BIGGEST BUILDINGS HERALD NEW ERA

Twin 1,350-Foot Towers in Trade Center Discard Previous Standards

STRUCTURAL COSTS CUT

Exterior Walls Will Carry Weight — Space-Saving Planned in Elevators

By ADA LOUISE HUXTABLE

The 110-story twin towers of the World Trade Center, planned for downtown Manhattan by the Port of New York Authourity, may herald a new era of skyscraper design for the city that has made the big building its trademark. At 1,350 feet, the towers will be the tallest buildings in the world.

"We simply took the attitude that nothing ever done before in a high building was right," says Minoru Yamasaki, the Birmingham, Mich., architect responsible for the design of the Center in collaboration with the New York firm of Emery Roth & Sons, and Port Authority architects and engineers.

By questioning current practices, the architects arrived at new solutions for the two basic problems that have long plagued conventional skyscraper design — space-consuming elevator shafts and high structural costs.

An Economic Lesson

Since the golden age of the skyscraper in the twenties and thirties, when most of New York's dramatic spires were constructed, it has been generally accepted that to go any higher would be a losing proposition. That was the era of feverish competition for the title of "world's tallest building," when the 927-foot 40 Wall Street tower vied with the 1,048-foot Chrysler Building, racing each other to set new records, with the Chrysler Building resorting to the theatrical device of raising a secretly prepared stainless steel spire to gain top honors, in turn to be topped by the Empire State Building, at 1,250 feet.

The result was New York's famous skyline, and an economic lesson. The amount of space needed for the elevators required to service the tall building left virtually no rentable area on the lower floors, sharply cutting income in porportion to the building's height. And as construction costs rose and building methods remained unchanged, the price tag of a really big structure became formidable.

Height Problems Weighed

Topping the Empire State, the highest to date meant thinking again about construction .services and costs. The architects did just that, with he aid of the Port Authority's chief of he Trade Center Planning Division, Malcolm P. Levy, John M. Kyle, chief engineer, and its architectural and engineering staff. As a team, they have come up with innovations that may start the skyscraper's climb upward again.

"We tried to simplify construction," Mr. Yamasaki explains, "and make the economics more sound." What they have arrived at is a reversal of accepted skyscraper techniques.

The original breakthrough that made the tall building possible was the development of the interior steel skeleton, which carried the building's weight on its regularly-spaced columns and eliminated the load-bearing masonry walls, which had to be made proportionately massive at the base as the building rose. With the steel frame, walls became thin skins, or curtains. This structural revolution took place in Chicago in the Eighteen-eighties, and almost all

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Trade Towers to Herald a New Era in Building Design

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large buildings are constructed this way today.

The Trade Center towers go back to the load-bearing wall, but with a very big difference. There is no interior skeleton. The exterior walls will carry the building's weight, with the help of columns situated within the central elevator core. With the elimination of all other interior columns, there will be clear 60-foot spans from the core to the outer wall.

This will be done by placing most of the structural steel on the outside of the building, as a series of extremely close exterior columns on 39-inch centers. With their horizontal cross-members, these outside walls become an exceptionally strong, rigid, supporting web of metal, actually a Vierendeel truss. When the four walls are locked together, the closest comparison would be a square, hollow tube punched with holes for windows.

This load-bearing truss-wall will be erected in prefabricated sections, each unit probably two stories high and three columns wide. The exterior will be aluminum or stainless steel.

The floors are to be formed by a series of horizontal trusses. Prefabricated in 60-foot-by-13-foot sections, they will be easily and quickly lowered into place, will be erected in prefabricated will contain space for conduits, and will represent the building's greatest economy.

All structural wall and floor components are planned as modular, factory-made units, for maximum strength, economy and speed of erection, offering distinct advances in cost-saving and efficiency for large-scale building.

The rigid truss-wall makes possible the building's extraordinary wall height and floor area, 43,000 square feet a floor, and provides the wind-bracing necessary for the tall tower, withstanding winds over 100 miles an hour at the top.

Inside, space is freed by a special express-local system of elevators. Rather than start all elevators to all floors from the ground, necessitating deep, space-consuming banks, expresses would take passengers directly to sky lobbies on the 41st and 74th floors for local service within the building's two top zones.

The structural system also dictates the building's appearance. The close steel columns of the outside walls make slender, rising ribs, with narrow 22-inch windows between them -- a vertical metal cage rather than a glass box. Corners are strengthened for visual and psychological effect only.

Near the base of the building, at the level of the lobby ceiling, the narrow steel columns are replaced by wider ones, on nine foot-nine-inch centers, to make room for doors and larger areas of glass.

At this point, Mr. Yamasaki's taste for graceful and romantic detail, seen in his Federal Science Pavilion for the Seattle Fair and the new Gas Company Building in Detroit, is evident in the handling of the facing of the large columns and their transition to the smaller ones above.

The front surface is treated as three joined strips, which rise, divide and fan out to meet the three narrower columns in a delicately flaring, suggestively Gothic-Oriental arch that is a purely decorative emphasis of the changing structural module.

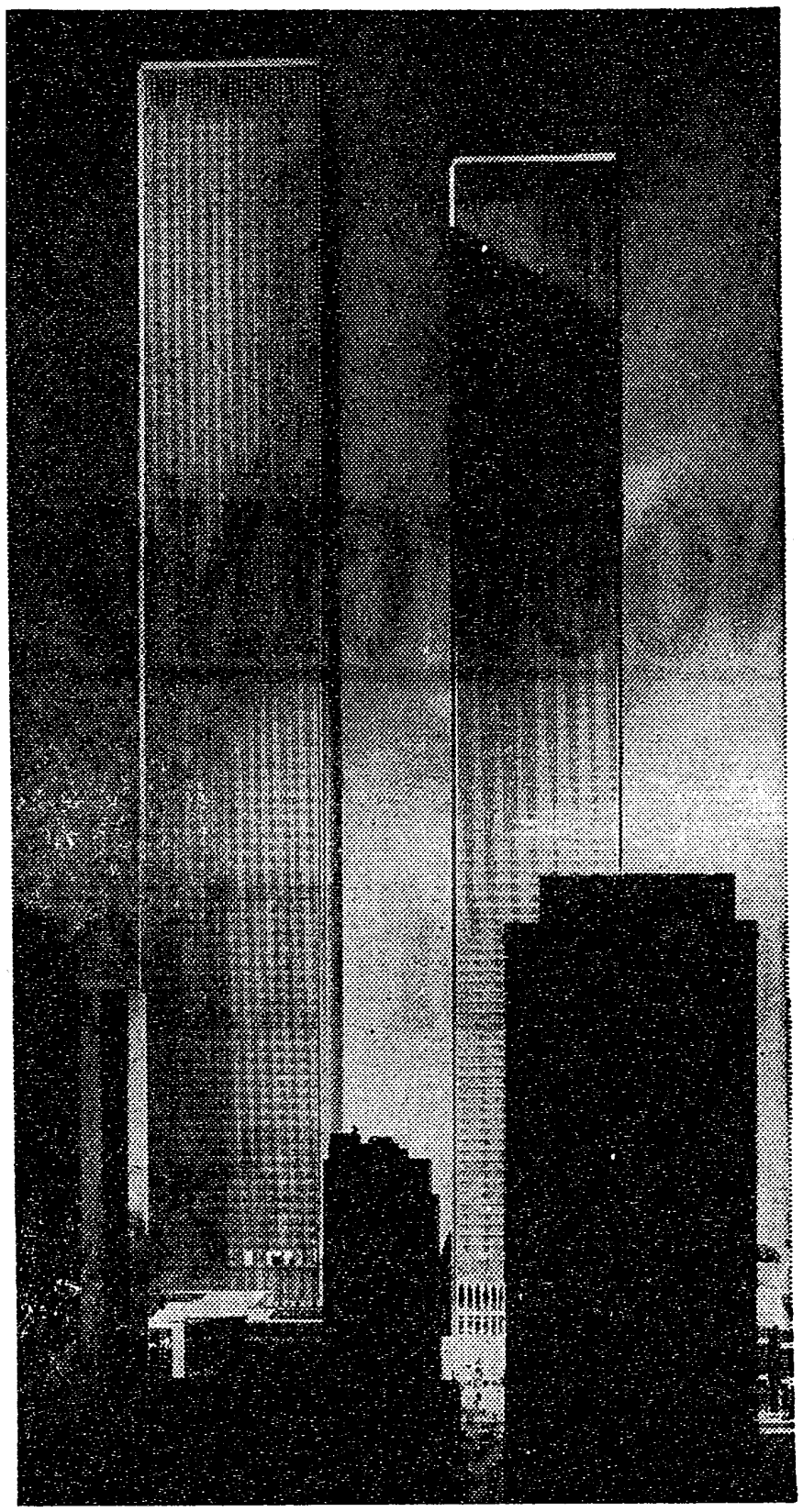
Experiments with the use of exterior truss-walls instead of interior skeletons have preceded the World Trade Center scheme and arousd considerble interest in the architectural world because of their potential for designs of unusual size and strength.

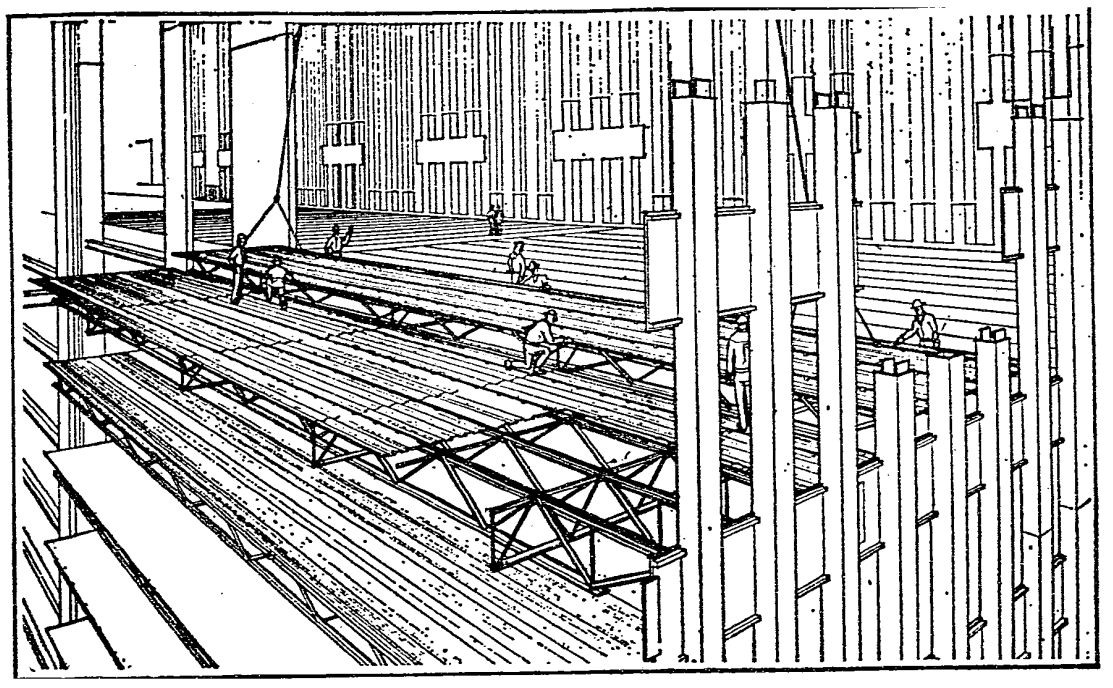
Two designs that have attracted attention are the Beinecke Rare Book Library at Yale by Skidmore, Owings & Merrill, with Gordon Bunshaft as design partner in charge, which uses the outside truss and interior core system, and I. M. Pei's design for the Earth Sciences Building at the Massachusetts Institute of Technology, which has exterior bearing walls of reinforced concrete.

According to Mr. Yamasaki, the World Trade Center design will be restudied and refined as work continues.

"If we do not improve the art of building through this project," says the architect, "we are not fulfilling our task."

The temperature in a room of a home should not vary more than about 2 degrees from the center of the room to its exposed corners, the American Furnace Company of St. Louis advises.





The sketch above indicates structural design of twin towers of World Trade Center, which will be built in Downtown Manhattan for Port of New York Authority. Floors will be formed by series of horizontal trusses.

Model of the project at left gives exterior view of 110-story buildings, designed by Minoru Yamasaki, architect, in collaboration with Emery Roth & Sons. The towers will rise to height of 1,350 feet.

At right, a view of towers' base showing the gradations of column widths. Windows between upper steel columns will be only 22 inches wide. Front surface is treated as three jointed strips, which rise, divide and fan out.