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Health and safety coordinators in building projects

Abstract

Purpose

In order to reduce the number of injuries on construction sites, a European Directive prescribes that the clients shall appoint safety and health coordinators in their projects. The purpose of this study was to find out who are appointed to be health and safety coordinators of the planning and projecting phase and what they do in order to prevent injuries on sites.

Design/methodology/approach

Since the 1st of January 2009, there shall be a coordinator of the planning and projecting phase in Swedish construction projects. Telephone interviews were made with the coordinators in 42 Swedish building projects.

Findings

The coordinators' education and experiences varied widely, as well as their descriptions of their duties: no duties, administration and active injury prevention. The coordinators who were classified as most active had at least one additional leading role in the projects.

Research limitations/implications

The study is qualitative for an increased understanding, not a statistical reflection of the coordinator population.

Practical implications

The legislation needs to clarify whether the early conceptual phase of the project is included in the coordinator's commission and whether she/he is supposed to participate in identifying, assessing and reducing risks through design changes. These clarifications will have an influence on when the coordinator should be appointed and what competence she/he needs.

Originality/value

The study increases the understanding of how the health and safety coordinators of the planning and projecting phase of building projects perceive their mission and what factors, according to them, have an influence on what they do.

1 Introduction

The risk of getting seriously injured at work in the building and civil engineering industry in Sweden is more than twice the average in the Swedish labour market. The risk of work-related diseases approved by the insurance company is five times the average (Larsson et al., 2011). The problem is pan-European. A study of casual factors in construction accidents reports that a third of all injuries in the UK workplace happen in the construction industry (HSE, 2003).

Project managers, architects, design engineers and construction supervisors have a potential to reduce occupational injuries on construction sites (Behm, 2005; Gambatese et al., 2008; Maitra, 1999; Szymberski, 1997).

A British study of factors which had contributed to 100 construction accidents applied an ergonomic system approach (Larsson et al, 2011). Primary causes of accidents are related to the materials, equipment, workplace and work team. These originate in shaping factors, such as attitudes/motivations, designs and specifications. The shaping factors are originally influenced by, for example, clients' requirements, economic climate, project management and risk management (Haslam et al.,2005).

According to Szymberski (1997), the ability to influence safety is highest in the beginning of a project and declines as the project proceeds (Figure 1).

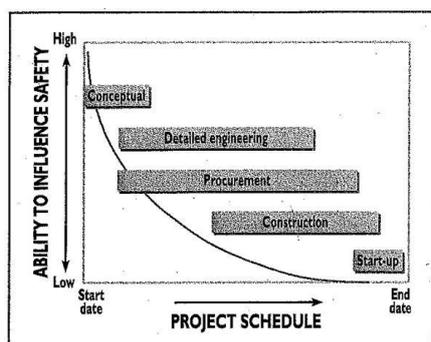


Figure 1: Time/safety influence curve (Szymberski, 1997).

If an occupational hazard is identified in the conceptual phase, the potential to make a design change which reduces the risk is relatively high. The best way to avoid injuries is to design for safety. Safer designs reduce the safety's dependence on the workers' behaviours and measures on site.

However, safety is not of high priority in the planning and projecting phase of construction projects (Almén, 2009; Almén and Larsson, 2012; Baxendale and Jones, 2000; Gambatese et al., 2005; Haslam et al., 2005; Smallwood, 2004).

Unsatisfactory architectural and poor planning of the works at the project preparation stage have played a role in more than half of the occupational accidents occurring on construction sites in the European Community (Council Directive 92/57/EEC, 1992). Council Directives define the safety duties for clients, project supervisors and employers. In order to improve the coordination between various parties, the client or the project supervisor shall appoint one or more coordinators for safety and health, at the project preparation stage and at the project

execution stage (Council Directive 89/391/EEC, 1989; Council Directive 92/57/EEC, 1992). These were adapted to the Swedish legislation in 2009.

According to the Swedish legislation, the client (the one who orders the execution of the building) shall see to it that work environment viewpoints are considered when they are applicable to the building phase as well as the future usage (AFS 1999:03; The Swedish Work Environment Act, 2011). In some projects, there is a professional client for whom construction project management is a part of the organisation's regular activity. In other projects, the client lacks construction competence and experience. There is no standard system for the organisation of a building project. It depends, for example, on if the client appoints a project manager for the projects and what kind of contracts there are. In some projects there is a main contractor, in others there is not. The way in which the project is organized will have an influence on the stakeholders' responsibility for safety and their power of influence.

Architects, design engineers and others who assist shall, within the framework of their assignments, heed the work environment viewpoints (AFS 1999:03; The Swedish Work Environment Act, 2011).

The Swedish Work Environment Authority provides guidelines for those who plan and project (e.g. clients, architects and design engineers), for example, "Proactive before construction" and "Checklist for projecting responsibility" (Swedish Work Environment Authority, 2004 and 2005). These guidelines (not updated to the regulation with demands on coordinators) summarize the regulation and present checklists. The checklists propose questions which can be used for inspection and by those who take part in the planning and projecting phase of construction projects. There are questions about how health and safety are managed, for example: "Is health and safety an item on the project meeting agenda?", "Does the contract between client and architect include providing input to the health and safety plan?" and "How does the client ensure that designers have enough health and safety competence?" There are also questions which can be used to plan and design for safety, for example, to ensure possibilities, to ensure that materials can be transported without excessive workload or risk of vehicle accidents, to prescribe building products which are not too heavy or too big for safe manual handling and to avoid unhealthy materials (Swedish Work Environment Authority, 2005).

The countries in the European Union have addressed the role as health and safety coordinators in different ways; the project manager with an overall responsibility can be the coordinator or there can be a separate and independent coordinator. Also the demands on the coordinator differ. Belgium and France require the coordinator to have a certain academic level, training and experience (Aires et al., 2010).

The occupational injury incidence rate has decreased in most European countries, but not all, from the period between the year when the countries regulations were adapted to the EU directive and the year of 2005. The decline may be caused by the Council Directive 92/57/EEC or by other influencing factors: for example, variations in productivity (Aires et al., 2010).

Since the 1st of January 2009, the clients shall appoint coordinators for health and safety in all building and civil engineering projects in Sweden. There shall be two coordinators: one for

the planning and projecting and one for the execution of the construction work. The coordinators shall have the education (extended regulation from 1st Jan 2011), skills and experience needed to perform their duties. The client can either appoint herself/himself or someone else (juridical or natural person) as a health and safety coordinator. If no coordinator is appointed, the client is responsible for all the coordinator's duties. The coordinator for the planning and projecting shall coordinate the application of relevant work environment rules which during each phase of the planning and projecting phase shall be followed on the question of the building phase as well as the usage of the building or construction. It is especially applicable when questions on the planning of building operations which shall be performed at the same time or after each other are concluded and when the time expenditure for such a building phase is calculated. The building work environment coordinator shall make sure that a work environment plan is made and prepare documentation which describes the building's construction, design and the building products being used (AFS 1999:03; The Swedish Work Environment Act, 2011).

The UK Health and Safety Executive authority provides help resources related to the CDM (Construction Design and Management) Regulations 2007. In "Managing health and safety in construction", there is a table which summarizes the duties of the stakeholders in relation to each other (HSE, 2007). The Swedish Work Environment Authority does not provide such a detailed oversight.

In the present study, health and safety coordinators of the planning and projecting phase answered questions about their education, experience, duties, the occupational hazards in the project and the injury prevention measures. The aim was to investigate whether there were any differences between the coordinators who took an active part in identifying, assessing and reducing risks through design changes and the coordinators who were less active.

Unfortunately the nomenclature differs in the actual area. In this article the following terminology is used. "The planning and projecting phase" includes the activities from the client's project initiation until the beginning of the production of the building. The phase when the building is produced will be called "the execution phase. In this article, the term coordinator is used for the coordinator of the planning and projecting phase unless something else is specified.

2 Method

For all large¹ building and civil engineering projects, the client shall send a prior notice to the Swedish Work Environment Authority. The authority's district of Stockholm received prior notices for forty-two building projects during a period of 15 days in March–April 2010. All these projects were included in this study. Projects of new buildings as well as renovations, rebuilding projects and demolitions were included. Projects of civil engineering were excluded. The prior notices included information about the projects (address, type of

¹ Lasting longer than 30 working days and on which more than 20 persons are occupied simultaneously at any time or when the work is scheduled to exceed 500 person-days

project, planned number of contractors and execution time) and the stakeholders (e.g., client, coordinators). Information about the clients' main activity was collected from the clients' web sites.

Telephone interviews with the health and safety coordinators for the planning and projecting phase were carried out (June–December 2010) by the main author of this article. The coordinators or, if the coordinators were juridical persons, their contact persons were contacted by telephone and informed that the participation was voluntary and that they were free not to answer questions when they preferred not to do so. The coordinators in all the projects (42 out of 42) chose to take part in the study. Two of the interviewed persons were coordinators in two projects in the study.

The coordinators were asked to give information about themselves, to describe their duties and to more explicitly describe what occupational risks had been highlighted in the planning and projecting phase of the projects and how these risks were managed:

1. The coordinator:
 - a. The coordinator's additional roles in the project
 - b. The coordinator's degrees of education
 - c. The coordinator's experience of planning and projecting
 - d. The coordinator's experience of work on construction sites
2. The coordinator's duties and influence on safety:
 - a. The main duties as a coordinator in the project
 - b. What influencing factors the coordinators found important for their possibilities to act for safety on site
3. Actual injury prevention in the project:
 - a. Occupational hazards in the execution phase which were highlighted in the planning and projecting phase of the project
 - b. How these hazards were managed

There were no predetermined reply alternatives for the coordinators to choose from. When necessary the answers were followed up with further questions like "How do you mean?" and "Can you please explain that a little bit more?"

Notes were taken during the interviews. Immediately after the interview, within 24 hours, the notes were compiled into a pre-prepared form where the answers from the semi-structured interview were sorted to make them better suited for further analyses. The forms and the original notes from all the interviews were read through in order to get an overall picture of similar opinions in several interviews and of different opinions on the same task.

The coordinators' descriptions of their duties were summarized in a table, one row for each coordinator. The duties were then categorized. The descriptions of their job varied widely, from no duties to both administrative (for example preparing a work environment plan) and awareness of actual injury preventive actions during the planning and projecting phase. As there were no predetermined replies, in some cases categorization was complicated. For example, "taking part in meetings" could imply administration and/or active participation in risk reduction. In order to avoid incorrect categorization, only the most clearly defined groups were further analysed: those who were defined as passive and those who took the most active part in injury prevention.

3 Results

3.1 Projects

New buildings were produced in 11 projects. In the remaining 31 projects, an existing building was renovated, rebuilt or demolished. A majority of the clients (27) were running building projects as a part of their regular activity as contractors, building administrators, building developers or municipalities. The rest of the clients were less experienced: for example, cooperative building societies, financing and insurance companies and retail businesses. The planned number of contractors was specified in the prior notice for 35 projects. The mean value of contractors in these projects was 8.5. At the time of the interviews, the production had started in all the projects; 22 were still under construction and 18 were completed. In two projects the coordinator did not know how far the project had proceeded.

3.2 Coordinators

All but two coordinators had at least one additional role in the project (Table 1); the majority had several. Therefore the total number of roles (78) exceeds the number of coordinators (42).

Table 1: The coordinators' additional roles in the projects

Additional role	Frequency
Project manager	18
Lead designer	13
Client	8
Health and safety coordinator for the execution phase	7
Construction manager	6
Other in the design/planning phase	6
Contract manager	5
Other in the execution phase	5
Site manager	4
Quality manager	2
Foreman	2
Architect	2
Total	78

In eight projects, the coordinator was a person working for the client's company/organization. Four of them were project managers in the project. Another 14 coordinators were projects managers, though not working for the client. This gives a total number of 22 coordinators being client and/or project managers in the same project.

A majority of the coordinators (28) did not have any degree of education above the upper secondary school. Ten coordinators had a Master or Bachelor Degree of Science in Engineering, and two had a Master Degree of Architecture. Two had another post-secondary degree.

The coordinators' estimation of how many years of experience they had from working in building and civil engineering projects are presented in Figures 2 and 3. The coordinators' experiences varied widely.



Figure 2: The coordinators' experiences of execution in building and civil engineering projects, 41 projects, mean value 14.7 years (one project: data not available).

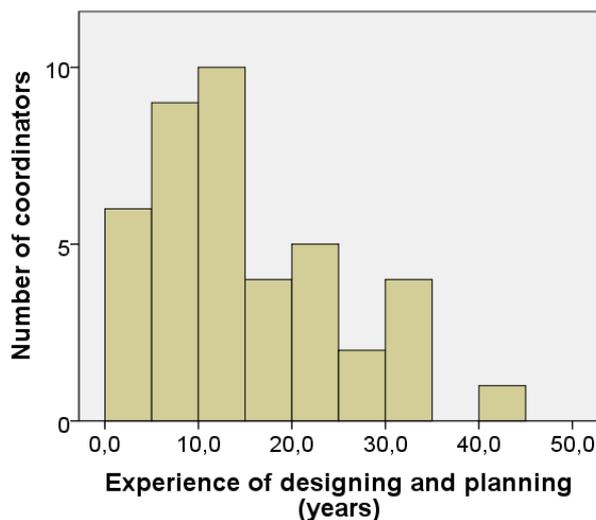


Figure 3: The coordinators' experiences of designing and planning in building and civil engineering projects, 41 projects, mean value 13.6 years (one project: data not available).

3.3 Duties

The most frequently reported duty was to prepare the health and safety plan, which is obligatory, and was mentioned by 17 out of 42 coordinators.

3.3.1 Hazards

A deeper analysis of the hazards which were reported by the coordinator in this study and how they were prevented has been reported in another article. The results show that most of

the hazards which were reported in the study were related to work on height, implied an excessive workload or exposure to chemical substances. Only a minor part of the hazards was prevented by design changes in the planning and projecting phase. The most frequent design measure was to prescribe building products with lower weight in order to reduce the workload (Almén and Larsson, 2012).

3.3.2 Passive coordinators

The coordinators in seven projects said that the coordination commission implied no duties in the project. These projects were of different kinds: replacement of old pipes in buildings, demolition, extension and rebuilding. The maximum number of workers ranged, according to the prior notices, from 8 to 23 and the execution times from 2 to 12 months.

The clients were four cooperative building societies, one municipality, one building administrator and one retail business.

None of these coordinators had any education above the upper secondary school. With one exception they had a long execution experience (10–47 years). The one who lacked experience was a one-off client. Four had a longer experience of work with planning and projecting (10–20 years). The rest had 0-3 years.

One coordinator had no additional role in the project. One person, the one-off client, did not know that he was a coordinator. The rest had a role in the construction phase of the project as contract manager, construction manager or site manager. Three of these persons were also the health and safety coordinator for the construction phase of the project.

Some of the coordinators explained why they had not performed any coordination duties in the planning and projecting phase of the project.

A coordinator working for the contractor in the rebuilding of a preschool project said that the documents were already completed when he was appointed. The contractor just updated them into production documents and stamped them. This procedure is, according to the coordinator, not so uncommon. The designers/clients do not want to be responsible.

A coordinator working for the contractor in a replacement of the old pipes project explained that the information in the prior notice that the contractor was responsible for projecting, planning and execution was incorrect. The contractor did not design. First, a consultant was the health and safety coordinator. The interviewed coordinator was not appointed until it was time to plan for the execution. Thus, the notice to the Swedish Work Environment Authority contained incorrect information, as the contractor was not appointed to undertake design work, just planning and execution.

A coordinator in another replacement of the old pipes project meant that there was not so much design in this kind of project, the character of the building was not changed, and everything remained in its position. He had a contractual agreement, with a reference to the Swedish Work Environment Act, however, no detailed scope or list of tasks and activities. Actually, he perceived that he had no commission as a coordinator besides formally on paper.

The coordinator who was the client in an extension of a retail business project expressed surprise when he was contacted to be interviewed as a coordinator. He said that “I am the client. In my world the contractor is responsible for everything.”

3.3.3 Most active coordinators

The coordinators in seven projects who said that they took an active part in the planning and projecting phase and gave at least one example of design change for safety were classified as most active. The projects were of different kinds: rebuilding, new building, replacement of old pipes and reparation after a fire. The maximum number of workers ranged, according to the prior notes, from 15-50 and the execution times from 4 to 14 months.

The clients were two municipalities, two building administrators, one financing company, one retail business and one haulage firm.

Three of these coordinators had an exam from the upper secondary school, two had a Bachelor and two had a Master Degree of Science in Engineering. Three had a longer (20–30 years) execution experience; the rest had a maximum experience of five years. Five had a longer experience (10–25 years) of planning and projecting; the remaining had two years.

All seven coordinators had at least one additional leading role in the project. Two coordinators were both project leader and lead designer, two were just project leaders, two others were lead designers. The last one was coordinator of the installations.

3.4 Coordinators' views of important factors

The following factors were brought up by at least one fourth of the coordinators as important for their possibilities to act for safety.

The coordinator needs knowledge of construction methods and experience from work on site. The coordinator should participate in all parts of the planning and projecting phase. Designers need to communicate regarding safety issues with one another and with the contractors. The coordinator's additional roles in the projects affect her/his possibilities to influence decisions in the planning and projecting phase. The coordinator's work is facilitated if the designers give priority to safety issues and understand what the occupational consequences might be from the designs.

4 Discussion

Only a minor part of the coordinators in this study bring up design changes for safety. This might reflect attitudes that it is up to the contractor to manage health and safety since this is not of high priority in the projecting and planning phase.

The coordinators who participate in the major part of the planning and projecting phase, and have one or more additional leading role in the projects, seemed to be more aware of couplings between designs and occupational hazards. A leading role over time implies oversight and power.

Passive coordinators in the study say that they are appointed late in the planning and projecting phase, in some cases not until the commencement of the execution phase. This may indicate that, despite the new legislation, there are established views in the building industry that safety problems should be solved by the contractor.

The views of the need for health and safety coordination in building depend on how one looks upon responsibilities and possibilities to influence safety. The area below Szymberski's time/safety influence curve, can be used to illustrate the possible outcome of health and safety

coordination in building projects. If safety management is seen as the contractor's responsibility, then it is logical that the coordinator's commission begins just before the production starts and continues during the execution phase. The area marked A in Figure 4 illustrates the possible health and safety outcome when the coordinator for the planning and projecting phase is appointed late. The area A is only a small part of the area representing the outcome when the coordinator is appointed early, marked B.

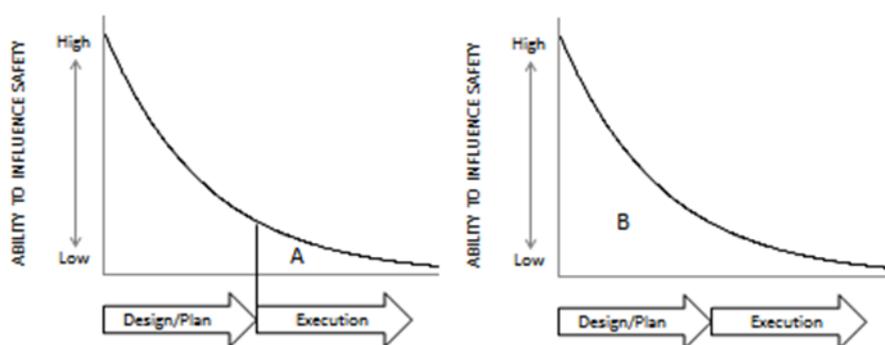


Figure 4: A modification of Szymberski's time/influence curve (Szymberski, 1997). The area under the curve illustrates that the possible outcome of health and safety coordination is significantly greater if the coordinator is appointed from the very beginning of the project (B) than if she/she is appointed just before the execution starts (A).

If the management view relies on Szymberski's time/influence curve, it is important that the health and safety coordinators take an active part in the whole project. Active participation implies that the coordinator is appointed early in the planning and projecting phase of the project and that she/he is involved in the planning and projecting process.

The results in this study indicate that project managers and lead designers might be suitable as health and safety coordinators of the planning and projecting phase of building projects. They are commonly engaged from the early stages of the project and have, in cooperation with the client, an influence on the design and the power to make design changes for an increased safety on construction sites. However, having a leading role and coordinating health and safety issues might sometimes imply conflicts of interest which need to be managed. The client is the one who decides what should be prioritized in the project.

There is no doubt that the coordinators have administrative duties such as to make sure that a work environment plan is made and prepare building documentation (AFS 1999:03; The Swedish Work Environment Act, 2011). The passive coordinators in this study do not report this duty. As the interviewer did not offer any predetermined replies, some of the coordinators might have made such a plan, though not found it worthwhile mentioning. However, as this is one of the few clearly expressed duties in the regulation, one can assume that most of those who did not mention this did not make one and were maybe not aware of the duty. After this study was made, there are additional regulations in Sweden which prescribe coordinator education for the commission (1st Jan 2011). One could expect that the coordinators in projects appointed after this regulation are more aware of their duties.

The new Swedish requirements regarding the coordinator for the projecting and planning phase include mainly basic health and safety education (laws and regulation). The Swedish

Work Environment Authority recommends 48 hours of education of which only four hours are suggested to deal with coordination in practice. The coordinator shall have experience which is relevant to the character of the project, though at least some kind of short construction practice (Swedish Work Environment Authority's web page). This is hardly enough time to prepare coordinators for taking an active health and safety leadership as well as communicating an active role to uncover hazards and reduce risks in the project. The requirements indicate that the coordinator is not expected to take such a leading role.

The coordinators shall also, according to the legislation, coordinate the safety work. This could imply that the coordinators are expected to take an active part in the identification, assessment and elimination/reduction of hazards. If so, the coordinator probably needs experience from both projecting and execution as well as good communication skills.

However, maybe it is good enough if the coordinator distributes risk checklists to those who take part in the projecting and planning phase and compile the remaining risks in the work environment plan, which is more of an administrative duty.

In 2011, the Institution of Civil Engineers (CIE) has graded coordinators' competence. Three areas are assessed: task knowledge of design and the entire construction project process, health and safety knowledge and experience of construction site and of the entire construction project process (ICE, 2011). The results in this study support that all these three competence areas are essential in the projecting and planning team in order to achieve actual risk reduction in construction projects.

Coordinators in this study emphasize that it is essential that designers take responsibilities for health and safety on construction sites and understand what the occupational consequences might be according to the designs. Some of them claim that their health and safety competence is not good enough. Education for professionals, for example architects and constructors, needs to focus on such understanding, especially regarding unusual and complex constructions. For ordinary designs, guidelines can be used.

There shall be a health and safety coordinator in all Swedish construction projects. Although this study only includes projects which have been notified, some coordinators claim that there is no need for a health and safety coordinator for projecting and planning in their less complicated projects. This might imply that the Swedish regulatory requirements for coordination are less applicable to smaller projects. In the UK, the client only has to appoint a coordinator in notifiable projects (HSE, 2007).

The coordinators' education and experiences are included in this study but do not, however, specify the skills which are needed to identify possible occupational hazards on site related to the design and to judge whether the working conditions are acceptable or not. One way to increase such skills among coordinators, architects, design engineers and others who take part in the planning and projecting phase is to offer regular workshops for training.

5 Conclusions

The education and experiences of the coordinators in the planning and projecting phase varies widely, as well as the descriptions of their duties: no duties, administration duties, and active injury prevention.

The coordinators who actively participate in the planning and projecting phase and describe design changes for an increased occupational safety on-site have at least one additional leading role in the project.

The results in this study support previous studies which state the importance of the following factors:

- Clients include demands on health and safety routines and actual injury preventive measures in contracts with all those who take part in the planning and projecting phase, especially the project leader and lead designer.
- The coordinator is appointed in the early stages of the planning and projecting phase.
- Designers should have enough health and safety competence to foresee occupational consequences of the designs.
- Health and safety communication should not only be written.

The legislation needs to clarify the roles and the time of appointment:

- if the coordinator is expected to take an active part in identifying, assessing and reducing risks through design changes.
- what planning is supposed to be coordinated, just planning before the start of the execution of the building or planning from the very beginning, including the conceptual phase.

These clarifications have an influence on when the coordinator should be appointed and what competence and influence she/he needs.

We recommend that:

- the Swedish Work Environment Authority provides a matrix overview of the stakeholders' duties and responsibilities on their web site.
- the Swedish Work Environment Authority provides more, and updated, guidance on their web site on how clients, designers and coordinators can plan and project for health and safety on construction sites.
- a diversification of the legislative requirements for the coordination of projects of different sizes/complexity is considered.
- a revision is carried out of what health and safety issues are included in the education for professions who participate in the projecting and planning phase in relation to their legal obligations.
- regular health and safety training for professional designers and coordinators in order to increase health and safety skills are arranged.
- further in-depth studies of how those who participate in planning and projecting perceive their responsibilities and how their duties to prevent injuries are carried out.

REFERENCES

Almén, L., & J. Larsson, T. (2014). Health and safety coordinators in building projects. *Built Environment Project and Asset Management*, 4(3), 251-263.

Aires, M.D., Rubio Gámez, M.C. and Gibb, A. (2010), "Prevention through design: The effect of European Directives on construction workplace accidents", *Safety Science*, Vol. 48 No. 2, pp. 248-258.

Almén, L. (2009), "Projekteringens möjligheter att minska risken för arbetsskador i byggproduktionen" (Design and planning possibilities to reduce the risk of getting injured on construction sites, in Swedish). KTH - CHB, Stockholm. <http://kth.diva-portal.org/smash/get/diva2:428311/FULLTEXT01.pdf> 2013-08-21

Almén, L. and Larsson, T.J. (2012), "Design measures for construction site safety, in *Conference of the Nordic Ergonomics Society 2012*, Saltsjöbaden, Stockholm. http://www.nes2012.se/documents/Proceedings/Scientific/Almen_L.pdf 2013-08-21

Baxendale, T. and Jones, O. (2000). "Construction design and management safety regulations in practice--progress on implementation", *International Journal of Project Management*, Vol. 18 No. 1, pp. 33-40.

Behm, M. (2005), "Linking construction fatalities to the design for construction safety concept", *Safety Science*, Vol. 43 No. 8, pp. 589-611.

Council Directive 89/391/EEC (1989), "Introduction of measures to encourage improvements in the safety and health of workers at work", In: Communities, T.C.o.t.E. (Ed.). <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31989L0391:en:HTML> 2013-08-21

Council Directive 92/57/EEC (1992), "Implementation of minimum safety and health requirements at temporary or mobile constructions sites", In: Communities, T.C.o.t.E. (Ed.). <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31992L0057:EN:HTML> 2013-08-21

Gambatese, J., Behm, M. and Rajendran, S. (2008), "Design's role in construction accident causality and prevention: Perspectives from an expert panel", *Safety Science*, Vol. 46 No. 4, pp. 675-691.

Gambatese, J., Hinze, J. and Behm, M. (2005), "Investigation of the Viability of Designing for Safety", available at http://www.elcosh.org/document/1892/d000693/Investigation%2Bof%2Bthe%2BViability%2Bof%2BDesigning%2Bfor%2BSafety.html?show_text=1 2013-08-21

Haslam, R., Hide, S., Gibb, A.G.F., Gyi, D.E., Pavitt, T., Atkinson and S., Duff, A. (2005), "Contributing factors in construction accidents", *Applied Ergonomics*, Vol. 36 No. 4, pp. 401-415.

HSE Health and Safety Executive, 2003. "Casual factors in construction accidents". HSE Books. <http://www.hse.gov.uk/research/rrpdf/rr156.pdf> 2013-08-21

HSE Health and Safety Executive, 2007. "Managing health and safety in construction", HSE Books. <http://www.hse.gov.uk/pubns/priced/l144.pdf> 2013-08-21

ICE Institution of Civil Engineers, 2011. "CDM 3 years on". <http://www.ice.org.uk/getattachment/d0fa4659-ba74-4fb9-9ef8-186a185b5447/ICE-CDM-3-Years-On-Report.aspx> 2013-08-21

Larsson, T.J., Oldertz, C. and Tezic, K. (2011), "Allvarliga arbetsskador och långvarig sjukfrånvaro 2011" (Severe work-related injury and long-term absence from work in 2011, in Swedish), AFA Labour Market Insurance, Stockholm.

Maitra, A. (1999), "Designers under CDM: a discussion with case studies" *Telford*, Vol. 132 Nos. 2-3, pp. 77-84.

Smallwood, J.J. (2004), "The influence of engineering designers on health and safety during construction", *Journal of the South African Institution of Civil Engineering*, Vol. 46 No. 1, pp. 2-8.

Swedish Work Environment Authority, 2004. "Förebyggande före byggande" ("Proactive before construction", in Swedish). http://www.av.se/dokument/publikationer/adi/adi_574.pdf 2013-08-21

Almén, L., & J. Larsson, T. (2014). Health and safety coordinators in building projects. *Built Environment Project and Asset Management*, 4(3), 251-263.

Swedish Work Environment Authority, 2005. "Checklista för projekteringsansvar" ("Checklist for projecting responsibility", in Swedish). http://www.av.se/dokument/publikationer/adi/adi_583.pdf 2013-08-21

The Swedish Work Environment Act (2011). <http://www.av.se/inenglish/lawandjustice/workact/> 2013-08-21

Swedish Work Environment Authority's web page on theme construction <http://www.av.se/teman/bygg/ansvar/bas.aspx> 2013-08-21

Szymberski, R.T. (1997). "Construction Project Safety Planning", *Tappi Journal*, Vol. 80 No. 11, pp. 69-74.