PEIKKO'S STRUCTURAL CONNECTIONS

USED IN NEW SENER ENGINEERING OFFICES IN MADRID

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Peikko works with precast company Artepref constructing new offices for SENER, a multinational Spanish engineering company.

Peikko's column shoe and hidden corbel systems were used for connecting prefabricated columns and beams in this significant office project. The new office building was integrated with SENER Engineering's current complex in the Technology Park of Tres Cantos village in Madrid.

The new office building has a rectangular plan. It is approximately 20 metres wide and 34 metres long. It has three floors and a basement floor connected to the parking area of the complex. The whole structure of the building is made of precast concrete: columns, beams and exterior cladding panels.

SENER, which was founded in Spain more than 50 years ago, is today an international reference in civil engineering and architecture, aerospace engineering, aeronautical and vehicle, actuation and control, power and process and naval engineering. It has more than 2,500 employees in thirteen offices around the world.

Artepref decided to use Peikko's products in the project because they reduced the overall construction, material and labour costs. The system was easy to adapt to any type of structure, which provided security, speed and cleanliness at the building site.

Juan Moreno, Technical Director of Artepref, said he chose to use Peikko's PCs Corbel System because it gave the firm the opportunity to build slim floors with hidden corbels. "This is a very nice aesthetic and architectural solution for offices." The system was also perfect for fulfilling the technical requirements imposed by SENER Engineering for the new building. "It was possible to avoid the traditional big concrete corbels, which take up more space and increase the total height of the building, for the same numbers of floors".

The columns were produced and transported without corbels, which were placed in the exact position once the columns

were assembled. The erection of the beams was easy, fast, safe and clean as there were vertical and horizontal tolerances for the corbels, and tolerance in longitudinal direction for the beams, Moreno added.

The adaptability of the Peikko connections for beams and columns was a key factor in meeting the requirements Artepref had set for the project. The technical department at Peikko Spain calculated and designed the connections for the project.

Both the floors and the roof of the building were made with pre-stressed concrete slabs, Artlum and Artplack types, originally patented by Artepref. The cladding of the building was made with precast concrete panels, in arid finish, in the same look and color as the rest of the complex of buildings in which it is integrated.

The structure of the building was designed with precast concrete columns of various sections, such as 50x50 cm, 50x60 cm and 60x70 cm rigidly connected at its base using Peikko HPKM Column Shoes along with corresponding HPM Anchor Bolts. Short Anchor Bolts type HPM L were used in the connections to the foundation. Long Anchor Bolts type HPM P were used in the connections of the columns to the cast-in-situ wall and column-column connections.

The beams of the building are prefabricated and have inverted L and T sections. The PCs Corbel (placed in the column) and PC Beam Shoe (placed at the ends of the beam) have been used for hidden beam-column connections in the second and third floors of the building.

When using Peikko's Hidden Corbel System, the torque effort existing in the isostatic beam-column connection has to be analyzed, and if needed, a system that absorbs this effort has to be used. There are several methods to do this. In this case, Peikko's technical department designed a welding solution to be used between steel plates incorporated into the column and the beam.

The erection process of the beams was performed in a fast, safe and clean way. To finish the erection work of the beams the joint between beam-column was filled with non-shrink grout. To get the fire resistance and durability for the structure the recess box of the PC beam shoe is also filled with non-shrink grout.

There were multiple benefits in using the Peikko column connections in the project. "It was quite easy to place the long bolts type HPM P inside the wall and columns. The interference between Peikko bolts and reinforcement of the wall and columns was minimal. Besides, it was possible to reduce the section of the upper precast columns," Moreno said and added: "The assembly process was faster and safer than traditional systems because it was not necessary to brace the columns, which in this particular project, would have been difficult and insecure."

Peikko provided technical support for Artepref throughout the project. Peikko calculated all the PCs Corbel connections and gave Artepref support with calculations and high quality and well defined details. Peikko also visited the building site regularly and instructed the construction team at site how to proceed in assembling the beams with Peikko PCs Corbel system.

"These were the most valued benefits of us cooperating with Peikko," Moreno concluded. ■

WHY TO USE PEIKKO'S SOLUTION IN MAKING A RIGID ELEMENT FRAME?

- Faster erection system for precast structures compared to traditional systems. This means shorter assembly time and cost savings in specialized workers and cranes.
- Safer system during and after installation of the columns and beams compared to traditional systems. This greater safety is very important in large scale projects where there are a lot of people and traffic at the same time in the building site.
- The connection of the columns using Peikko's system is rigid immediately after tightening the nuts. Temporary bracing is not needed in the erection of the columns. Final strength in the connection is achieved after grouting of the joint and once recesses have been done and cured. This means savings in braces and labor costs for installation. It also eliminates the need for auxiliary elements on the site, which would make the access of cranes and lorries difficult and slow down the pace of construction.
- The system allows leveling the structures several centimeters in height in a quick and easy ways, relating to the height of the project (-2 cm, +3 cm depending on anchor models used)
- Factors like cold weather or rain do not affect the timing of erection work.
- The accuracy required in foundations when placing the Peikko anchor bolts helps the rest of the precast structures fit perfectly, which is not always the case with traditional systems.