Inelastic analysis of composite sections

Abstract

This paper describes the development of a numerical algorithm used for the inelastic analysis of composite sections subjected to combined axial force and bending moment. The algorithm is based on finding the strain distribution across the section for a given applied loads and mechanical properties of the materials. The application of algorithm is illustrated by analysing a reinforced concrete section. The stress–strain relationship adopted for the concrete is based on a non-linear monotonic model, which is capable of predicting both ascending and descending (softening) parts of the stress–strain curve. For the reinforcing steel, the relation assumed to be bi-linear elasto-plastic in tension and compression. The developed algorithm predicts the exact mode of strain distribution for elastic, plastic and elasto-plastic stages of behaviour. Newton–Raphson concept has been implemented to determine the strain distribution across the section. The algorithm can be used to analyse both regular and irregular cross-section geometry, different materials with single or multi-layered steel bars.