

Relation between Strength, Stiffness and Curvature in Reinforced Concrete Sections

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Objective

To show the relation between strength, stiffness and curvature in reinforced concrete sections

Introduction

The purpose of this virtual experiment is to observe the relation between the yield curvature, ϕ_y , yield moment, M_y , and flexural stiffness, EI_{cr} by conducting a parameter study of the moment-curvature response of circular and rectangular RC sections using the MC-Parameter simulation tool of the Virtual Laboratory of Earthquake Engineering.

Method

1. Go the MC-Parameter tool in the "Simulation Tools" section of the VLEE. Open "MC-Parameter: Circular Columns". (Remember that only registered user can use the tools)
2. Fill the parameter matrix by defining the properties of ten sections. The diameter, amount of reinforcement and axial load ratio should be varied among the sections.
3. Run the analysis and observe the results shown in figures 1 - 6 of the user interface.
4. Repeat steps 2 and 3 for Rectangular Columns and Beam sections
5. Answer the following questions and prepare a report with your findings
 - Is Stiffness independent of strength as assumed in FBD?
 - What are the main factors affecting the yield curvature?
 - Is it necessary to know the reinforcement of a section in order to compute the yield curvature?
 - If yield displacement of a RC element is found by double integration of the curvature profile at yield, can it be concluded that yield displacement is independent from strength and stiffness?
 - How the amounts of flexural reinforcement affect the strength and stiffness of the section?
 - Optional: Study Fig 5 and 6 to see under what conditions a direct relation can be established between material strain and curvature