and 30 % by weight for varied water-cement ratio of 0.45 and 0.55 to determine the effect of varied granite sludge ratios on the compressive strength and workability of cement concrete. Compressive strength tests were conducted on masonry mortar with 1:3 control mix for different water-cement ratios 0.55 and 0.45. The percentage of granite sludge powder added by weight was 10, 20 and 30 as a partial replacement material to cement. The results of compressive strength test indicate that replacement of cement with granite sludge up to 20 % showed good strength. However, beyond 20 % replacement of cement with granite sludge was not encouraging. On similar lines experiments were conducted on cement concrete for mix M20 of proportion 1: 1.96 : 3.38 for 0 %, 10 % and 20 % replacement of cement by granite sludge powder, the results of which indicate that the workability decreased as the percentage of granite sludge powder increased and a substantial reduction in compressive strength was noticed at 10 % and 20 % replacement of cement by granite sludge powder.