

Terminal 2F of Airport CDG Paris, France

B. ZHAO

CTICM – Centre Technique de la Construction Métallique, Paris, France

1 GENERAL INFORMATION

Client:

Aéroports de Paris, France

Architect:

P. Andreu et JM. Fourcade

Planning of structural framework:

Stahlbau Lavis GmbH

Executive company:

SPIE Batignolles

Paimboeuf/Effel

Caltec

Viry

Fischer

Ponticelli

Jurassienne

Fire protection expertise:

CTICM

Processing time:

1995 – 1998

Kind of building:

Terminal of airport

Total length:

520 m

Ground-plan:

130 000 m²



Figure 1. Terminal 2F of airport CDG (Copyright by RFR)

2 INTRODUCTION

The Hall 2F of the Charles de Gaulle airport opened a new traffic unit of the Charles de Gaulle site from April 1998. This terminal is part of the extension project of this airport to ensure additional air traffic of 13 millions of passengers.

3 STRUCTURE

The buildings of the terminal are mainly composed of a central core to receive both check-in and check-out of passengers and two peninsulas for boarding of passengers, each of them capable of receiving the simultaneous boarding of twelve planes. The central core of the terminal is 520 meters long and covered by a steel structure with a span of about 70 meters supporting a concrete shell “skin” below and a roofing in zinc. The two peninsulas are built with steel truss structure using full glazed façades.

3.1 Central core

The central core is composed of into eighteen shells. Its steel structure with a total weight of 5600 tons is car-

rying the vertical loads of both lower concrete shell, which has a curved vertical part of 28 cm thick as well as a slightly curved horizontal part of 12 cm thick, and a roofing structure in zinc. The chosen system of the steel structure is with longitudinal arches having a span of 57 meters and a spacing of 21 meters. These arches using I type welded section with variable height (maximum 2 meters high) are supported at curved side by massive concrete columns and on the other side by V column system composed of two tubes with a diameter of 457 mm, which in turn rest on massive concrete support. They are connected together by truss frame or welded section beams with a spacing of 6 meters. Finally, secondary beams at the lower part in IPE360 supporting the concrete shell and purlins at the upper part in IPE180 supporting the roofing in zinc are adopted.

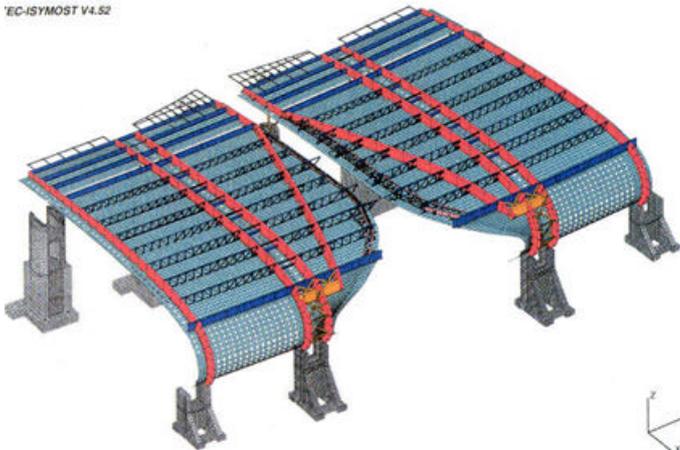


Figure 2. Truss frames of the central core of the terminal 2F of airport CDG (Copyright by RFR)

3.2 Peninsulas

The two peninsulas are fully identical. They are composed each of 650 tons of steel and 8500 m² of glazed façade. The steel frame, in oblong shape, consists of 50 arches with a spacing of 2.85 m.

These arches designed as truss structure with three simple joints have a span varying between 13 m and 48 m and a height varying between 8 m and 22 m without any thermal expansion joint. Each half truss behaves as half Vierendeel beam to support the vertical load. All these trusses are linked together at the top by a steel box, considered as the backbone of the structure. At the lower part, the trusses are linked together with purlins. In addition, the structure is stiffened by the transversal bracing system every six trusses and two longitudinal bracing systems at the lower part of truss structure, forming then a rigid frame.

4 FIRE SAFETY STUDY

Concerning the central core, the French fire regulation requires a fire resistance of 30 minutes for the load bearing structure, that is the concrete shell and the supporting steel structure. Concerning the later, provided a fire pro-

tection offered by the concrete shell situated below it, the various openings created on the concrete shell for both natural lightening and smoke extraction could lead to an important heating of part of the steel structure in case of fire inside the hall therefore question arises about its resistance subjected to such heating

As a consequence, a fire safety study has been made by CTICM in order to clarify above situation, in which a special methodology combining both convection and radiation effects was applied to determine the heating of steel structures.

The mechanical behavior of the principal load bearing steel structure exposed to localized heating is investigated on the basis of advanced calculation model with an approach of global structural analysis (see figure 4). It has been shown that the displacement of the main frame is slightly modified without any risk of collapse.

The resistance of secondary beams near the openings is checked by using the approach of member analysis by comparing the critical temperature of these members with their maximum heating obtained from the same methodology for main frame of the steel structure.



Figure 3. Peninsula made of steel truss structures (Copyright by Viry)

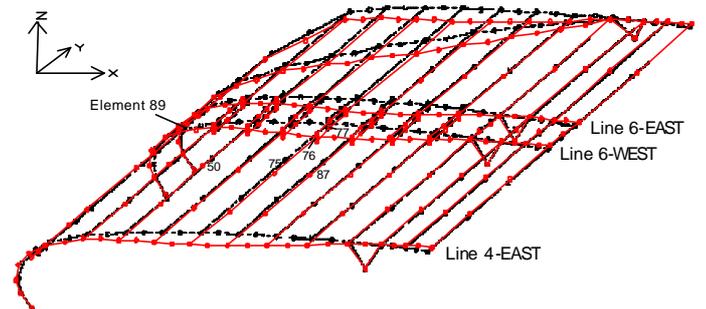


Figure 4. Applied modelling in global structural analysis of the central core

REFERENCE

CTICM Revue Construction Métallique N°3 1998, « Terminal de Roissy CDG2F » and « Ingénierie incendie dans la conception du terminal de Roissy CDG2F »