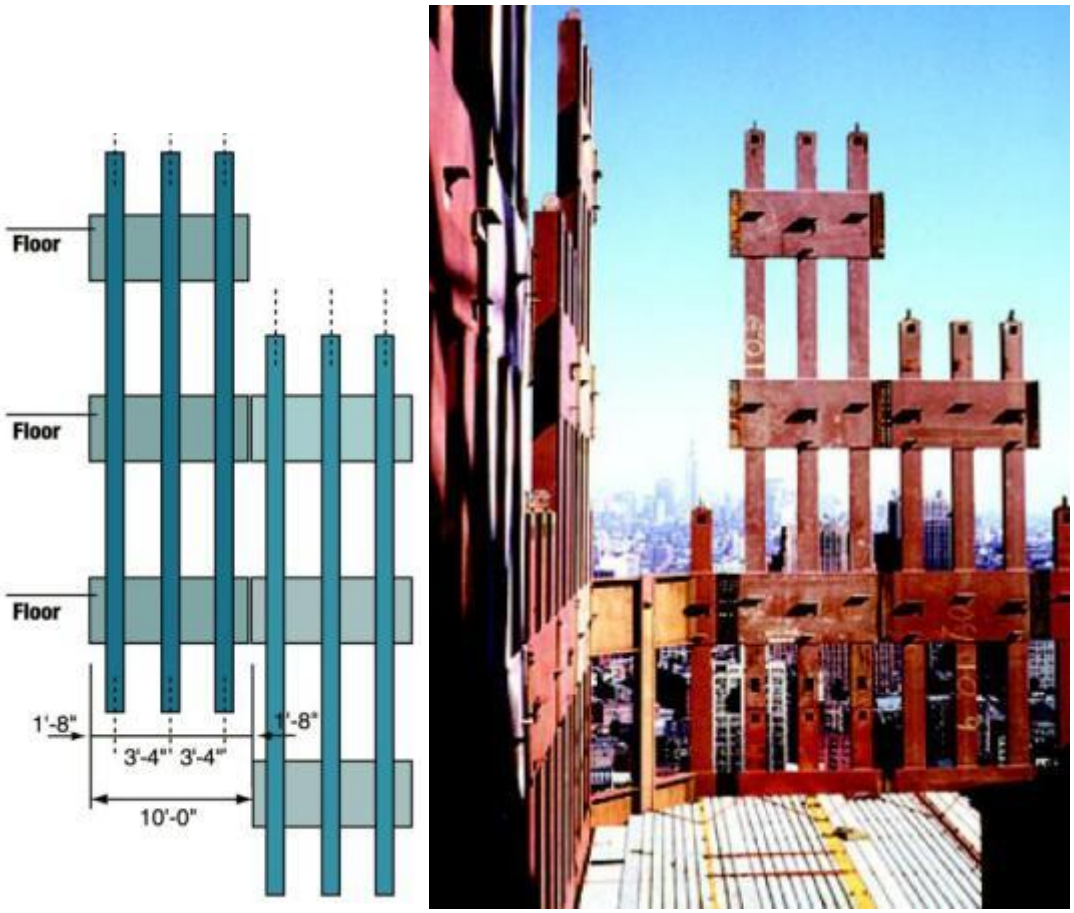
The Perimeter Walls

The Structural System of the Twin Towers

The towers' perimeter walls comprised dense grids of vertical steel columns and horizontal spandrel plates. These, along with the core structures, supported the towers. In addition to supporting gravity loads, the perimeter walls stiffened the Towers against lateral loads, particularly those due to winds. The fact that these structures were on the exterior of the Towers made them particularly efficient at carrying lateral loads. Richard Roth, speaking on behalf of the architectural firm that designed the Towers, described each of the perimeter walls as essentially "a steel beam 209' deep." [1] Regardless, it is clear that the core structures were designed to support several times the weight of each tower by themselves.

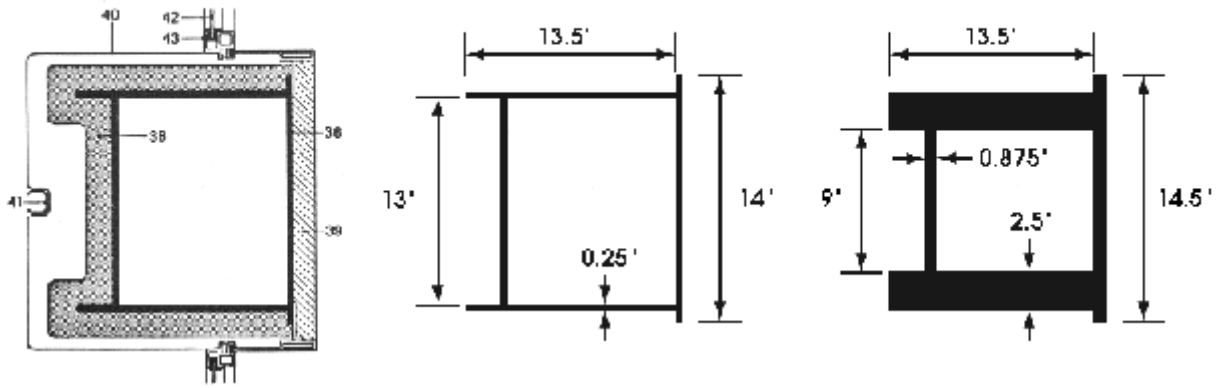


As the diagram and photograph illustrate, the perimeter wall structures were assembled from pre-fabricated units consisting of 3 column sections and 3 spandrel plate sections welded together. Adjacent units were bolted together: column sections were bolted to adjacent columns above and below, and spandrel plate sections were mated with adjacent sections on either side with numerous bolts.

There were 59 perimeter columns on each face of the towers, and one column on each corner bevel, making a total of 240 perimeter columns in each tower.

Like the core columns, the thickness of the perimeter columns tapered from the bottom to the top of the towers. The illustrated cross-sections represent columns near the top, and near the mid-section of the towers.

Horizontal section through an external column with window frame connection



This diagram shows horizontal sections of the Twin Towers' perimeter columns. The leftmost figure shows a section of a column, its enveloping insulation, and the aluminum cladding with window frame conections. The left and middle figures show sections of a column near a tower's tops, where the steel was thinnest. The rightmost figure shows section of a column in the lower part of a tower, where the steel was much thicker.

References

1. City in the Sky, *Times Books, Henry Hold and Company, LLC,* , page 134-136