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FUJI P.S TECHNICAL REPORT

Construction of Gymnasiums Using the PCaPC construction Method

Project Overview

Project Name : Construction of a New Gymnasium
Location : Tokyo
Building Scale : 2nd floor above ground (9.98m)
Type of Structure : Prestressed concrete Structure and reinforced concrete Structure
Total floor area : 2,151.61m²

Photo-1 Completion of precast members assembly

Introduction

This building is designed as a gymnasium, and it has a unique R shape design (Figure 1).
The top surface of the roof is a single concentric circle, and the inside has a complex shape. Due to the complexity of the shape, precast was necessary. In addition, the short construction period of around 10 months and the large span of up to 25.4m were factor for using the precast prestressed concrete (PCaPC) construction method.
Our company manufactured and transported precast members and performed assembly and prestressing process on-site. For on-site assembly, due to the unique shapes and the heavy weight of the members, it was necessary to planning carefully the availability of transportation, the lifting methods and connecting methods of precast members.

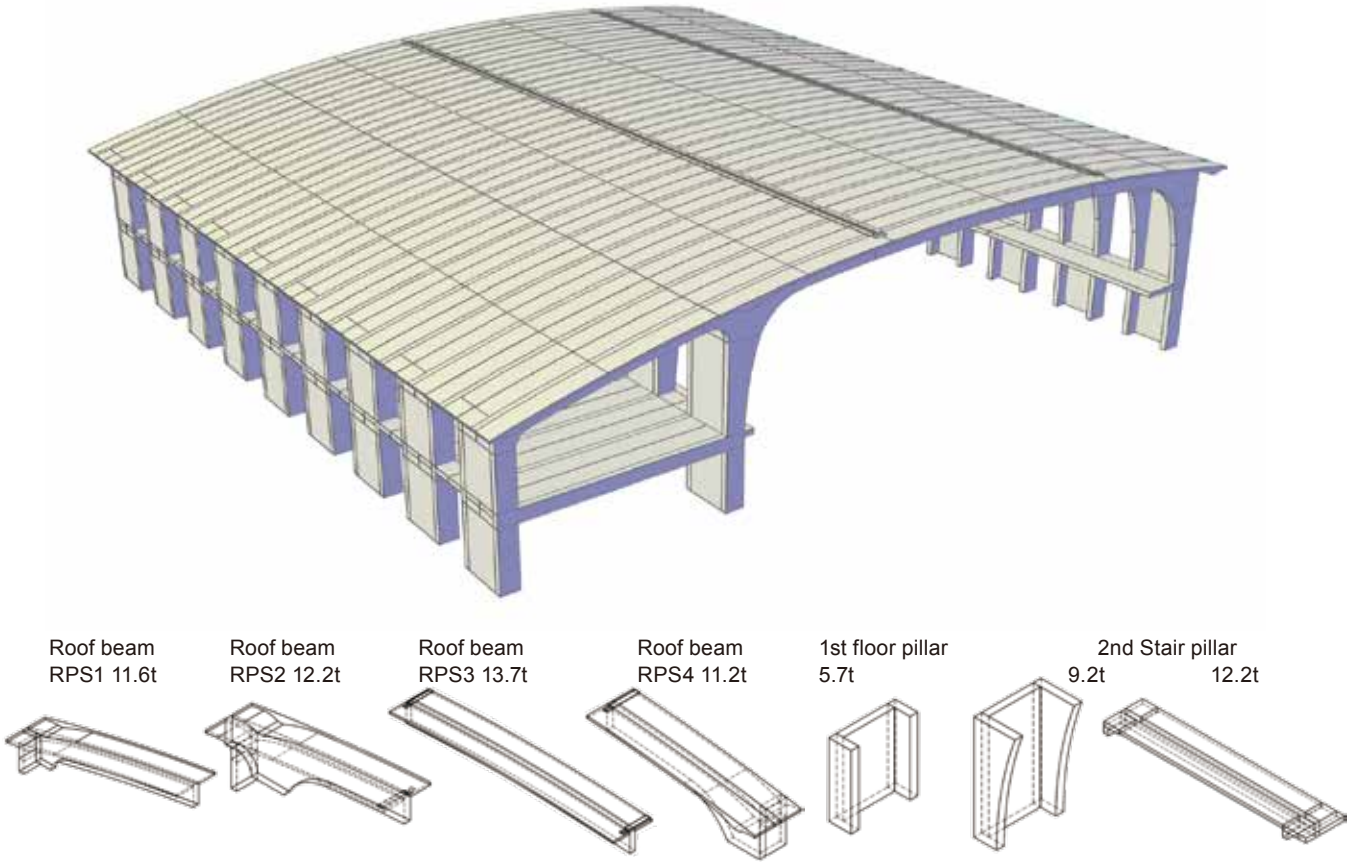

Figure-1 Precast-Prestressed concrete structure assembly completion perspective and 3D diagram of precast members

Parts Arrangement and Connection Method

The precast members are composed of pillars with earthquake-resistant walls on the 1st floor (referred to as "1st floor pillars "), beams with slabs on the 2nd floor (referred to as "2nd floor beams"), pillars with earthquake-resistant walls on the second floor (referred to as "2nd floor pillars "), and beams with slabs on the roof (referred to as "roof beams"). Joints section are not provided at the joints of each precast member, and the precast members are joined by tensioning PC tendons.
Both first and second floors of pillar members are U-shaped members that integrate two pillars and one earthquake-resistant wall. The second-floor beam is a pre-tensioned member which has been prestressed at the factory. The roof beam is divided into four sections, which are erected using supports and then crimped together with PC tendons.

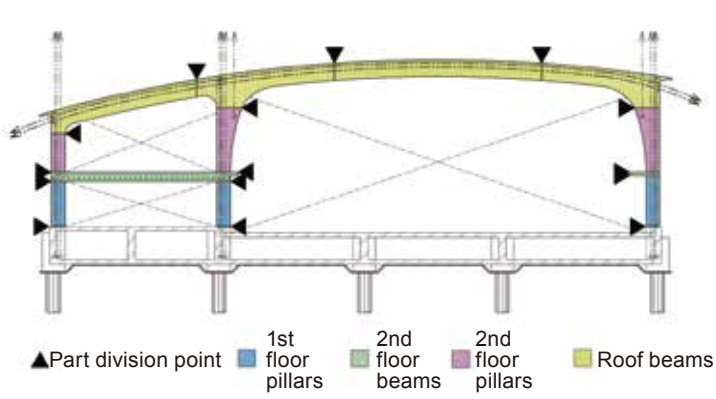

Figure-2 Precast parts arrangement (framing elevation)

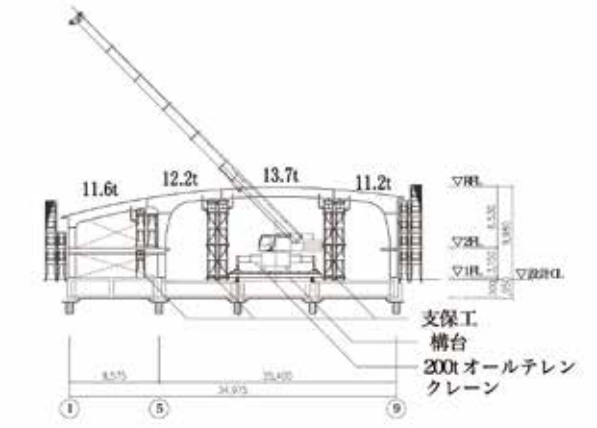

Figure-3 Construction plan (framing elevation)

Construction of Precast-Prestressed Concrete Method

A 200-ton crane was used for erection, and due to the lack of space, a platform was built inside the building and constructed from the west side to the east side. For this reason, the scaffolding plan and split position of roof members were determined by considering the cranes arrangement, the scope of cargo handling work, and the position of lifting members (Figure-3).
Regarding the accuracy of construction, the alignment of the beams was considered important. Therefore, the top edge position of the 2nd floor pillars was carefully managed with an accuracy of ±5mm to ensure the beam alignment (Figure-2, Figure-3).
This Precast-prestressed concrete construction method project was completed during 2.5 months. This project was an example of taking advantage of the short construction period and large spans that are characteristic of PCaPC construction method.

Photo-2 Erection of roof beams

Photo-3 Completed of construction (Inside the gymnasium)