

Contributing human and organizational factors for damage of Bos & Lommer plaza in Amsterdam

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Abstract

The Bos & Lommer plaza complex in Amsterdam was completed in 2004. This complex consisted of apartments, shops and a parking for over 500 cars. In 2006, an 11 ton truck was positioned on the plaza deck and caused structural damage. Part of the load bearing structure had failed and the apartments were evacuated, until the deck was strutted.

Forensic investigations showed that detailing of the reinforcement was questionable and the amount of reinforcement was insufficient, or deviated from drawings. The whole complex was evacuated until measures were taken. Subsequently, investigations of the shops and apartments above the parking showed that the design of a 1 m thick transfer floor might have been erroneous.

Profound investigation of this case showed various human and organizational factors, that might have contributed to the failure. The stacking of various functions resulted in a complex load bearing structure. The building process was complex with over 50 subcontractors. The safety culture was not well developed, given heavily economizing on costs and very tight planning, fragmentation and no clear final responsibility. Risk analysis and checking procedures were lacking. Communication and collaboration could have been improved.

This paper will give insight in technical causes of the failure and in underlying contributing factors. These underlying factors will be systematically studied, by using a theoretical framework.

Keywords: Forensic Structural Engineering, Failures, Human and organizational factors

1 Introduction

The multifunctional Bos & Lommer plaza complex in Amsterdam was delivered in 2004. It consisted of apartments, businesses and shops, a two-storey parking lot for more than 500 cars and a market place. In 2006 an 11 ton truck drove on the market place, which was the roof of the parking garage, and caused structural damage. A concrete half-joint underneath the deck had failed. Residents of apartments were evacuated until the deck was strutted and a reduced maximum load on the deck was introduced and enforced.

Investigations on the causes were started. It was concluded that the detailing of the reinforcement was questionable and the amount of reinforcement was insufficient.

Furthermore, at a number of locations in beams and floors the actual reinforcement differed from the by drawings prescribed reinforcement.

Finally, further checking of the project showed that the design of a 1 m thick transfer floor might have been erroneous. Distributed loads on the slab were assumed, but concentrated loads should have been considered, so reinforcement was not placed at the right positions.