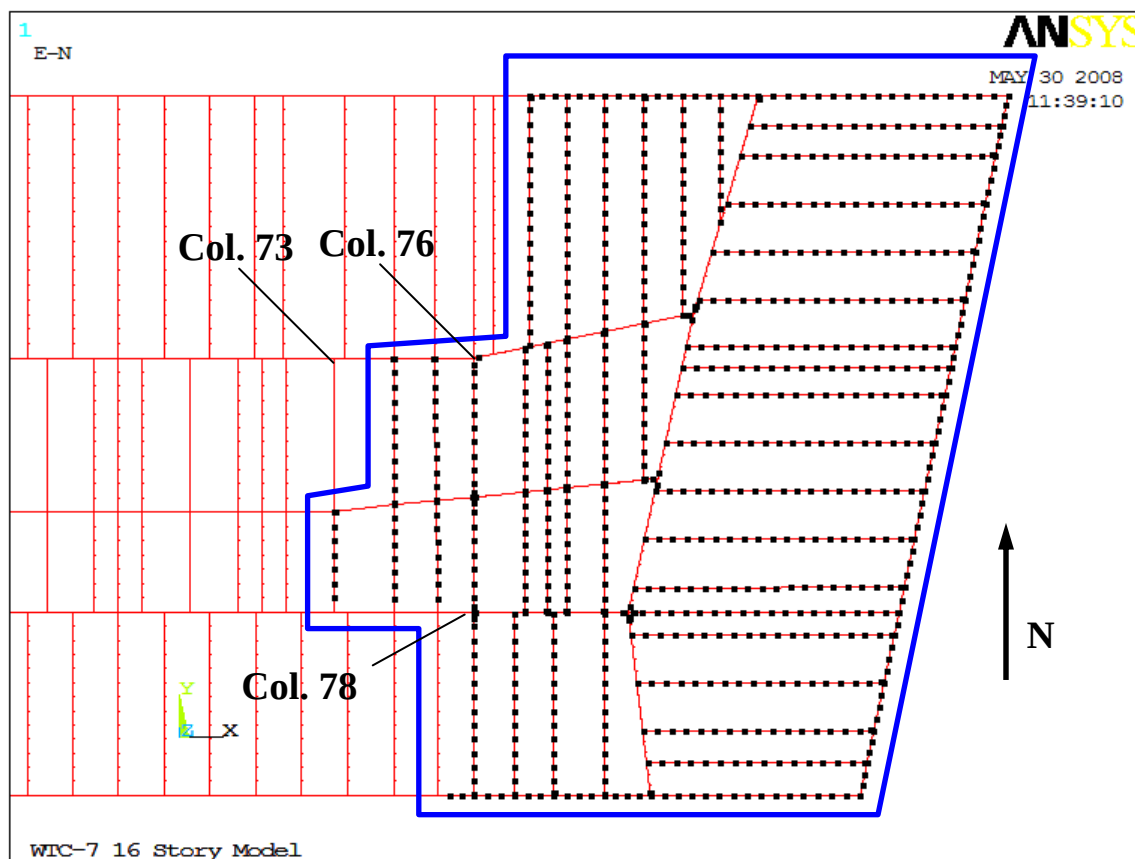


Framing connections outside of the selected area, or on other floors not subjected to fire, were modeled as either fixed or pinned, using typical modeling approaches. Connections were not modeled in the exterior moment frame, as no failures were observed there prior to the onset of global collapse. Column splices were also not modeled for interior columns, as the purpose of the ANSYS model was to accumulate local failures up to the point of buckling in a column. When column buckling appeared to be imminent, the analyses were continued in the LS-DYNA 47 story model.



Note: Black colored dots show the location of shear studs and connections modeled with break elements.

Figure 11–9. Area of the floor where connection failures were modeled.

Analytical Model for Fin Connections

The analytical model used for the fin connection is depicted in Figure 11–10. The girder is located on the right side in each diagram in Figure 11–10. The model shown has three bolts, but a fin connection in WTC 7 had up to 6 bolts. The connection model accounted for: (1) shear failure of individual bolts, (2) tear-out failure at each bolt location, (3) vertical block shear failure of the connection plate, (4) horizontal block shear failure of the web or connection plate, and (5) vertical and horizontal failure of the connection plate-to-column weld.