Appendix H

Finite Element Meshes Used for Effects of Cross Sectional Shape and Confining Material

Meshes are shown in this chapter in the same method as Appendix G. Black dots are shown at the location of all nodes. Thin lines indicate the outlines of the solid concrete elements. Thick lines indicate the presence of spring elements. Spring elements are used to represent longitudinal rebar, hoop bars, or FRP confinement.

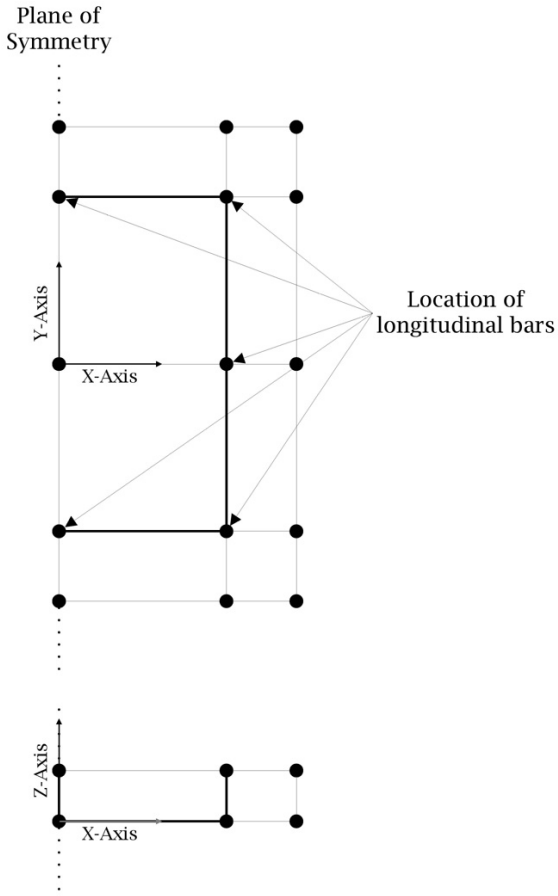

Figure H.1: Finite element representation of square column confined by steel hoops, used for comparison in Chapter 7.

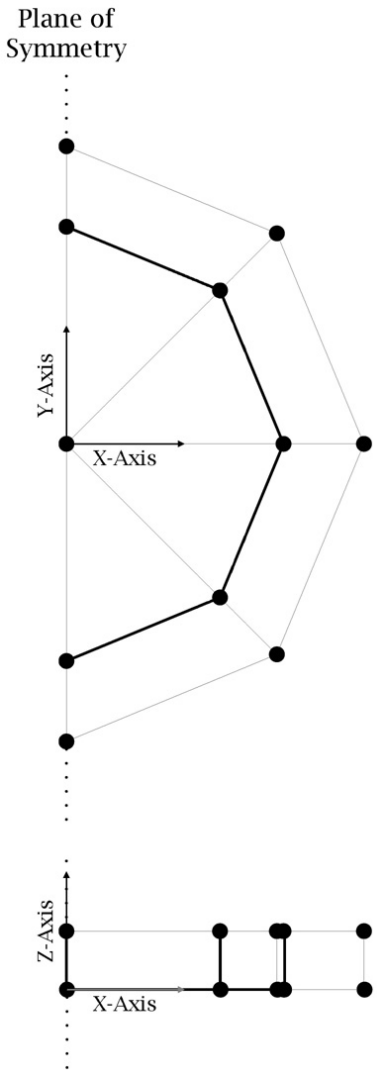

Figure H.2: Finite element representation of circular column confined by steel hoops, used for comparison in Chapter 7.

Four different hoop spacings are analyzed for each of the meshes shown in Figures H.1 and H.2. The figures depict the three inch hoop spacing. For each individual hoop spacing considered, the height of the mesh in the z direction is equal to half of the hoop spacing.

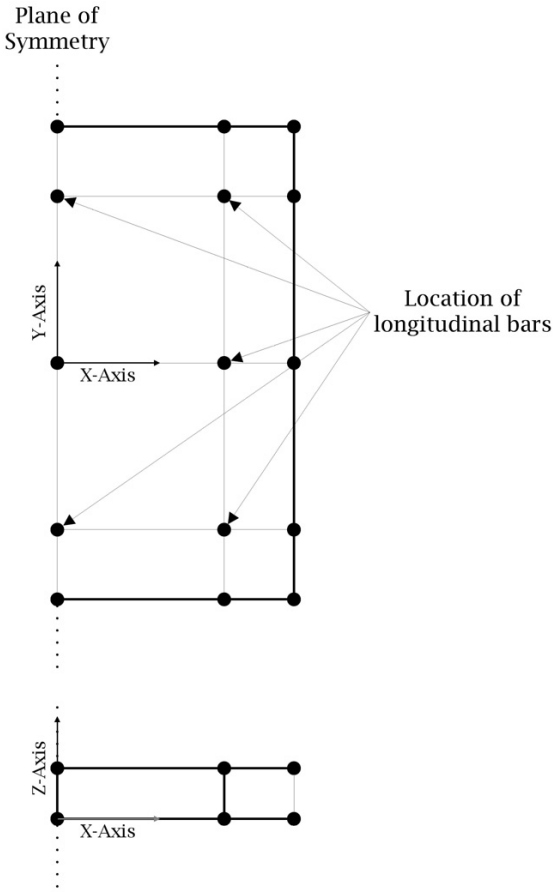

Figure H.3: Finite element representation of square column confined by FRP, used for comparison in Chapter 7.

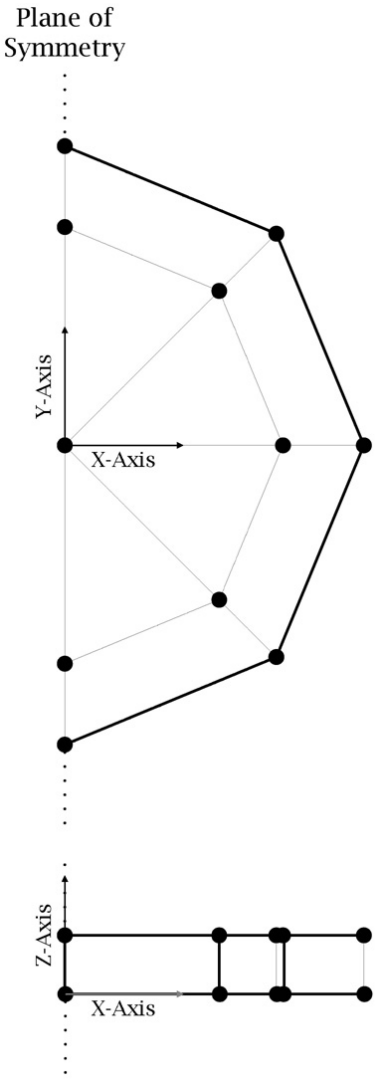

Figure H.4: Finite element representation of circular column confined by FRP, used for comparison in Chapter 7.

Mesh refinement is necessary when the neutral axis crosses the integration points at the edge of the compression side of the section. For the axial load-moment combined loading case with axial loads of 0, 140, 280, and 420 kips (0, 623, 1246, and 1868 kN) applied to the square cross section confined by FRP, the mesh shown in Figure H.5 is used to correctly capture the location of the neutral axis. This fine of a mesh is not necessary for any other section or load case.

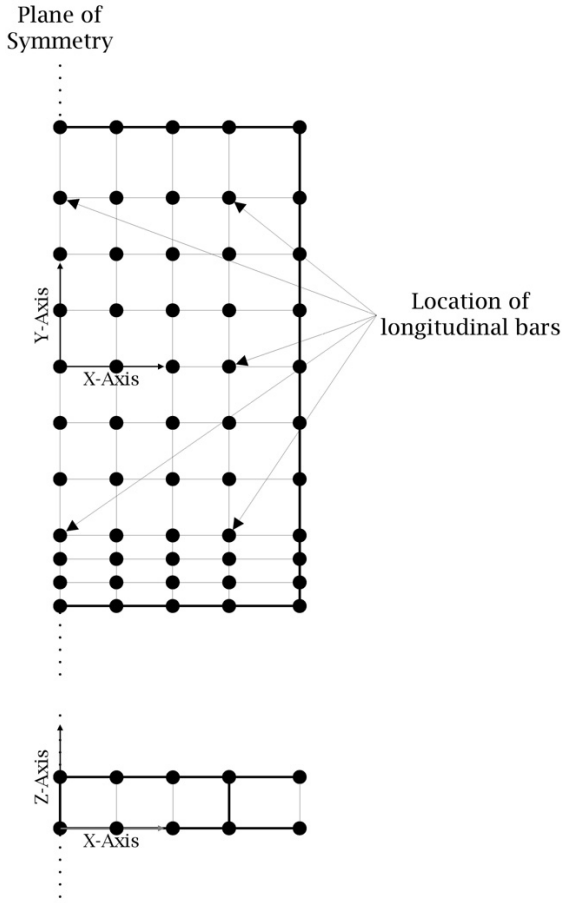

Figure H.5: Finite element representation of square column confined by FRP, used for special load cases of comparison in Chapter 7.