



Mechanical and Durability Properties of Ultra-High Performance Concrete (UHPC): A Comprehensive Experimental and Numerical Investigation

Nilima Nilkanth Kale

Research Scholar, D Y Patil International University, Akurdi, Pune, India

Dr. Atul Kolhe

Department of Civil Engineering, D Y Patil International University, Akurdi, Pune, India

Abstract:

Ultra-High Performance Concrete (UHPC) is a cementitious composite material characterized by exceptional mechanical and durability properties, including high tensile strength, enhanced ductility, superior durability, and compressive strength exceeding 150 MPa. This study focuses on a comprehensive experimental and numerical investigation of UHPC behavior. Various mix compositions incorporating silica fume contents ranging from 20% to 30% were analyzed under different loading conditions. Numerical models were developed to simulate UHPC performance and to evaluate the influence of silica fume on mechanical and durability characteristics. The results demonstrate that the proposed modeling approach effectively captures the strength, ductility, and overall performance efficiency of UHPC materials.

Keywords:

UHPC, Compressive Strength, Steel Fibres, Durability, Chloride Penetration, Finite Element Simulation, Mix Design Optimisation.