

ANNEX 4-B

Case study

BILBAO EXHIBITION CENTRE

BEC is the new Exhibition Centre in Bilbao, Spain. The exhibition centre has a floor area of 117 000 square metres, in 6 halls. The halls have no internal columns or supports, thanks to steel lattice girders in the roof. Concerning fire safety, performance based rules were applied with the result that some parts of the structures stay unprotected.

BILBAO EXHIBITION CENTRE, SPAIN



Aerial view

BEC is an initiative designed to offer the best possible service for exhibitors, visitors and the general public in a modern, convenient, practical and highly functional trade fair facility.

1. Construction Details

Structure

The project consists of 111000m² of exhibition area in 6 halls: the “Arena” hall (30000m²), the medium hall (21000m²) and the “small” halls (4x15000m²). The exhibition halls are free of columns. 24300 tons of steel for the structure of the halls and 19200 tons of corrugated steel in the foundations were used.

The box trussed beams of the halls are 125 to 167m long. The roof tubular spatial structure consists of 60 panels (37x37m).

The concrete walls are covered with a “steel skin” to prevent an aggressive impact of the building with the surrounding landscape

The loads are specified by the National Annex NBE-AE-88. The magnitude of loads depends on the use of each area:

- Car parks use load: 400kg/m²
- Lorries accesses: 4000kg/m² (national regulation: 1000kg/m²)
- Hall areas: 4000kg/m²
- Pedestrian zones and accesses: 400kg/m²
- Office areas: 300kg/m²
- Restaurants: 300kg/m²
- Roof (only for maintenance purposes): 100kg/m²

These loads are supported in the different areas with the following structural elements:



Internal view of Hall n°5

Car park

The columns and beams of the car park are made of reinforced concrete and the floors consist of prefabricated concrete alveolar plates with a compression layer of concrete.

Lorries accesses and hall floors

Prefabricated concrete alveolar plates with a compression layer of concrete.

Hall structure

The columns are of reinforced concrete. The box beams are composed of four trussed beams and are made of structural steel.



Hall structure during erection

2. Fire Safety concept

The national standard in Spain for fire protection is the “NBE-CPI-96: Condiciones de Protección Contra Incendios”.

The NBE CPI-96 is based on a prescriptive approach but the characteristics of the structure of the BEC allow an alternative study to avoid the severe prescriptive requirements for roofs passive fire protections thanks to low fire load, good ventilation ,large diaphanous spaces with high thermal dissipation, and presence of active protection measures (automatic sprinklers)



Plan drawing of BEC

Construction Time:

Initiation : September 2001
Inauguration: April 2004

Application Benefits

- Column free internal space
- Maximum flexibility concerning the use
- Modern fire engineering
- Good working conditions through transparent structure

Project Team

Client : Basque Government (47,7%), Bizkaia Regional Gov. (47,7%), & others

Architect : César Azcarate (IDOM) ; Esteban Rodríguez (SENER)

Structural Engineer : SENER & IDOM

Executive company : Companies cooperating in temporal venture:

- Balzola S.A.
- Dragados
- Eraiker 2000
- Ferrovial Agroman
- URSSA