

Within the substation were nine transformer vaults that housed the units that converted the 138 kV incoming power to 13.8 kV for transmission throughout Lower Manhattan. Access within the substation was provided by stairwells on the west side, in the center, and on the east side of the building. None of these stairs extended into the 47-story building above. In fact, concrete walls fully separated the substation from WTC 7.

1.2.3 The Structure

WTC 7 was an irregular trapezoid, approximately 100 m (329 ft) long on the north face and 75 m (247 ft) long on the south face, 44 m (144 ft) wide, and 186 m (610 ft) tall. The 47 story building contained approximately 200,000 m² (2 million ft²) of floor area. A typical floor was similar in size to a football field. The gross floor area was about 75 percent of that contained in the Empire State Building. As shown in Figure 1–3, about half of WTC 7 rose outside the footprint of the Con Edison substation.

Structurally, WTC 7 consisted of four "tiers."

- The lowest four floors housed two two-story lobbies, one each on the center of the south side of the 1st and 3rd floors. The north side of the 1st and 2nd stories was the Con Edison substation. The remainder of the north, east, and west sides of these four stories was conference space, offices, a cafeteria, etc.
- Floors 5 and 6 were mechanical spaces. Within the volume bounded by the 5th floor slab and the 7th floor slab were three transfer trusses and a series of eight cantilever transfer girders. As their names indicate, these steel assemblies distributed the load of the upper floors of WTC 7 onto the structural frame of the Con Edison substation and the structure of the lowest four floors of WTC 7.
- Floors 7 through 45 were tenant floors, all structurally similar to each other. The exception was a reinforcing belt truss around Floors 22 and 23.
- The 46th and 47th floors, while mainly tenant floors, were structurally reinforced to support special loads, such as the cooling towers and the water tanks for fire suppression.

The structural frame was designed to distribute the weight of the building (gravity loads) and resist (lateral) wind loads. The frame included columns, floor assemblies, spandrel beams, girders, and transfer elements.

From the 7th floor to the 47th floor, WTC 7 was supported by 24 interior columns and 58 perimeter columns (numbered 1 through 57, plus 14A, which was located near the south end of the west face) (Figure 1–5). Twenty-one of the interior columns (numbered 58 through 78) formed a rectangular building core, which was offset toward the west of the building. The remaining three interior columns (79, 80, and 81) were particularly large, as they provided support for the long floor spans on the east side of the building.

In the final design of WTC 7, the layout of the columns did not align with the building foundation and the Con Edison columns. Therefore, a set of column transfers were constructed within the volume bounded by the 5th and 7th floor slabs. These are depicted in Figure 1–6, along with the numbers of the columns to which they connected.