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Visualization of Stress Patterns for Stepped Rectangular Specimens Using Experimental Photoelasticity Method and Finite Element Analysis

Om Prakash Sondhiya[1] and Roopesh Tiwari[2]
Department of Mechanical Engineering, Institute of Engineering &Technology, DAVV, Indore[1]
Department of Mechanical Engineering, SAGE University, Indore[2]

Abstract: *In the fields of mechanics and materials science, photoelasticity is a reliable experimental method that provides a visual evaluation and analysis of the distribution of stress in materials that are transparent or translucent. This non- destructive testing technique uses the special property of materials known as birefringence or double refraction to visualize stress on a model under load. The process involves building a physical model that mimics real-world structures, applying mechanical stress to the model, and carefully choosing a suitable photoelastic material that exhibits birefringence. The material undergoes birefringence when it is under stress, which causes changes to its optical characteristics. As a consequence, different stress levels are reflected in the pattern, which makes it easier to identify stress concentrations and possible failure areas and offers insights into how materials behave under varied circumstances. In the current study a photoelasticity unit was used to evaluate the stepped rectangular specimen under four different stresses. Next a comparison was made between the experimental analysis results and ANSYS simulation (Finite Element Analysis). Because of its intuitive user interface, the software functions as a virtual laboratory by enabling simulations with user-defined problem parameters that are tailored to the users circumstances.*

Keywords: Isochromatic and isoclinic fringes, Polarization, Photo elasticity, Polari scope, Stress, Jones calculus

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