



## Ultra High-rise Building with High Seismic Performance and Dampers Concentrated on Specific Stories

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### Summary

In recent years, frequently the plan and cross-sections of ultra high-rise buildings in Japan have become more complex associated with diversification of use. Also, frequently the lower levels include an atrium space or similar in order to function as public space.

The Yomiuri Shimbun Tokyo Headquarters Building has been designed as a comfortable space with extremely high seismic performance, with a rational structural scheme for a building as described above.

### 1. Introduction

This building has 3 stories below ground, 33 stories above ground, 2 penthouse levels, and has an L-shape consisting of a high-rise volume of height about 200 m and a low rise extension volume of height about 70 m. (Fig. 1)

The entrance and hall are provided in the low rise part, which is designed in an open scheme provided with several atria. The offices are provided from the 7th floor upwards, with a highly flexible office space.

The structural scheme includes steel plate seismic walls that remain virtually elastic during a major earthquake provided in the 1st to 7th floors where there are many atria, thereby forming a stiff base in which seismic braces are provided, and above this viscous seismic walls are provided concentrated conforming to the building scheme and the façade scheme up to the 14th floor. (Fig. 2)

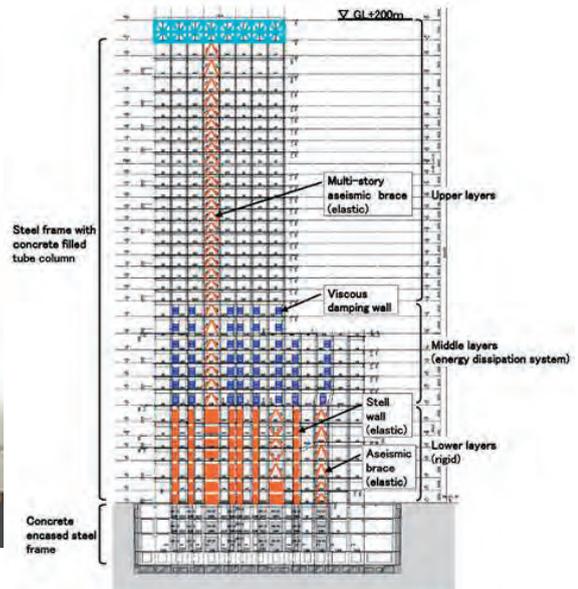


Fig. 1 Image of the building      Fig. 2 Outline of typical structural system

Normally, the building plan shape becomes smaller in the building height direction, so in the part where the stiffness is greatly reduced the response acceleration during earthquakes tends to increase. However, in this building a scheme has been adopted in which the energy absorption is concentrated in the 7th to 13th floors where the stiffness suddenly changes, thereby realizing a more economical and more rational building that is integrated with the architectural scheme. Also, the response of the higher floors is smoothed by the use of elastic central pillars using seismic braces from the 7th floor to the RFL, and by providing a shear deformation type structure (predominantly bending deformation of beams and columns), a scheme is provided in which the shear force during an earthquake is effectively distributed.

As described above, the Yomiuri Shimbun Tokyo Headquarters Building is an example of ultra high-rise building for multiple uses that clearly applies a structural scheme with dampers concentrated on specific floors. (Figs. 3 to 6)



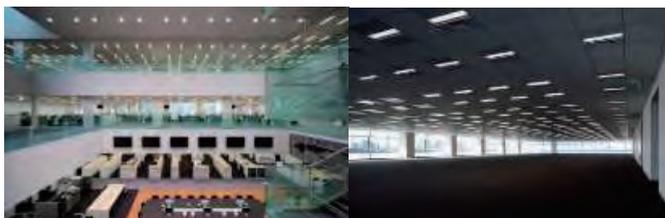
*Fig. 3 Characteristic external appearance and high aspect ratio*



*Fig. 4 Open atria*



*Fig. 5 Space and 2 halls*



*Fig. 6 Open and highly flexible occupied spaces*