



Structural safety during construction

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Summary

Structural safety during construction is a main concern for the building industry. Collapses of temporary structures or incomplete permanent structures are a threat for the safety of persons. Based on data from Dutch Labour Inspectorate this study concluded that approximately 20% of the fatalities during construction are related to structural failures. The total number of fatalities during construction exceeds (disputable) acceptability limits in the Netherlands. Structural failures were especially influenced by motivation of employees, available equipment and procedures. Improvement is needed, which can start with an increase of safety awareness.

Keywords: structural failures, incident database, structural safety, occupational safety

1. Introduction

A building site is generally considered to be one of the most dangerous places to work [1]. Safety during construction is believed to be poor. A large share of the total number of structural failures already occurs during the construction phase of a structure [2].

Two recent examples within Dutch building industry are the collapse of a temporary structure during casting of a floor of the B-tower in Rotterdam in 2010 and the collapse of a roof of an extension of the FC Twente stadium in 2011.

In October 2010 the 70m high B-tower was under construction in Rotterdam. The floors of the first five storeys were constructed as precast composite plank floors, for which a temporary support structure was necessary. Scaffolding was used to create this temporary structure. On October 21st 2010 the third floor collapsed during casting of the concrete, resulting in five injuries among the construction workers. Investigation from the Dutch Safety Board [3] revealed that a large number of stability braces was omitted in one direction, resulting in instability and collapse of the temporary structure. The vertical elements of the scaffolding had an unsupported height of approximately 11,5m because of a void underneath the third floor.

In July 2011 an extension of the FC Twente stadium was built [2]. The roof structure consisted of a cantilevering steel structure with steel sheeting, which was stabilized by bracings. The roof structure was loaded by some heavy video screens, in addition to the usual loads. Because of time pressure various parties were simultaneously working on the load bearing structure, finishing structures and technical services. On July 7th 2011 part of the roof collapsed, resulting in two fatalities and nine injuries. Investigation from the Dutch Safety Board [4] revealed that the main load bearing structure was not completed and stabilized when the finishing structure was applied. In addition, the structure deviated from the intended dimensions. These aspects contributed to the collapse, according to the Dutch Safety Board.