

Project for a train station.

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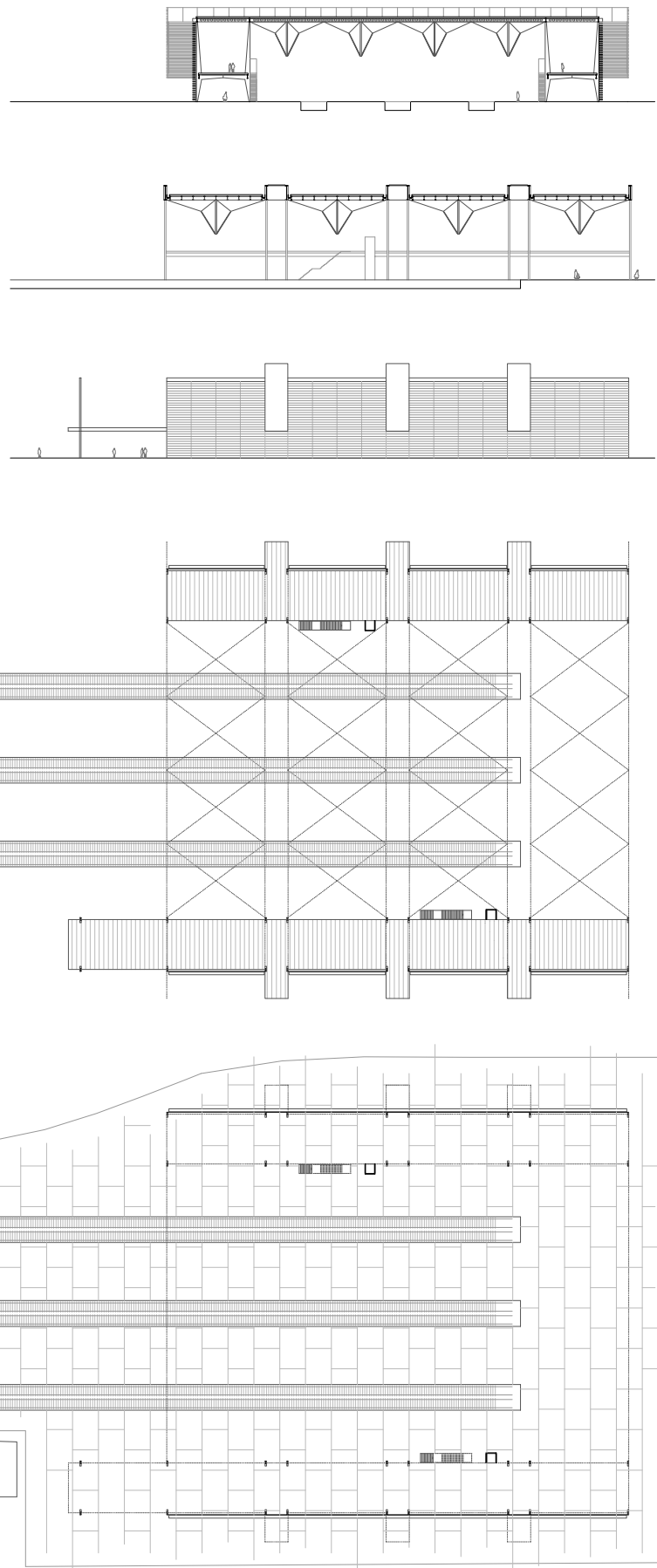


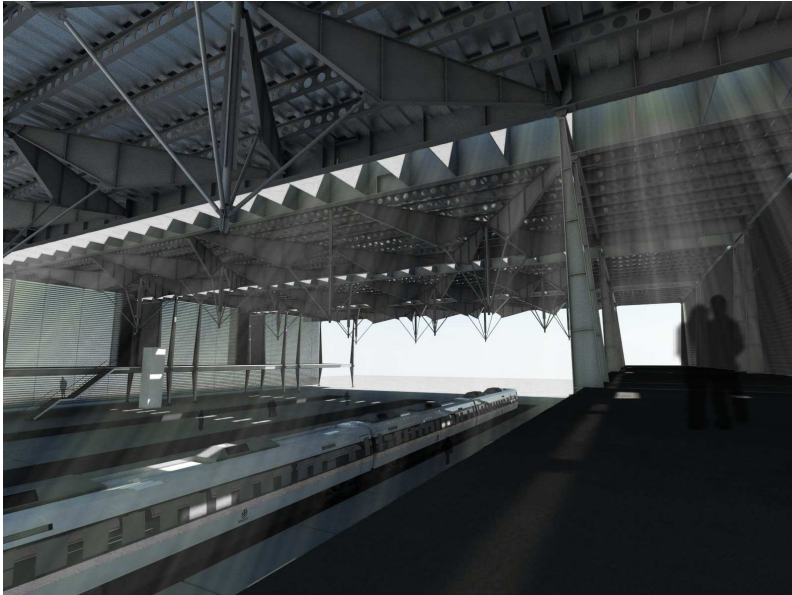
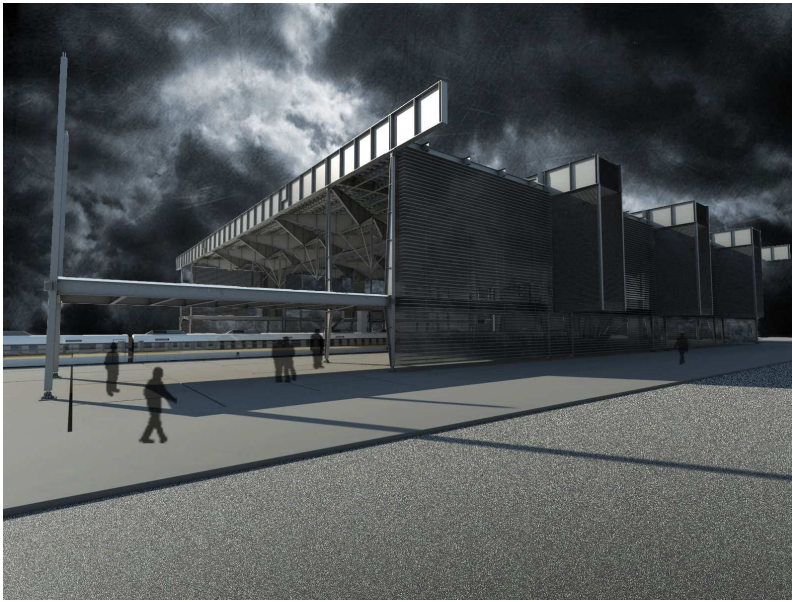
The current project was proposed in 2011 as a part of the course of study “Structural Designs 2”, which is taught by Javier Estévez Cimadevila, professor of structures in the ETSAC (the Architecture School of La Coruña). We were asked to design a single-span structure to cover the three railway platforms which take up 50 meters wide, besides saving some space for several stores and offices.

Apart from these specific requirements, the structure of a building always has to be considered an essential part of architectural design, as far as the structure has to turn an abstract idea into something real, enriching the original proposal. In that sense, as well as the fact that precise calculation is of fundamental importance for the end result of construction, an accurate structural scheme in accordance with the project design is even more important, especially when the technical requirements are as demanding as they are in this case.

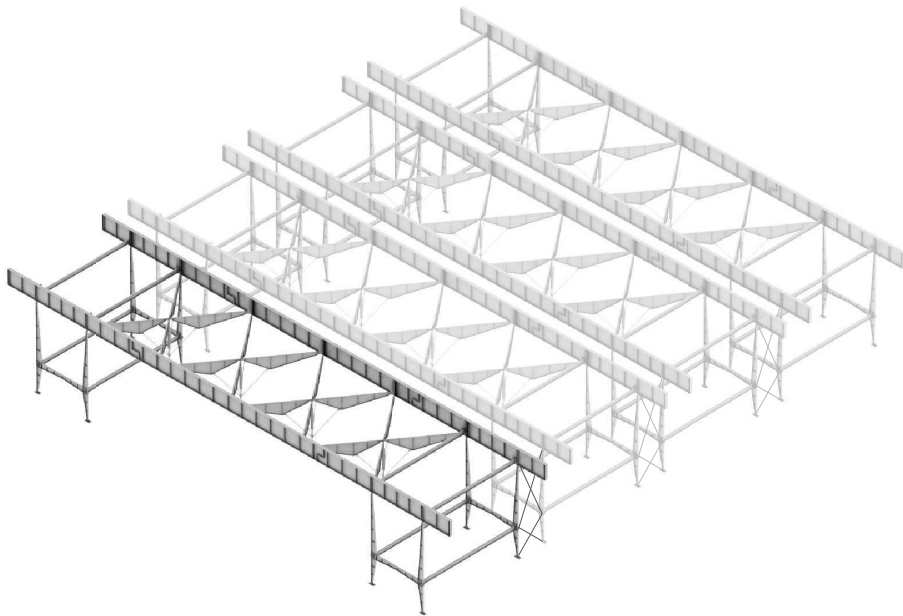
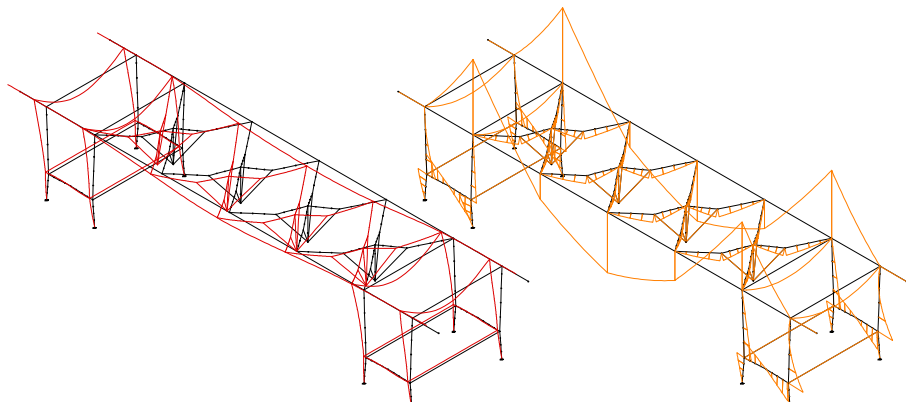
Under these, a single space is designed to contain trains as well as waiting travelers; a single space to contain two raised platforms at its sides for shops and the offices. Although these are above the flow of people coming and going, they are always in visual connection with the trains, thereby easing the tension caused by waiting. This is the structure that, without any decoration, configures the space within the building. There are three basic elements which are repeated for all purposes, one of which, the large crossed girders that brace the whole building, descend from above as if they wished to leave the roof, creating the characteristic image of the project.

As can be seen in the architectural plans, it was decided to create a single space to contain everything. It can also be seen that the structure is modified to meet the needs of the project, so that the two phases of the process, the design of the building and its structure, are interconnected, giving rise to a single solution. It will be in fact one of the structural elements, the large crossed girders, the one which creates the image that represents the project. To prevent distorting this image it was decided to make the other elements in the structure as simple as possible, including the large reinforced girders which cross the whole span of the building, consciously sacrificing strict structural efficiency in favor of the consistency of the design as a whole. For the entrance it is proposed to repeat one of the "H" shaped pillars outside the building, creating a covered space for travelers and functioning as the threshold of the large main space.

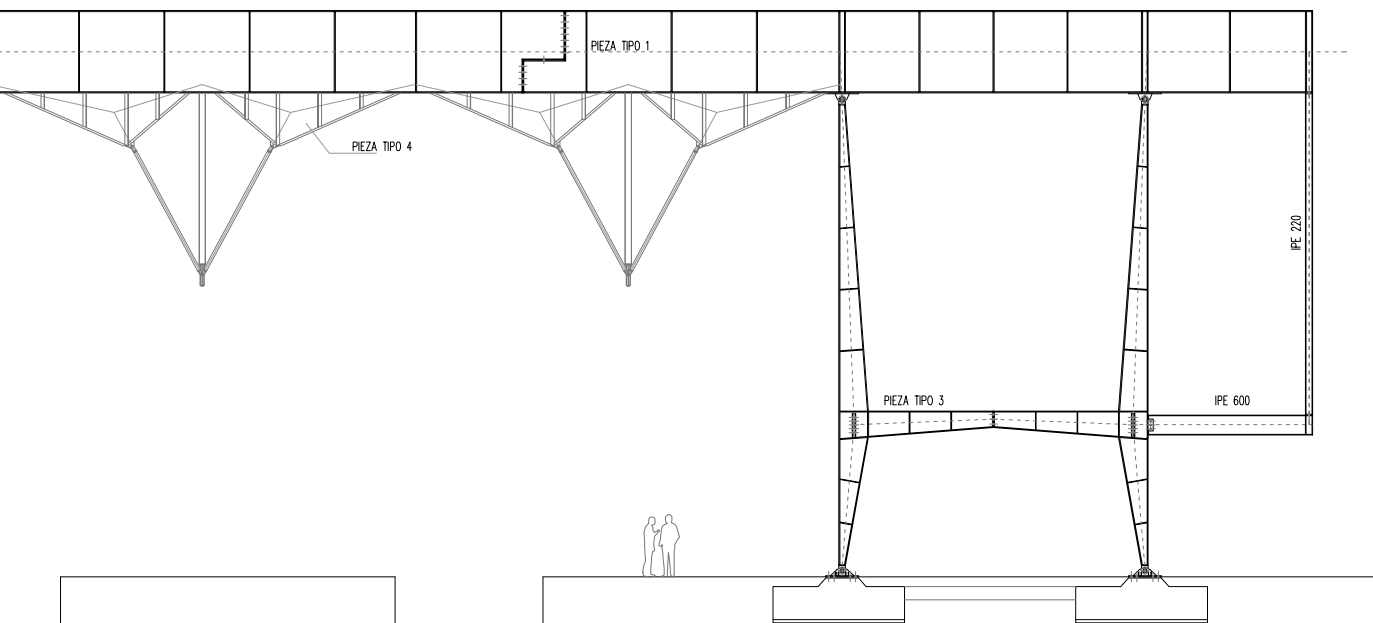


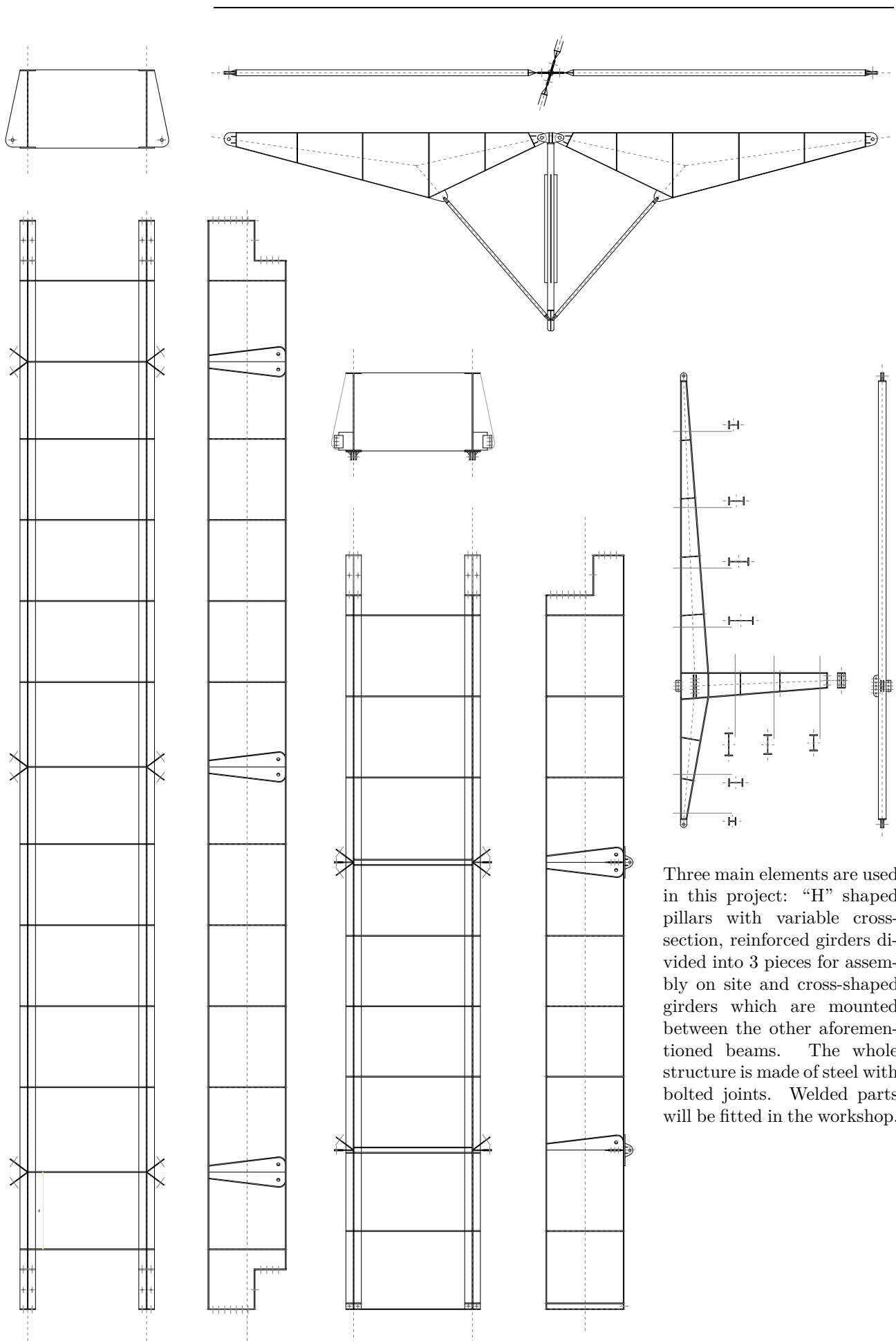


From the first there was the intention of expressing the intense activity within the station on the outside of the building. That is why smoked glass with slats is used to protect the inside against the sun, allowing the light in and letting us make out what is happening inside the building. Light enters not only through the façades but also through the gaps created by the large girders that run from one side of the building to the other. At night the illumination system change and the large crossed girders turns into big lamps, illuminating the trains and travelers. In this way the perception of the building changes completely depending on the hour of the day.



Three fundamental premises were taken into account when designing the structure. First of all its components had to be mass-produced, and it had to be easy to expand if necessary. That is why a small number of standard parts were used, which repeated form the space of the station. Secondly, the different elements are divided to be easy to transport and assemble on site. This is why all of the parts can be transported using standard means of transport, while bolted joints are used at the most suitable points of the structure. Finally, special emphasis was placed on ensuring that the roof structure from one side to the other fits well with the structure from front to back. This is because both dimensions are equally important in such a large building. The bracing of the structure lengthways takes the form of X-shaped crosses between the four standard modules, where the porticos are duplicated. In the orthogonal direction this bracing is by the rigid linkage design of the variable section pillars, which would prevent the building from collapsing. Lastly, the crossed girders will brace the flat roof.

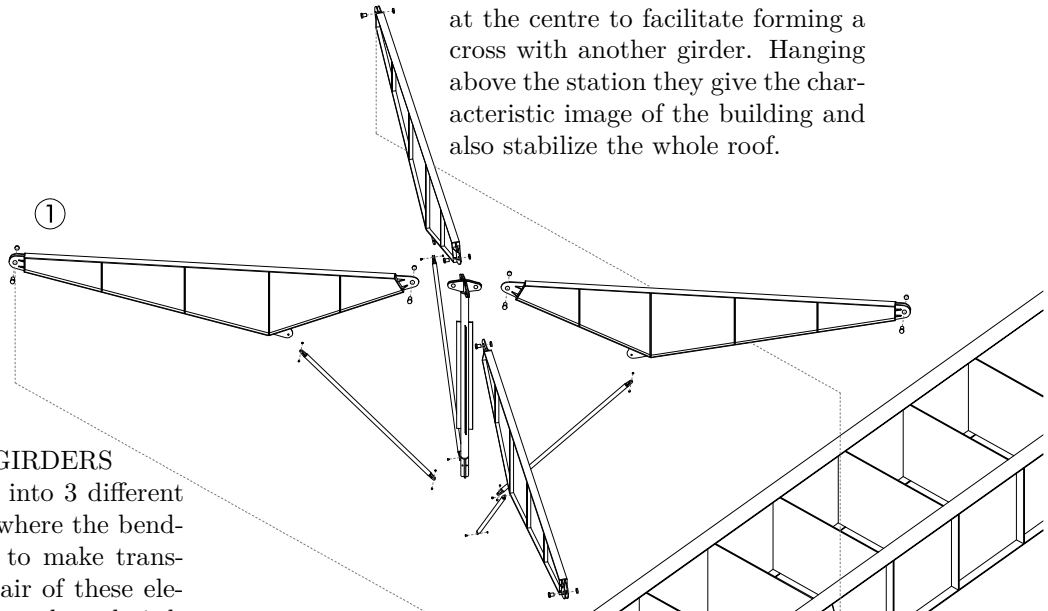




Three main elements are used in this project: “H” shaped pillars with variable cross-section, reinforced girders divided into 3 pieces for assembly on site and cross-shaped girders which are mounted between the other aforementioned beams. The whole structure is made of steel with bolted joints. Welded parts will be fitted in the workshop.

1. CROSSED GIRDERS.

These are reinforced girders shaped at the centre to facilitate forming a cross with another girder. Hanging above the station they give the characteristic image of the building and also stabilize the whole roof.

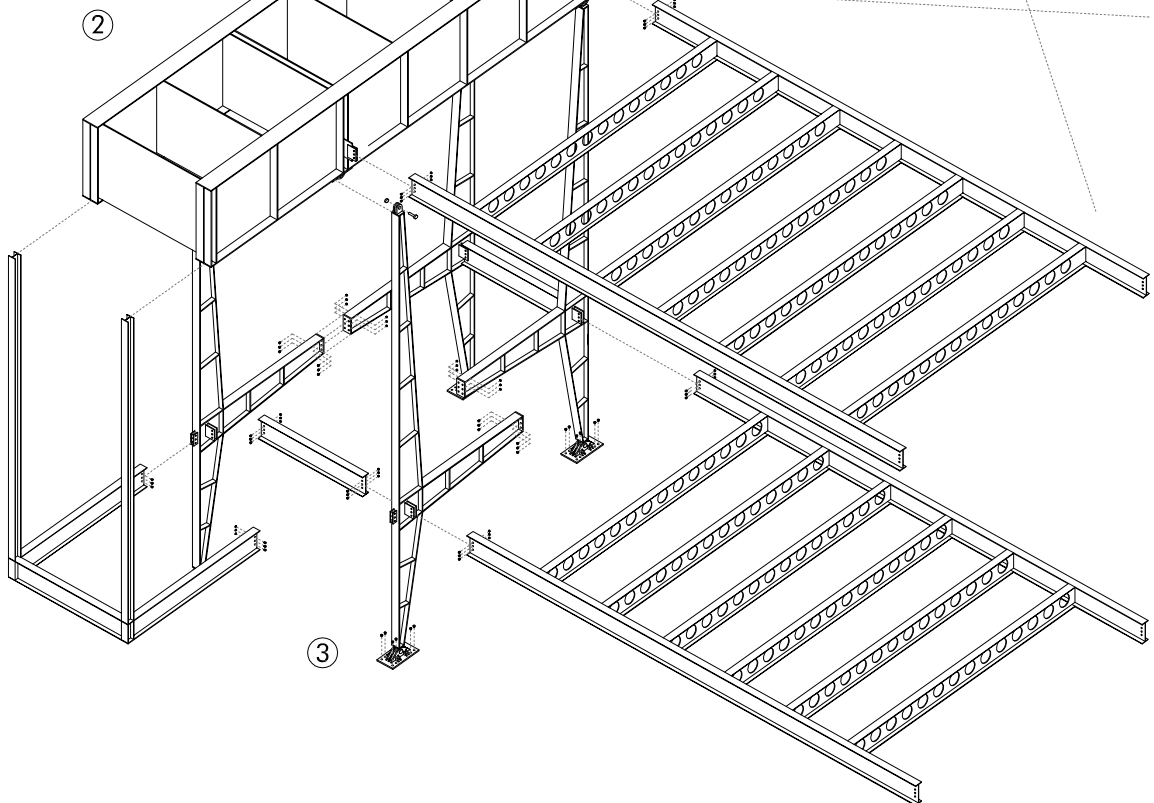


2. REINFORCED GIRDERS

Each one is divided into 3 different parts at the points where the bending moment is null to make transport easier. Each pair of these elements holds four cross-shaped girders. In the central part of the station roof, where two girders are very close to each other they are joined by perpendicular metal sheets to prevent lateral buckling and with the intention that they will work together as a single element.

3. "H" SHAPED PILLARS

These are divided into two parts for ease of transport. These parts become thinner closer to the supports, where articulated joints are formed.



1. In the first step of erection the “H” shaped pillars are put into place. Due to their geometry they are perfectly stable and so do not need to be propped. After this the reinforced girders are fitted. These are divided into 3 parts. The ones at the side will be supported at two points and will be fitted first, ready to receive the central part. At this point the separation between the supports of the girder generates a pair of forces able to absorb bending moments, and this will be beneficial for the whole structure.

2. In the second phase, the crossed girders will be assembled on the ground and put into place with a crane, after which they will be bolted.

3. Thirdly, all of the secondary structural elements will be fitted. These include the IPE profiles, the cellular girders and the braces which hold the platforms projected outside the façade plan.

4. Finally the metal and concrete floor and the elements covering the façade are installed, such as, protecting slats, waterproof covers, etc.

