"Las Cañas" Shopping Centre in Viana, Spain

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1 GENERAL INFORMATION

Client:
Construcciones Murías S.A.

Architect:
SAS Estudio de Estrategias Arquitectónicas

Planning of structural framework:
DASEIN Ingenieros, S.L.

Executive company:
Construcciones Murías S.A.

Fire protection expertise:
LABEIN Technological Centre

Processing time:
Inauguration: October 2003

Kind of building:
Shopping centre with 65.000 m^2 of surface area.

Maximum height:
20 m

Ground-plan:
L-shaped.

Figure 1. Entrance of the shopping centre


Figure 2. Corridor structure during erection


Figure 3. Finished corridor

2 INTRODUCTION

The shopping centre consists of 80 shops, 12 cinemas, 1 discotheque, a 12-lane bowling and a hotel with 75 rooms. It is expected to have 8 million visitors per year.

3 STRUCTURE

The structure of the shopping centre is completely executed in steel. A basic drawing of this layout is shown in Figure 4. The yellow area corresponds to the main corridor formed by IPE columns and trusses (HEB profiles) which support the beams of the roof structure (see Figure 2)

There is a supermarket attached to the corridor on one side (blue area). Its roof is supported by timber beams resting on steel columns.

The red area corresponds to the retail area, whose roof is supported by continuous beams (IPE) on steel columns.

The grey area corresponds to cinemas, also supported on steel columns.

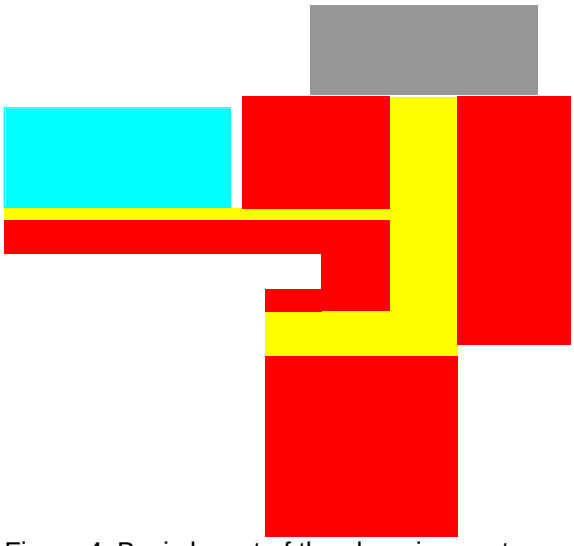

Figure 4. Basic layout of the shopping centre

4 FIRE SAFETY CONCEPT

For this kind of buildings (isolated buildings, lower than 28 m and lightweight roof <100kg/m^2), the NBE-CPI-96 (Spanish national regulation for fire safety) establishes a fire stability of 30 minutes for the roof structure as well as the columns supporting it.

A fire safety study was performed based on natural fire safety concept to define the level of protection required by the structure to meet the safety goals of the regulation. Therefore, it was analysed if some of the steel elements could be left unprotected. Also, it was verified by simulation the smoke control system previously designed with analytical methods.

Smoke control is a main concern in this kind of buildings due to the following features:

- High number of people
- Occupants do not know the building
- Egress routes, which can be affected by smoke coming from a fire.

Several fire scenarios were studied to cover different fire safety goals:

- Structural stability of the shops adjacent to the main corridor
- Structural stability of the supporting elements of the corridor.
- Verification of the smoke control system formed by smoke vents and draft curtains.

CFD calculations were performed to obtain thermal flux on steel elements as well as to validate the smoke control system. Figure 5 shows a CFD output of smoke temperature in the main corridor due to a fire in a shop. FEM calculations were used to assess the structural behaviour of the steel elements.

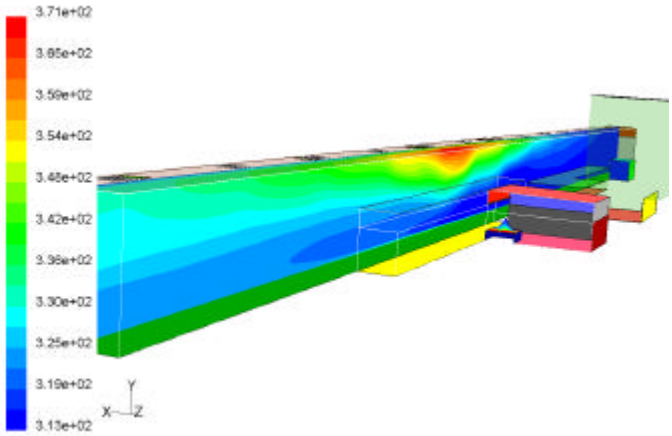

Figure 5. Temperature of hot gases in the main corridor due to a fire in a shop

The final conclusions of this study were the following:

- The supporting structures of the corridor were maintained without passive protection.
- The beams inside the shops adjacent to the corridor remained unprotected
- Some columns embedded in masonry walls were recommended not to be protected.
- It was recommended to increase the size and number of smoke curtains in the main corridor.