

# COMMUNICATION OF HEALTH AND SAFETY INFORMATION IN CONSTRUCTION

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Occupational health and safety is important to the design, construction, maintenance, refurbishment and demolition of buildings and facilities in all branches of industry, business and commerce. Health and safety issues have been a major consideration in construction. Far too many people get hurt, injured or die even though the situation has improved over recent years. Accident and fatality rates continue to be significantly higher than other industry sectors. Although all parties involved in the construction industry may address their respective responsibilities, the lack of integration between each organisation often results in communication problems which jeopardise health and safety. Of particular note is the communication during the design phase. All information pertaining to the project must be readily accessible for all parties, to ensure smooth and hitch-free project execution. This paper reviews the challenges in the communication of health and safety information in the design phase of construction projects. It characterises the various aspects of collaborative communications at this stage and highlights the problem area. It also presents the preliminary findings of interviews with members of the design team as part of the first author's PhD studies.

Keywords: communication, design, health and safety, inter-organisational relationships.

## INTRODUCTION

The construction industry typically has complex communication processes because a lot of parties are involved in the business process (Charoenngam *et al.*, 2003). An example of this complex nature is that multiple reports must be prepared to ensure that information is delivered to all organisations, departments or personnel using it. This can be a particular problem if a channel and a mechanism of communication is not adequately designed and carefully considered.

Communication challenges among all parties involved in a particular construction project may result in an array of problems such as addition in time needed for project completion, cost that exceeds the original budget and lack of control of design changes including the aspects of health and safety. Health and safety in a construction project is critical and must be given utmost attention. It must be a primary focus from the design phase to project completion and even beyond into use, maintenance and finally demolition. Any negligence in project design or management may result in accidents that will not only burden responsible companies in damages payments, but

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also tarnish company reputation and ongoing projects. In more severe cases, the party responsible may face legal action and claim and court processes will waste valuable time and money.

However, according to Hislop (1999), the risks associated with other work are less appreciated and the opportunities to reduce those risks are often overlooked, such as designing welding locations or steel connections at easily accessible points. Designers may not be able to eliminate all safety and health risks, but they can make significant contributions to workplace safety, if they are motivated to do so. Owners are in strong position, as clients, to motivate the designers to make these considerations.

## **SCOPE AND PURPOSE OF THE STUDY**

This study describes a research project focusing on communication of health and safety information in construction. Methodologies used for the study will be discussed. Research will scrutinise issues that appear in the communication of every construction industry player, including communications within the Client's team, between the designer (or structural engineer) and the CDM Coordinator, where health and safety problems need to be identified, between the designer (architect or structural engineer) and the contractor, within the contractor and subcontractor's team where project and safety information has to be communicated to the workforce and the site manager has to ensure that they understand site rules and health and safety procedures related to the activities they are going to perform.

## **LITERATURE REVIEW**

### **Industry Trends and Challenges**

Safety in the contracted work environment is under pressure by a variety of industry trends. Downsizing and outsourcing of work, the increasing complexity of operating systems, increased specialisation of equipment, and more potent chemical products create an environment ripe for accidents (Hislop, 1999). Jannadi (1996) mentioned that the most important factors affecting the construction safety are:

13. Maintaining safe work condition
14. Establishing of safety training
15. Educating workers and supervisors
16. Effective control by main contractor of the numerous subcontractors
17. Maintaining a close supervision of the workers and
18. Assignment of responsibility to all levels of management and workers.

Maintaining a range of employees with the technical expertise suited to attend to the construction, modification, maintenance, and also the operation requirements of the complex systems of today's operations is an expensive venture that most organisations cannot invest in. As a result, the expertise of specialty contractors is needed to deliver construction work and to meet and specialised cyclical work requirements.

### **Changes in the industry, trends and challenges**

According to Yisa *et al.*, (1996), the construction industry faces a continuous circle of changes in workload, work mix and the method of managing the changes and by definition, changing its product all the time. Job site safety and health in construction has improved in recent years, as reflected in the reduction in injury and illness rates since the early 1990s (Hislop, 1999). In the context of construction in the UK, health and safety continues to receive serious attention, with the establishment of CDM Regulations in 1994 and their revision in 2007. All construction aspects should be

given due consideration in the implementation of health and safety. This includes the roles played by all parties involved.

The new millennium sees construction facing challenges such as downsizing and outsourcing of work, the increasing complexity of operating systems, increased specialisation of equipment, and more potent chemical products that create an environment ripe for accidents (Hislop, 1999). Most apparent in this industry is the rapid forward advancement in innovations and technology. For construction to become a safe industry, one that is not tainted with a record of a high fatality rate, health and safety aspects must grow in accordance with other areas of development. Sadly, this is not typically the case.

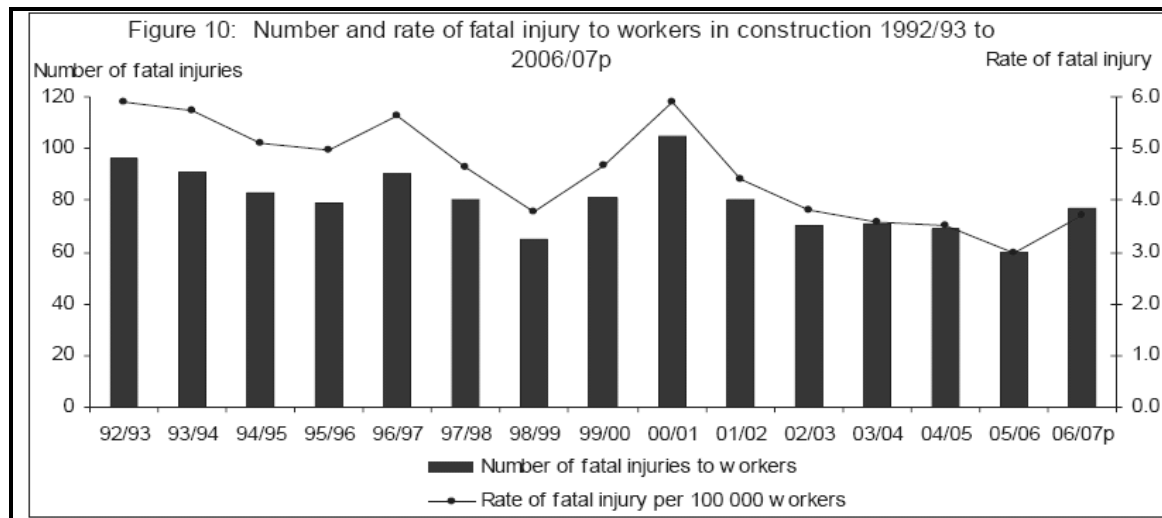
*Table 1 Accidents of construction workers in the UK (adopted from: Langford et al., (2000))*

Year	Injuries leading to absence from work for over 3 days	Fatal accidents	Nonfatal accidents	All reported injuries
1987	16 316	100	2587	19 003
1988*	16 916	134	3416	20 466
1989	19 826	109	2998	19 826
1990	17 829	120	3830	21 879
1991	16 151	98	3276	19 525
1992	12 953	87	2740	15 780
1993	10 910	77	2531	13 518
1994	11 043	81	2574	13 698
1995	11 174	83	2627	13 884
1996	9695	79	2477	12 251
1997	9666	90	4054†	13 810
1998	9668	74	4171	13 913

Table 1 showed statistics for accidents in construction for the years 1987 to 1998 in the UK. In the recent 2 decades, it is clear that with effort and awareness from all parties in the construction industry, the number of accidents is reduced from year to year.

According to the report, looking over the past five years, there is no overall trend in the rate of fatal injury. The 15-year trend in the rate is generally downwards, which is statistically significant, and shows an average decline of 3.9% per year. Evidently from the statistic, all measures taken by the parties involved in the construction industry to reduce accident, injury and death rates are successful for only a period of time. Other aspects that are more relevant to the health and safety situation in construction at present must be identified to ensure a steady decline of accident and death rates over time.

Figure 1 Number and rate of fatal injury to workers in construction 1992/93 to 2006/07 (adopted from: Statistics of Fatal Injuries 2006/2007, HSE UK (2007))



Fiona (2000) responded by mentioning that responsibilities for planning and coordination for health and safety are often unclear, and compliance with health and safety law is generally poor. Ringen *et al.* (2001) proposes the same notion that many hazardous exposures result from inadequacies in access to information, measurement technology, and personal protective equipment. In this decade, the construction industry needs to upgrade the level of security for everyone involved, in particular improving health and safety management. This is especially true in terms of communications between all construction operators. All information pertaining to the project must be readily accessible for all players, to ensure a smooth and easy project execution.

According to Faniran (2001), construction projects are complex joint ventures that involve many different parties and organisations, such as clients, designers, consultants, contractors, and inspectors. Problems mainly occur during inter and intra field communication process. The major factor that contributes to poor project performance is the lack of integration and co-ordination between the industry's professions.

### Health and Safety trends (post CDM)

The construction industry is one of the UK's largest industrial sectors, providing employment of eight percent of the working population. The industry also represents one of the most complex and dynamic industrial environments. According to Langford (2000), the issue of construction safety assumed considerable importance with the introduction of the Health and Safety at Work Act of 1974 (HMSO, 1974) and more recently, the Construction Design and Management (CDM) Regulations of 1994 (HMSO, 1994) have reinforced the importance of managing safety in the construction industry in a self-regulatory context. Such context requires the development of a safety culture and, as a consequence, a change of attitudes. Such attitudes will be shaped, in part, by the regulatory framework governing safety in construction. However, the greater influence will arise from factors that are part of the work practices and individual behaviour of construction workers.

## STUDY OBJECTIVES AND RESEARCH METHODOLOGY

The objectives of this study are to investigate the challenges in the communication of health and safety information in the design phase of construction projects. It characterises the various aspects of collaborative communications at this stage and highlights the problem areas. In the context of looking at overall health and safety communication process in construction, the communication flow is also being examined as well. However, while opportunities to address safety in designs may exist, design-phase barriers were perceived to be present that inhibit or even prohibit their implementation. The authors sought to understand these barriers, including potential limitations presented by conventional design practices and the knowledge and understanding of design professionals related to design for safety. This is based on a combination of qualitative and quantitative research methods including literature review, case studies and detailed surveys involving large and small construction companies. Observations on drawings and other documentations are being carried out and interviews conducted to investigate the current industry practice.

### SEMI STRUCTURED INTERVIEWS WITH DESIGNER-ARCHITECT COMPANIES

For information related to communication of health and safety information in construction for design phase, one of the main early sources of information is architect. Lead architects from four design companies have been interviewed. The architects firms targeted were in the East Midlands area which was accessible to the first author. They were contacted by telephone, followed by a formal letter with an invitation to join the study and the research abstract. Meetings have been held in their premises and each lasted about one and a half hour for each interview. The intent of the interview was to investigate:

1. Health and safety communication flow in construction.
2. Methods of sharing information.
3. Health and safety communication content.
4. Communication barriers and challenges.

*Table 2 Participating companies and interviewees.*

Overview		Interviewee Details		
Company	Industry	Interviewee	Position	Years of experience
A	Construction	A	Architect (Partner/Director)	35
B	Construction	B	Architect (Director)	25
C	Construction	C	Architect (Director)	8
D	Construction	D	Architect (Associate Partner)	10

### Interview Findings

The findings of the interview are discussed based on the aims of the interview which are: health and safety communication flow, methods of sharing information, health and safety communication content and communication barriers and challenges.

### *Health and Safety communication flow*

Generally all four companies share similar opinion and much the same experience regarding communication flow in construction. Based on design and build projects for example, the communication starts with the client proposing an idea for a construction project, they would refer to the architect to put their ideas into drawings. At this stage, the architects bear the responsibility to ensure that the construction project could be carried out and maintained safely. At this stage also, the first discussion regarding health and safety that should be highlighted in the drawings. The architects as the lead designer will include the potential risks in the schematic plan. The communication will then expand to other designers such as structural and mechanical engineers. These engineers will enrich the drawings with necessary detailing including the specification for health and safety aspects. All the four interviewees agreed that, at this stage, the communication with other designers would be fairly straightforward. They highlight the possible risks and put the appropriate details in the drawings. Any changes done to the drawings will be communicated to all of the design team members via meetings or fax and emails. Design risk assessments would be carried out to highlight the potential risks and hazards. Risk assessment forms were used by all four companies. In this way, all the changes and possible risks are recorded and filed for reference. In his opinion, interviewee B mentioned that in using a risk assessment form, only the main or important potential risks would be highlighted, rather than highlighting all the minor 'conventional' risks such as the danger of not wearing hardhats on construction sites. Sharing the same opinion with interviewee A, interviewee B mentioned that all the usual potential risks that repeated in every construction project should not be highlighted. Rather only the unusual risks should be pointed out.

After the design stage, the communication will continue as the main contractor is appointed. Project information has to be communicated in detail in order to share the architectural/engineering knowledge acquired during the design stage. Communication between designers and the contractor during design changes is also vital. The exchange of information has to be mutual because the contractor, through his experience and skills, may add additional considerations to the project.

### *Methods of sharing information*

All the four interviewees basically used the same method to share information regarding health and safety. Throughout the design process, regular meetings had been held among designers to produce set of drawings that will, at best, eliminate the potential risks. According to interviewee B, in every meeting, they would include a sub-section to discuss health and safety in that particular construction project. Interviewee A strongly pressed on the need for discussion regarding health and safety right from the beginning of the proposal meeting with the client. According to him, some of the clients are not aware or not knowledgeable enough regarding construction in general to be aware of potential risks. It is the designers' duty to keep the clients informed at every point of the construction. On the contrary, interviewee C would not discuss health and safety aspects at appraisal until outline proposal stage. The element of health and safety would then be included in the drawings, based on their knowledge and experience and the clients updated about this from time to time starting from the detailed proposal stage. Interviewee D shares the same opinion and experience with company A and B.

Meetings during the design stage are much simpler according to interviewee C. Other professionals will be informed regarding changes to the design via meeting, fax or

emails. The communication becomes more complicated in the construction phase, according to them, due to expansion of communication channels.

#### *Communication Barriers*

Interviewees A, C and D explained that the extent and nature of the communication barrier depends on whether the other professionals they deal with are local or come from other places. If the other parties are local, the communication regarding the project they are working on would be much easier and quicker. They could conduct meetings on a regular basis. But this could not be applied if the other disciplines they deal with come from different places. Communication through telephone calls, emails and faxes will take place. As most of the decision, changes, risks and hazards evaluated or even changes on the design need immediate attention, the process of communication via telephone, fax and internet takes a longer time. Interviewee B had different views on health and safety communication barrier. In the context of communicating the health and safety information, in his opinion, the CDM coordinator should be actively involved in the construction as well as keeping all the professionals involved on track. But this does not happen in the real construction world. What is happening is that the architect has always been the person to be relied on health and safety information and actions. When the communication goes down to contractors and subcontractors, the expansion of health and safety communication will be greater. As the result, the communication will be ad\_hoc and it is thought that contractors do not retain the same health and safety information as the designers. Too much documentation also, in his opinion, would lead to missed crucial health and safety information. At the end of the communication process, all the thick health and safety file and the tender documents would not be read. Interviewee B suggested the risks that they have assessed should be highlighted individually and this information should be kept and used accordingly.

#### *Construction Communication Challenges*

In the matter of construction communication challenges, all four companies have both some similar and some varied opinion and experience. Interviewee A mentioned the challenge that he has to face in managing a construction project is to deal with a lot of paperwork. According to him, too much paperwork takes too much time for the preparation and it takes more focus than the risks that they really have to pay attention to. From his experience, the common risks that would happen in every construction site should not be addressed in every construction design. What is really important are the unusual risks that would be likely to occur in each particular project. According to him, the contractor selected should be experienced and knowledgeable enough to manage all the usual risks in any construction project. Another challenge that he has to face as a professional in construction is to live with the expectation that the architect knows everything. In this regard, most of his clients depend on him, not only for design aspects but also health and safety aspects. This opinion shared with interviewees B and D. In their opinion, the clients themselves should know about construction rather than putting architects under undue pressure to ensure the project will be constructed and maintained safely. Interviewees B and D shared the similar experience regarding construction communication challenges. The challenge they experienced was to ensure the contractor retains all the health and safety documentation and use them appropriately where necessary. This is to minimise and possibly eliminate all potential risks that would lead to fatal injuries. Contractors, as the main players for a project in the construction phase should also share all the health and safety information with subcontractors and the site workers. This crucial

responsibility should be taken seriously. Finding from the interviews with all four architect companies shows that in their opinion the legislation should not be a 'blanket' set of laws. For example, the construction site worker must wear a hardhat all the time. But, to do painting for an internal part of a building, this is not necessary. In their opinion, the usual tasks in a project on construction site should be left to construction site staff to make judgments.

Another challenge mentioned by interviewee C is the inadequate training for small construction companies. Based on his eight years experience as a designer and having dealt with all type of contractors, he is aware that small companies do not have adequate training on health and safety matters and do not have proper documentation systems. Whereas the health and safety awareness of medium-sized and large companies is considerably higher. The bigger companies normally allocate budgets for health and safety training for their staff and have proper health and safety documentation systems.

## **DISCUSSION**

In the findings from the interviews with senior staff in the architecture companies, in general, communication during the design phase is not as complicated as the communication involving contractors and the professionals for the construction stage. The communication amongst designers would still be classified as straightforward and they did not address major issue or challenges sharing information between the designer team.

The communication circle between designers mainly via formal and informal meetings with the aid of telephone calls, fax and emails. For health and safety issues, the use of risk assessment forms to highlight the potential risks and hazards and, at best, try to eliminate them. Such forms have successfully reduced the amount of time going through thick documentation such as health and safety files and tender documents.

Geographic location has been identified as the challenge for the designers from all four companies to communicate with the other team members. As the lead designer, architects bear the responsibility to identify risks in a construction project at the earliest stage and the client and design team members normally depend on them to obtain the initial health and safety information. This has put pressure on them to ensure they have the correct information and to keep the client updated about all changes and risks that are likely to occur. It also becomes a challenge for the designer to ensure that the contractors get the necessary health and safety information and use it appropriately. It is very important for the contractor to obtain health and safety information because the contractors need to ensure that all the work carried out on site is safe and all the possible risks had been reduced or eliminated. The contractors must also ensure the subcontractors and site workers receive the same health and safety information.

The architects interviewed also agreed that highlighting only the unusual risks on a particular project is essential. The risks and hazards highlighted should be specific. This saves time and produces less documentation on health and safety matters. This is particularly important in regard of construction projects involving many disciplines. The data could easily be lost and to avoid communication breakdown.



## CONCLUSION

This paper has reviewed the general health and safety communication in construction in design stage. Four architectural companies had participated in the data collection and the data is based on their knowledge and experience. The research will be continued on specific issues and the communication strength will be investigated further based on specific construction projects. The findings from case studies will be used to develop framework on communication of health and safety information which then will be evaluated by a set of questionnaires.

## REFERENCES

- Charoenngam, C., Coquinco, S.T. and Hadikusumo, B.H.W. (2003), Web-based application for managing change orders in construction projects, *Construction Innovation*, **3**, 197-215
- Faniran, O.O., Love, P.E.D., Treloar, G. and Anumba, C.J. (2001), Methodological issues in design-construction integration, *Logistics Information Management*, **14**(5/6), 421-426.
- Health and Safety Commission (2007), *Statistics of Fatal Injuries 2006/2007*, National Statistics HSE UK
- Hislop, Richard D, (1999), *Construction site safety:: A Guide for Managing Contractors*, Lewis Publishers
- Jannadi, M. O. (1996), Factors affecting the safety of the construction industry, *Building Research and Information*, **24**(2), 108-112.
- Langford, D., Rowlinson, S. and Sawacha, E. (2000), Safety behaviour and safety management: its influence on the attitudes of workers in the UK construction industry, *Engineering, Construction and Architectural Management*, **7**(2), 133-140.
- Murie, F. (2007), Building Safety – An International Perspective, *International Journal Occupational Environment Health*, **13**, 5-11.
- Ringen, K. and Seegal, J. (1995), Safety and Health in the Construction Industry, *Annual Review Public Health*, **16**, 165-188.
- Yisa, S. B., Ndekugri, I. and Ambrose, B. (1996), A review of changes in the UK construction industry: Their implications for the marketing of construction services, *European Journal of Marketing*, **30**(3), 47-64.