

Chapter 3

Accident Sources and Prevention in the Construction Industry—Some Recent Developments in Finland

Kari Häkkinen and Ville Niemelä

Abstract The construction industry is well known as one of the riskiest industries in regard to work accidents, even in advanced economies. This paper reviews health and safety hazards and the risks of accidents in construction work. Some accident statistics are presented based on the claims data of the Finnish workers' compensation system, with a narrative case example of a fatal accident. The fatal accident demonstrates the risks involved with working at height and the hazards, which emerge at a shared workplace where several sub-contractors work together. The recent focus on improving safety performance has contributed to positive developments, which have resulted both in an improvement in the claims statistics as well as a number of new innovations to improve safety practices at construction sites. Some large international contractors have taken the leading role in the development of safety management in construction projects. The improvements seem to be strongly related to the sharpened role of top management, as a consequence of which there is now increased attention paid to safety by supervisors and employees alike. New tools and processes, i.e. in incident investigation and reporting as well as work planning procedures, have contributed to more effective and systematic site safety practices. However, the way forward towards a zero-accident culture in the construction industry is a continual and persistent effort through which a significant improvement in the results may occur. This means that, awareness by all of the parties involved is a constantly needed prerequisite, and complacency should be avoided.

K. Häkkinen (✉)

If P&C Insurance Company Ltd., Niittyportti 4, PO Box 1032, 00025 IF Espoo, Finland
e-mail: kari.hakkinen@if.fi

V. Niemelä

If P&C Insurance Company Ltd., Niittyportti 4, PO Box 1022, 00025 IF Espoo, Finland
e-mail: ville.niemela@if.fi

1 Characteristics of Health and Safety Hazards and Risks in the Construction Industry

Construction projects differ vastly in the scale and the nature of work involved, i.e. they can range from the building of houses or commercial and industrial buildings and plants, or heavy civil engineering constructions such as bridges, tunnels, roads, water systems to railroads, harbours and airports. Furthermore, the hazards connected with repairing older buildings and structures are different compared to the construction of new houses and infrastructure. The demolition of old buildings is generally considered to be more risky for employees than working on new constructions.

There are very often many employers working together at the same construction site. A large construction project typically has a main contractor and a large chain of sub-contractors, including many small employers with a variety of competencies and skills. The safety management of such large construction projects is very challenging. Good cooperation and communications between all parties concerned is of utmost importance. While the main contractor has the major role in the overall safety management and coordination, it is important that all employers and employees alike actively take care of their duties in regard to matters of safety. Moreover, clear definitions of the roles of the clients and the owners of the constructions are nowadays prescribed to be essential for loss prevention in major construction projects.

Typical accident scenarios on construction sites are slips and falls whilst walking and working on sites, falls from a height, motor vehicle collisions, excavation accidents, injuries involving the use of hand tools and machines, and being struck by falling objects. Some of the main health hazards on-site are solvents, noise, asbestos and manual handling activities. In specific tasks and projects, construction employees may be exposed to special hazards which could lead to serious accidents such as electrocution, drowning, asphyxiation, fire and explosion (ILO 1998).

Howarth and Watson (2009) have classified the hazards of construction projects in the following five categories: (1) Hazards presented by the local environment; (2) Hazards presented by work activities; (3) Hazards presented by a deficiency in people's knowledge, attitude and behaviour; (4) Hazards presented by the movement of people, plant and machinery; (5) Hazards presented by materials. The identification of safety hazards is a key process of safety management exercised throughout all phases of a construction project. Due to the complex nature of the construction safety issue, specific laws and regulations have been issued for construction sites in most highly developed countries. These laws and regulations supplement the general employer duties described in the general health and safety legislations of each country.

2 Some Loss Statistics

In the construction industry, the frequency of accidents is higher than in most other industries, and a major share of serious and fatal accidents is every year registered to construction work.

However, during recent years, a positive declining trend of accident frequency rates is visible in the statistics for the construction sector in Finland, thus indicating a positive safety development (see Fig. 1).

According to the insurance statistics of Finland for 5 years (2005–2009) the most common working task performed before an injuring event occurs in the construction industry is walking and moving at a worksite (Fig. 2a). The share of human movement injuries, in serious accidents leading to permanent work disabilities, equates to more than half of the cases. Injuries to shoulders represent as much as 25 % of the accident pension cases and the total amount of injuries to the upper limbs equates 41 % of accident pensions (Fig. 2b). In addition, accidents occur frequently when using hand tools, in the manual handling of materials and during the use of machinery. The most common body parts injured are hands and arms—from fingers to shoulders, and legs including knees. The fatal injuries result mostly from head injuries or multiple injuries to the body due to falls from a height.

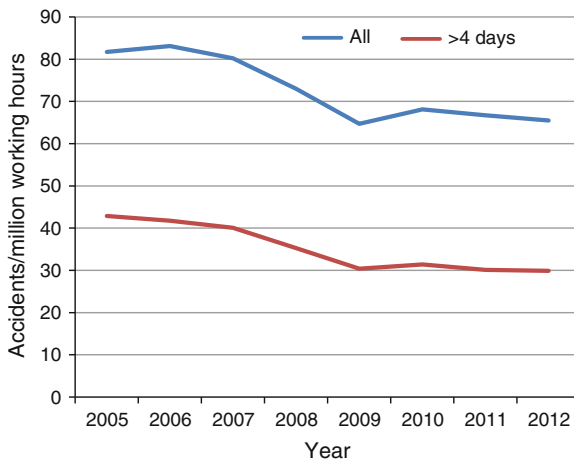


Fig. 1 The trends in accident frequency rates in the construction industry of Finland during the years 2005–2012, presented for all compensated accidents and for of the accidents leading to more than 4 days’ absence from work (The data are issued by the Federation of Accident Insurance Institutions in Finland)

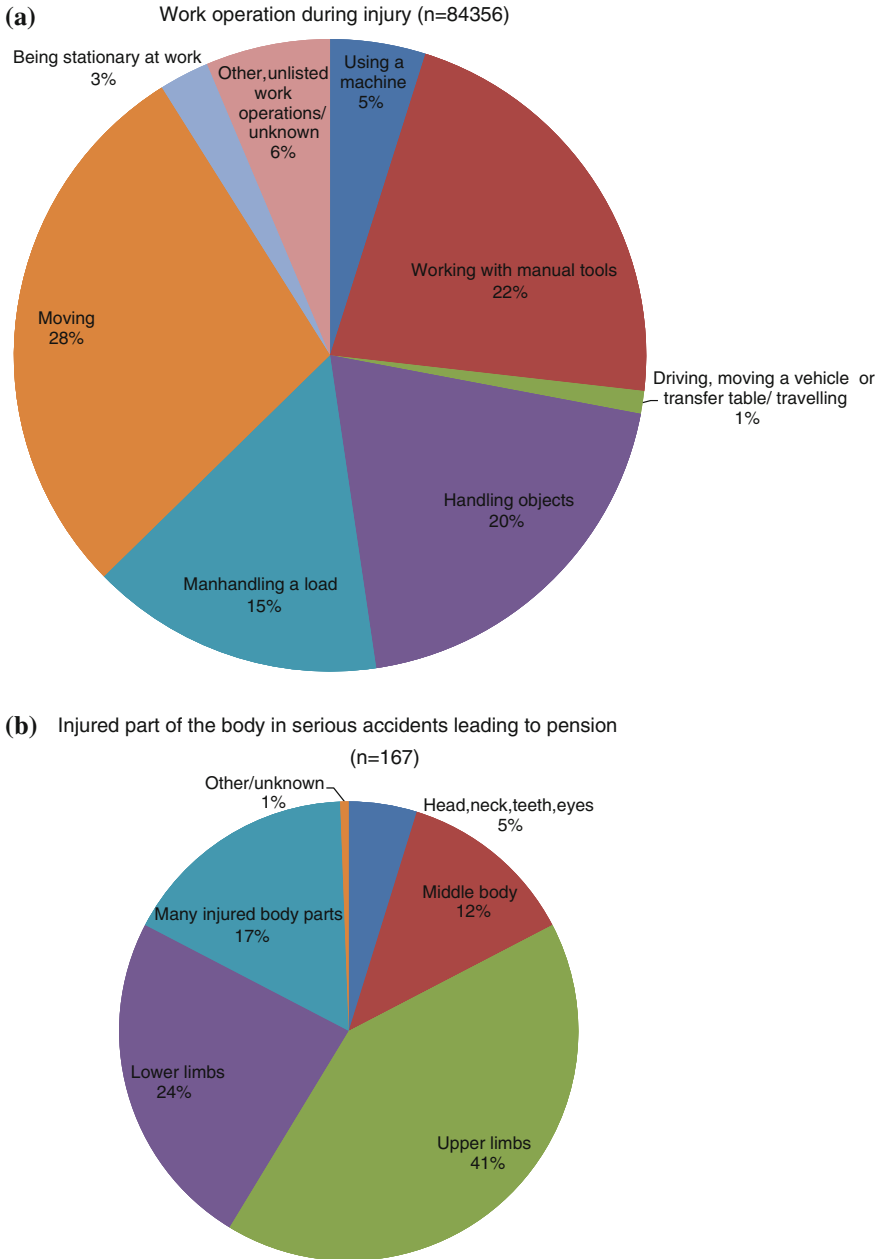


Fig. 2 a All notified accidents in the construction industry by work operation of the injured person leading to the injury. **b** Injured part of the body in serious accidents leading to pension in the construction industry (Source The national statistical database issued by the Finnish Federation of Accident Insurance Institutions, including all notified work accidents in Finland during the years 2005–2009)

3 A Fatal Accident Case: Working at Height

Working at height is work where a person could fall and get injured if adequate precautions are not taken. This description applies to most industrial workplaces and is—and has been—a major source of many fatal accidents, particularly in the construction industry. The case below is a classic situation that led to a fatal injury when falling precautions failed.

3.1 What Happened?

A three-floor enlargement project of a school building was ongoing and several different tasks were under construction simultaneously. Two men were installing a temporary plasterboard wall on the third floor when they ran out of boards and were instructed to carry the missing pieces from the second floor after their lunch break. During this break a group of sub-contractor workers started installing permanent handrails in the stairway where the boards were supposed to be carried through.

As a part of this task the temporary handrails from the landing on the third floor were removed and were still missing when the workers carrying the plasterboards were passing the spot. Whilst turning the board to enable it to go through a doorway on the right, the worker carrying the board from the rear apparently stepped off the landing and fell 3.5 m. He died after 3 months in hospital care.

3.2 What Caused the Accident?

The installation of the handrails created an immediate risk of falling for anyone in the area. The coordination of tasks during production planning should have taken these hazards into consideration and scheduled them so that the temporarily dangerous access would not have been needed until it was safe again.

A sub-contractor creating a safety hazard is responsible for arranging and completing the required safety measures. Because the temporary handrail needed to be removed in order to complete the task, the obvious danger of falling should have been notified clearly and the access to the stairway and landing closed until the handrails were completed.

Carrying the plasterboard through a stairway was not the normal procedure, the other boards were lifted earlier to the third floor with a telescopic handler, but this option was not available anymore. In any case, the stairway was used as the main route to the third floor. Closing the access during the handrail installation work would have been the absolute correct thing to do.

3.3 Preventing Similar Accidents

The main contractor is responsible for coordinating the construction project activities so that separate but simultaneous tasks do not create hazardous conditions for anyone on the same construction site. The main contractor must also appoint a safety coordinator to overlook and verify the correct safety actions, as well as the ones that the sub-contractors are responsible for.

In this type of situation where a work operation creates a high-risk condition in a certain area, the area must be secured so that no one can enter without proper safety precautions. It is also important to assure the safety of workers working in a high-risk area. Adequate falling protection, a safety harness in most cases, is vital when work must be done in a place without stationary fencing.

In shared workplaces like the construction site in this case, appliance of the same safety rules and procedures regardless of contractor would benefit all. In this work situation during lunch break, the installation workers stepped aside to give room to pass when workers carrying the boards entered the landing. So despite the hazard, the mentality was more “everyone takes care of his/her own work” rather than “safe working together”. When all workers on a site know and follow the rules and procedures, the evolvement of a safety hazard into a serious accident can be stopped before it is too late.

4 The Focused Prevention Approach Towards Zero Accident Performance

While work accidents regularly have multiple causes that can be identified by a thorough accident investigation process, some general sources of loss can be identified based on the long-term experience with construction safety issues:

- *Inadequate access systems, walkways and fall protection at worksites*, especially in the use of ladders, scaffolds and other temporary solutions, unprotected openings on floors and the lack of guardrails, personal fall protection equipment not in use.
- *Poor housekeeping and tidiness of worksites* contribute to numerous accidents at construction sites, e.g. the storage of materials and tools, the installation of hoses and cables, dusty, oily, dirty and icy floors, inadequate space for walking and working due to litter and extra materials at the sites.
- *Safety management systems are not working*, this may be due to inadequate organization or poor leadership and supervision at a site, or because the agreements and communications between the contractors are not observed.
- *Planning of the construction project is inadequate*, with a lack of proper risk assessment procedures and failures in the control of deviations from the original planning.

In recent years, the construction industry in Finland has actively developed new innovations to improve safety performance. The new approaches in prevention have been achieved to a large extent with close cooperation between employers, trade unions, occupational health and safety inspectorate and insurance companies. At present, an ambitious goal to reach a zero accident level for the industry by the year 2020 has been published. Large international construction companies have a leading role as the forerunners in this development. Moreover, the interest of top management towards safety improvements has grown a lot during recent years. Nowadays, accident frequency rates and trends constitute a major performance indicator for construction companies, and employers compete positively with each other for safety excellence. Parallel to this development, line managers, foremen and employees are currently the main actors in health and safety, rather than only safety managers and specialists.

The sharpened focus on safety management at construction sites has also improved tools and processes in practical health and safety work. The traditional weekly inspections of construction sites have been substituted by a more systematic TR observation method (European Agency for Safety and Health at Work 2004). The TR tool gives a measurement indicator based on the observations of house-keeping and other safety-critical issues at the site. Thus the progress of the site in health and safety performance can be followed week by week by the company management and safety inspectors. More recently, iPads and mobile phone tools are used to aid the assessment, thus making the process more effective and repeatable at site conditions.

Accident investigation routines have been improved particularly by the large contractors. The trends are towards more detailed fact-finding investigation as well as interviews to reveal the root causes of the incidents. The pressures from management and clients of the projects as to better safety concern have also improved the reporting of the near-accidents at construction sites. The best construction companies now report some thousands of near-accidents and at-risk situations, while only a few lost-time accidents have occurred at their sites.

It is a well-known fact that accidents at construction sites often occur at work situations which are unplanned, often due to unexpected changes in the work flow. To improve the site practices, a major Nordic contractor Skanska initiated the so-called Work Safety Plan. In this procedure, employees and management together plan a reasonably safe solution to an encountered new situation without any pre-existing plan. The plan is documented and signed by both an employer and employee representative. The procedure has been used very frequently, and thousands of plans are documented yearly at the Finnish work sites. But the challenges are still ahead: in too many accident cases still occurring, no need for Work Safety Plan has been identified before the start of the work.

The way towards a zero-accident culture is long and difficult in the construction industry. Parallel to declining accident rates, the improvement gets more challenging, and from time to time there may appear increasing of losses. Prevention is first and foremost a human affair. Both managers and employees need to be continuously awakened and aware of the hazards and develop new ways to improve

safety, to communicate better, and to take care of the daily routines as to the maintenance of the good working conditions. Construction sites are changing continuously and people are exposed to the changing conditions, be it the weather, technology, organization or the economic environment, or something else. But the building companies and their employees are now more and more committed to the goals to improve safety. The way towards zero-accident culture in the construction industry is a persistent effort where results may be meaningfully improving, but awareness of all parties involved is needed constantly, and complacency should be avoided.

References

- European Agency for Safety and Health at Work (2004) Achieving better safety and health in construction (information report). Office for Official Publication of the European Communities, Luxembourg
- Howarth T, Watson P (2009) Construction safety management. Wiley-Blackwell, Chichester
- ILO (1998) Encyclopaedia of occupational health and safety, vol 3, 4th edn. Industries and Occupations, Geneva