

COMPARATIVE STUDY ON GEO POLYMER CONCRETE BEAMS WITH ORDINARY PORTLAND CEMENT CONCRETE BEAMS

A Project Work submitted to



*Visvesvaraya Technological University
in partial fulfilment of the requirements
for the award of degree of*

**Bachelor of Engineering
in
Civil Engineering**

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2013-14

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ABSTRACT

Ordinary Portland cement (OPC) is an important material used in the production of concrete. However manufacturing of OPC has many disadvantages such as depletion of raw materials like Limestone, Clay etc. Each tone of cement releases an equal amount of carbon-dioxide. Hence it is not ecofriendly. Hence there is a need to develop alternate material for OPC. One such alternative is Geopolymer. The Geopolymer has several advantages such as reasonable strength gain in a short time, good volume stability, excellent durability etc.

Cement Concrete is used in all structural elements like beams, columns, slabs, footings etc. In the present study an attempt was made to know the behaviour of reinforced beams made out of Geopolymer concrete and comparison of results with reinforced beams made out of OPC concrete beams. The Geopolymer concrete beams and Ordinary Portland Cement Concrete beams was subjected to loading and flexural behaviour and shear behaviour was studied and compared.

Geopolymer concrete was prepared using alkaline solution in the place of water. Hence there was a need to know the chemical composition of reinforced bars in Geopolymer concrete beams. A comparative study on chemical properties of reinforced bars was done for both Geopolymer concrete beams and Ordinary Portland Cement concrete beams. Finally a comparative chart is made which gives flexural strength, shear strength and chemical properties of both Geopolymer concrete beams and Ordinary Portland Cement concrete beams.

The materials used in the project work are suitable as they give good results in the basic tests. The load at failure in flexure subjected to two point load test for Ordinary Portland cement concrete beams and Geopolymers concrete beams were 111.3kN and 151.7kN respectively. The flexural strength of Ordinary Portland cement concrete beams and Geopolymers concrete beams were 11.13kN-m and 15.17kN-m respectively which are higher than the theoretical strength of 8.78kN-m. The flexural strength of Geopolymers concrete beams was 26% higher than that of Ordinary Portland cement concrete beams. The maximum deflection observed was 5.9mm in Ordinary Portland cement concrete beams and 8.99mm in Geopolymers concrete beams.

The maximum load at failure in shear subjected to point load near support for Ordinary Portland cement concrete beams and Geopolymers concrete beams were 131kN and 187.67kN which are higher than the theoretical strength of 49.13kN. Further the shear strength of Geopolymers concrete beams was 30% higher than that of Ordinary Portland cement concrete beams. The chemical compositions of the reinforced bars were within the limit as per IS1786-2008.