

New high-rise Akasaka Prince Hotel, Tokyo (Japan)

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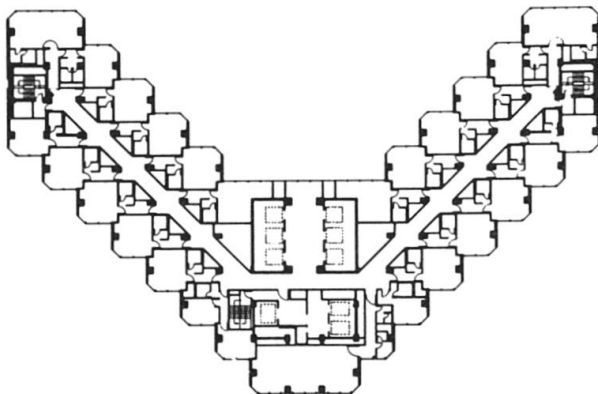


4. New High-rise Akasaka Prince Hotel, Tokyo (Japan)

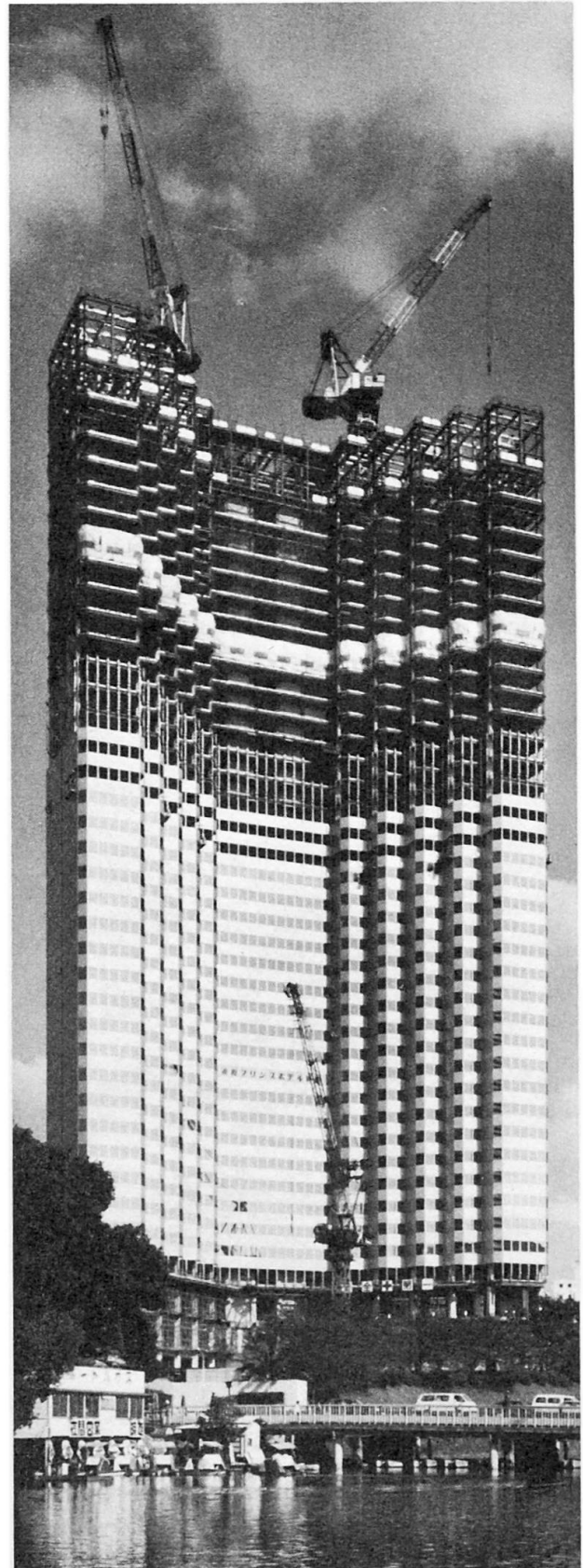
Owner: Seibu Railway Co.
Architect: Kenzo Tange + URTEC
Structural engineer: Arch. Design Div, Kajima Corp.
Contractor: Kajima Corporation
Working duration: Approx. 3 years
Opening date: 1983

General Description of the Building

Typical floor area: 1,485 m²
 Total floor area: 67,485 m²
 Stories: 39 stories above and 2 stories underground
 Building height: 139.8 m above the ground level
 Typical story height: 3.2 m
 Structural system:
 2nd basement fl.: Reinforced Concrete Structure
 1st basement fl. to 2nd fl.: Steel Encased Reinforced Concrete Structure
 3rd fl. and above: Steel Structure
 Exterior finish: Aluminum Curtain Wall with Mirror Glass
 Structural materials:
 Concrete: Approx. 25,000 m³
 Reinforcing Steel: Approx. 2,800 t
 Structural Steel: Approx. 8,500 t
 HISPLIT Tee-Stub: Approx. 500 t



Typical floor plan



The Hotel under construction

Dr. Kenzo Tange is the architect of this high-rise hotel building with the capacity of 761 guest rooms. This hotel is under construction at Akasaka, in the centre of Tokyo.

The most attractive feature of this hotel is the V-shaped building plan consisting of two wings and this plan has the great reflection on the exterior elevation of modern architecture. However, the unusual shape of this plan induced new problems for the structural engineer. Two of them are summarized hereafter :

- the design of the **structural system** to minimize the stress and deflection of building structure against earthquake forces and wind forces in all directions, to ensure a high resisting safety during earthquake and storm and not to spoil the residential comfort even in such circumstances;
- the use of a **construction method of steel frame** to simplify the connection of this complicated structural frame, in three dimensions, to raise the productivity of yard fabrication, to simplify the erection at the job-site and to ensure high quality control with minimum efforts.

Design and construction

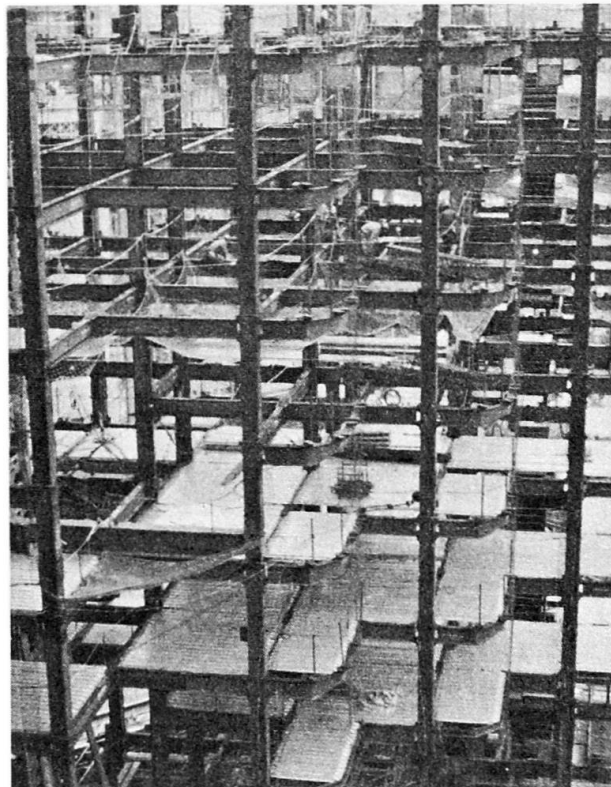
The **structural system** employed in this building is a combination of rigid steel frame (4.0 m bay x 4.0 m bay) and precast concrete shear walls (slitted shear walls) that are located at central core portion and at the edge of each wing to minimize the torsional deflection of the building.

The slitted shear walls above mentioned, in case of this building, bear 30 to 50 % of horizontal force due to earthquake and storm.

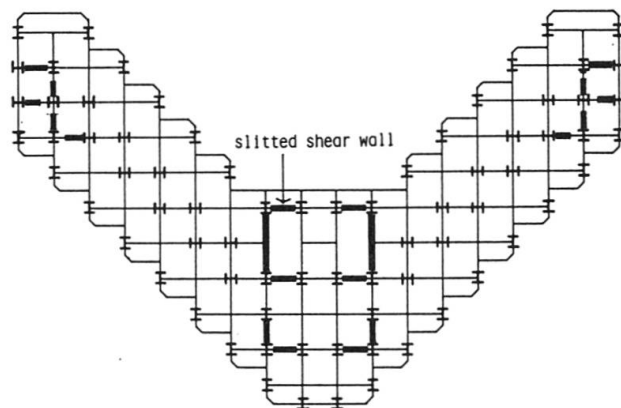
The safety of this structural system against earthquake or storm was studied and confirmed by a three dimensional elasto-plastic analysis program developed by Kajima Corporation.

The **construction method of steel frame** employed in this building is the prefabrication method by means of HISPLIT Tee-Stub at the column-girder rigid connection. Employing these simplified connection details, steel fabrication in the yard was reduced to the minimum and at the same time erection speed at the job-site was raised drastically. This HISPLIT Tee-Stub is designed for a most idealistic shape and dimension to raise the joint efficiency nearly to the maximum. It is manufactured by Hitachi Metals, Ltd. on a mass production basis for the great need from the middle and lower storied steel frame construction in Japan now. A great amount of studies for the theoretical analysis and full-size scale strength tests have been carried out to confirm the strength and ductility of this kind of connection. This construction method was employed in the project of the trade center building in the German Democratic Republic (Internationales Handels- und Einkaufszentrum) that has 25 stories above and one story basement.

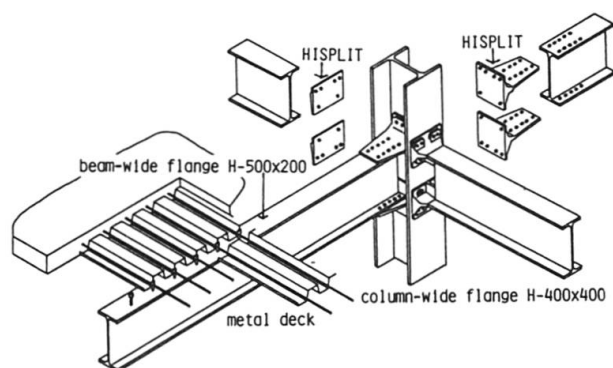
(K. Sato)



View of the steel frame system



Framing plan



Structural system