

Improving chain management of contractor safety

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TNO Quality of Life | Work & Employment

1. INTRODUCTION

It's getting more and more common for construction work to be organized into short-term projects. The short-term nature of these projects implies that employees are only temporarily needed. Specialised other companies and their employees are hired to perform the work better, faster and usually cheaper. Not only do employers hire contractors, these contractors usually hire subcontractors and a chain of companies emerges (Goudswaard, 2002). A disadvantage of this organisational form is that the number of people and companies involved rises and it becomes more difficult to co-ordinate responsibilities and to monitor the work process. Difficulties in controlling occupational risks arise, leading to an increase in accident rate amongst (sub)contractors (Amerongen 2007, Zwanikken 2001) In January 2007, the Dutch TV programme "Netwerk" powerfully illustrated this problem when it broadcasted a documentary entitled 'The Promised Land'. Netwerk reported a story of an industrial accident involving a Polish employee working via a subcontractor. Netwerk concluded that the company where the accident occurred had shifted its responsibility to the subcontractor: a Polish employment agency that supplies cheap labour.

These notions underlie a research effort on contractor safety and actor chain co-operation/management by TNO Quality of Life (2007-2010), in close co-operation with the Dutch Ministry of Social Affairs and Employment. The project aims to identify opportunities

for improving occupational safety in the chain of clients, contractors, subcontractors, and other relevant stakeholders.

The project aims to develop tools or methodologies that help companies in complex chains to better control occupational risks. This should lead to:

- a diagnostic instrument enabling the identification of opportunities for improving occupational safety in the chain;
- specific instruments for resolving commonly experienced problems and issues, published in a "catalogue for chain management".

Major construction or maintenance projects typically involve a prime contractor who makes use of subcontractors. These subcontractors, in turn, engage other subcontractors who, likewise, may also hire further subcontractors. In the resulting complex chain of companies, responsibilities must be closely co-ordinated and monitored to ensure that work can be carried out safely. The large number and the diversity of actors involved appear to have negative consequences for attention paid to safety (Habilis Ltd, 2004; Zwetsloot, 2007). For these reasons and because TNO had previous experience in the building industry, TNO choose to use construction as the subject for this study.

This paper contains the 2007 results and an outlook into 2008 and further.

2. METHODS

The study comprised a literature scan, the development of an analytical framework, interviews, brainstorm sessions, and the testing of a chain simulation tool.

2.1 Literature scan

The search was directed at chain management in general, safety chains, communication in chains and contracting and subcontracting issues. Criteria for selection of papers were occupational safety issues in chain management, useful definitions of chains, responsibilities of parties involved in chains including legal matters, and accidents related to chain management.

2.2 Analytical framework

The development of an analytical framework for chain management issues and contractor safety as a basic subdivision for the results (see Figure 1). The authors consulted several TNO specialists in the building environment and contractor safety and combined these findings with those from literature.

2.3 Interviews: interviews were conducted with safety specialists and operators from construction companies, process industry, main contractors and subcontractors and the Dutch Labour Inspectorate. The interviews focussed on finding bottle necks and solutions in the control of safety in complex building situations. In addition, we asked all parties how they currently control safety in all phases of the building process.

2.4 Brainstorms

Brainstorm sessions with contractors and experts about improving co-operation. In two workshops with stakeholders from government, process industry, construction companies and others, we discussed the difficulties in controlling safety in complex construction work, possible solutions and the usefulness of diagnostic instruments and instruments for improving safety in chains.

2.5 Chain simulation tool:

Testing of a chain simulation tool in three workshops. This tool has been developed by TNO mostly used in relation to issues with dangerous substances (Zwetsloot 2007). The tool can be used with the actual actors relevant to a case or with people playing their roles. The tool consists of a preparation step comprising identification of the key stakeholders, analysis with the key stakeholders of the current situation, identifying conflicting perspectives of the stakeholders and, finally, chain simulation with the actors. We modified the tool in such a way that we could do a simulation within one and a half hour during a session as part of larger meeting. Two sessions with actors who played a role were conducted. One simulation was done with actual workers in road construction. The three sessions were evaluated with the actors with respect to their usefulness for improving safety.

3. RESULTS

3.1 Analytical framework

The analytical framework in Figure 1 shows a construction chain, from design until use of the utility (Timmerman, 2005; Bomel Ltd., 2004).

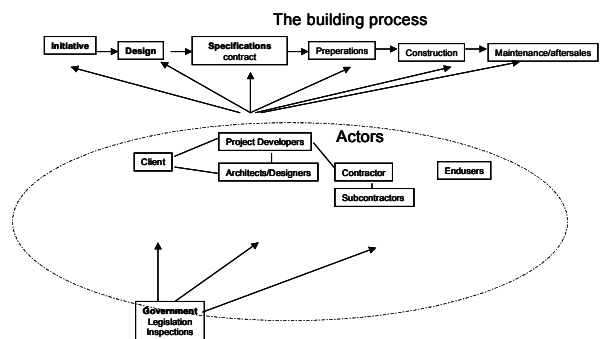


Figure 1: Analytical frame work

Also shown is a interdependent set of stakeholders (actors) who have influence on occupational safety in all phases of the chain. The model presented has served as a guideline for our studies. From the graphic it is clear that the organisation required to successfully work with all actors (the actor chain) throughout the phases

of the building process are considerable. Within the building process many phases can also be defined. The figure gives a general description of a construction chain although not all actors are involved in all phases.

The actor chain (or more aptly actor network) consists of the client, architects, designers, project developers, main contractors, subcontractors, sub-subcontractors and end-users. Additionally, several government institutions are involved through regulation and inspection.

3.2 Literature

The literature study has resulted in a list of difficulties and solutions in controlling occupational safety when using (sub)contractors. Additionally we observe three developments which put pressure on building safety:

1. Rapid change is going on in the labour market. This leads to an increase in the use of flex workers and the use of - mostly temporary - project organisations. Additionally, work is contracted out to smaller organisations. More and more these contractors are used for doing parts or all of the work (Eksted 1999). This leads to more complex organisations and complex forms of communication which also tend to make the management of safety and health issues more complex (Siemieniuch and Sinclair, 2002).
2. The tasks delegated to contractors and subcontractors are typically high risk. In many cases, contractors do the hard physical and dirty labour in relative bad labour circumstances (Amerongen, 2007).
3. Lastly, the workload of (sub)contractors is generally high due to a competitive market. They have to achieve high quality results in a limited amount of time for a limited amount of money. In some cases occupational safety is at stake (Goudswaard, 2002; Zwanikken, 2002).

These developments result in various difficulties in controlling safety throughout the actor chain:

- Many cooperating stakeholders which leads to long and complex communication lines. This may lead to misunderstanding and loss of information.

- Complex, splintered and unclear responsibilities between actors. Often it is not clear who has ownership of controlling safety at the site.
- Lack of skilled and experienced labour. Both in the home country, and in other from which contractors are increasingly sought.
- Increasingly, different cultures are present in building projects. Differences in culture and language can hamper effective communication on safety issues.
- Similarly safety cultures in individual contractors may differ, especially when they are from different countries of origin.
- The more contractors the more difficult to teach safety rules and culture to all.
- Laws and certification systems leads to increasing needs to write down all relevant regulations in procedures. This can result in an uncontrollable mass of procedures and instructions which are hard to know all for the contractors and subcontractors.

Solutions to overcome difficulties in safety management in chains as reported in literature are:

- Reduction of complexity of organisational structures and processes in cooperation of all stakeholders (Frijters, 2005).
- Involvement in an early phase of all (sub) contractors in controlling risks focused on an early recognition of most important risks and communication problems (Winkler, 2006).
- Early planning of complex projects. This makes it possible to take sufficient safety measures in time.
- The use of methods and instruments to assure a structured way of looking at safety aspects in the preparation phase of complex projects (Frijters, 2005).
- Safety performance of contractors and subcontractors should be part of the selection criteria of clients. These criteria should be also be checked by audits at contractors (Winkler, 2006).
- Reduction of complexity by dividing the project in smaller projects, combined with a risk assessment for each small project (Frijters, 2005).

- Clients should co-operate for a longer time with the same contractors in more than one project. This helps implementing a joint safety and co-operation culture (Riedijk, 2001).
- Improvement of safety leadership with contractors (Duran, 2006).
- Improvement of training and education of the “blue collar” workers, combined with constant attention for safety (Duran 2006, Riedijk, 2001).
- Implementation of a joint safety management system for all concerned parties in a complex project (Riedijk 2001, Goudswaard, 2002).
- Communication about the safety performance of all contractors during the project (Riedijk, 2001, Amerongen, 2007).
- Increase of safety inspections by contractors and clients (Amerongen, 2007).

3.3 Interviews and brainstorm sessions

The interviews consisted of semi-structured interviews with key-actors in the process industry, the utility construction industry and the Dutch Labour Inspection. All key actors mention the same - related - difficulties in controlling safety in construction chain management. They also have several ideas about improvement of the control. The following aspects are relevant:

3.3.1 Integration in design and planning

- Integration of occupational safety in the designing and planning phase of complex projects. In most complex projects, occupational safety of the construction workers has no attention in the designing and planning phase. Architects and clients should involve contractors in these phases. In the contracts are many specific agreements about price, quality of the work and delivery dates. Safety performances of contractors of safety measures at the workplace are mostly no subject in the contract phase. Besides that, many (sub) contractors are involved in a big complex project and they depend on each other concerning the realisation of the work within the agreed time. Deadlines are important and hard to realise. In this situation the level of occupational safety is under pressure.

- Existing instruments, like the obligatory safety & health plans¹ in the design phase do not function well enough. The use of this instrument is often a matter of routine and a “copy and paste” process which does not contribute in improving safety on the construction site.
- Training and education of the obliged safety and health co-ordinator should be improved. In several cases the co-ordinator is not able to co-ordinate all the safety and health plans because of lack of knowledge about safety.

3.3.2 safety culture

- More and more contractors use subcontractors from abroad and this can trouble communication at workplace level. Actors can have different safety cultures and safety levels leading to a complex organisation structure in which it becomes difficult to manage safety on the workplace.
- Improvement of safety leadership at all levels is necessary.

3.3.3 Clarification and centralisation of responsibilities

Due to the many actors in complex construction projects and the complex regulations, safety responsibilities become splintered and unclear. It appears to be unclear in what cases the client is responsible and in what cases the main contractor or subcontractors are responsible for workplace safety. Besides clarification of legislation, stakeholders should have a clear agreement on this in the contract phase of the project.

3.4 Chain simulation

Three workshops at two conferences have been organised. All workshops had the same subject: the risk of accidents for highway construction workers making sleeves for wiring. The maintenance operators were concerned about their safety because the distance between their workspace and the traffic was in their opinion too

¹ In the Netherlands most contractors are certified by the Safety Checklist for Contractors (VCA). Most clients in the Netherlands demands this certificate and part of the demands is to have safety and health plans in the designing phase of projects.

small. In this case we played the games with people involved in the subject but not necessarily the real players. Therefore we made scripts for the most important actors in advance:

- Members of Parliament
- Ministry of Transport, Public Works and Water management) (MoTPBW) as client
- Local government of Amsterdam
- MoTPBW as road manager
- MoTPBW as central traffic controller
- Main contractor road maintenance
- Project manager
- Project leader
- Quality, environmental, safety and health (QESH) manager.

3.4.1 Case related results

- After the contract phase there is too little room for improvisation and reconsidering of the agreements, even if it is necessary for assuring safety for the road workers. Agreements about time slots for clearing two lanes on the highway are not negotiable, even if low traffic makes this possible. Only in high pressure situations (crisis) agreements will be considered.
- Contracts deal with standard situations, but unexpected situations are common and solutions have to be improvised. Consider to make agreements on “what-if situations”.
- The client has not enough knowledge of the situation at the workplace.
- Communication during the project is poor. Safety specialists are not involved until calamities occur.
- Accidents have also consequences for the client, not only for the contractors. The client should be more aware of that.
- Stakeholders should trust each other and it is necessary to invest in relations. Therefore one should know and speak to each other, not only about contracts and crisis, but at a regular base.
- Soft skills like communication skills are underestimated skills in this area.

3.4.2 Evaluation of the chain simulation instrument

After the workshops the usability of the chain simulation instrument was evaluated. It appeared that:

- All participants were enthusiastic about the usability of the tool. It appeared that no stakeholders in the chain oversees the total chain and the game helps to get a more holistic view of the complexity of the chain.
- The tool is a convenient way for giving insight in the roles and wishes of all stakeholders. This helps to start thinking about solutions in a more creative way.

4. DISCUSSION

Improving safety in chain management is crucial in an increasingly complex world. The literature search and the interviews clarified the main strengths and weaknesses in chain management. Especially, co-operation in an early phase of a project is crucial in controlling safety. The simulation workshop gives participants, which are companies or representatives from the chain, insight in each others' viewpoints and statements and increases understanding and willingness to co-operate in an early phase. The simulation workshop is also well suited to identify weak and strong points in a chain and can be used as an instrument to improve co-operation. There seems to be a need for more concrete safety instruments with all actors involved in the building process. Further research will be focused on collecting these instruments and make them easily available for all actors.

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