

# MARQUEE IN THE NEW RAILWAY STATION OF MALAGA

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## ABSTRACT

The commercial centre VIALIA and the new railway station of the AVE (high speed train) in Malaga was inaugurated in November 2006, just on the place of the former railway station. The new railway station with an investment of 134,7 million Euros occupies a surface of 51.377 m<sup>2</sup>, five times the surface of the former station. The enclosure is the biggest intermodal and commercial centre of Spain which comprises a parking of 21.000 m<sup>2</sup> for 1300 parking places, one commercial area and a hotel with a total extension constructed of approximately 100.000 m<sup>2</sup>. The spaces of leisure contain cinemas, shops, restaurants, bowling, gymnasium, swimming pool and zones of passenger's traffic

## INTRODUCTION

During the years 2001 and 2002 it was realized by the author of this paper, the project of the Commercial Centre VIALIA and railway station of AVE (high speed train) of Málaga, called María Zambrano station. The works began at the middle of the year 2002 finishing on 2006.

The Commercial Centre VIALIA transformed the former railway station of Malaga on a modern station for the high-speed trains, together with a great Commercial Centre named VIALIA, with an extension of approximately 100.000 m<sup>2</sup>, that contains nine cinemas, restaurants, shops, a bowling centre and a gymnasium with a swimming pool placed between two floors.

The complex includes a hotel of four stars called Barceló VIALIA, with seven floors and 222 rooms, with dimensions in plant of 48,00 m for 15,45 m, and with a height over the level of the street of 35,50 m. The Commercial Centre VIALIA includes also a parking with two underground levels whit a surface of 25.000 m<sup>2</sup> for 1300 parking places.



Fig. 1 Location of Málaga in Spain



Fig. 2. Former railway station

The new station of the AVE (high speed train) of Malaga constitutes the biggest passengers' intermodal and commercial centre of Spain.



Fig. 3.. Entry to the new station of the AVE of Malaga María Zambrano



Fig. 4. Air sight of the new commercial centre and railway station in Málaga

The architectural set integrates perfectly the intermodal station that connects the line of AVE, which joins Madrid with Málaga, with the suburban rail networks, the Commercial Centre of VIALIA, the hotel Barceló VIALIA and the underground parking.

### THE MARQUEE

Before the trains reach the railway station, it is located a very big marquee with a span of 71 meters without any intermediate pillar. Under the marquee there have been constructed four platforms that give service to 8 trains of high speed called in the Spanish terminology AVE, six with an international width (UIC71) and two with an Iberian width. The pillars of the marquee on both sides, were made in reinforced concrete in the lower part with a shape of inverted trunk of cone inclined in his three low meters, and fixed in the bottom with two reinforced concrete walls, that will be use as a containment of lands, for the excavations that will be necessary making in the future, to lower the platforms under the level of surface terrain.

The roof of the marquee is inclined, with the top part of the pillars in the most elevated one of 16,50 m of height, joined by means of two tubular profiles of 35,5 cm of diameter in every support.

The pillars in the less elevated part of the roof have 13,72 m of height, which makes an appreciable difference of level between both ends of the roof, for the rapid evacuation of the rain water.

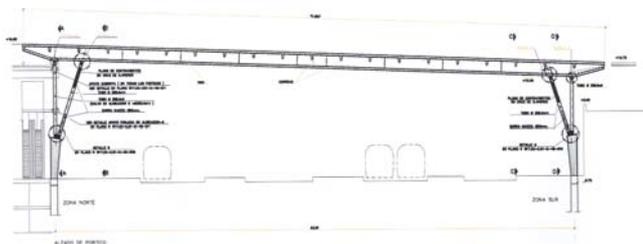


Fig. 5 Transverse section of the marquee



Fig. 6 Air sight of the new railway station

The marquee is tied horizontally on the roof in both ends and vertically in the planes of the tubular pillars with crosses.

The portals of the marquee with different height in his ends of 16,50 m and 13,72 m have on the top a girder beam of 1,60 m of height, with a hollow section in form of trapezium of 60 cm in the top base and 35 cm in the bottom one, with the low end rounded with half tubular profile.

The transverse beams which support the roof of the marquee have a similar section with a high of 60 cm and a width in the top base of 30 cm.

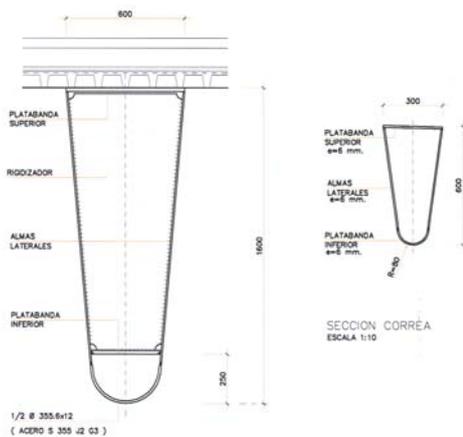


Fig. 7 Transverse section of girders

Fig. 8 Air sight of the marquee with the former station

### THE PROJECT

The Project of the marquee has been realized by means of a model of finite elements realized with the program SAP2000N. The structure is constituted by 10 metallic portals separated 8,00 m each from the following one, covering a zone of 72,00 x 71,475 m<sup>2</sup>. The cover is rigidity by means of San Andres's crossings on initial and end portals of the marquee (see figure n ° 9)

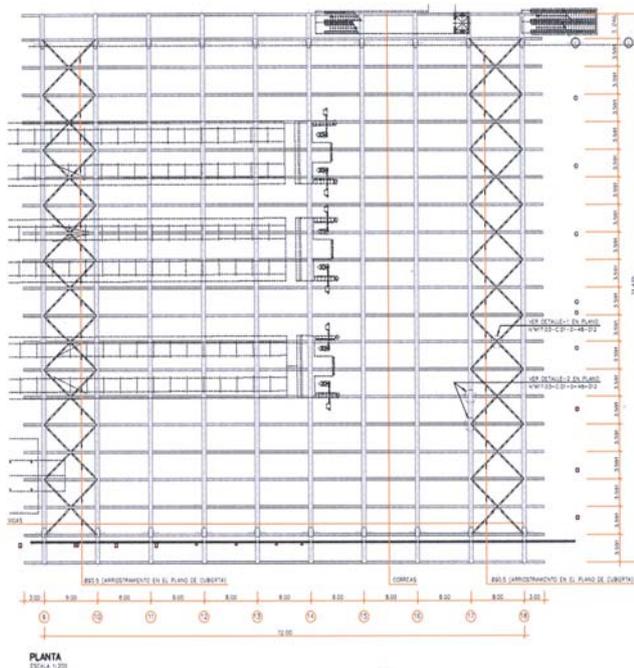


Fig. 9 Plant of cover of the marquee of platforms

The portal type is constituted by a girder of 1,60 m. of height that covers a span of 63,81 between supports.

The supports of the girder are constituted in every end by two pillars one vertical and the other inclined with the lower part of them in the top of a reinforced concrete pillar tied by two joints together.

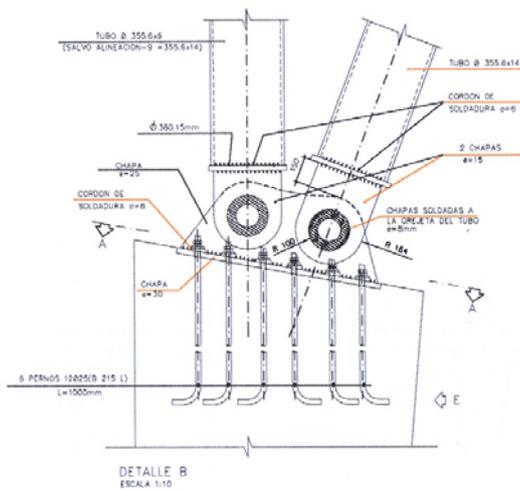


Fig. 10 Detail of the support of pillars



Fig. 11 The marquee from the parking in construction

## THE CONSTRUCTION

The pillars of the marquee begin on the top of a pillar of reinforced concrete over the sheetpiling to support the earth, when in the future the railways will be buried, at their arrival to the station of Málaga, proceeding in that moment to the corresponding excavation.

The pillars of the marquee have a low part of reinforced concrete of 3 m of height, with a troncoconical section.



Fig. 12 Supports of reinforced concrete



Fig. 13 Supports of reinforced concrete finished

Over these concrete reinforced supports the metallic pillars of the portals are pinned (see figure 10).

The construction of the marquee was realized preassembling in the near area to the station two portals to give him rigidity to the set and raising with derrick to the place where they must be mounted (see figure 14).



Fig. 14 Construction of the marquee



Fig. 15 Air sight of the marquee

Once mounted the main frame of the marquee and ties a every portal with the others, it was proceeded to place the cover of the marquee, the drainage, the lighting and the rest of finishing (see figure 15).

## CONCLUSIONS

Finally it was constructed the biggest marquee in the railways stations in Spain without any intermediate pillar.

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