Contributing human and organizational factors to the collapse of the FC Twente stadium roof

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Abstract

In 2011 the city of Enschede was shocked by the collapse of the roof of an extension for the FC Twente stadium. The structure collapsed during construction and two fatalities and nine injuries were recorded. The cantilevering steel roof structure was covered with corrugated steel sheets and stabilized by bracings. Investigation showed that the structure was already loaded with the finishing structure before it was completed and stabilized. Contributing influencing human and organizational factors to the incident were the tight schedule resulting in a flawed construction sequence. Furthermore, there was too little attention to the way of execution during design, unjustified trust between parties resulting in inadequate coordination, checking and allocation of responsibilities.

Keywords: human and organizational factors, causes of failure, forensic engineering

1 Introduction

On July 7th 2011 an extension of the roof of the FC Twente stadium collapsed during construction. This extension would increase the stadium's capacity with an additional 10.000 seats. Additional capacity was needed because of a successful period of the soccer club.

During assembly of finishing structures for this new roof, a roof truss collapsed. This resulted in a progressive collapse. To fatalities and nine injuries were recorded.

A collaboration of the Public Prosecution, Labour Inspectorate of Ministry of Social Affairs and Employment and the Dutch Safety Board [1] started an investigation. Dutch Safety Board reported the outcomes of this investigation to the public [2].

To focus on learning points related to structural safety, it is worthwhile to investigate failure cases with a framework of set parameters. Terwel set up a framework with possibly influencing factors for structural safety [3,4]. The framework is based on critical success factors derived from management literature and factors from safety science. In chapter 3 this framework will be explained.

At first, this paper reveals technical causes of the failure. Subsequently, it presents human and organizational factors in the building process that might have played a role in the collapse. The focus is primarily on engineers and contractors who play an important role in the primary building process.

The analysis of the technical, human and organizational factors of this case is based on a report of the Dutch safety board, an earlier paper on technical causes and various news paper articles [1,2,5-7]. The current analysis is an extension of chapter 7 of the PhD-thesis: "Structural safety:

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