

Stress Analysis of a Singly Reinforced Concrete Beam with Uncertain Structural Parameters

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Abstract

This paper presents the efforts by the authors to introduce interval uncertainty in the stress analysis of reinforced concrete flexural members. A singly reinforced concrete beam with interval values of area of steel reinforcement and Young's modulus and subjected to an interval bending moment is taken up for analysis. Using extension principle, the internal moment of resistance of the beam is expressed as a function of interval values of stresses in concrete and steel. The stress distribution model for the cross section of the beam given by IS 456-2000 (Indian Standard Code of Practice for Plain and Reinforced Concrete) is modified for this purpose. The internal moment of resistance is then equated to the external bending moment due to interval loads acting on the beam. The stresses in concrete and steel are obtained as interval values for various combinations of interval values of structural parameters. The interval stresses and strains in concrete and steel obtained using combinatorial solution; search-based algorithm and sensitivity analysis are found to be in excellent agreement.

References

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