

Figure 10–4 shows the thermal loading on the 16 floor model at 12 different instants in time. Each sub-figure shows a view of the WTC 7 model from the southeast corner, similar to that shown in Figure 10–2. Each sub-figure shows the thermal state at the time stamp noted in the top right hand corner. The results are presented at half hour intervals, with the first sub-figure showing the thermal loading at 12:30 p.m.

Figure 10–5 shows the thermal loading on the 16 floor model as viewed from the northeast corner. Each sub-figure is similar to that shown in Figure 10–3. Thermal loading data are visually shown at half hour intervals, starting at 12:30 p.m. The concrete slab has been removed from the images to allow a more detailed view of the interior beams and columns.

The simulation results shown in Figure 10–4 and Figure 10–5 indicate that there was significant heating of the floor systems on Floors 7, 8, 9, 11, 12, 13 and 14.¹ The floors below Floor 7, Floor 10, and the floors above Floor 14 did not heat significantly due to the absence of fire activity. The exterior columns and core columns also did not heat significantly on the fire floors. The results indicated that there was intense heating of the floor beams in the northeast corner after 3:30 pm, especially those on Floors 7, 8, 11, 12 and 13.

In the following sections, FSI results are described on a floor-by-floor basis. The figures in each of the following sections are visual representations of the thermal state of that floor at specific instants in time.

Floor 7

Figure 10–6 and Figure 10–7 show the thermal response of Floor 7 at 12 different instants in time ranging from 12:30 p.m. to 6:00 p.m. at half hour intervals. The exterior and core columns above the 7th floor were subjected to fires on the 7th floor, while the columns below the 7th floor were subjected to the thermal environment on the 6th floor. The floor beams for the 7th floor were also subject to the thermal environment on the 6th floor. As indicated earlier in this Chapter, it is unlikely that there was a significant fire on the 6th floor, so the floor beams and the columns below the 7th floor would have been at about ambient temperature, and the concrete slab would have been subjected to heating only from a fire on the 7th floor.

Late in the day, the most intense heating was in the northeast sector and the center of the south wall, just east of where there was extensive debris damage.

The thermal response of the exterior and core columns was highly dependent on the thickness of the insulation, the shape and size of the column, and, to a lesser extent, on the fire growth and spread pattern. The simulated exterior and core columns were covered with a mean insulation thickness of 22 mm (7/8 in.), which resulted in only a small increase in the temperature of the columns. The maximum temperature in the exterior and core column simulations at 6:00 p.m. was 100 °C to 200 °C.

The 100 mm (4 in.) thick concrete slab was protected by 9.5 mm (3/8 in.) thick insulation on its bottom face. The top surface of the concrete slab indicated high temperatures, above 675 °C, during the course of the simulation. Since the concrete slab had low thermal conductivity, there was a sharp temperature

¹ In the graphics, a concrete floor slab is labeled with the number of its floor. The beams that support the slab are labeled with the number of the floor below. Thus, e.g., the 11th floor beams stay cool because there was no fire on the 10th floor, while the 11th floor slab is heated by the fire on the 11th floor.