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DEPARTMENT OF CIVIL ENGINEERING

DISSERTATION REPORT ON

"PERMEABILITY CHARACTERISTICS OF GEOPOLYMER CONCRETE"

(KSCST sanctioned Project)

Project Guide

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Abstract

The global use of concrete is second only to water. As the demand for concrete increases the cost of construction material increases, as well as the demand for Portland cement also increases. On the other hand, the climate due to global warming has become a major concern. The global warming is caused by the emission of green house gases, such as carbon dioxide (CO_2), to the atmosphere by human activities. Among the green house gases, CO_2 emissions, because the production of one ton of Portland cement emits approximately one ton of CO_2 into the atmosphere. In order to address the environmental effect associated with Portland cement, there is a need to use other binders to make concrete.

One of the efforts to produce more environmental friendly concrete is to replace the amount of Portland cement in concrete with by-product materials such as fly ash. Another effort to make environmental friendly concrete is the development of inorganic alumina-silicate polymer, called Geopolymer, synthesized from materials of geological origin or by-product materials such as fly ash that are rich in silicon and aluminium.

In our study the design mix of M-30, M-40, M-50 and M-60 chosen for 12 Molarity. The test specimens were 150x150x150 mm cubes, 100x200 mm cylinders heat-cured at 60°C in an oven for 24 hours and at ambient air temperature curing 28 days. The compressive strength of GPC was verified with Non Destructive Test methods like Ultrasonic Test, Rebound Hammer Test. The split tensile strength test was carried out for GPC cylinders. The durability of GPC was verified with RCPT set up in accordance with ASTM Standards. The curing time varied from 7 days to 28 days. Longer curing time improved the polymerization process resulting in higher compressive strength. Both curing time and curing temperature influence the compressive strength of geopolymer concrete. Freshly prepared geopolymer mixes were cohesive. Therefore compaction of mix could be achieved easily by vibration using a table vibrator. There was no bleeding which may be attributed to viscous. As the grade of the concrete increases, the RCPT charges decreases for different grades of concrete considered. Thus we can say that permeability is low in case of GPC. Fly ash based concrete is economical in case of mass concreting and is eco-friendly.