Curvature Ductility of RC Sections With and Without Confinement
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This work presents expressions of curvature ductility of reinforced concrete rectangular sections. The material stress-strain behaviour and the definition of ductility have been reviewed from the literature. A detailed parametric study has been carried out to observe the effect of various variables on ductility and moment carrying capacity of the section. Variables selected to incorporate in the expression of curvature ductility are (i) ratio of axial load on the section to the product of gross cross sectional area, and characteristic strength of concrete, (ii) ratio of amount of tension steel to the gross cross sectional area, (iii) ratio of amount of longitudinal compression steel to tension steel, (iv) volumetric ratio of transverse reinforcements, (v) ratio of core area to gross cross sectional area, and (vi) ten times characteristic strength of concrete to the yield strength of longitudinal steel. A linear regression analysis is carried out to obtain the statistical models of various variables versus ductility. Then the effect of different variables are combined together in a single expression of ductility by means of non-linear regression analysis. Four sets of expressions are proposed for unconfined two-sided reinforced, unconfined uniformly reinforced, confined two-sided reinforced, and confined uniformly reinforced sections. Each set contains three expressions for three different grades of steel namely: Fe 250, Fe 415, and Fe 500. The proposed expressions cover most of the reinforced concrete sections used in practice. The error lies within ±10% of the actual, which is adequate enough to be used in design without carrying out for detailed computations. A computer program is given along with flowchart, user’s manual, and program listing to compute moment-curvature relationship and curvature ductility of a RC rectangular sections.