

THE EFFECT OF THE RATE OF LOADING ON THE MOMENT-CURVATURE RELATION OF PRESTRESSED CONCRETE BEAMS

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Abstract

The report deals primarily with the effects of the rate of loading on the moment-curvature relation of prestressed concrete beams. The tests covered a wide range of loading rates, which necessitated different recording and loading techniques at different stages. The shortest loading time was 0.05 second and the longest 112 days.

The loading and recording equipments and the experimental procedure are described in some details. The experimental results are analysed and typical curves demonstrating the effect of the rate of loading on the moment-curvature relation are given. The dependence of ultimate moment, crackling strength, and curvature at rupture on the rate of loading are discussed. The effects of other factors on the moment-curvature relation were also investigated; the relationship was found to depend on the properties on the beam section.

A theoretical analysis is presented. Ultimate moments are expressed in terms of variables which depend on the rate of loading. The effects on the ultimate moment of varying these functions are considered. The theoretical analysis largely corroborates the experimental results. The ultimate moments of under-reinforced sections generally increase as the rate of loading increases but the increase is only significant at very fast rates of loading. For over-reinforced sections, ultimate moments vary with the rate of loading in such a way that there is a rate of loading at which the ultimate moment is a minimum.