# The new football stadium of Genoa (Italy)

## 4. The New Football Stadium of Genoa (Italy)

*Owner:* *Municipality of Genoa*
*Architect:* *Gregotti Associati s.r.l., Milano*
*Engineer:* *SZ Sajni e Zambetti s.r.l., Milano*
*Contractor:* *Stadio di Genova S.p.A., Genova*
*Works duration:* *24 months*
*Service date:* *1989*

### General

The municipality of Genoa, within the limits of the general plan of requalification of the stadium seating for football matches for the 1990 World Cup, decided in 1985 to demolish and rebuild its L. Ferraris football stadium.

The preliminary studies showed that the project would have been heavily conditioned by the following special problems:

1. Location

The stadium had to be rebuilt on the same area of the previous one, an area which is surrounded on three sides by buildings only 8 meters away.

2. Building contingencies

Demolition and rebuilding of the stadium should be made in two successives phases, leaving the possibility of carrying out at the same time the programme of the National football championships for the full period of two years foreseen to complete the building. Moreover, it was required to assure availability of at least half of the seats.

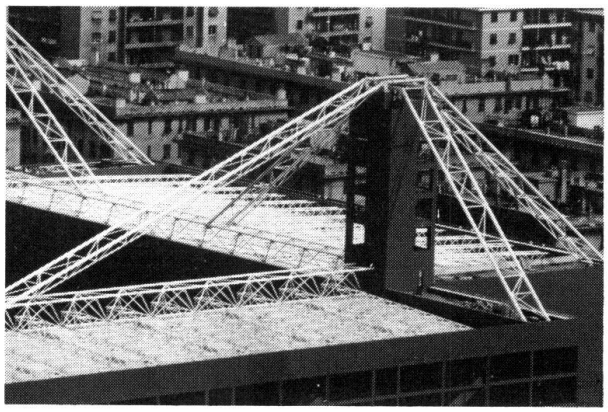

*Fig. 2: Detail of corner building*

### Solution

In order to ensure the flow of the spectators in spite of the very narrow ground all around, it was decided to create four squares, each one located externally at each corner of the stadium.

In each of these four squares the building of four reinforced concrete structures has been foreseen having an L-plan and including services, staircases and relative connections for security purposes.

*Fig. 1: Stadium in the city*

The 53 000 seats planned for spectators were allocated in four stands at 2 and 3 levels with a rectangular plan. It follows that these stands were separated from each other by the four structures having the L-plan.

It is evident that each structure, separating the seats, has an important security function.

The abovementioned contingencies made necessary the demolition and the rebuilding of half the stadium, and precisely the west side, keeping at the same time the opposite side.

Once the first half of the stadium had been completed and made functional the work proceeded with the other half of the stadium.

*Fig. 3: Inside view of the Stadium*

**Reinforced concrete structures**

All structures were made in reinforced concrete with the exception of the roofing.

The main structural arrangement foreseen for the L-plan corner buildings and for the stand consists of a series of walls, slabs and diaphragms which together would form a box-type structure of high stiffness.

This relevant stiffness has been obtained without making use of structures having more than 40 cm thickness, in spite of the overhanging of the upper stands and the high values of loads due to the spectators.

It should noted that such a solution required a short time schedule and cheap costs notwithstanding the fact that structures were forseen to prevent a medium size earthquake for the case of the stadium being full.

Diaphragm structures have been completely cast in steel forms; some of these diaphragms have been prestressed by means of Diwidag rods.

All slabs have been formed by predalles lightened by means of polystyrene.

All the steps of the stands were pre-fabricated having a suitable profile useful to fix the seats.

Foundations were made of plinths for the West side and on piles for east side due to the different soil conditions.

*Fig. 4: Anchor stays*

**Steel roofing structure**

The roofing is surely the most remarkable element of the whole design and its scheme has been suggested by the configuration of the stadium and in particular by the four L-shape corner buildings.

Instead of adopting the usual scheme of bracket overhanging from outside, a bridge-stay scheme was considered more suitable in such a case.

Owing to the particularly windy conditions of the site and lightness of roofing structure, stays could be subject to compressive stresses.

As a result, stays and roofing girders have been designed as triangular sectioned tubular trusses.

It follows therefore that the roofing structure consists of four girders having spans of 140 and 73.5 meters resting on the tops of the four L-plan reinforced concrete buildings and supported by stays being parallel to the sides of the playing area, and of secondary girders at right angles to the previous ones and having spans varying from 23.1 to 30.9 m.

The action of the fore stays is opposed by the anchor stays and by these transmitted to the reinforced concrete buildings in order to balance the horizontal actions.

This concept involves studying details in general, paying particular attention to the study of the disconnection of the two stays.

For this purpose a specific rigid compound trolley running over PTFE (Poly Tetra Fluoro Ethilene) has been designed on the top of the reinforced concrete towers.

The unusual scheme adopted had the result of the use of only 1035 tons of tubes and plates with an incidence of 90 kilos per square meter of roofed surface.

This result is very favourable in comparison with similar roofing schemes.

*(Alfio Sajni)*