

Flexural Strength Design of RC Beams with Consideration of Strain Gradient Effect

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Abstract : The stress-strain relationship of concrete under flexure is one of the essential parameters in assessing ultimate flexural strength capacity of RC beams. Currently, the concrete stress-strain curve in flexure is obtained by incorporating a constant scale-down factor of 0.85 in the uniaxial stress-strain curve. However, it was revealed that strain gradient would improve the maximum concrete stress under flexure and concrete stress-strain curve is strain gradient dependent. Based on the strain-gradient-dependent concrete stress-strain curve, the investigation of the combined effects of strain gradient and concrete strength on flexural strength of RC beams was extended to high strength concrete up to 100 MPa by theoretical analysis. As an extension and application of the authors' previous study, a new flexural strength design method incorporating the combined effects of strain gradient and concrete strength is developed. A set of equivalent rectangular concrete stress block parameters is proposed and applied to produce a series of design charts showing that the flexural strength of RC beams are improved with strain gradient effect considered.

Keywords : beams, equivalent concrete stress block, flexural strength, strain gradient

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