Effects of the amounts of Flexural and Transverse reinforcements in the performance of RC sections

Vinicio A. Suarez

Objective

To show the Effects of the amounts of Flexural and Transverse reinforcements in the performance of RC sections

Introduction

In traditional force-based design, it is generally accepted that excess of reinforcement usually leads to a safer structure. The purpose of this virtual experiment is twofold: (a) to observe the influence of the longitudinal steel ratio in the strength, and ductility capacity of the section; (b) to observe the influence of the transverse steel ration in the strength, and ductility capacity of the section.

Method

1. Go to RC-Analysis in the "Simulation Tools" section of the VLEE. Open "RC-Analysis: Circular Columns". (Remember that only registered user can use the tools)
2. Define the section and material properties of the section you want to analyze.
3. Run the Moment-Curvature analysis
4. Record the section and material properties you entered along with the following parameters from the output:
   - Yield moment, M_y
   - Cracked Inertia, I_{cr}
   - Ductility capacity, μ_ϕ
   - Confined concrete strength, f'_{cc}
   - Ultimate confined concrete strain, ε_u
   - Longitudinal steel ratio, ρ
   - Transverse steel ratio, ρ_v
   - Axial load ratio, ALR
5. Repeat from 2 varying the amount of longitudinal reinforcement
6. Repeat from 2 varying the amount of transverse reinforcement
7. Repeat from 2 varying the amount of axial load

8. Optional: Repeat from 1 using Rectangular Column and beam sections

9. Answer the following questions and prepare a report with your findings

   - How is the ductility capacity of the section affected by the amount of longitudinal reinforcement?

   - How is the ductility capacity of the section affected by the amount of transverse reinforcement?

   - How are the shear strength and flexural strength affected by the amount of transverse reinforcement?

   - How are the shear strength and flexural strength and ductility capacity affected by the amount of axial load?

   - Can you conclude that putting more longitudinal reinforcement than needed will result in a safer structure?

   - What conditions make the shear strength curve to cross the moment curvature curve? What does it mean that both curves cross?