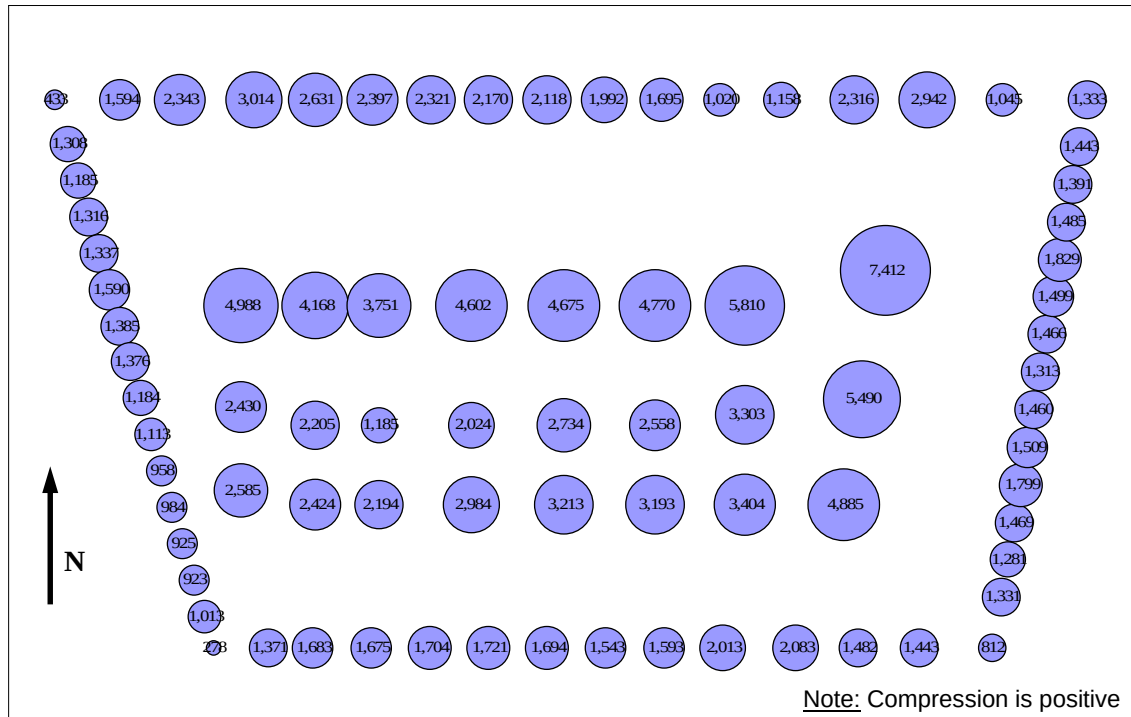




Summation of Column forces:

North: 32,500 kip	East: 19,300 kip
South: 21,100 kip	West: 16,600 kip
Interior: 87,000 kip	Total: 176,500 kip

Figure 11–29. Column forces (in kip) above Floor 8 at 3.5 h for Case B temperatures.

Building Response at 4.0 h

After 4.0 h of heating, there were considerably more failures of floor beams, girders, and floor slab sections at Floors 8, 10, 11, 12, 13, and 14. Fire-induced damage on Floor 9 was limited to the failure of three floor beams and several connections. Figure 11–30 to Figure 11–36 show the failures in the connections, beams, and girders. Figure 10–27 to Figure 10–40 in Section 10.3.3 show the temperatures of structural members.

Floors 8, 12, 13, and 14 had the most damage, with the greatest vertical deflections, axial stresses in beams and girders, areas of crushed slab, and areas of failed beams and girders. Floors 10 and 11 had girder and beam failures at the east side of the north floor area, near Column 79. The damage that occurred between 3.5 h and 4.0 h is described below.

Floor 8. Elevated temperatures in the north floor framing on Floor 8 ranged from about 550 °C at the east side to 300 °C at the west side. Axial stresses were compressive and remained around 20 ksi to 30 ksi in many of the core and north floor beams, but had increased to 52 ksi in some locations in the core near the failed floor framing. Figure 11–2 shows that the yield strength for the A572 Grade 50 steel used for the beams was 54 ksi at room temperature. As the temperature in these beams was less than 400 °C, the beam strength and stiffness was not reduced appreciably.