Advanced Technologies Applied in Obayashi Technical Research Institute

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Summary

Towards further development of the seismic engineering, two new buildings were constructed at the Obayashi Co. Technical Research Institute located in a suburb of Tokyo. The buildings incorporate the following three advanced seismic technologies.

*Active base isolation system

*Friction slip damper with two levels of slip force “FSD2”

*Ultra high strength steels (780 MPa and 1000 MPa)

Keywords: active base isolation; ultra-high strength steel column; friction slip damper; friction slip damper with two slip force levels

1. Introduction

Advanced seismic technologies are applied to the newly constructed two buildings, which are parts of Obayashi Co. Technical Research Institute. One is the technical research centre “Techno Station” The other is the open laboratory “OL2”.

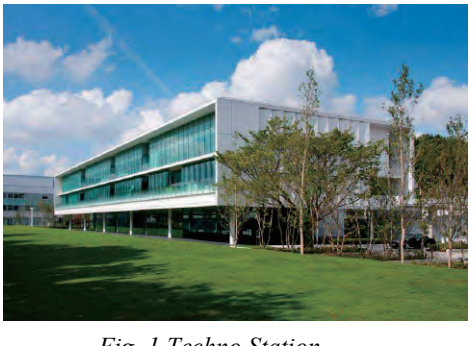


Fig. 1 Techno Station

Fig. 2 OL2

2. Active base isolation system

The absolute vibration control is an active vibration control method for base isolated structures to stay in the absolute space and to have vibration free environment, by applying control forces through actuators during earthquakes. This control includes feed forward control, which applies counter force of the input ground motion, and feedback control, which adds absolute damping to the structural system. This system is applied to the real full scale building “Techno Station” for the first time in the world.

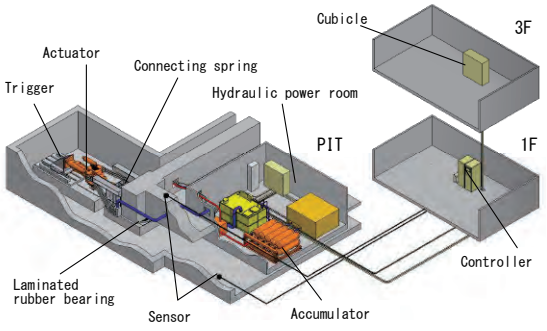


Fig.3 Active base isolation system

3. Friction slip damper with two slip force levels "FSD2"

FSD2, installed in OL2, provides two levels of slip force. When the first slip force level is set for moderate earthquakes and the second for severe earthquakes, FSD2 could slip under both moderate and severe earthquakes with the optimum slip force, and thereby improves earthquake energy consumption.

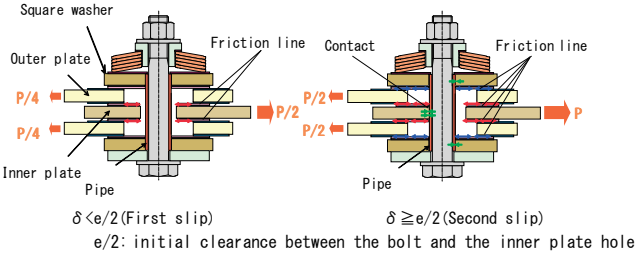
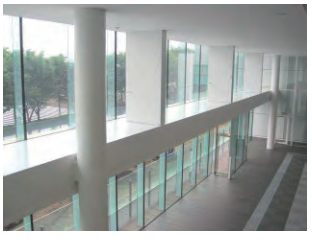


Fig. 4 FSD2

4. Ultra high strength steels

The ultra high strength steel of 780 MPa is utilized for the main columns in Techno Station, and the ultra high strength steel of 1000 MPa to the main columns in OL2. These steels could realize enough structural performance with minor structural members. Effectiveness is highly improved with the active base vibration system and the damper.



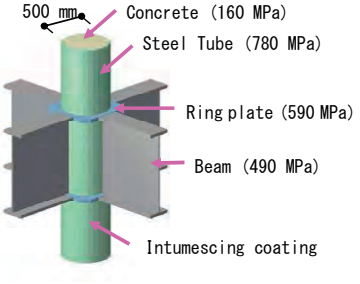


Fig. 5a 780MPa steel column

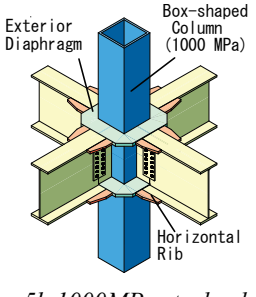


Fig. 5b 1000MPa steel column

5. Conclusions

The technologies described in this paper provide superior seismic performance without losing freedom of planning, and hence harmonize diversity in planning of structural system with superior seismic performance.