Earthquake-resistant reinforcement and retrofitting

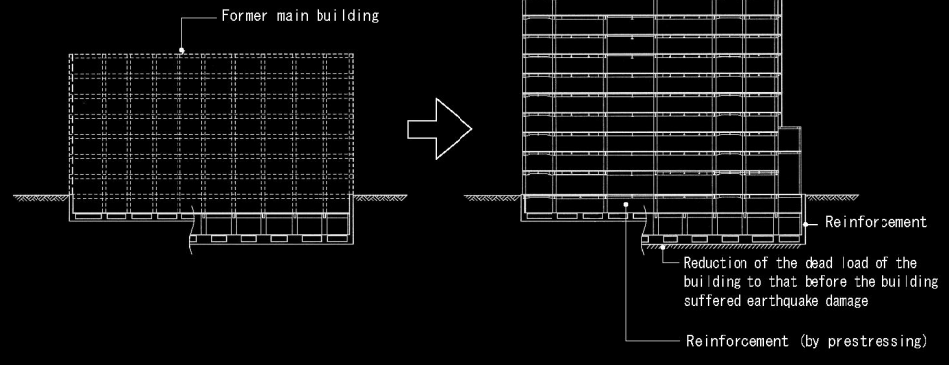
To use building for long periods, an appropriate reinforcement plan that meets various conditions is important.

Daimaru Kobe

This is an example of post-earthquake reconstruction utilizing the existing underground structural frames.
The superstructure of reinforced concrete construction that suffered devastating damage from the Hanshin Awaji Earthquake was demolished. The substructure with relatively little damage was reused by reinforcing.
By comparison with the case of replacing the whole building, rehabilitation was completed at a low cost and in a short time. To shorten work periods as well as minimize effects on the existing lightweight foundation, steel construction was adopted for the superstructure.
It is made possible to double the beam spans in the superstructure by prestressing footing beams for reinforcement.

RC construction
7-storied building

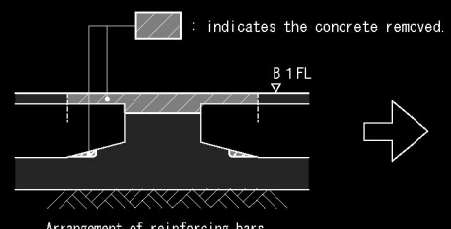
S construction
10-story building



Demolition of the main building, except for the underground exterior walls and B1F floor
(Demolition of 1F floor beams and B1F columns)

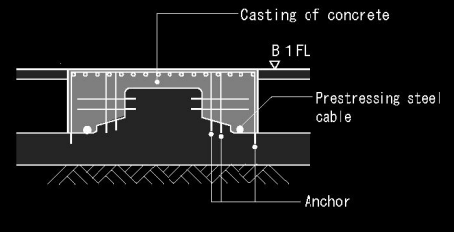
Erection of the new building section
Type of structure: steel construction, pure-moment-resisting construction)
(Demolition of 1F floor beams and B1F columns)

Existing



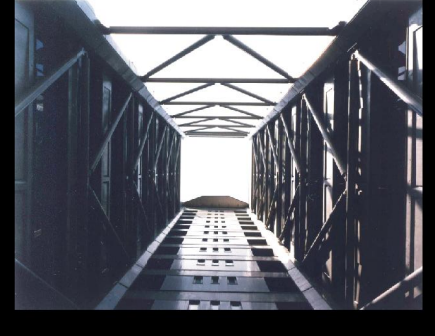
Arrangement of reinforcing bars on the sides of existing footing beams and at the top of the ground and casting of concrete

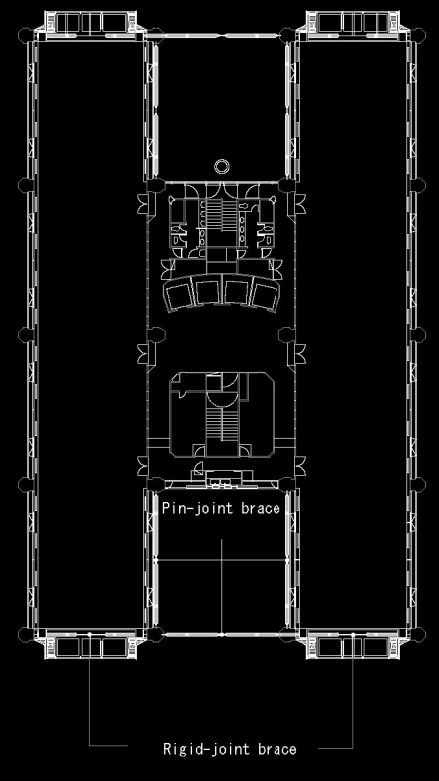
After reinforcement



Shizuoka Prefectural Office East Building

This is an example of earthquake-resistant reinforcement using seismic vibration control braces. The prefectural office building completed in 1970 was reinforced for upgrading the earthquake resistance of the building to maintain administrative functions in the assumed Tokai Earthquake.
Seismic vibration control braces are attached to the existing structural frames to absorb earthquake energy and not to cause damage to the building.
The braces are V-shaped in every two layers and of a slender and light design so as not to damage the outward appearance of the building.





Rikkyo Chapel

This is an example of earthquake-resistant retrofitting of the historical building by the adoption of a base isolation system.
The chapel of brick construction is designated as a historical building by the Tokyo Metropolitan Government Historical Building, Landscape and Design Conservation Project.
To secure structural safety of the building with a minimum of change in outward and inward appearances, a base isolation system is adopted. Laminated rubber bearings and lead dampers are inserted below the continuous footing to base-isolate the building as well as minimize the reinforcement of the superstructure, including the joint between brick and reinforced concrete.