Roof collapse of the terminal 2E at Paris-Roissy Charles de Gaulle Airport

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The 23rd of May 2004, in the morning, a part of the roof of the terminal 2E of the Roissy Charles de Gaulle airport collapse, causing the death of 4 people.

Design by les Aéroports de Paris (ADP) and the architect Paul Andreu, designer of the future Beijing opera house, the terminal 2E is a 650 meter long jetty with a width of 30 m. 17 airplanes, including two Airbus A380, can simultaneously be parked and it is built to accommodate annually up to 10 million passengers. The access to the airplanes is done by 6 metallic footbridges. This jetty consists essentially of a reinforced concrete shell shaped basket handle, covered with a glass roof.

The collapse was limited to the part of the jetty where the concrete shell supports the bridges. To determine the responsibilities of this tragic accident, three commissions of experts were formed. Among the parties involved are ADP, owner and project manager, GTM, general contractor company, INGEROP, execution studies design office, VERITAS, external checker, and BAUDIN-CHATEAUNEUF, a subcontractor company responsible for manufacturing the steel footbridges.

The company BAUDIN-CHATEAUNEUF has requested the expertise of Greisch office to determine, on its behalf, the causes of the collapse and analyze if the execution of the footbridges was likely to be at the origin of the disaster. Taking into account the interests at stake, the Greisch office has added the skills of Professors R. WALTHER and J.-F. KLEIN, eminent Swiss specialists in the field of concrete structures.

In July 2005, the team thus formed submitted an impressive report to the panel of experts. This report highlighted deficiencies in the overall design of the jetty and design and execution deficiencies. It is based on very detailed studies, for which the Greisch office has used the most recent theories concerning the constitutive laws of materials. The methodology used, the results obtained and the conclusions presented were unanimously appreciated by the members of experts team.

Our main conclusions on the collapse are:

• even if the longitudinal rebar quantity is not sufficient, this is not the cause of the collapse. The code safety cannot be reached but the resistance can be justified under the actual loads;
• the collapse is due to the local resistance under the concentrated forces of the struts. The struts have perforated the shell locally due to a lack of stirrups causing the complete collapse of the structure;
• the footbridges connecting the jetty are not at all the cause of the collapse of the shell. Even more, their presence increases the safety.
Current shell non linear

Approach of actual behaviour

- Collapse mode
- Without local collapse!

Plastic hinges
Underneath connection and at mid-height

Hinges ➔ Cracks