Appendix G

Finite Element Meshes Used for Comparisons to Tests on Reinforced Concrete Members

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 fiber reinforced polymer (FRP) confinement.

G.1 Chaallal and Shahawy (2000)

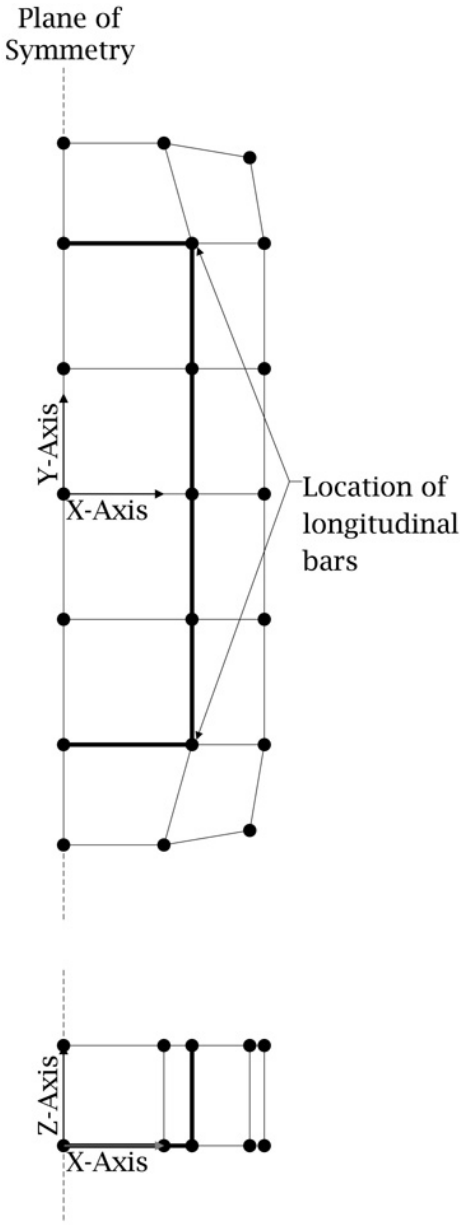

Figure G.1: Finite element representation of member tested in Chaallal and Shahawy (2000).

G.2 Harries and Carey (2003)

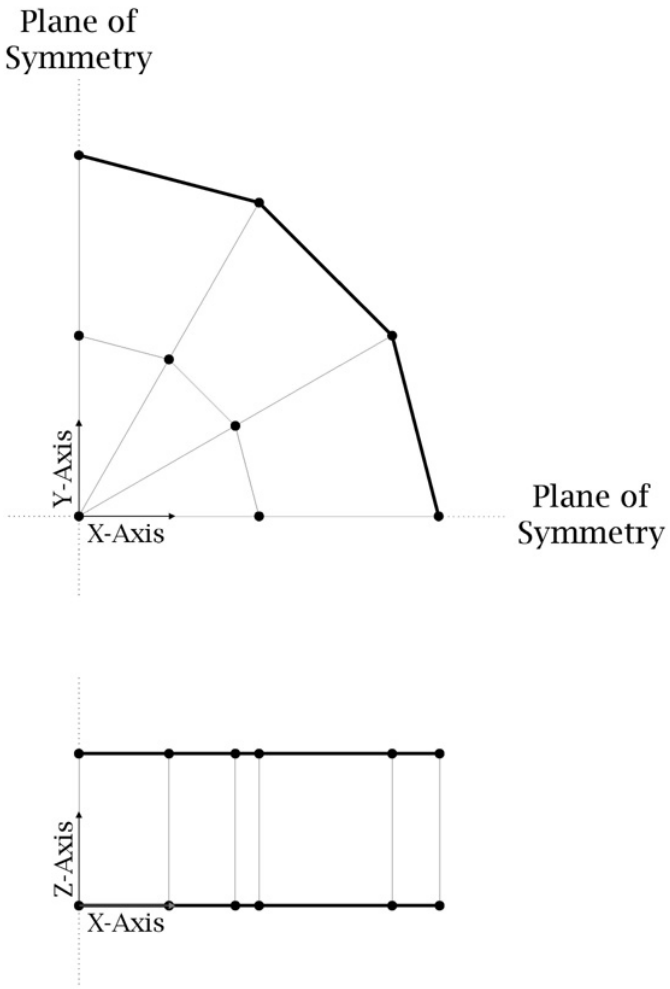

Figure G.2: Finite element representation of member with circular cross section tested in Harries and Carey (2003).

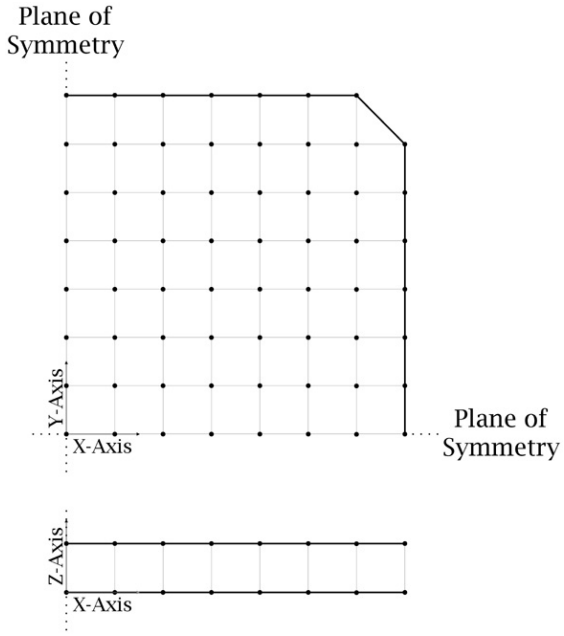

Figure G.3: Finite element representation of member with square cross section and 0.43 inch (11 mm) corner radius tested in Harries and Carey (2003).

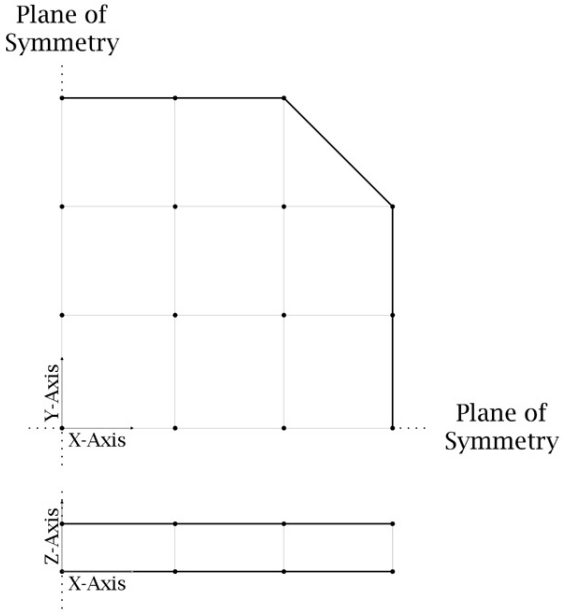

Figure G.4: Finite element representation of member with square cross section and 0.98 inch (25 mm) corner radius tested in Harries and Carey (2003).

G.3 Harries and Kharel (2003)

The mesh used for the members tested in Harries and Kharel (2003) is identical to the mesh depicted in Figure G.2.

G.4 Mander et al. (1988a)

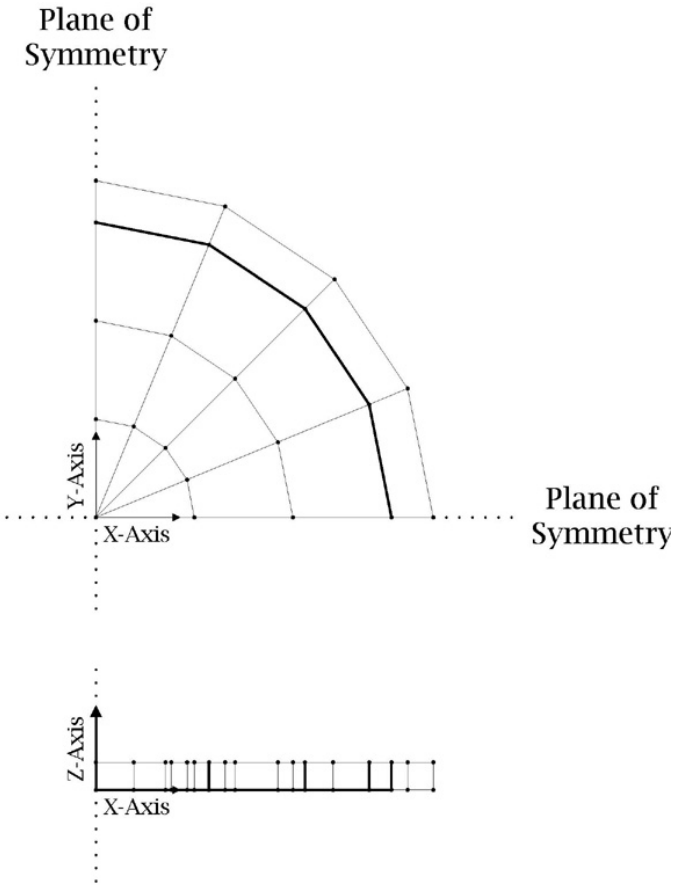

Figure G.5: Finite element representation of column 1 tested in Mander et al. (1988a).

Note that the longitudinal bars are redistributed for the mesh in column 1. Mesh refinement is necessary to preserve element quality. Thus, five longitudinal bars are in the mesh to represent the four that are actually in the column. The longitudinal bar area is defined to be equivalent and, therefore, the bars in the mesh are each smaller than the actual longitudinal bars in the column. However, this does not

affect performance of the column under pure axial load, which is the only load case considered for this column.

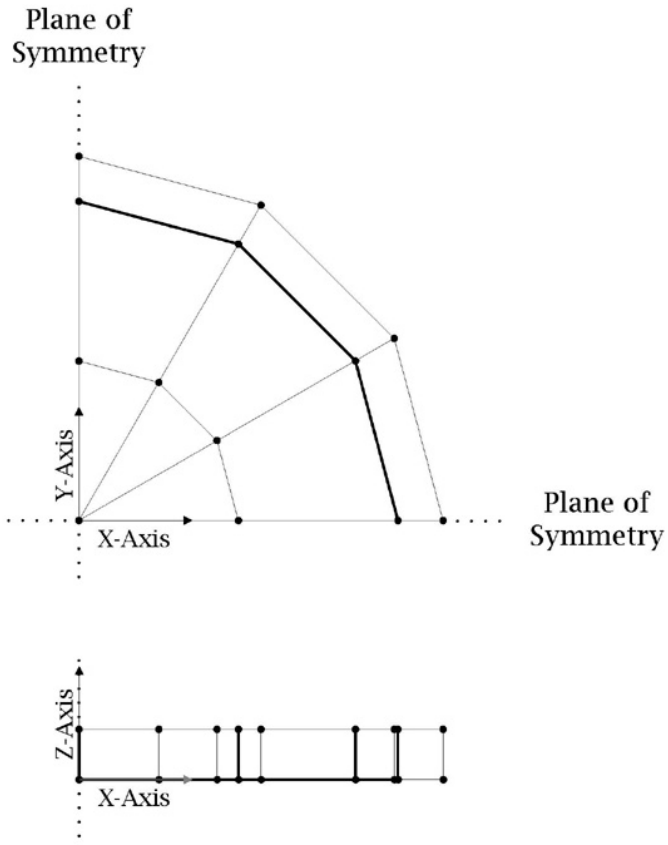

Figure G.6: Finite element representation of columns 2-4 tested in Mander et al. (1988a).

For each column, the height of the mesh in the z direction is defined as half of the hoop spacing. Thus, meshes representing columns 2 through 4 each have a different value for the height. Figure G.6 depicts the height for column 2. The mesh shown in Figure G.6 is also used to represent the unconfined column with the same height as column 4. The longitudinal rebar and hoop elements are removed for that case.

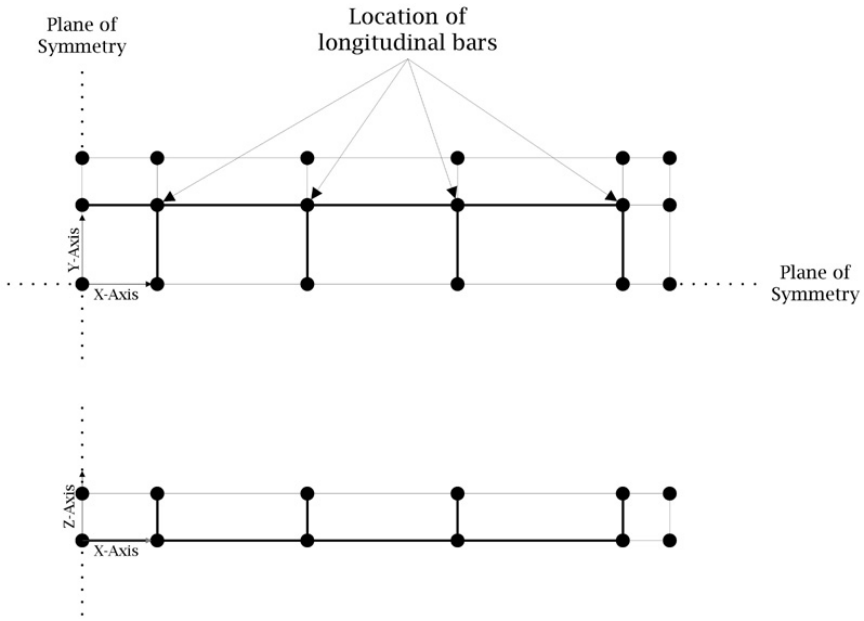

Figure G.7: Finite element representation of walls 1, 3, and 4 tested in Mander et al. (1988a).

Wall 3 has a hoop spacing equal to twice that of walls 1 and 4. The correct height of the mesh in the z direction (equal to half the hoop spacing) is used for each individual mesh. The height depicted in Figure G.7 is representative of the height for walls 1 and 4. The mesh shown in Figure G.7 is also used to represent the unconfined wall with the same height value as walls 1 and 4. The longitudinal rebar and hoop elements are removed for that case.

G.5 Scott et al. (1982)

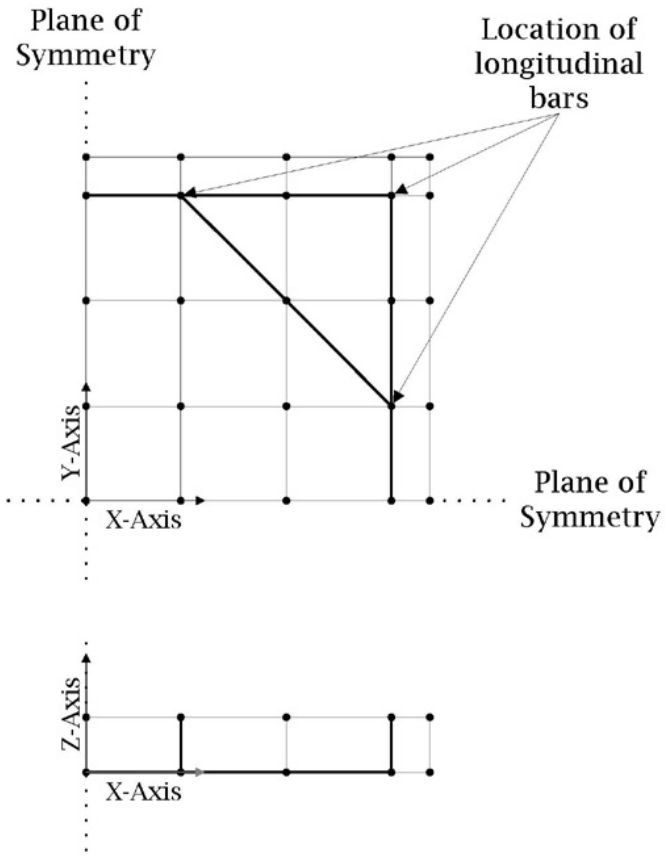

Figure G.8: Finite element representation of column 2 tested in Scott et al. (1982).

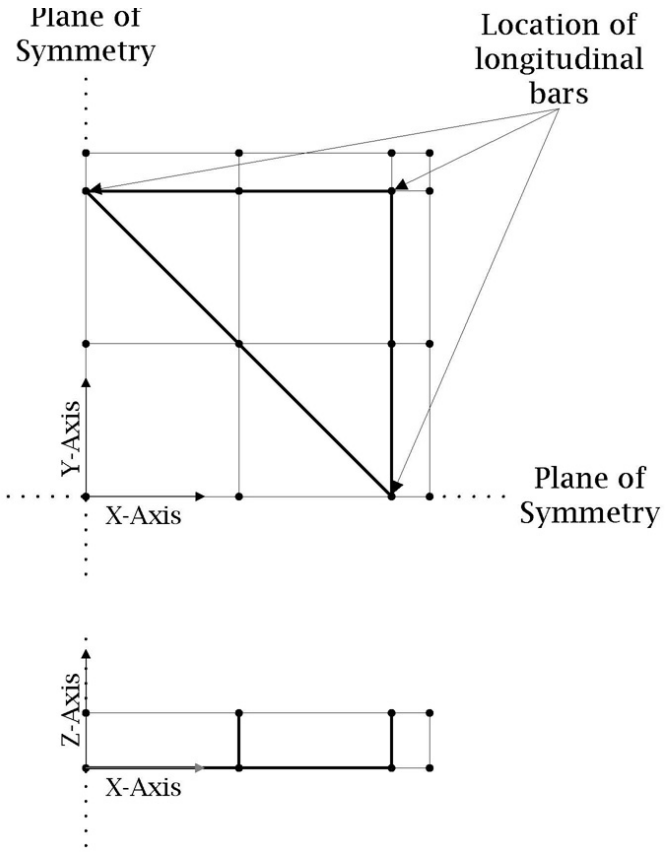

Figure G.9: Finite element representation of column 6 tested in Scott et al. (1982).

The mesh shown in Figure G.9 is also used to represent the unconfined column. The longitudinal rebar and hoop elements are removed for that case.