

Basilica of the Sacred Family



The Expiatory Temple of the Sagrada Família began its construction in March of 1882.

1. Antecedents: construction started under the direction of Architect Francisco de Paula del Villar y Lozano who, due to disagreements with the property, decides to renounce the work. It is from 1883 when Gaudí leads the project, giving it a larger and monumental character.

During the following years, until his death in 1926, Gaudí collaborated with different architects, sculptors, draughtsmen and modellers, in new architectural solutions. After his death, the project goes through different architects, always respecting the original idea, but economic problems and a fire during the

civil war that destroyed scale models and plans created by Gaudí, forced to stop the works on several occasions.

The incorporation of new technologies in the project brings it close to completion, scheduled for 2026, the year of the centenary of the great architect's death.

2. Stainless steel: the use of stainless steel has been a constant during the project in recent years through a modular solution.

In 2008, Roldan, S.A. long product factory of the Acerinox group, began supplying duplex stainless steel reinforcing bars, that are significantly increasing its use 2014 onwards .

Durability is the main reason why stainless steel is being used in the construction of the

upper levels of the towers. The difficulty of replacement and/or any future intervention, as a consequence of the corrosion of conventional rebar in a saline environment as is the case in Barcelona, would have a high cost.

There is a large number of types of stainless steel, however, the project team selected duplex 2205 (EN 1.4462) for its high resistance to pitting corrosion, characteristic to be taken into account in environments near the sea with presence of chlorides.

This is a grade of stainless steel with high mechanical properties, which provides great strength and lightness to the different modules that are currently being built, such as the Towers of the Evangelistas, Mare de Deu and Jesus Christ.

The most relevant properties

Image 1



of this selected stainless steel grade are:

- Yield strength 0.2 % higher than 450 MPa.
- Tensile strength between 650 and 850 MPa.
- Elongation higher than 25%.
- Brinell hardness maximum 270HB.
- KV value (RT) higher than 10 Joules.

Duplex stainless steel is used in a variety of formats both in long and in flat products.

Construction works use flat products such as sheets and plates that go from 2 to 100 mm thick for the main structures of the temple, as

Image 2





they are the reinforced beams for the structural pillars, or supports of stone slabs. Long products such as square and round bars for the production of heads of tensioning of the panels and stone slabs, or the production of spikes (spherical elements that guarantee the correct positioning of the panels) in diameters from 65 to 390 mm in circular section and from 70 to 80 mm in square section, with a standard length of 6 meter.

Reinforced stainless steel bars are used in the production of auxiliary anchor rods between the different structural elements, in the production of reinforcements welded to main metal structures and for other elements such as slabs, stairs and skin reinforcement, also included in the interiors of the structures covered with “trencadís” (mosaics of irregular ceramic pieces).

Rebars have been supplied from 6000 to 12000 mm in length, and between 8 and 40 mm in diameter.

3. Execution of works: it is an expiatory temple so its construction is financed exclusively by donations of parishioners and visitors' entrance fee. Therefore the

activity of the basilica could not be affected during its construction. Besides, as works were progressing, the need to have a greater space of work that did not interfere in the environment was evident.

The assembly works of the different modules are carried out in the facilities that the Sagrada Familia has got in Galera, a small town eighty kilometres from Barcelona. Part of the West Sacristy was built there in 2016.

At present, the panels with which central towers are taking height by means of the innovative process of tensioning the stone are being manufactured. This tensioning consists of stones with a specific shape and finish together with stainless steel structures [image 6].



Image 3

Thanks to this construction system, the towers can be raised more quickly and easily.

For instance a level of the Tower of the Evangelists, which has a height slightly higher than 3 meters, can be assembled in the basilica in less than 6 hours.



Image 4

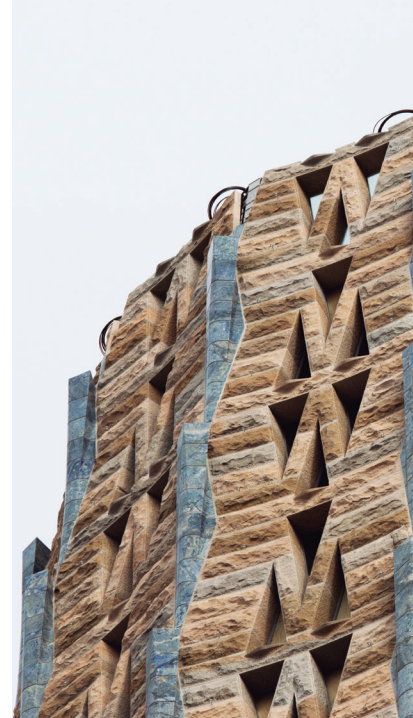
The working time of the panels depends to a large extent on the level to be built and on the dimensions of the tower, but it ranges between three and five weeks.

The panel of the image 4 corresponds specifically to one of the lower levels of the central Tower of Jesus Christ (hence its enormous dimension), it weighs 24 tons and is more than three meters high.

In the exploded view of the Tower of Jesus Christ stainless steel of the railing that surrounds the staircase and the structure of the interior of the elevator can be seen [image 4].

Once assembled and verified their correct fit, they are disassembled by pieces and packed in boxes for transport to Barcelona. In figure 5 we can see the level 10 of the tower at the time of packaging.

Another detail [Image 7] shows the triangular windows, whose stainless steel profiles have been subjected to different tests that guarantee high degree of sealing.





MATERIAL :

Stainless steel Dúplex 2205 (EN 1.4462)
Manufactured by por Roldan S.A.
and supplied by Inoxcenter in Barcelona

FUENTE / SOURCE :

[Fundació Junta Constructora del Temple Expiatori de la Sagrada familia](#)
www.cedinox.es

As the work progresses a greater degree of automation of the processes is achieved, being able to work with increasing volumes of stone. Each and every one of the pieces are duly numbered, which ensures their traceability at all times (origin of the material, tests suffered, final position in the work, etc).

The architectural studio responsible for the project, always aimed to be as honest as possible with Gaudí's original idea and the elements he selected for the work.

The added value is the new modular system used for the placement of the modules since they do not carry any type of external framework or scaffolding does not affect the facade of the basilica.

4. Conclusions.

The Temple of the Sagrada Familia is a perfect example of how a current, versatile, machinable, transformable, durable and resistant material as stainless steel, can solve important problems in emblematic buildings, providing constructive solutions never seen before.

Image 7



Image 8

