Japan Radio Co. building no. 109 (Japan)

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8. Japan Radio Co. Building No. 109 (Japan)

Owner: *Japan Radio Co., Ltd.*
Architect: *Hideo Ichinohe (Taisei Corporation)*
Contractor: *Taisei Corporation*
Construction Period: *March 1988 – November 1988 (9 months)*

The building is a four storey electronic machinery assembly plant covering an area of 27 m × 42 m. It was constructed with an open space, pillar free design by means of post-tensioned beams in order to be flexible for future changes in production lines and building usage.

The sectional configuration of the building has two limiting conditions. The first is that due to the north side slant line limit (under Japanese construction standard regulations this limit is to ensure sunshine to neighbouring buildings), the floor level of the fourth storey has been kept down to GL + 13.2 m and the fourth storey has been set back to a distance of 18 m. The second limiting factor is the existence of high voltage lines in the air space above the building. These limit the total height of the building to GL + 16.9 m.

In addition to the above limitations, the total height of the girders for the second, third and fourth floors had to be less than 4 m and the roof girder height for the roof

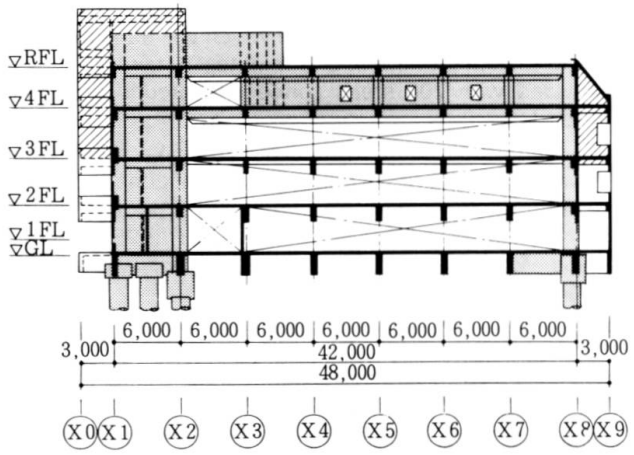

Fig. 1 Framing elevation of Y axis

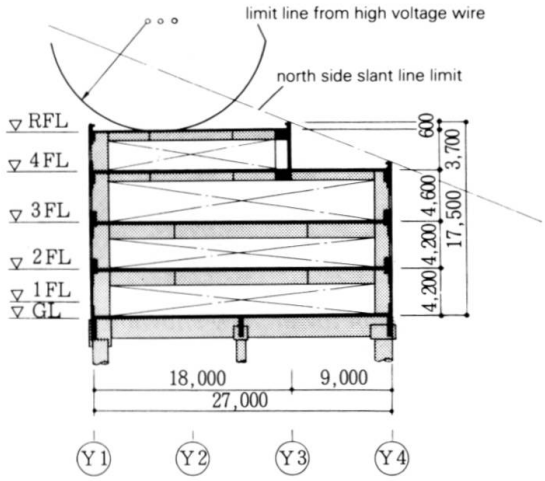

Fig. 2 Framing elevation of X axis

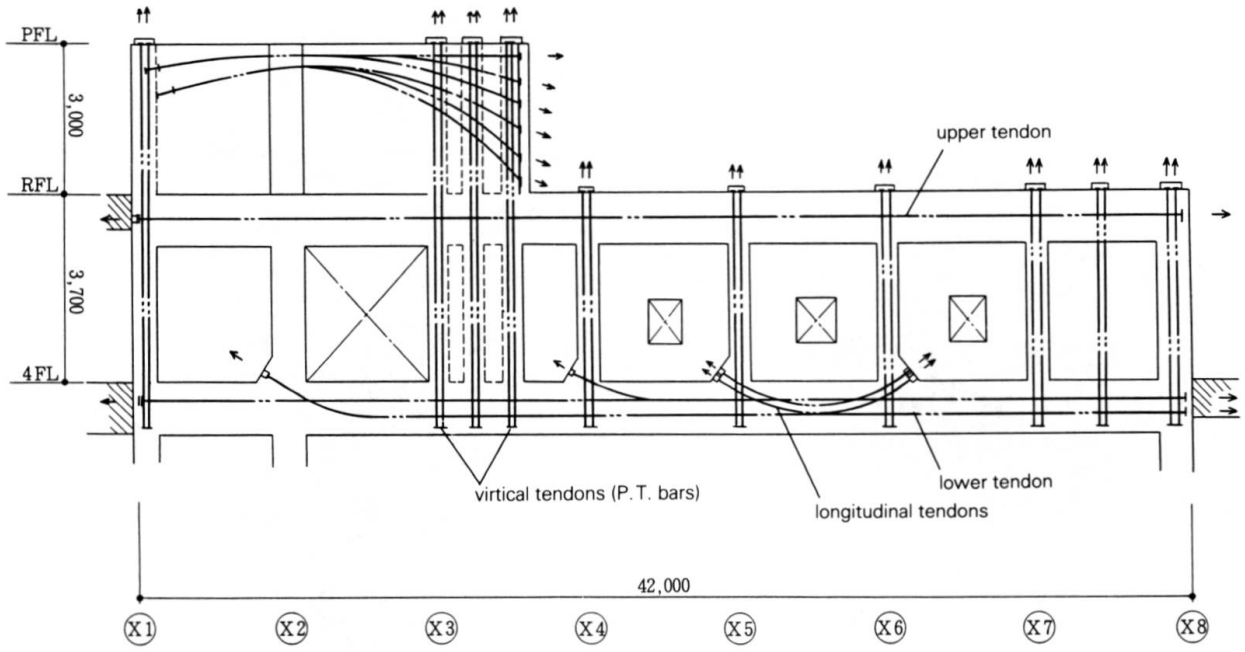

Fig. 3 Megastructure beam

Fig. 4 Inside room at 3rd floor

floor less than 1.0 m, due to the requirement of clear height for each floor. These were essential conditions in the planning of the building.

With ordinary structural design, the girder height of the second and third floors would be 1.5 m each and the fourth floor girder height would be more than 1.5 m, making the total girder height of those three floors exceed 4 m. In order to clear these limits, the exterior wall was utilized as shown in Fig. 1 and beams were put up with a height of one storey over a span of 36 m at right angles to the short cross-beams to form a cubic lattice work of beams with the fourth storey and roof spanning beams to take up the weight and resist gravity.

The 36 m span beam (hereafter referred to as te megastructure beam) is shaped as shown in Fig. 3. A large hole has been constructed in the left end to make a passage way and because of this, the left end is fastened to the wall above, which is utilized as a girder, and suspended by means of post-tensioning tendons. The structural analysis was three-dimensional and the stress at the particular points was calculated according to te load conditions during the execution and final construction stage, to determine the tendon arrangements and stress force of the tendons.

For the structural design of the building, utmost care was taken with the analysis and during the procedure involving the introduction of prestress force to the structure and in matching the given stress corresponding to the variable stress in accordance with the construction phase. However minute the analysis, the anticipated stress cannot be obtained unless the actual stress is adequately given according to the procedure mentioned above.

Prestress was introduced in the following order: vertical tendons (P.T. bars), the upper and the lower strand cables in te megastructure, the right angle roof floor spanning girder and the fourth floor girder.

Prestress was applied to the structure in three steps and one third of the stress was applied during each step. No cracking at all was observed, and the result was good.

(H. Ichinohe)

Fig. 5 General view of the building