The Floors

The Structural System of the Twin Towers

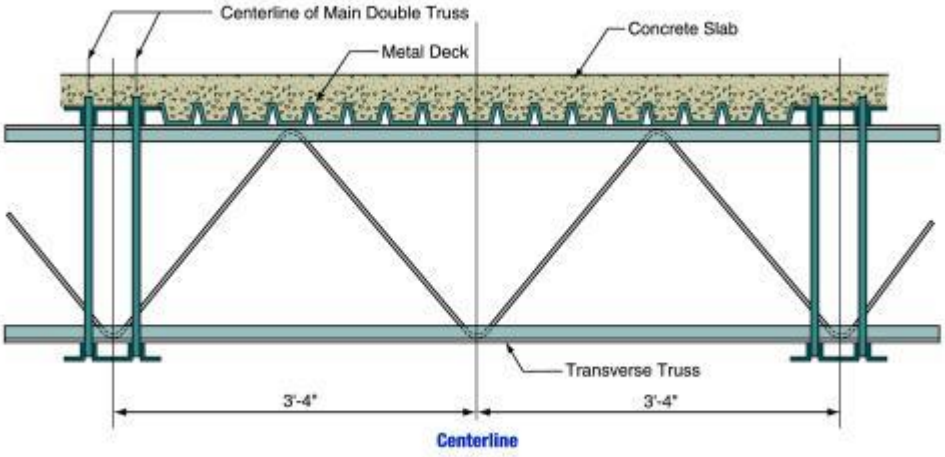


Figure 2-9 Cross-section through main double trusses, showing transverse truss.

This illustration from FEMA's report shows a section of the flooring system. The main double trusses, of which two are pictured, are perpendicular to the view plane.

The floors of the Twin Towers completed the structural systemwhose main elements were thecore structures and the perimeter walls. The floor diaphragms were annular structures that spanned the distance between the core structures and the perimeter walls, providing large expanses of uninterrupted floor space. The cores had their own flooring systems, which were structurally independent of the surrounding floor diaphragms.

The floor diaphragms consisted of lightweight concrete slabs poured onto corrugated steel pans, which were supported by trusses. Primary double trusses were interwoven with transverse secondary trusses -- a fact ignored by the truss failure theory. The primary trusses were 900 mm deep, and spaced on 2.04 m centers.

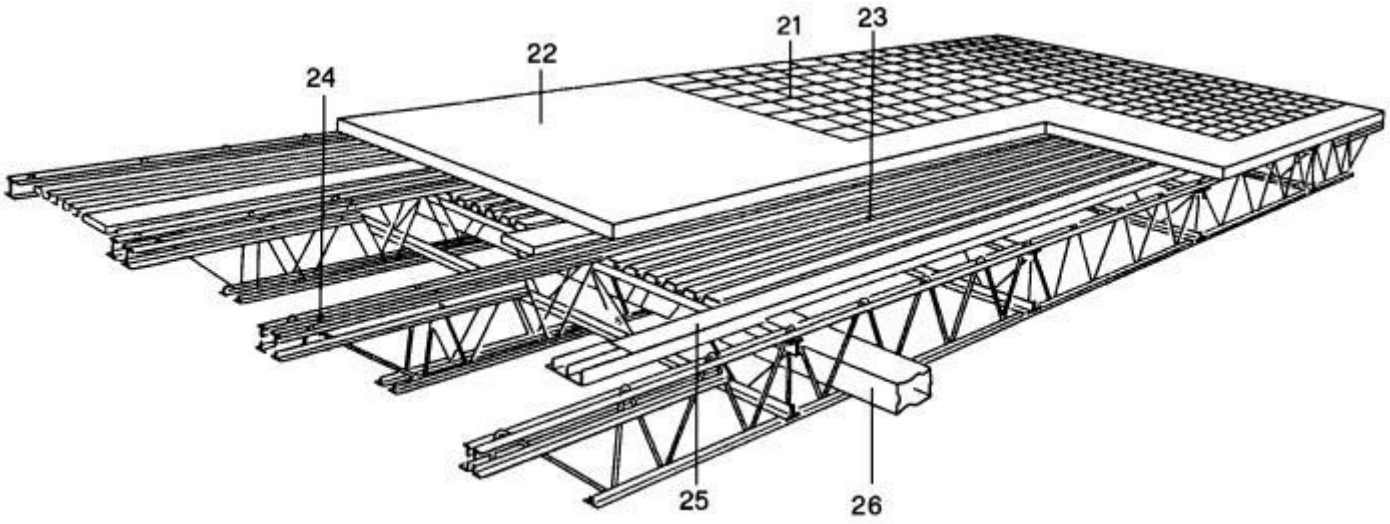
The 10 cm thick concrete slabs were apparently a lightweight form of concrete typically used in high-rises. Its density and exact composition remain unknown, but such lightweight concrete is typically 60% as dense as concrete used in roads and sidewalks. The floors were the only major part of these mostly steel buildings that contained concrete.

LINK

Some Floors Had More Than Trusses

FEMA's report implies that the floor diaphragms were supported only by the webbed trusses described here. It gives no indication of other structures that may have helped transfer the substantial lateral forces due to wind loading between the perimeter walls and core structures, and it provides no detail on the flooring system in the towers' cores, which were apparently supported by heavy steel I-beams. This idea that all the floors were undergirded only by trusses is a prerequisite to the truss-failure theory, which blames a chain-reaction of failures of the trusses for the building collapses. There is evidence, however, that certain floors had solid steel-frame support structures rather than light open trusses, such as the following passage from the*Engineering News-Record*:

On the 41st and 42nd floors, both towers will house mechanical equipment. To accommodate the heavy loads, the floors are designed as structural steel frame slabs. All other floors from the ninth to the top (except for 75 and 76, which will also carry mechanical equipment) have typical truss floor joists and steel decking.[1]



This illustration from Multi-Storey Buildings in Steel gives a three-dimensional view of a floor section.

LINK

Truss-to-Column Connections

Most variants of the truss-failure theory blame the detachment of the truss ends from the perimeter walls for the pancaking of floors, and eventual total collapse of the buildings. It has been asserted that only one or two bolts connected the truss ends to the perimeter walls. However, according to both of the official government reports, the truss ends rested on steel plates that were both welded and bolted to the top chords of the trusses and attached via bolted damping units to their lower bottom chords.

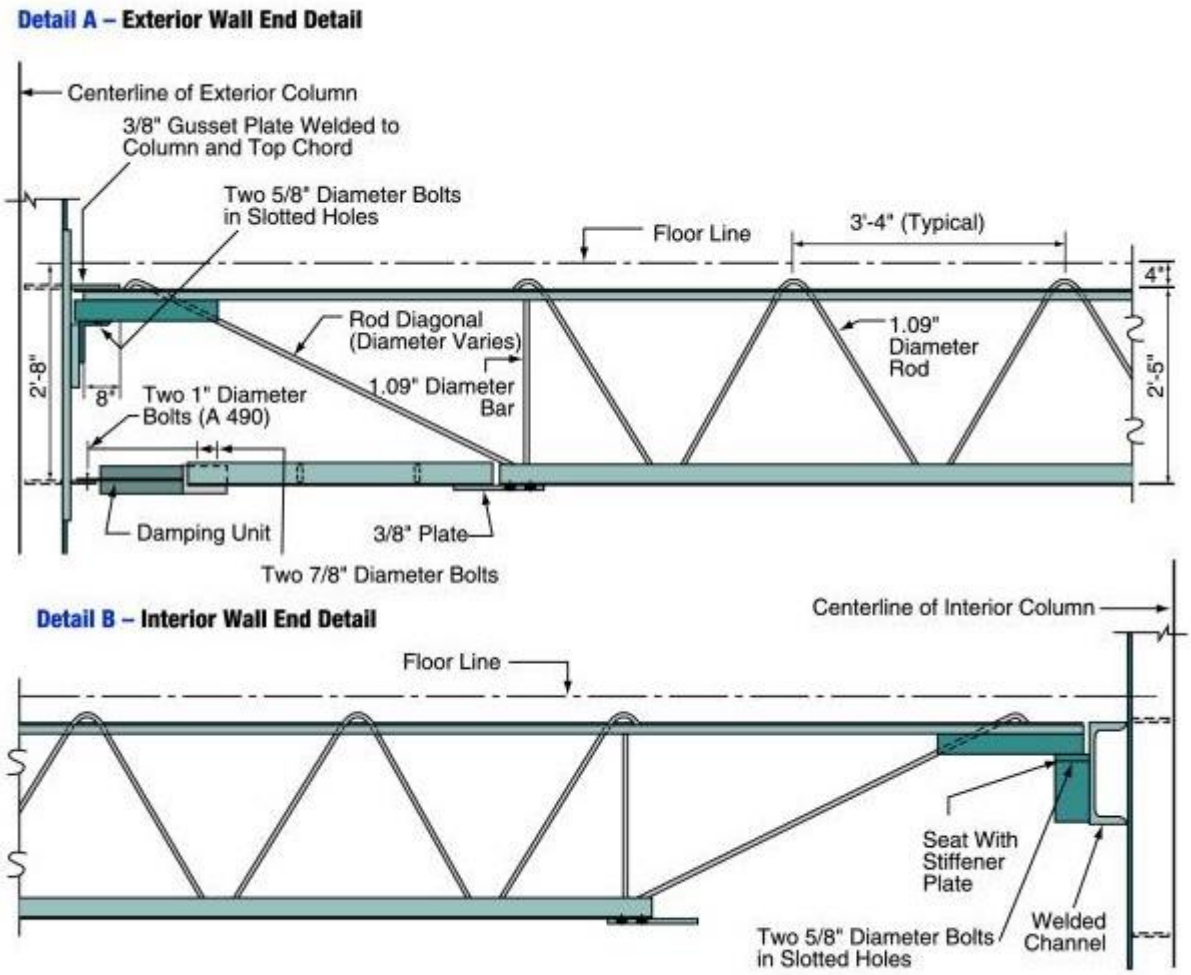


Figure 2-6 Floor truss member with detail of end connections.

This illustration from FEMA's report shows details of truss-to-column connections.

References

1. World's Tallest Towers Begin to Show Themselves on New York City Skyline, *Engineering News-Record*, 1/1/70