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Guggenheim Museum, Bilbao, Spain

The Guggenheim Museum in Bilbao, Spain offers a unique architectural vision using traditional building materials such as steel and glass with other special combinations such as titanium, Spanish limestone and LWAC (Lightweight Aggregate Concrete).

To design this precious gem of the Spanish city of Bilbao, the engineers had to solve a tremendous problem; the poor quality of the soil on the bank of the Nervion River, which is mainly composed of industrial waste accumulated during decades of steel production.

The weight of the Museum's gigantic structure had to be reduced in every possible way. One of the most important actions was the choice of a very light slab structure, designed with galvanized (galvanized) corrugated steel sheet, connected to a 60 to 80 mm thick concrete slab.

FACTS

Client: Consorcio del Proyecto Guggenheim Bilbao
Architect: Frank O. Gehry and Associates
Consultant: IDOM / SOM
Builder: Ferrovial and Lauki
LWA supplier: Aridos Ligeros SA

The system is light in itself, but the use of expanded clay in the concrete has reduced the total weight by around 30%. To achieve the design density with a compressive strength of 25 MPa, the ready-mix concrete plant used a mixture with special Leca® expanded clay with an apparent density of 550 kg / m3, particle density of 900 kg / m3 and a granulometry between 3 and 8 mm. The concrete was made at a company close to Cavia, in Ortuella, transported by truck and placed by pneumatic pumps.

Gross construction area: 28,000m2
Public opening: October 1997
Volume of lightweight concrete with Leca® lightweight aggregates: 4,800m3
Lightweight concrete LC25:
Compressive strength: 25 MPa
Fresh density: 1700 kg / m3
Dry density: 1600 kg / m3
Slump: 8-10cm
Type of aggregate: Arlite F-5
Water/cement ratio (nominal): 0.60
Modulus of elasticity: 18000 MPa