Improving health and safety in construction

Phase 2 - Depth and breadth

Volume 7 - Analysis of HSE Mechanisms

Prepared by BOMEL Ltd for the Health and Safety Executive 2004

RESEARCH REPORT 236
This report describes a study into the use of the Influence Network to develop a model to relate HSE interventions to health and safety in construction. This will aid the development of strategies and monitoring their effectiveness.

An Influence Network workshop was held with HSE Construction Division staff. Analyses have given an insight into the underlying organisational and human factors influencing accidents and ill-health. These indicate that of the Direct influences, Competence, Situational awareness/risk perception, Communications and Information/Advice are primary influences. Of the Organisational factors, Training, Procedures, Management/supervision, Communications, Safety culture, and Design are significant. At the Policy level, key factors are Contracting strategy, Company culture and Safety management. The Regulator and the Market are the primary environmental influences.

The current HSE intervention strategy is targeted at two safety issues (falls and transport), four health issues (cement dermatitis, HAVS, noise and musculoskeletal injury) and five groups of stakeholders (Government clients; clients, designers and planning supervisors; SMEs; workforce; and formwork/falsework manufacturers). Five key risk control measures have been identified for reducing risks when used to underpin the intervention strategy. These include mechanisms for: design improvements; targeting SMEs; demonstrating economic benefits; raising awareness of organisational duties; and increasing risk perception/competence among workers.

This report and the work it describes were funded by the Health and Safety Executive (HSE). Its contents, including any opinions and/or conclusions expressed, are those of the authors alone and do not necessarily reflect HSE policy.
## CONTENTS

1. **INTRODUCTION**
   1.1 BACKGROUND
   1.2 CONTEXT OF THE STUDY
   1.3 AIMS AND OBJECTIVES
   1.4 SCOPE OF WORK AND APPROACH
   1.5 SCOPE OF THIS REPORT

2. **HSE INTERVENTION MECHANISMS**
   2.1 INTERVENTION MECHANISMS AVAILABLE TO HSE
   2.2 INTERVENTION MECHANISMS USED BY HSE IN CONSTRUCTION
   2.3 CONSTRUCTION DIVISION PLANNED INTERVENTIONS FOR 2002/03

3. **INFLUENCE NETWORK MODEL**
   3.1 BACKGROUND
   3.2 METHODOLOGY
   3.3 ADAPTING THE INFLUENCE NETWORK FOR CONSTRUCTION HEALTH AND SAFETY

4. **INFLUENCE NETWORK WORKSHOP**
   4.1 INTRODUCTION – WORKSHOP OBJECTIVES AND ATTENDEES
   4.2 INFLUENCE FACTOR RATINGS
   4.3 INFLUENCE FACTOR WEIGHTINGS
   4.4 CONCLUSIONS FROM THE CAUSATION WORKSHOP

5. **ANALYSIS OF THE INFLUENCE NETWORK**
   5.1 INTRODUCTION
9. CONCLUSIONS 113

10. RECOMMENDATIONS 117
   10.1 GENERAL RECOMMENDATIONS 117
   10.2 RECOMMENDATIONS FOR FURTHER WORK 120

11. REFERENCES 121

APPENDIX A  DETAILED INFLUENCE NETWORK FACTOR DEFINITIONS
APPENDIX B  WEIGHTINGS FROM THE WORKSHOP
EXECUTIVE SUMMARY

INTRODUCTION AND OBJECTIVES

This report has been prepared by BOMEL Limited for the Construction Division of the Health and Safety Executive and describes a study of health and safety in construction in relation to HSE’s perceptions of the issues and its mechanisms for addressing those issues.

The work described in this report comprises part of Phase 2 of the project ‘Improving Health and Safety in Construction’ the other parts of which have also been carried out by BOMEL. This project follows on from the successful completion of Phase 1 which comprised a pilot study trialing an Influence Network technique to understand the organisational and human factors influencing the health and safety of workers in the construction industry. The approach not only provided new insight into the interrelation of the influences between the parties involved, but it also offered a mechanism for identifying areas where improvements will be effective in reducing risk, and for evaluating their potential effectiveness.

The four key objectives of the study are to:

1. Define HSE interventions / activities in the context of the construction industry taking account of the intervention strategy.
2. Convene an HSE workshop comprising Construction Division staff to agree the definition and extent of HSE functions, the current rating and relative weighting / significance on stakeholders within the construction industry.
3. Analyse the Influence Network to identify areas where changes may be particularly effective but incorporating a measure to ensure balance and reflect statutory duties.
4. Report, documenting use of model to support strategy planning and performance measurement.

HSE INTERVENTION MECHANISMS FOR THE CONSTRUCTION INDUSTRY

The current and future HSE interventions have been identified from the published intervention strategy for the Construction Division. The interventions are considered in relation to the following key health and safety themes amongst others:

- Falls from height.
- Cement dermatitis.
- Transport.
- Hand arm vibration syndrome.
- Exposure to noise.
- Exposure to musculoskeletal injury.
Current emphasis on the ‘High 5’ (site tidiness & welfare; falls from height; manual handling; transport; and asbestos) particularly for small businesses is noted.

The interventions will be aimed at the following key stakeholders:

- Government – as a client.
- Clients, designers and planning supervisors – particularly on larger projects.
- SMEs and sole traders – to raise awareness and improve competence.
- The workforce - to raise awareness and improve competence.
- Manufacturers – to reduce risks through design and ensure provision of suitable information.

Discussions at the Intervention mechanisms workshop focussed on the previous intervention mechanisms used by the HSE in relation to construction. These could broadly be categorised as being:

- Traditional interventions – including regulations and enforcement.
- Guidance mechanisms – guidance, code and standards, safety awareness days, industry forums and advice.
- CDM goal setting mechanisms – mechanisms for complying with the health and safety at work act, and participation in design or site meetings.
- Hardware regulations – prescriptive regulations including CHSW.

UNDERLYING CAUSES AND INFLUENCES

A two-day accident and ill-health causation workshop was held with members of the Construction Division, and an Influence Network was quantified along with discussions of the underlying reasoning. The key underlying causes and influences were felt to be as follows:

- The construction industry is very much dominated by the ‘just get it done’ culture, where reputations are made or lost on the ability to deliver.

  *Risk Perception* and *Situational Awareness* are heavily influenced by the underlying culture as workers were felt to know what the problem was, but did not appreciate its significance thinking ‘it won’t happen to me’.

- Changing the construction industry culture to include health and safety was felt to be one of the key improvements needed.
Compliance tends to be with what the workers consider to be the most important issue/culture. Typically, this is ‘get the job done by the deadline’ rather than ‘get the job done safely’.

The skills shortage has lead to companies employing less skilled (or suitable) workers than they did in the past leading to a subsequent dilution of skills on site. Thus some companies are taking on work that they do not have the necessary competencies to undertake.

Procedures and plans tend to be viewed as a burden to be completed to satisfy the client/HSE requirements rather than to help get the work done. Whilst the letter of the regulations (such as CDM) may be complied with, the spirit is not.

Site management is typically left to sort out the problems in order to get the job done.

Management and Supervision are considered to be critical to improving health and safety in construction. However, they tend to be impeded by a lack of Training, experience and Competence; having so many other issues to deal with; having multiple trades working simultaneously; and the fact that there are so few supervisors for the work required.

The Information and Advice getting to the workforce is poor. Information from risk assessments (where they exist, and are relevant) does not make its way to the workforce.

Poor Communications were often cited as being major contributors to accidents.

Design for Safe Construction was felt to be poor with a lack of interest amongst designers. Improving this factor was felt to be an uphill struggle.

Clients need to exercise more influence by including health and safety requirements explicitly in contracts. This way a civil liability would be introduced, and Compliance would be more likely. (The government would have a good opportunity to do this with forthcoming infrastructure projects).

The construction industry has a multiplicity of drivers including cost, time and conditions. These dominate the thinking, and the situation is getting worse with the continual client pressure for reductions in construction time.

Along with Company Culture, Health and Safety Management was felt to be the most important Policy level factor. However, there was felt to be a greater need for a culture more so than system, given that a safety management system will follow from the culture.
• There is a disparity in resources between HSE and the construction industry, but HSE were felt to be effective due to the approach taken and the respect for HSE within the construction industry.

MODEL TO SUPPORT STRATEGY PLANNING AND PERFORMANCE MEASUREMENT

A methodology has been presented indicating how the Influence Network model can be used to support strategy planning and performance measurement. The quantified Influence Network model developed during this project can be used to re-test the findings of the previous evaluation exercise based on the ratings and weightings on a variety of health and safety issues from the research in this Phase 2 project as a whole.

AREAS FOR CHANGE

Both quantitative and qualitative analyses of the Influence Network have been undertaken in order to identify potential areas for change. These indicate that there are five key risk control measures that appear to offer the potential for reducing the hazards and risks associated with construction when used in addition to, or to underpin, the components of the intervention strategy. These measures are listed below and estimates of their potential relative risk reduction are made in the report:

• Improvements in design for safe construction
• Additional routes to target smaller companies
• Demonstrate the economic benefits of better health and safety
• Raising the awareness of the intent health and safety duties and appropriate controls
• Increasing Risk perception and Competence among workers.

RECOMMENDATIONS

Consideration should be given to implementing the following five risk control measures in addition to, or to underpin, the components of the proposed intervention strategy.
1. **Improvements in Design for safe construction**

A three-pronged approach is required in order to address:

- **Education and Training** for designers
- **Client influence** on designers
- **Regulatory influence** on designers

**Education and Training for designers** requires:

- **Education of undergraduates** – by universities in conjunction with industry and HSE as part of the curriculum on higher education courses.

- **Initial and Continuing Professional Development for designers** – by the professional institutions, other industry bodies and on-the-job training in order to raise awareness both of the problems and practical solutions.

- **Provision of suitable information and advice** - to underpin the education and training initiatives this could be achieved by a combination of industry-HSE guidance and by requiring health and safety issues to be addressed explicitly in codes of practice.

Mobilising **Client influence on designers** requires the following issues to be addressed:

- **Education of clients** - as to the costs, benefits and legal implications of health and safety via HSE influence on client bodies.

- **Inclusion of health and safety provisions in contracts** - this will both raise awareness of health and safety, and impose a civil liability on the parties to the contract. For public procurement contracts, this requires joined-up government.

**Enhancing the Regulatory influence on designers** requires the following issues to be addressed:

- Audits of designers’ compliance with CDM – this will provide HSE with the opportunities both to identify the typical problems that designers have, and provide guidance to designers on how they should be discharging their duties under CDM.

- **Proactive intervention at the beginning of a project** - when it is easier to make a substantial impact and the designer is less resistant to change.

- **Utilise computer-aided learning (CAL)** - as a means of communicating health and safety information to undergraduates (as part of their education) and professionals (as part of their initial and continuous professional development).
2. **Targeting of smaller companies**

Additional means of targeting smaller companies include:

- The use of Customs and Excise as a means to identify smaller companies involved in construction or maintenance work via VAT returns.

- Use Builders merchants and hire shops as a route to disseminating information to smaller companies.

- Use manufacturing and other companies who employ small maintenance companies as a route to target these smaller companies (either as a means of disseminating information or including health and safety in the contract procurement strategy).

- Consider prescription/risk assessment for small companies, say targeted at seven or so key areas (to make it easier for them to understand and comply).

3. **Demonstrate the economic benefits of better health and safety**

Cost is an integral part of the current construction culture in the UK, and any messages about health and safety need to recognise this. As such, the economic benefits of good health and safety need to be demonstrated to those who do not currently appreciate this. Real life case studies and examples are required in order to demonstrate what the real costs and benefits are. In this way, health and safety can be communicated in a way compatible with the prevailing culture. This could go some way to improving *Company culture* and thus drive down an influence from the top of organisations.

4. **Raising awareness of the intent of health and safety duties and appropriate controls**

Until those with high-level responsibility within organisations appreciate what they need to be doing, it will be difficult to get them to actually fulfil those duties. There is a need for the *spirit* of the regulations to be complied with as well as the letter i.e. relevant risk assessments leading to meaningful method statements applicable to the hazardous elements of the work to be carried out. The proposed actions could be incorporated into the advice, inspection and enforcement activities of the Construction Division, in particular when concentrating on the specific health or safety themes noted in Section 2.

- Raise awareness of the purpose of risk assessments and where they should be carried out (i.e. with particular focus for the hazardous activities rather than the straightforward activities).

- Raise awareness of the link between risk assessments and method statements.
• Take a tougher line on the use of generic risk assessments and method statements that bear little relevance to the key hazards on a project.

5. Increasing Risk perception and Competence among workers

Action is required at several levels in order to tackle the Risk perception and Compliance issues. Action is required at board level in order to underpin actions further down the chain and set the overall culture. This implies a staged process. Obviously, this highly complex and difficult area requires considerable attention in its own right in order to understand the underlying cultural driver. However, Inspectors could be used to promote the message as part of their duties. The following issues that would need to be addressed:

• Modifying Company culture - Political and Regulatory input are required in order to get the health and safety message over at Duty Holder board level. Communication is required in terms that will be understood and significant to the businesses (see Recommendation 3).

• Improving Safety culture - Management and supervision are key to developing a positive Safety culture, but are highly dependent on having the support from the overall Company culture.

• Improving Risk perception / Situational awareness - Improving Risk perception / Situational awareness requires the provision and Communication of appropriate Information and Advice to the work force such that they appreciate the risks and do not persist thinking that ‘it won’t happen to me’.

Whilst use of the Influence Network technique has proved successful in this project, it is recognised that further work is required in order to develop some of the concepts and issues identified in this project. In particular, further work is required to understand the situation relating to Design for safe construction in terms of what the key levers are to improving the treatment of health and safety in design. Having identified the ‘Market influence’ as being of fundamental important in this work, there is a significant need to explore sub-influences such as economics and finance and their inter-relation in generating risk using the Influence Network, in order that more strategic policy areas for risk management and control can be identified in relation to potential HSE interventions. This will help ensure health and safety action will be effective in the context of construction business activity.
1. INTRODUCTION

1.1 BACKGROUND

This report has been prepared by BOMEL Limited for the Construction Division of the Health and Safety Executive under a research contract (RSU reference 4362/R64.089), and describes a study of health and safety in construction in relation to HSE’s perceptions of the issues and its own mechanisms for addressing those issues.

The work described in this report comprises part of Phase 2 of the project ‘Improving Health and Safety in Construction’, the other parts of which have also been carried out by BOMEL. This project follows on from the successful completion of Phase 1(1) which comprised a pilot study trialing an Influence Network technique to understand the organisational and human factors influencing the health and safety of workers in the construction industry. The approach not only provided new insight into the interrelation of the influences between the parties involved, but it also offered a mechanism for identifying areas where improvements will be effective in reducing risk and for evaluating their potential effectiveness.

The Phase 1 trial focused specifically on fatal falls from height with two principal strands to the study. Detailed analysis of the accident data from HSE’s RIDDOR database provided insight into the risk profile which then informed an Influence Network workshop in which an expert group assessed the quality and importance of some 30 underlying risk influencing factors. Phase 1 demonstrated the value of the technique both for understanding the underlying causes of accidents and for developing strategies to bring about improvements in Duty Holder health and safety performance. One of the objectives of Phase 2 is to ensure robustness of the technique as an active tool for safety improvement. The priority areas identified in Phase 1 are addressed in Phase 2, combining ‘data’ gathering and Influence Network workshops to provide a basis for active and demonstrable improvements in both health and safety. HSE and the Association of British Insurers (ABI) have provided the funding for Phase 2. The ABI specifically funded the work on hand-arm vibration syndrome.

Phase 2 addresses the following complementary issues:

1. Validation of the Influence Network technique to ensure that the representation of the construction industry interactions is robust and the quantification of risk and risk control effectiveness is appropriate across the range of practices and stakeholders.

2. Application of the technique to a wider set of health and safety issues in construction to see if common themes can be identified and/or to reveal factors specific to individual accident / activity types.

3. Extension of the use of the Influence Network technique from providing insight into the factors influencing the incidence of accidents and ill-health, to additionally determining effective risk control measures and improvements.
4. Identification of information categories that could usefully be collected as supplements to the RIDDOR reporting process and / or in the course of HSE investigations.

5. Use of the Influence Network approach to develop a model of the ways in which HSE’s interventions contribute to health and safety of the workforce, as a basis for helping in the development of strategies and plans and for monitoring effectiveness.

6. Taking as examples key issues within the construction priority programme so that Phase 2 forms an integral part of the Construction Division’s work.

7. Ensuring that the work is underpinned by a thorough and comprehensive understanding of ‘data’ and information held by HSE and within the industry on accidents and ill-health, giving a sound and robust basis for HSE to use in other aspects of its work.

In order to address these issues, the work has been divided into a number of work packages reported as follows:

Volume 1 Construction health and safety Phase 2: Overview
Volume 2 RIDDOR data analysis
Volume 3 Workplace transport accidents - Underlying causes and risk control
Volume 4 Hand Arm Vibration Syndrome - Underlying causes and risk control
Volume 5 Falls from height - Underlying causes and risk control
Volume 6 Generic model for health and safety in construction
Volume 7 Analysis of HSE intervention mechanisms

This report constitutes Volume 7 of the series. It addresses, in particular, the fifth of the Phase 2 issues listed above relating to the use of the Influence Network approach to develop a model of the ways in which HSE’s interventions contribute to health and safety of the workforce, as a basis for helping in the development of strategies and plans and for monitoring effectiveness.

1.2 CONTEXT OF THE STUDY

In June 2000 the Deputy Prime Minister and the Health and Safety Commission (HSC) launched the Revitalising Health and Safety (RHS) Strategy Statement\(^{(2)}\). Underpinning this were the new targets for health and safety in the UK given in Table 1. The HSC also invited Advisory Committees to set targets for their industries. The Construction Industry Advisory Committee\(^{(3)}\) (CONIAC) responded by setting more stringent targets for the construction industry. These are shown in Table 1 alongside the RHS targets.
Table 1  Revitalising health and safety (RHS) and CONIAC targets for health and safety

<table>
<thead>
<tr>
<th>Target</th>
<th>By 2004/5</th>
<th>By 2009/10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduction in incidence rate of fatalities and major injury accidents</td>
<td>-5%</td>
<td>-10%</td>
</tr>
<tr>
<td>Reduction in incidence rate of cases of work-related ill-health</td>
<td>-10%</td>
<td>-20%</td>
</tr>
<tr>
<td>Reduction in number of working days lost per 100,000 workers</td>
<td>-15%</td>
<td>-30%</td>
</tr>
</tbody>
</table>

In October 2000, the HSC established eight ‘Priority Programmes’ within its Strategic Plan. One of these priority programmes is Construction. This decision acknowledged the high risk of construction workers with the industry contributing around 33% of the fatal injury accident numbers over the last five years and around 16% of the major injury accident numbers. A major reduction in construction accidents and injuries would make a significant contribution to achieving the Revitalising targets.

1.3  AIMS AND OBJECTIVES

The overall aims of this study are to:

1. Define HSE interventions / activities in the context of the construction industry taking account of the intervention strategy.
2. Convene an HSE workshop comprising Construction Division staff to agree the definition and extent of HSE functions, the current rating and relative weighting / significance on stakeholders within the construction industry.
3. Analyse the Influence Network to identify areas where changes may be particularly effective but incorporating a measure to ensure balance and reflect statutory duties.
4. Report, documenting use of model to support strategy planning and performance measurement.

1.4  SCOPE OF WORK AND APPROACH

The purpose of this work is to assess the influence of a wide range of human, hardware and external factors on health and safety in the construction industry. Once an understanding of the underlying causes of health and safety problems is attained then appropriate risk control and prevention measures may be generated which can be applied in practice to improve health and
safety in construction. The approach adopted to achieve this is the Influence Network methodology. The specific steps involved in the work are as follows:

- **A workshop to identify the underlying causes of health and safety problems in construction and evaluate the effectiveness of risk prevention and control measures** – this workshop represents the experience and judgement of a variety of HSE construction inspectors. The workshop session was structured using the Influence Network technique in order that participants’ experience was systematically focused on the underlying causes of health and safety problems in construction. The workshop also allowed the HSE inspectors the opportunity to identify the effectiveness of a variety of risk prevention and control measures that will be practical and cost effective and which can be implemented to have long term benefits.

- **A workshop to identify a range of HSE Intervention mechanisms and discuss their effectiveness based on past performance** – this enabled the HSE inspectors to consider the possible (alternative) range of Intervention mechanisms in light of the discussions and issues raised during the causation workshop.

- **Analysis and reporting** – The underlying causes are not always obvious and therefore careful analysis of the information gathered is necessary to reveal the predominant influences and critical paths of influence from the widest ‘environmental’ factors (political, social and commercial), through the corporate policy and organisational influences to the factors directly influencing the likelihood and consequence of accidents or the health of the workforce. The reporting must clearly justify the risk estimates made in order to ensure that the results are fully justified and can be used confidently as a basis for development, appraisal and evaluation of Intervention strategies.

### 1.5 SCOPE OF THIS REPORT

Section 2 contains a review of the HSE Intervention mechanisms, addressing what mechanisms are available overall, which mechanisms have typically been used in Construction and what the future Intervention plans are for the new Construction Division.

The Influence Network technique is introduced in Section 3, leading to a customised Influence Network for health and safety in construction. In Section 4 the discussions from the causation workshop are summarised, whilst a detailed analysis of the results is presented in Section 5.

The results of the Intervention mechanisms workshop are discussed in Section 6.

Based on a combination of views from workshop delegates and industry best practice, potential risk control measures and their effectiveness are explored in relation to HSE Intervention mechanisms, an interrogation of the Influence Network is undertaken in Section 7.
In Section 0 the potential role of the model to support strategy planning and performance measurement is discussed.

The conclusions drawn from this work are presented in Section 9, followed by recommendations in Section 10.

The references used in this work are given in Section 11, and the appendices contain detailed information from the workshops.
2. HSE INTERVENTION MECHANISMS

2.1 INTERVENTION MECHANISMS AVAILABLE TO HSE

Overviews of the structure and operation of HSE is contained in references 5, 6 and 7. Based on these, and consultation with HSE, the following generic intervention mechanisms have been identified as forming part of the HSE approach:

- **Policy setting** - proposing new measures that are commensurate with the risks to be addressed, e.g. new law and developing the line to be taken in negotiation of European directives to reflect the issue as it manifests itself in Great Britain.

- **Regulating** - targeting action on those who should be controlling the risks

- **Standard setting** - exerting pressure for heavier penalties on transgressors.

- **Permissioning** – The HSC charges duty holders who operate ‘permissioning schemes’ requiring regulatory approval for certain activities, e.g. testing, licensing, certification, approvals, exemption and acceptance of notifications. This typically applies to major hazard industries such as gas transportation, offshore and onshore petrochemicals and the railway industry.

- **Inspecting** – Inspectors can enter any premises where work is being carried out without notice. If they are not satisfied with the level of health and safety standards being achieved, they have several means of obtaining improvements including: advice or warnings; improvement or prohibition notices; prosecutions in the criminal law courts and investigations.

- **Investigation** – in order to learn the lessons from a particular accident or incident or prepare legal action. Findings would be disseminated by publishing studies and reports.

- **Enforcement** - enforcement of existing legal provisions, for example in the course of inspection;

- **Promotion** - publicity campaigns to create awareness, for example the ‘Good Health is Good Business’ campaign and the publicity given to the poor maintenance of domestic gas heating installations, with WWT a principal example in construction;

- **Knowledge base** - improving the available knowledge base through Research;

- **Guidance development** - providing more information and guidance to duty holders to enable them to fulfil their responsibilities and legal duties;
• **Representation** - engaging the assistance of intermediaries in the health and safety system (e.g. safety representatives, consultants).

• **Advice** – through direct contact, services such as Infoline etc.

### 2.2 INTERVENTION MECHANISMS USED BY HSE IN CONSTRUCTION

A variety of the generic intervention mechanisms described in Section 2.1 have been used in construction. These have included but are not limited to the following:

- **Regulations** - Construction (Health, Safety and Welfare) Regulations 1996\(^{(8)}\) (CHSWA), and Construction (Design and Management) Regulations 1994\(^{(9)}\) (CDM)

- **Guidance** – Including Guidance and Approved Codes of Practice for CDM

- **Codes and standards** – Membership of and input to a variety of codes and standards committees including those relating to work at height, plant and temporary works.

- **Enforcement** – Traditional inspection roles in relation to construction sites carried out through routine inspection or with an intensive blitz focus.

- **CDM Designer audits** – Visits to designers offices in order to ascertain whether they are fulfilling their duties under CDM.

- **Participation in design or site meetings** – For complex high profile projects, HSE inspectors have attended meetings early on in the design and construction processes to ensure that health and safety issues are considered at the point when most of the important decisions are taken (and the implications of changes are less).

- **Product development** – Involvement with industry in development of new and improved products such as those involving construction plant.

- **Participation in industry forums** – Involvement with industry, professional and product forums in order to produce guidance, obtain feedback, exert influence and clarify good practice. Such participation has produced guidance such as the tests for roofing assemblies\(^{(10)}\).

- **Commissioning research** – Such as this project and others investigating accident data and evaluation of the Construction Priority Programme.
2.3 CONSTRUCTION DIVISION PLANNED INTERVENTIONS FOR 2002/03

2.3.1 Introduction

The Construction Division has published(11) its priorities for planned interventions in 2002/03. These priorities are summarised here in order to provide a background to the planned interventions.

Inspectors in HSE’s new Construction Division will concentrate on the hazards which make the biggest contributions to the toll of injury and ill health in the industry, as well as targeting the interventions at those who are most likely to influence change. The intervention programme aims to:

- Encourage greater commitment to achieving improved health and safety performance targets from all those in the construction procurement and supply chain.
- Encourage better communication and co-operation between all those involved in delivering a safe and healthy work environment.
- Promote the development of a competent workforce at all levels.

2.3.2 Planned visits

The HSE expect government clients to operate as best practice clients and have management arrangements in line with the procurement guidance issued by the Office of Government Commerce (OGC No 10: Achieving Excellence though Health and Safety) by March 2004. The HSE will be specifically targeting 10 government departments in this year’s work programme.

The programme is also designed to secure more effective and efficient interventions with clients, designers and planning supervisors. A more strategic approach will be adopted with larger projects to assess the management arrangements for controlling risks, and to make effective use of our site inspection time.

Small and Medium Enterprises (SMEs) and sole traders will be engaged in improving their health and safety awareness and performance whilst contributing to the construction industry’s ‘Revitalising health and safety’ targets. HSE will be arranging a number of health and safety awareness raising days for small businesses throughout the country, and the expected outcomes will include:

- Improved awareness of high risk activities and health issues.
- Improved level of health and safety competence amongst SMEs and sole traders.
- Increased membership of the Working Well Together (WWT) Campaign.

The workforce is very important to the HSE programme and the HSE target is to increase health and safety awareness and encourage health and safety competency and co-operation of workers
paying attention to ‘hard to reach’ and vulnerable groups such as agency labour, young workers, ethnic minorities and non English speakers. The aim is to:

- Improve worker awareness of high risk and processes.
- Improve level of worker health and safety competence.

HSE will also be targeting manufacturers of formwork and falsework, to ensure that they are producing products for which:

- Risks have been eliminated or reduced through their design.
- Any remaining risks have been addressed through design or the establishment of safe systems of work for their use.
- Clear and unambiguous information on the safe and healthy use of the product has been produced.

### 2.3.3 KEY RISKS INSPECTORS WILL CONCENTRATE ON

The HSE health priorities for the year will be to:

- Reduce the incidence of cement dermatitis by improving the management and control of exposure; insisting on good standards of welfare and health surveillance for those who may be exposed.
- Reverse the increased incidence of HAVS by eliminating work that leads to high exposure; improving tool selection and increasing health surveillance.
- Reduce exposure to noise by eliminating noisy processes through substitution, selection of noise reduced equipment and encouraging audiometry as a means of monitoring progress.
- Reducing worker exposure to the risk of musculo-skeletal injury through the promotion of the use of lighter weight construction products, in particular kerbstones, lighter weight blocks and bagged products.

The HSE priorities for safety for the year will be:

- Transport through promoting effective planning and management of vehicle movements, including risks from slewing machinery and reversing, and focusing on the segregation of vehicles and pedestrians.
- Falls by reducing falls from height through promoting the appropriate selection and use of equipment, where possible eliminating the use of ladders, and designing out risks of falls from work at height.
3. INFLUENCE NETWORK MODEL

3.1 BACKGROUND

Influence diagrams are used to identify principal factors which influence each other and the outcome of a set of circumstances. These have been used as qualitative socio-political modelling tools for many years. In the 1980s a particular form of influence diagram, now termed an ‘Influence Network’ to distinguish its form from the many influence diagram types in existence, was developed to model how human and organisational factors could affect the likelihood of human error leading to accidents in hazardous environments (e.g. nuclear power stations, petrochemical plants, aerospace).

In 1995, following a House of Lords review of marine safety, the UK Marine Safety Agency (now the Maritime and Coastguard Agency, MCA) commissioned BOMEL to lead the development of a comprehensive risk based methodology for potential use by the International Maritime Organisation (IMO) as a basis for future improvement of shipping safety. The resulting methodology was adopted by the IMO and is now incorporated into IMO Guidelines for this purpose. One element of BOMEL’s work was to carry out a full review of methods to account for human performance within the context of the technical, organisational and wider commercial and social spheres as illustrated in Figure 1.
The Influence Network approach for human performance was enhanced by BOMEL to cover human and hardware performance in a single analysis thereby giving a comprehensive approach to understanding the factors which influence the likelihood of human error or hardware failure in the causation of accidents. This approach has rapidly gained wide acknowledgement and has been applied in risk assessment and, perhaps more importantly, in the development of risk reduction strategies for a variety of accident scenarios in a wide range of industrial sectors. The structuring within the network gives coherence to fragmented information and the quantification enables weaknesses and areas where change may achieve substantial benefit to be identified.

3.2 METHODOLOGY

The Influence Network is developed from consideration of a generic set of influences which are structured in a hierarchy representing the influence domains shown in Figure 1. The Generic Influence Network is shown in Figure 2 and described in the following sections.

At the top is the event (i.e. the undesirable event) being considered. This could be at any level from a complete risk profile (e.g. occupational health) to a specific disease in specified circumstances (e.g. HAVS in construction).

Below the top event is the direct causal level which is made up of human, hardware and external factors. Generally, there will be data available from which the direct causes can be determined and the relative importance quantified. Where the data are often unhelpful is in understanding and delineating the underlying influences which nevertheless have a great bearing on the likelihood of an incident occurring and on the outcome or consequences. In order to model
these influences, the Influence Network has adopted a hierarchy below the direct causal level as follows:

- **Direct performance influences** - these directly influence the likelihood of an accident being caused.

- **Organisational influences** - these influence direct influences and reflect the culture, procedures and behaviour promulgated by the organisation.

- **Policy level influences** – these reflect the expectations of the decision makers in the employers of those at risk and the organisations they interface with (e.g. clients, suppliers, subcontractors).

- **Environmental level influences** - these cover the wider political, regulatory, market and social influences which impact the policy influences.

In terms of the construction industry, the relevant stakeholders were felt to fit into the model as shown in Table 2.

**Table 2** Construction stakeholders applied to Influence Network levels

<table>
<thead>
<tr>
<th>Influence level</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct level</td>
<td>Applies to site operatives and technicians, i.e. the people actually carrying out the construction work.</td>
</tr>
<tr>
<td>Organisational Level</td>
<td>Applies to the site organisation and local management.</td>
</tr>
<tr>
<td>Policy Level</td>
<td>Applies to both the client and construction company management. Contracting strategy, ownership and control and company culture apply to the client (i.e. the organisation commissioning and paying for the construction activity) the remainder apply to the contractors carrying out the work.</td>
</tr>
<tr>
<td>Environmental Level</td>
<td>The Political Influence incorporates both national and local government procurement strategy as well as government as guardians of worker and public safety. Otherwise the Environmental Level influences are external to the organisations represented at the Policy Level, such as HSE as a principal regulatory influence.</td>
</tr>
</tbody>
</table>

At each level of influence, influencing factors have been identified as shown in the network in Figure 2. The factors have been determined based on accepted theories of human factors and safety and risk management. The categories have been expanded further and refined through practical application to a range of scenarios. Each influence in the generic network is defined together with a scale from best to worst practice. This provides a basis for making judgements about the relative importance of each influence (weighting), the current quality of each influence (rating) and the potential effect on the quality of the factor by introducing risk control measures.

The process of customising the Influence Network approach for application to a specific problem consists of the following stages:
1. Clearly define the problem in terms of the risks being considered, the parties involved (stakeholders), the physical situation and circumstances, the applicable laws, regulations and procedures, the equipment and materials being used, the failure modes being considered and the limits of measurement of both the frequency and consequence components of risk.

2. Collect and analyse all available data to establish a baseline of current and historic performance and the direct causes and failure modes that can be established from this data.

3. Assemble a group of ‘experts’ in the topic being studied including those with direct experience at the operational level as well as those representing organisational functions, policy makers and the wider community of influence.

4. Use the experts either in a structured workshop session to carry out the following steps:

5. Review the generic influence set and define each influence in more detail in relation to the ‘top event’ being considered.

6. For each influence define the scale from worst to best practice, 0 to 10, both in relation to practice in the industrial sector being considered and in relation to the experts’ wider experience in other sectors.

7. For each influence agree, between the experts, its current rating on the best/worst practice scale.

8. For each influence above the environmental level (i.e. at the policy level) agree relative weightings of influence (totalling unity) from the level below. These are weighted as high (H), medium (M), low (L) or zero with two intermediate classifications: HM and ML.

9. Repeat Step 8 for the influences above the policy and organisational levels.

10. Repeat Step 8 for the influences above the direct level, considering different influence on the top event.

11. The Influence Network can then be quantified to obtain a Network Index which can be directly related to current risk level. In essence this consists of summing the product of the ratings and weightings through the network. There is a mechanism of adjustment at each level if the experts’ evaluations at that level are significantly at variance with the summation of the effects of the more remote influences.

12. Use the Influence Network and quantification model to identify critical influences and influence paths through the network in order to concentrate risk controls on the most important influences. Define appropriate risk controls for the important influences.

13. Assess the effects of the risk controls defined in Step 12 on the existing influence ratings.
14. Re-evaluate the Influence Network Index for the revised ratings from Step 13 to assess the potential effect on overall risk level.

The risk quantification process in Steps 5 to 14 can be achieved in a one day workshop. The ideal number of participants is around four to eight experts plus facilitator and recorders.

3.3 ADAPTING THE INFLUENCE NETWORK FOR CONSTRUCTION HEALTH AND SAFETY

Prior to using the Influence Network to explore the factors influencing health and safety in construction, a review was carried out of the various workshops held to investigate specific construction health and safety issues in this project including: falls from height, hand-arm vibration syndrome and transport issues. This review identified the issues that are likely to shape the broad risk profile to be modelled by the network. The customised Influence Network is shown in Figure 3. This network was used as a basis for discussion in the workshops, and was considered satisfactory by the participants without further customisation being necessary. It was noted that whereas the early workshops had focused on specific health or safety issues and explored differences between subsidiary areas of activity (e.g. safety at roadworks compared with plant operations), the aim in this workshop was to take a broad overview across construction health and safety as a whole.

![Customised Influence Network](image-url)

**Figure 3** Customised Influence Network used to identify the factors that are likely to be most relevant to health and safety in construction
4. INFLUENCE NETWORK WORKSHOP

4.1 INTRODUCTION – WORKSHOP OBJECTIVES AND ATTENDEES

The workshop was held at the HSE offices at Rose Court on 9 and 10 September 2002, and concentrated on the following objectives:

- Identification of the factors that influence health and safety in construction and structuring of the Influence Network such that these factors could be investigated.
- Rating these factors in terms of current practice.
- Weighting the influences of each of the factors on other factors.
- Identifying possible risk control measures.
- Considering the impact of a variety of HSE intervention mechanisms in terms of cost and effectiveness.

Prior to the workshops each of the participants was provided with a briefing document, describing the Influence Network methodology and application (as in Section 3.2 of this report) and also giving definitions for each factor with an anchored rating scale defining poor, moderate and excellent practice. These factor definitions are reproduced here in Appendix A.

Workshop attendees from HSE were experienced inspectors from operational Field and Sector roles. Attendees for all or part of the two days were Trevor Allan, Mohammad Abrar, Alex Cattan, Mark Hatfield, and Michael La Rose. BOMEL facilitators and recorders were Helen Bolt (Chartered civil engineer, BOMEL Director), Sally Caruana (Psychologist) and Mike Webster (Chartered civil and structural engineer).

Those HSE attendees from the Sector were particularly involved in data and intelligence about the industry and concerned with devising and supporting interventions in relation to specific hazards (e.g. falls) or industry groups (e.g. maintenance workers). Field Inspectors had experience of traditional inspection activity and the implementation of some of the new Construction Division initiatives (e.g. at early stages of large projects or on use of workplace transport). All brought considerable depth and breadth of perspective from these quarters.

The workshop composition was not as originally intended but was governed by availability so not all angles were encompassed by the groups as intended. There remains the need, therefore, to combine this perspective with parallel contributions from policy, press / publications, technology, strategic planning and specialist enforcement groups, particularly in respect of the intervention mechanisms and their effectiveness.
4.2 INFLUENCE FACTOR RATINGS

The first stage in the workshop was to discuss each of the factors influencing health and safety in construction and get a measure of the rating inspectors would ascribe to current practice and their understanding of the issues and factors affecting the range of practice. The discussion also sought to draw out inspectors’ observations about factors that appear to be changing so that their potential impact on health and safety in the future can be assessed.

The ratings of current practice for each factor in the context of health and safety in construction were assigned using the pre-defined scale (as per Steps 6 and 7 in Section 3.2) against the definitions in Appendix A. The rating scores are summarised in Figure 4 but should be interpreted in light of the discussions leading to the influence ratings which are detailed below and summarised in Section 4.4.

![Construction Health and Safety](chart)

**Figure 4** Ratings obtained from the Workshop
4.2.1 Direct level influences

**D1 Competence - The skills, knowledge and abilities required to perform particular tasks safely.**

Competence is generally considered to be quite low, however, it is not uniform and is highly dependent on the type of worker i.e. there are considerable differences between skilled workers and labourers. It is also dependent on the different types of work and the supervision available. Competence also varies geographically, with London and the South East suffering the worst problems due to skills shortages.

The construction industry typically employs untrained workers who pick up skills and experience subsequently. Unfortunately, many members of the ‘new’ workforce have different safety cultures, and it is difficult to train some of these workers, particularly those from Eastern Europe who also have language difficulties. Not having this safety training can lead to problems on site.

Skilled trades such as electricians, scaffolders and steel erectors receive more formal training. They tend to know what they are doing, and it is only a matter of asking them to do the job. At the other end of the labour market, labourers might have the physical ability to wield a pick axe, but not have much idea elsewhere. Even the trades have seen a skills and experience dilution compared to the past. Whilst all of the members of a group of workers will be formally qualified there will be few with significant experience that the others can ask. This also applies to management and supervision.

The culture on construction sites is not conducive to labourers picking up health and safety issues from foremen and other supervisors. In briefings, workers may be given the full picture, but are then told this is the ‘short cut’, and it is the ‘short cut’ that is then used when carrying out the work.

Employment of workers is often based on a judgement of ‘do they look capable of doing a days work?’. If they do then they are employed. The skills shortage leads to companies employing less skilled workers now than in the past. The skills shortage also leads to companies taking on work that they are not competent for, as clients are desperate for someone to do the work. Agencies are no more than body shops. No checks are carried out on workers or their tools (which are often of domestic standards).

The CSCS may lead to a two-tier system, where the unskilled workers migrate to those sections of the construction industry with lower standards, as they cannot get work with the larger contractors operating the certification schemes. However, certified workers may not act competently on site due to other pressures. What will happen in the first year after certification? There is potentially an analogy with just having passed the driving test, where most accidents occur soon after.

Better sites tend to have more competent workers. However, smaller organisations will attempt a broader range of activities with the consequence that those with least resources are required to deliver most.

Competence was not considered to be the main driver for construction health and safety. This factor should be seen in the light of training.

<table>
<thead>
<tr>
<th>Category</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>SME particularly micros</td>
<td>&lt;3-4</td>
</tr>
<tr>
<td>Larger companies</td>
<td>5-6</td>
</tr>
<tr>
<td>Skilled workers</td>
<td>7-8</td>
</tr>
</tbody>
</table>
**D2  Motivation / Morale - Workers incentive to work towards business, personal and common goals.**

Historically, the main motivator has been keeping your job. The construction industry is relatively close knit with an informal ‘black list’. Being on this list means that it could be difficult to find other suitable employment. However, the current skills shortage now empowers workers. They will now cease work at poor unsafe sites. Better workers migrate to better employers leaving the worst employers with the worst workers.

Motivation and morale will vary depending on both the employer and the supervision employed. Companies respond to different messages. They will tolerate extra effort for the larger clients if that is what is required, but once they move to a different site they will either revert to their default culture or adopt the requirements of the next client. This is especially apparent if the response of the same company is considered when working for major clients such as BP or LUL compared with other smaller clients.

General construction was considered to be completely different to construction work carried out for the process and petrochemical industries. For the petrochemical projects compliance is automatic, and the contractors fit in with the required culture.

Motivation changes with time on site. At the beginning it is quite bad, picks up during the project and then deteriorates towards the end of the project. At the end of the project the workforce wants to speed up and get onto the next job. Planning also tends to fall apart towards the end of a project with numerous trades on site all wanting to work in the same area.

In the Midlands much construction is for factories, warehouses etc, where the primary structural form is typically steel sheds. Few accidents occur during the primary steel erection. They tend to occur during snagging when much of the work has been completed and the nets, edge protection etc. have been removed.

Due to the fragmentation inherent in the industry, those sub-contractors further down the supply chain will typically not have seen much of the risk assessments or information produced. Not knowing what is the right or wrong way to go about work was felt to be a hindrance.

Health and Safety is not the primary motivator. Getting the job done is. Workers may have the best of intentions regarding health and safety but their priority will be to go ahead and solve the problem. Reputations are built on the basis of getting the work done. Problem solving ability is a key requirement for construction workers, but this creativity needs to be harnessed to solving health and safety problems. The standard of health and safety was felt to be directly proportional to how good the site manager is.
D3 Teamworking - The extent to which individuals work in teams and look out for each other's interests.

This factor is complicated as both ends of the rating spectrum are evident in the construction industry. Teams work well within themselves, but there is negative peer pressure. The peer pressure typically revolves around getting the job done.

Created and imposed risks are viewed differently. If workers perceive themselves to be in control of the risks, then such risks are of less concern i.e. if the risk emanates from someone in their own team. Risks imposed by other teams or trades do cause concern. For instance, a roofing team will highlight dangerous scaffolding straight away as the risk is not under their control.

Each trade will work well on its own, but not necessarily with other trades. Design issues often put trades out of sync with one another. Each trade wants to get their own job done, and has little interest in the other trades except where it causes them problems. Cross-trade toolbox talks may be a way of addressing cross-trade difficulties. There have been examples where representatives of each subcontractor on site have been made responsible for policing certain issues i.e. the M&E contractor on one site was responsible for ladders, whilst the ground works contractors was made responsible for traffic. Each then had to report at bi-weekly meeting. This served to encourage interest and responsibility outside their own disciplines. There has also been a move to multi-skilling on maintenance work where solving a problem may require a variety of skills.

Design and planning need to address coordination issues otherwise subcontractors become risks to one another i.e. if one removes the edge protection and then moves on leaving potential hazards for following subcontractors.

Construction workers operate in different teams all of the time. Teams are short lived for that site. Thus, there is little corporate learning due to the churn rate. Partnering is leading to more cooperation between supervisors and foremen. For instance, the steel erection foreman might supervise ground workers to undertake the preparatory work that the steel erectors require themselves for safe access. The concept of a common goal can be shared in partnering. However, trade separation is still the traditional approach.

| Rating | 5 |
**D4 Situational Awareness/Risk Perception - The extent to which workers are aware of hazards and risks.**

Workers know what the problem is but do not appreciate its significance. They overestimate their ability to deal with the problem. The view is that ‘It won’t happen to me’, and thus complacency is the root to errors. There may be an analogy with smoking; people will smoke anyway despite knowing about the potential health problems.

Not many workers appear to have seen the HSE posters. Sites do tend to know of the HSE inspection blitzes, but do not tend to take any real notice. Contractors do not view prohibition notices issued in blitzes as being ‘real’ prohibition notices as some issues are picked up that would not otherwise have been raised on ‘normal’ inspection visits.

The Summit video has moved the issue from workers who have an accident ‘being stupid’ to this is what can happen to you. This has had a significant effect on some managers, but have enough workers seen it? Should the video be shown on TV? The whole family would then see it and realise the consequences of an accident. The video also needs to be shown at Safety Awareness Days (SADs).

<table>
<thead>
<tr>
<th>Hazards</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risks</td>
<td>3</td>
</tr>
</tbody>
</table>
**D5 Fatigue/Alertness - The degree to which performance is degraded, for example, through sleep deprivation, or excessive / insufficient mental or physical activity, or drugs / alcohol.**

Construction is a physically demanding occupation; therefore workers will get tired during day leading to accidents early in the morning or late in the afternoon.

This factor is on a downward trend. With the current skills shortage, contractors are having to travel more. The current trend is for travelling rather than living on site in a caravan. Perhaps this is a function of an ageing workforce who now want to go home in the evening. Less alcohol is consumed now, but the effects of travelling have replaced the effects of a hangover.

Restrictions on working hours lead to more night working. For instance, hospital maintenance has to be done at night due to operational pressures. Supervision is not so good during night working, particularly maintenance.

Time pressures result from clients being unwilling to commit capital for long periods. For instance, retailers have to be open by October in order to cash in on the busiest time of the year in the run up to Christmas. Pressure from neighbours with regard to such things as noise levels can limit working hours. Enforcement can also lead to work being stopped, with workers going down pub until the problem is sorted out.

Drugs are an issue and there is potential for sites to act as a market place. The effect of cannabis on performance has not been established. Ecstasy, like cannabis, stays in the body for a long time. Whilst it may be detected in workers, it would be difficult to establish whether it was a cause of the accidents, as may have been taken at the weekend. The Police will test for drugs if there is a driver involved. However, compulsory testing is not permitted.

| Rating | 5 |
Physical health is self-selecting due to the nature of the work. As workers progress, they become less active as they move from doing the job to supervising others doing the job. There is more stress now due to reduced staffing, fast track timetables, client pressures (more interference) and greater expectations of workers. Perhaps earlier retirement is a result of this. Mental health may also be an issue.

As a result of the macho culture, there is a tendency for workers to work even when they should not. If they do not work, they do not get paid. With little choice but to work the result is older workers with ill health problems. Aches and pains are viewed as an occupational hazard. Workers are typically happy to be in work. On one site an occupational nurse examined 400 workers, leading to a third of them being referred to their GP. Occupational deafness is also a big issue. Stress is an issue with site mangers, as is heart disease.

Safety issues are more immediate than health issues. Workers will make immediate ‘cost-benefit’ judgements: ‘It’s hot therefore I want to take my top off’, with skin cancer being viewed as a minor issue. However, awareness is high with regard to a small number of issues, including asbestos and blocks. For instance, heavy blocks are now a lot cheaper (>27kg) as there is less demand for them due to their weight. In general, awareness levels are as good (or bad) as other industries. A claims culture is more noticeable now, with a greater awareness of health issues among younger workers. However, insurance industry drivers may lead to a reduction in reporting as high levels of reporting could increase insurance premiums.

30 years ago asbestos was not believed to be a problem. Now, everyone knows about the problem. The industry is possibly at a similar stage now for musculoskeletal problems, with bricklayers starting to appreciate how heavy blocks are, but there is little real awareness of the dermatitis problem. However, there may be an element of self-selection as workers are not able to lay bricks when they are suffering dermatitis.
D7 Communications - The extent to which the frequency and clarity of communications are appropriate for ensuring effective task and teamwork.

Within team communications are reasonable. Between teams, communications are poor. There is an isolationist view of teams. Communicating with someone else may mean that you have to wait for them to complete their work before you can complete your own work. Communication is typically forced by problems occurring. Partnering is perhaps a little better. Principal contractors are required in law to coordinate other contractors. However, communication is unlikely to address health and safety explicitly.

At smaller end of construction, the workers would ‘just get on with it’. Family businesses might have better communications. Often, there may be loose-knit associations between local firms.

| Rating | 3 |
Availability of Information / Advice - The extent to which people can access information that is accurate, timely, relevant and usable.

Some sites will adapt method statements. Some companies go down the paper trail, but do not necessarily appreciate what is required. Better companies often have less paperwork as what is produced is more focussed. Whilst the law is being complied with by many organisations, the spirit of law is not always followed. CDM implies duties that some organisations feel that they can discharge with paperwork. For instance, to comply with CDM organisations will provide files of paperwork, but this paperwork is not at all user friendly with risk assessments being generic or unpractical. On the whole, information tends to be generic. Often, inspectors will find method statements for work amongst the piles of paper that exist and they will often be completely irrelevant to that site.

Inadequate or inappropriate method statements lead to problems. The best hope is for a structured approach where there will be a need to stop, think and plan. There is also a need to look at the mechanisms by which information is delivered. Information should lead to specific areas.

Method statements tend to concentrate on the bulk of the activity, and are not necessarily risk lead. For instance, roofing method statements may be produced for the main roof. This is a relatively easy area to construct. It is laying the first sheet or fitting vents that are the difficult tasks, and these should have risk assessments to inform the method statements.

Method statements may be appropriate at the start of the project, but not necessarily so as the work progresses and circumstances change. Method statements will often arrive on site at the same time as the workforce, leaving no time to read them before the work starts. Informal risk assessments will be undertaken by workers and their supervisors and work adapted.

Information on what contractors should be doing typically reaches the site office, but those actually doing the work are unlikely to receive this information and will not know what they should be doing. However, they may well know what they think that they should be doing. There are typically three types of contractor: those who do not have the knowledge, those who have the knowledge but do not use it, and those who do not care.

Workers are told what to do on site. There is no real reading culture. Those who are not trained / competent often do not have access to the right information. Information typically comes from supervisors. They will have to read method statements and communicate them to the workers. Little information reaches workers on issues such as COSHH, whilst mobile scaffolding units do come with some information.

The ‘Absolutely essentials’ booklet is popular. This booklet may improve awareness. The HSE Info line will occasionally bring a caller through directly to an inspector, but these callers are typically not the workers.

<table>
<thead>
<tr>
<th>Rating</th>
<th>0-5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typically</td>
<td>&gt;3</td>
</tr>
</tbody>
</table>
D9  **Compliance - The extent to which people comply with rules, procedures or Regulations.**

If one management / culture imposes requirements / rules then workers will comply with them. However, the rules may be to: ‘get the work done by 4 o’clock’. Health and safety may not be viewed as a key area for one site, when it is on another due to the different site obligations. Workers do not set out consciously to comply with the rules and regulations. They only comply if the site imposes health and safety rules, as the culture is typically anti-regulation.

When there are conflicting requirements, the workers will follow those that they perceive to be most important. Production issues tend to dominate (i.e. how much, how quickly). Workers do not want to have to wait for scaffold or trench boxes to be installed as this slows their productivity.

Expediency is key. In the short term it is easy just to get on with it, i.e. entering a trench without a trench box because it is only going to be for two minutes, or entering a trench to make sure that the trench box goes in properly. Essentially, it is a case of: ‘what can I avoid in order to get the job done’. Factory work is repetitive, but construction is one-off e.g. a trench being filled in.

Compliance is self-perpetuating. Workers will default to production-orientation as it has been indoctrinated in them in the past. There is more compliance than there used to be. Workers were able to get away with more in the past. Five years ago the question was ‘do they have one on site?’ now it is ‘do they use it?’. Hard hats and boots are visible and thus easy to check. Two years ago the wearing of high visibility clothing was not common, but it is now. Workers know about harnesses (but they still seem unaware of the need to anchor them). This improvement in compliance comes from site rules, not peer pressure. Health and safety plans are typically available. They may be of no practical use, but they are there now.

<table>
<thead>
<tr>
<th>Compliance in general</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compliance with health and safety</td>
<td>3</td>
</tr>
</tbody>
</table>
**D10  Suitable Human Resources - The relationship of supply to need for suitable human resources.** Relates to the appropriate mix and number of workers in terms of experience, knowledge and qualifications.

The current skills shortage creates its own hazards, and the construction industry is worried. Big contractors are now turning down work in London as they are unable to resource these projects.

Construction is not attractive as an industry. It is seen as having poor welfare and requiring work in all conditions. Production jobs as a whole are not popular now. Young people are not interested in jobs in construction, when there are so many better jobs available now in the service sector. In particular, few are interested in construction jobs in London hence the use of Eastern European labour. Companies need to be taking on and training potential workers, but this is not feasible for short term work, hence the proliferation of subcontract labour.

| Rating | 4 |

**D11  Internal Work Environment - The level of noise, temperature, congestion, light and vibration existing in the place of work.**

There is still the same variation in environments as there always has been. Site housekeeping is not that good, and is dependent on the management team. Housekeeping is typically dealt with after an observation has been made. Lift shafts and atria act as rubbish chutes, wheelie bins could be provided if the skips are inaccessible. However, if there is a clean up gang, then workers are likely to make even more of a mess as they know that someone else will deal with it.

Lighting is task specific. There may be a high level of lighting in the task areas, but workers may have to make their way through the darkness to get there. Lack of communication and coordination also lead to some of these hazards.

Some areas are improving. For instance, pile heads are not broken in situ so often now. However, the scabblers are likely to be used elsewhere. MCG contractors have a recognition of the problems. This was not always the case in the past.

| Rating | 5 |
D12 External Working Environment - The conditions external to the site which impact on construction activity e.g. weather, public proximity, external distractions etc.

The question needs to be asked as to whether a site is starting at the right time of year weather-wise. Ground workers are often working at the worst time of year when there is rain and mud or solid ground; or hazardous work is done when there is little light. Wet weather can lead to slip and trip hazards and there is a need to judge whether such work should be done at that time of year or not. However, client schedules tend to dominate. Steel erectors have the authority to down tools in adverse weather, but many other workers feel unable to do so.

Considerable development is taking place in London, with sites getting smaller and smaller due to the lack of available space. Site accesses are often too tight, and contractors may not be able to get permission from councils to put up hoardings in some Central London sites due to limits on pavement access. In the summer holidays the main risk is from children. There is often little Local Authority interest elsewhere in London or the rest of the country, even when public safety is cited. Safety to the public is not always thought of at the design stage and is typically left to the contractor.

Planning typically involves crane locations, site access and site huts. Police, highways, planning, and building control all have to be dealt with. Health and safety legislation temporarily overrides planning legislation so long as the police agree (i.e. providing two site entrances for safety). Planning densities are likely to increase due to pressure on green field development meaning a return to semi, terrace, town houses built up to the pavement line to get more properties in. Such developments will make sites more congested.

| Rating | 3-4 |
**D13 Operational Equipment - The extent to which operational equipment and materials are available, conform to best practice, meet the usability needs of the operator and are inspected and maintained.**

Equipment gets very hard use in construction due to the nature of the work. Inspection tends to be carried out at the end of the life of a piece of equipment to see if the life can be extended, rather than during its life. The effort put into inspection and maintenance is likely to be directly proportional to the value of the equipment rather than the risk associated with operating it. For instance, a webbing strop is cheap therefore it is just used until it requires replacement. However, it will typically be used for too long before replacement is deemed necessary.

Workers will also use their own equipment on some sites. This equipment is therefore outside any inspection and maintenance system operating on the site. If workers have to buy their own equipment, and it is expensive then will put more effort into looking after it. Higher risk is associated with smaller pieces of equipment, adaptations or misuse, and selection problems. For instance workers need to be aware that some domestic ladders will not always take their weight let alone them plus materials or equipment.

The vibration message has been getting through in the last year. Companies will buy new equipment to solve the vibration problem rather than change the work process to eliminate the need for vibrating machinery. Noise is not seen as that important, and is just treated as an occupational hazard.

Successful hiring is a function of providing a good specification. Hirers will often over-provide if they do not have the right model in stock. Communication is a problem in hiring. By the time that the message has gone through from site to the head-office procurement team, specific information and requirements can be lost. Workers will try to get by with whatever is provided.

The introduction and widespread use of mobile elevating work platforms (MEWPs) has been a major advance in recent years. MEWPs are even used on the smallest sites now. However, MEWPs are often used on unsuitable ground thus introducing another hazard. Training on the use of MEWPs is not always given to everyone who will need to use the equipment. MEWPS are now considered to be a routine piece of kit. Whilst their use was closely controlled in the past, now, workers jump on board a MEWP ‘just to do a quick job’. Construction equipment tends to be used or adapted to fit whatever task is required.

Speed and efficiency have been the main drivers for the introduction of new or improved equipment, but this can have a safety knock-on. The introduction of kerb handlers has made a useful contribution to health and safety, but not yet as significant as MEWPs or the increased awareness of vibration.

Granite kerb stones are required in London by some planners, but these are scabbled on site rather than in the factory and thus there is no real progress. Designer’s risk perceptions are such that they do not always see the problem and thus act accordingly.

| Rating | 5 |
PPE are typically available on sites. However, workers views may vary with regard to what constitutes PPE. Also, the requirements of some HSE inspectors are variable.

In comparison with operational equipment, PPE is viewed as throw away items and therefore little thought is given to it. Dust masks and ear protection are badly dealt with. In particular, site management do not follow up to make sure that they are worn properly. Dust masks do not always work due to workers not fitting them properly, or using the wrong masks for the hazard, or there is just a poor fit to their face. Ear defenders are not always available, particularly the ones that fit to helmets. There appears to be a hierarchy of PPE. Hats, boots, high visibility clothing and gloves are typically available and used. Masks, ear defenders and goggles are not always available or used.

Some trades are better than others, as are the south and larger sites. PPE is there now. This is a big improvement over the past. However, there is a need to go further and understand how to use it. It may take a generation for the message to get through. What about making PPE more trendy? If PPE are comfortable then they stand a better chance of being worn. Maintenance of PPE is not appreciated. Just getting workers to wear items of PPE is considered to be a success.

Many plant operators use belts in the south, but not elsewhere. Workers may not have been trained to use harnesses. Possibly even some trainers do not understand harness issues. They think that harnesses are more of risk. Harnesses and lanyards are often not appropriate to the job that is being done, and their selection is unlikely to have been discussed with the workers beforehand. Hence, they are unpopular with workers. Inertia reels are also being used in inappropriate circumstances.

Personal mobile phones are sometimes used where there are no proper radios. Insurers could imply contributory negligence if a worker is using a mobile phone before or during an accident. On balance, mobile phones were considered beneficial as they allow emergency services to be called immediately.

| Rating | Range greater than for Operational equipment | 4-6 |


4.2.2 Organisational level influences

O1 Recruitment and Selection - The system that facilitates the employment of people that are suited to the job demands.

This factor is very variable. Specialist trades score highly as the trade schemes know what is required and train and certify accordingly (e.g. scaffolders and scaffolders cards).

Whilst workers may have basic competency, they may well not have full competency for a range of vehicles and tasks. For instance, workers may have forklift tickets, but these may not apply to the particular vehicle or job in hand. For plant ticketing is becoming the norm. However, dumper drivers are unlikely to have associated qualifications / competencies. The situation has improved for plant, but not elsewhere except where a checking regime has been introduced. Companies are typically interested in whether a worker has a ticket for a 5 tonne excavator rather than whether they have the necessary competencies / experience for the particular job. In addition, there are a multitude of excuses for not having card available. However, there is the fundamental question as to whether or not a card implies competence.

Companies do not always know who is actually working on a site. Workers may swap between sites, but not tell management. Management may do some checks, but the primary competence check may have been done by a subcontractor. Some attention is paid to competence at recruitment, but not necessarily in job assignment. Photocopies of tickets are likely to be kept in a ring binder on site but are not necessarily referred to.

Roofers, ground workers etc may not currently belong to the CSCS scheme although it does cover their trades. However, they will soon need CSCS cards to get onto major sites. This should provide a driver for take up of the scheme. Unions are also interested in the CSCS scheme as a means of preventing non-union labour. Employers want the scheme as a means of sifting out those who can deliver from those who cannot.

| Rating | 6 |
Training - The system that ensures the skills of the workforce are matched to their job demands.

Trade training has been reasonable. Whilst training is typically associated with the core trade skills, it will address health and safety. The professions are likely to have had a small amount of training, but not much.

Some site supervisors have low levels of training or experience, and are not necessarily competent to run a site and manage risks. Some workers were trained as operators, but now act as supervisors. The extent of some site manager’s safety-awareness training typically results from having worked with various tools and looked after other sites. CITB have only just introduced ‘Supervisor’ and ‘Manager’ CSCS cards in the last year. Site managers have typically progressed through the hierarchy, and are expected to manage. However, little formal management training is provided until they reach the level of contracts manager. Big sites are better. Supervisors will have been to 3-5 day health and safety courses with annual top-ups.

Some contractors are taking on trainees now. However, this is not typical and is driven by the current skills shortage. The message is not getting out to the industry as to where to get training and if money is available. CITB need to advertise that grants are available for training as some firms are unlikely to be aware of them.

| Rating | 2 |
O3  Procedures - The system that ensures that the method of conducting tasks and/or operations is explicit and practical.

Procedures tend to be paper-led, but really need to be risk-led. Quite often, the health and safety plan is no more than a mass of paper in ring binders. Generic health and safety plans are typically printed out to satisfy the CDM regulations rather than to help anyone. Perhaps organisations should be asked to identify the 10 highest risk activities and write method statements for them as a first step. Method statements should be written for the difficult areas where people will need help, not the easy and obvious activities. Method statements and health and safety plans are often seen as a burden, something to comply with.

Procedures are audited occasionally, but the emphasis tends to be on whether there is a system rather than whether it is a good system or not. Few companies have objectives for their audits, with health and safety often included as part of the quality system. Access to procedures is variable. More often than not, workers do not have access to the procedures. There is a similar problem with COSHH.

Risk assessments and safe systems of work should be included in the construction industry vocabulary (e.g. ‘permit to work’). The link between method statements and risk assessments is not obvious. They are often seen as two separate exercises rather than one informing the other.

There are few examples of procedures being updated. They are typically retrospective rather than proactive. For instance, if there is a delivery delay this may lead to rescheduling the sequence of activities thus forcing a change in the method statement / procedures.

| Rating | 2 |
Coordination, timing and the overall timescale lead to problems. Site managers will give thought as to whether an activity is reasonable or not. Whilst they may not have the necessary knowledge they will consider health and safety in finding a solution. Site management are not always involved in planning, but are often left to sort out the problems. Their input tends to be reactive schedule-driven planning, done at the work face in order to get the job done.

Site management are hampered by having to sort out buildability issues relating to poor design. Hand-over periods are such that there is overlap between constructing the main frame and the fit out, leading to several principal contractors tending to be on site concurrently.

Input from designers and planning supervisors can be positive if made in the right way at the right time and they have the right health and safety knowledge. For instance, health and safety information could be included on drawings. This is not that common, but is effective when used.

Bigger issues will typically be dealt with by planning. Any plan should actually be tailored to the process or job. A holistic approach is required. However, CDM may have led to health and safety planning being seen as a separate exercise to project planning - it is not. If the whole planning process is undertaken then information for the health and safety plan should fall out.

Financial pressures dominate, such that ‘white van man’ will do a job without scaffolding, and thus undercut other contractors. They will have considered health and safety but will have rejected it as not considered necessary for winning the job. Labour only subcontractors will just get on with the job without waiting for the equipment to arrive.

It is suggested that builder’s merchants and plant hirers may be a route to ‘white van man’. It is acknowledged that HSE need to recognise the target and think of how to get the message to across. The problem is what message or information can actually be given to them.
**O5 Incident Management and Feedback** - The system of incident management that ensures high quality information is available for decision-making when and where it is required, including the collection, analysis and feedback of incident and near-miss data.

Big contractors are likely to be fairly rigorous in their investigations. There is a hierarchy. In the best organisations, information will be fed back to workers via toolbox talks; at the next level the information may be fed to other site managers, but not workers; and in other cases, the management will just sit on the information in case of claims.

There is still a blame culture. Organisations do not want to open up the potential for civil claims via an internal report. Data collection is also a commercial secret for insurers as this enables them to set premiums at the appropriate levels.

Workers will talk about accidents afterwards if it involved one of their colleagues. However, they know that he would have been working in much the same way as they would; therefore they are not honest with themselves. There tend to be two responses to investigations: stonewalling or wanting to get the issue into the open and remove the problem.

The transient nature of the workforce leads to dismissal of an accident by some organisations, as it was ‘not one of theirs’. Big contractors will investigate all accidents but the depth of enquiry will vary, as subcontractors will hold some of the records. Subcontractors may hide accidents due to their relation with the principal contractor. However, many subcontractors will also rely on the principal contractor for advice on health and safety etc.

<table>
<thead>
<tr>
<th>Large contractors</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elsewhere - Negligible</td>
<td></td>
</tr>
</tbody>
</table>

36
Management have so many other issues to deal with in addition to health and safety. An example was quoted where four levels of management missed a key trench safety problem. Managers need to communicate to be effective.

Supervision is still overstretched, but there has been a slight improvement recently. Supervisors will also tend to be working as well, not leaving much time for supervision. Smaller contractors may have roving supervisors looking after 3 or more sites. Occasionally, on some sites no one is in charge or even employed by the contractor.

On big sites, particularly retail sites, clients want to be earning money as soon as possible. In a recent example, one supermarket chain was able to go from a green field to opening a store in 24 weeks. They now want to cut this down to 18 weeks, but this may lead to a variety of problems due to multiple trades overlapping on site.

Typically sites do not have sufficient supervision to match the number of trades on site and the speed of the construction programme. Poor management is endemic in construction. The Engineering Construction Industry Association (ECIA) members have accident statistics one tenth of construction even though they are doing construction work. This is likely to be because their sites are well managed to petrochemical standards.

There is a lot that can be learnt from petrochemical sites and transferred into general construction. Petrochemical clients will remove a permit to work if they do not like the way that work is done. Petrochemical clients and contractors are used to working on live plant therefore everything is planned to the last detail as huge amounts of money can be lost due to delays. This philosophy is transferred to new projects.

| Rating | 3 |
Communications - The system that ensures that appropriate information is communicated clearly to its intended recipients.

Many accident investigations lead to poor communications being cited as a significant issue. It is rare to find good communication in the construction industry, although communication is freer in partnering.

If one of the duty holders has clout (and uses it) they can influence communication. However, it can also lead to parties clamming up due to the unequal relationship. Communication needs to be a two-way system. A client who has a good health and safety and public profile will be a significant influence in communicating their requirements.

In larger projects, the planning supervisor will focus in on responsibilities and how they are communicated down the chain. The planning supervisors on larger projects tend to be better. They are also independent, and see their role as communicating with the other duty holders.

Often planning supervisors are tied in with quality, quantity surveying, progress payments etc on small projects. The planning supervisors are often bypassed if the other duty holders already have good communications.

Drawings are critical for communicating health and safety information. They are the only form of information that actually reaches the worker. Paperwork just sits in office. Safety alerts, safety committees and safety advisers are used on some sites, leading to involvement and ownership. Safety representatives were felt to make a difference to the workforce attitudes to health and safety. Where invited into companies, workers safety advisers were getting a good response without the problems anticipated by the Construction Confederation, such as unions hijacking health and safety as a means of increasing membership.

| Rating | 4 |
**O8 Health and Safety Culture - Product of individual and group values, attitudes, competencies and patterns of behaviour in relation to health and safety.**

The bigger organisations are adopting a safety culture as they see the social and financial benefits. However, there is a long way to go for such an approach to be transmitted down the supply chain.

Image does not drive health and safety for most construction companies, although it does for some. Being asked to report on accident history when tendering for work is likely to have an impact as it impinges on one of the key drivers winning new business. There have been improvements, but the can-do culture predominates over any health and safety culture. The culture needs to be directed at health and safety as a means of harnessing the ownership and creativity present in the construction industry. The responsibility for accidents needs to be spread between the duty holders so that it is not seen as one organisation’s problem.

Those sites that encourage cooperation amongst the workforce are more effective than those with strict rules, as such rules need permanent policing by the site management.

<table>
<thead>
<tr>
<th>Rating</th>
<th>4</th>
</tr>
</thead>
</table>

**O9 Equipment Purchasing - The system that ensures that the appropriate range of equipment is available.**

Addressed at the Direct level in Operational and Safety equipment.

<table>
<thead>
<tr>
<th>Rating</th>
<th>4-6</th>
</tr>
</thead>
</table>

**O10 Inspection and Maintenance - The system that ensures equipment and materials are maintained in good working order.**

Addressed at the Direct level in Operational and Safety equipment.

| Rating | 4 |
O11 Pay and Conditions - The remuneration package and benefits in the context of working hours and conditions and welfare facilities. Also welfare facilities.

Pay is typically linked to productivity. At the domestic end of the market, the time pressures are not so great. At the larger end of the market, bricklayers tend to be paid per house.

There appears to be a two-tier labour market. At the unskilled end, the pay will only attract those who are desperate for work, whereas at the skilled end workers can pick and choose as to which sites they work on.

Penalties feed through to workers. With time pressures getting worse now this leads to a conflict between financial penalties and health and safety.

Welfare facilities are appearing now, and are better at the larger end of the market. Chemical toilets and standpipes are still the typical welfare facilities on smaller sites. Some smaller sites are now providing units with hot running water. This makes a difference. Drying rooms are still an issue though. There appears to be a lack of imagination. For instance, on congested house building sites, double garages could be used as rest rooms where it is not possible to install site huts. The utilities are the biggest barrier to improving welfare conditions on site.

<table>
<thead>
<tr>
<th>Rating Pay structure and terms / condition are a negative influence</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Welfare</td>
<td>7</td>
</tr>
</tbody>
</table>
Design for Safe Construction - The process of design to ensure buildability of new structures, and operability and safety during maintenance, repair, and refurbishment of existing structures (both in relation to the existing structure and the design of any repair, maintenance or refurbishment scheme).

Designers were felt to have an acceptance of their responsibility, but want to keep their heads down. Architects do not have any training in health and safety during their first degree, with architects and surveyors being felt to be more of a problem than engineers.

Improving this factor was viewed as being an uphill struggle (although issues such as the specification of block paving were improving). There was perceived to be a lack of interest among designers. It was felt that designers were talking a different language (aesthetics etc.), and that they would rather concentrate on the structure, than the individual components and details. However, safety problems are typically with such details, and design can influence a variety of other issues including buildability, best value, maintenance all of which are likely to impact on health and safety. Framework contracts provide opportunities for better deals due to the involvement of the designer over the whole life of a structure.

Some organisations with procedures and mechanisms were already fulfilling their ‘CDM’ duties, others remain largely untouched by CDM. It was felt to be difficult to detect the effect of CDM on designers. CDM is often considered to be more of an issue for contractors than designers. There was also the thought that safety in use could also be included in CDM.

HSE now undertakes pre-planning visits to designers, followed as part of proactive inspection and intervention plans including sample visits at high risk times during the construction programme. Intervention is easier at the start of the project when the costs of changes are considerably less and there is less resistance from the designers. Similar inspections on other larger projects involving public bodies such as MoD, NHS etc. Large high profile projects with long potential lives are targeted in London in order to ensure that health and safety is considered early on, and to check that parties are adhering to agreed plans. This contrasts with the systems used in the past which emphasised quantity rather than quality and thus did not encourage in-depth visits.

Some companies do take a proactive approach, and contact HSE and other regulatory bodies for advice. However, some designers consider health and safety advice as an intrusion. In addition, many single practitioner designers work from home or are loosely affiliated to companies, in which case they are difficult to communicate with.

The HSE have given talks on health and safety to Local Association meetings of various professional institutions. However, the audiences are largely self-selecting, with those who have an interest attending several talks whilst the majority attend none.

| Rating | 1 |
4.2.3 Policy level influences

P1 Contracting Strategy - The extent to which health and safety is considered in contractual arrangements and the implications.

There appears to be a Contracting strategy hierarchy:

1. On larger projects, there tend to be health and safety advisers in meetings.
2. With lesser developers in London and the home counties the driver is to do the bare minimum and then sell the building on as quickly as possible (the first four sentences of the ‘poor’ definition apply). The extent of health and safety on some contracts is limited to stating that CDM regulations 7 and 13 should be adhered to, and that there should be a foreman on site.
3. When a person lives in a house that is being worked on they have greater power and occasionally contact HSE.
4. The final category corresponds to those who have little clue about construction risks, choose the cheapest contractor and have a variety of problems. Whilst these problems relate primarily to quality, health and safety problems also arise.

Some builders just get on with refurbishment projects without asbestos checks. Some local authority projects are carried out with virtually no risk assessments or method statements. Lack of resources is claimed to be behind this.

Local authorities typically have preferred lists where the contractors have to fulfil a small number of criteria to get on the list, but from then on the selection is on price, despite ‘best value’ (particularly for maintenance work). Central London councils such as Westminster and Kensington & Chelsea are better, but primarily because of public relations concerns.

Local authorities generally take little responsibility for the work once the contractor has been selected. The Building Control officer is primarily concerned about compliance with Building Regulations and planning issues rather than health and safety. Building Control officers have enforcement powers over the final building, but do not have a health and safety component within their armoury and, as such, they contact HSE. Consideration is being given to increasing the powers of Building Control Officers to address health and safety issues, particularly for domestic projects not notifiable under CDM. However, there is concern over whether local authorities would be willing to take on this extra work given both their limited internal resources and the cost of external resources (around half of the building control work is done in the private sector).

Domestic clients are unlikely to be there when the work is being done. Contractors thus have little coordination, and are just there to get the job done. There is unlikely to be any consideration of competence or training on health and safety. Getting the job done to time at lowest cost is likely to be the greatest concern.

Traditional contract routes allow control over whom you use to carry out construction work. However, these tend to be used by the less sophisticated (often domestic) clients. However, the newer type of contracts (management contracting) where the responsibility for selecting the other parties lies with one party tend to be used by those clients who do tend to know what is
going on. Thus the least sophisticated clients are taking on the greatest workload (and responsibility).

There is little inclusion of health and safety in standard forms of contract. If health and safety were included in a sensible way in standard contracts then it is more likely that those clauses would be complied with as not only would there be a criminal liability but a civil liability as well (along with the lower level of proof required to establish guilt in a civil court). This may reduce the current tendency to pass liability down the supply chain. When subcontractors are nominated by the client the principal contractor is unable to sack them. Some projects do have innovative approaches to health and safety. Again, there is a two-tier system.

There were felt to be two types of planning supervisor: those who comply with the law plus providing quality control; and those who comply with the spirit of CDM. Other than relatively simple jobs there are few jobs that an individual planning supervisor is competent to tackle due to the sheer scale of knowledge / experience required. A similar issue exists for designers.

There is an inability to see what needs to be done, i.e. what the spirit of CDM is. There have been examples of rogue planning supervisors, i.e. architects taking on the role for the extra fees but without properly understanding what is required.

Some planning supervisors do actually carry out a coordinating function. Some organisations view planning supervisors as a nuisance due to their need to collect information. However, some contractors are actually carrying out the planning supervisor’s role implicitly even if they do not necessarily recognise that they are doing it.

<table>
<thead>
<tr>
<th>Developers and domestic clients</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local Authorities</td>
<td>4-5</td>
</tr>
<tr>
<td>Major clients</td>
<td>8</td>
</tr>
</tbody>
</table>
Ownership and control was not really felt to be improving.

The client is the key player as he is the one who pays for the works. However, in the vast majority of contracts there is little client presence, as the client has delegated responsibility to the principal contractor. A client cannot delegate his section 2 and 3 responsibilities under CDM as these responsibilities would fall back on the client if the other duty holders were to fail. In fact, delegated responsibilities are likely to fall back on the client. For example, does a client take on the principal contractor’s responsibilities if the principal contractor is not competent?

Little can be done with domestic clients unless either the contractor takes on ownership and responsibility, or a client’s agent is appointed. Bigger clients will typically take most ownership, local authorities less so, and domestic clients a lot less. Local authorities have conflicting interests and limited budgets, and their health and safety commitment ultimately falls apart at committee levels. Local authority chief executives tend to believe that their local authorities are exercising reasonable health and safety performance even if the reality is somewhat different.

Ownership and control need to be cascaded down through an organisation. The system only breaks down when someone says this is nothing to do with me and passes the responsibility on. Anyone needs to feel able to say to their chief executive that they are not going to do this activity as it is unsafe.

Health and safety works best in organisations that have a clear focus and purpose. It needs the chief executive to state clear health and safety objectives such that people can relate to it at all levels (e.g. BP sets standards for all). This is probably easier for private industry than local authorities or central Government. Local authorities are a collection of various functions under one roof i.e. highways, education, social services etc.

Accident rates can be reduced the board demonstrating ownership. There needs to be similar agendas shared among all of the directors at board level otherwise there is the potential for ownership of individual problems (sales, marketing, technical etc), but not the overall problem.

| Rating | 2 |
Company Culture - Culture within an organisation consists of assumptions about the way work should be performed; what is and what is not acceptable; what behaviour and actions should be encouraged and discouraged and which risks should be given most resources.

Safety culture is generally low in construction, but it is improving. Culture is at least recognised as an issue now, whereas it may not have been in the past. Most people would recognise that they have some form of health and safety role now.

Whilst a company may have a good safety culture, this needs to be passed through supervisors etc. on to the workforce. If this culture does not penetrate the workforce, it is debatable whether it is a good culture or not.

The construction industry is very broad, and includes several cultural variations, such as the following:

1. Family businesses – these may have good culture.
2. Small companies - some may have a good culture with full involvement of managing director. However, once they expand they may lose control of their financial and health and safety performance due to dilution.
3. Companies that don’t have good health and safety performance
   a) As they do not really care.
   b) Think that they have a reasonable health and safety performance, but do not in reality, thus there is a perception gap.
4. Companies that have a reasonable health and safety performance, and their performance does meet their perception.

Construction has so many other drivers: cost, conditions, time etc. Companies maybe so busy trying to meet deadlines and correcting snagging that it is difficult to break out of the cycle and focus on performing better. Those that have broken out of the circle tend to be profitable and start to refuse to take on high-risk work. Companies need to see the benefits of health and safety in order to develop an appropriate culture and break out of the cycle.

Company culture grows with time. Large projects allow culture to develop over time. People need a feeling of belonging in order to develop a culture. Whilst some companies have a culture on site this is considered to be a function of the site agent. However, companies also perform differently on different sites.

In joint ventures, each organisation will have its own culture and may not share this with others, or the various cultures may just not get on with one another. On the other hand, some companies will impose their culture for the duration of the contract. If this affects the ‘unwilling’ recipients then the culture is likely to become more ingrained. However, when workers leave that culture (site) they typically revert back to their own default culture. Imposition implies a lack of buy in, and until there are a large number of organisations imposing the same culture it will be difficult to get take up, unless there is some external influence.

Companies need to see a benefit of a particular culture. They see the benefit of a profit culture and this drives the industry. Profit margins are small in many construction companies, and any
extra cost is likely to be unattractive. The benefits of a health and safety culture thus need to be translated into the terms that companies understand (i.e. costs and monetary benefits).

| Rating | 0-8 |

**P4 Organisational Structure - The extent to which there is definition of health and safety responsibility within and between organisations**

Where companies have repetitive and standardised products, they can possibly tend towards the excellent definition. Where there is little staff turnover and a feeling of ownership a good structure can develop. However, this is not common with construction.

Typically, the principal contractor will determine the organisational structure for others. Some contractors may have good organisational structures, but this is unlikely to transfer horizontally to other contractors.

| Rating | 4 |
**P5 Health and Safety Management - The management system which encompasses health and safety policies, the definition of roles and responsibilities for health and safety, the implementation of measures to promote health and safety and the evaluation of health and safety performance.**

More safety management systems (SMS) exist now than in the past, but there are doubts over whether these systems are actually effective or not. There needs to be a culture more than a system, although ultimately, a SMS will follow from the culture.

Those organisations with a well-defined product would have a rating close to 10. Most companies, however, have ratings that would imply the moderate definition and below. Improvement can be seen, in that a few companies with a rating near 10 can actually be named.

Some audited systems score highly despite having omitted some relatively simple issues. Audits tend to address what is there rather than what should be there. Whilst safety is addressed, health tends to be omitted.

Imposition of a safety management system (SMS) needs to be full time in order to get the message over. Any lapse and there will be a reversion to the default way of working. High levels of technical expertise within a group can lead to such groups building up their own informal systems. However, some issues will have been imposed on them.

SMS at the lower end of the construction industry tend to be reactive. The priority is to manage the way out of problems that are often imposed by others in the supply chain. SMS tend to be hardware oriented with few people or management issues. Hardware issues are easy and immediate and can be addressed through prescription.

The client and HSE impose needs for SMS on principal contractors. Some principal contractors will delegate the SMS out to health and safety consultants. It is at this point that the system can break down. Some principal contractors have health and safety advisers to fulfil the principal contractor’s legal duty and satisfy the client’s requirements but these advisors have no authority. Some principal contractors have external health and safety consultants who come in every so often, do spot checks and report back but, again, they have little role other than to satisfy HSE and client requirements and their appointment is little more than window dressing. Some health and safety managers have little authority but still have a responsibility.

| Rating | 4 |
Labour Relations - This extent to which there is a harmonious relationship between managers/directors and the workforce. It also concerns the extent to which there is the opportunity for workers to affiliate with associations active in defending and promoting their welfare, and the extent to which there is a system in place for pay negotiation.

It is usually necessary to ask whether there is consultation on sites or not. Consultation with the workforce does occur on some sites, typically through site meetings, although these tend to be production oriented rather than driven by health and safety.

Feedback can occur through prizes for suggestions (or STOP cards) leading to improvements in health and safety performance or through notes in pay packets. However, pay is market driven.

Fragmentation, subcontracting and the ‘hire and fire’ culture all mitigate against good labour relations. Whilst there are few (union) health and safety representatives on site, there was a feeling that improvement in health and safety on site could be linked to representation.

Incentive schemes can be negative. For instance, if a bonus is payable if a site goes 365 days without an accident, what happens to the person who has accident on day 350? Will they be willing to report that accident and thus make it obvious that they are the reason for everyone losing their bonuses? Do such schemes promote under-reporting of accidents? Similarly, site managers may not want HSE inspectors to serve a notice as it will affect the site’s performance indicators. This will be the driver rather than a concern about what lessons could be learnt. Whistle blowing is not encouraged in the construction industry. It is viewed as the wrong thing to do, and can lead to blacklisting.

| Rating | 2 |
P7  

*Company Profitability - The extent to which companies are subject to competition over market share and constrained as to the price that they can charge.*

Construction is not a highly profitable industry. There are too many companies, and some have pulled out of certain markets. However, health and safety was felt to have less to do with profitability than culture given that construction has never been overly profitable. Perhaps those larger companies who have been around for a long time just have a different culture.

Many developers are speculators with little collateral leaving little room for health and safety. Despite house builders having relatively high profit margins at the moment, they have made little investment in health and safety; possibly due to ignorance.

Companies need to have health and safety pointed out to them before they recognise its importance. Typically, this only occurs when they have a problem or accident. Companies may also improve their health and safety performance accidentally. For instance they may decide to use mobile elevating work platforms (MEWPs) because they make the work easier, but the correct use of MEWPs will also typically be safer than many other means of working at height.

Whilst companies will boast of the value of a project, they see no cost benefit in improving health and safety. Health and safety has not been grasped as being a management issue. Why is health and safety not managed in the same way as other corporate issues such as finance, quality and productivity?

| Rating | 5 |


4.2.4 Environmental level influences

E1 Political Influence - The profile of, and practices within, Government related to safety in the industry.

Health and safety has a high profile within Government as was evident from the Summit last year. However, is the health and safety portfolio one that a minister may want due to its high political profile. Now that HSE has moved to the Department of Work and Pensions (DWP) it has been grouped with other work-related issues.

There is likely to be plenty of government expenditure on infrastructure in the future, with considerable expenditure planned for the road and rail networks. Whilst the Treasury will be providing the money to fund these capital projects, the question is whether there will be any health and safety conditions attached to this expenditure. Such conditions would spell a true Government commitment to health and safety.

The Office of Government Commerce guidance (OGC 10) is known about, but there appears to be little take up. Some Government departments have not recognised their stakeholder duties yet. This could lead to problems if health and safety is not seen as part of the Government package. Public procurement contracts should have health and safety as part of contracts along with pre-planning input. This is happening with the Ministry of Defence (MoD) but, possibly, not elsewhere.

MoD procurement is now centralised, and they are looking for best value with health and safety as an integral part of the planning process. The MoD are planning three types of project: new build simple barracks; new build docks; and major refurbishment works of existing facilities. The MoD approach should have an impact just by getting health and safety considered in the project.

| Rating | 6 |
**E2 Regulatory Influence - The framework of Regulations and guidance governing the industry and the profile and actions of the Regulator.**

Whilst it is too early to comment on the effectiveness of the recent intervention approaches adopted within the Construction Division, the policy and strategy do seem reasonable. The new Construction Division should improve the focus. Typically the rating might be 5 and below, although there are areas that would tend towards 10.

In addition to HSE, there are a series of other Regulators who impinge on the construction industry (e.g. Environmental, Planning and Building Control) but who do not necessarily cooperate or overlap with one another. There appears to be no common health and safety direction between regulators. Whilst there are some areas of overlap between HSE and the Environmental Health regulator, both have limited resources.

It is important to distinguish the influences of statute and enforcement (i.e. the extent to which enforcement activity contributes over and above the mere existence of legal requirements in terms of levels of compliance and improved standards of health and safety practice).

Construction sites are more concerned about whether an HSE inspector can impose delays, they are not so bothered about the fines. All sites have something that could be improved. In some cases minor improvements are required, in others major improvements are required.

Judgments have to be made on how effective site safety management systems are. For instance, the question could be asked as to whether the site has ignored or just not recognised a hazard. About 80% of the time in inspections is spent on providing advice. Sites are quite happy to sort out the problem there and then rather than have a Prohibition Notice served on them.

There is a huge disparity in resources between HSE and the construction industry, but HSE are effective due to the approach taken. This involves contact and advice, not just full-time enforcement. Respect for HSE within the construction industry enables an impact to be made. There has been a change from an aggressive policing role to one of ‘this is your problem - how can it be sorted out’. The industry view of this changing role has been positive. However, SMEs have always been difficult to access and a national database of enforcement would be useful.

On construction sites workers know who the HSE inspector is, and are interested in what they have to say. This contrasts with the manufacturing sector where an inspector’s presence is not so obvious (nor is facility as hazardous).

HSE Guidance was considered to be good, but there is possibly too much of it. Guidance should perhaps be for generic issues with industry then left to address specific issues i.e. steel erection. Guidance, Approved Codes of Practice and Regulation cause confusion. Are all three absolutely necessary? The implementation of the temporary work at height directive may result in guidance, but industry typically wants prescription. Regulations are goal-setting, with the role of Guidance being to interpret the regulations and be a bit more specific but not in great detail. Industry should provide the detail in line with best practice. Goal setting has perhaps gone too far. Goal setting regulations are considered reasonable if they are supported by more prescriptive Guidance. This has not necessarily been the case in the past. Ideally, there should be general guidance with industry left to sort out the details for themselves, i.e. it should be the
duty holder’s role to manage the risk. Guidance has been more user-friendly recently, not taking on ownership of the law but helping the industry comply with it. Prescription gives clarity. Prescription is favoured in order to level out the playing field for tendering as prescriptive requirements do not require a level of interpretation. The MCG initiative and published statistics will also effectively give HSE another tool to inspect companies with.

HSE is driven to reactive work in order to meet its public commitment. A proactive approach would be better. Such an approach would also drive down the necessity for reactive work. Health and safety targets may not necessarily change public expectations. These targets may protect HSE to an extent in that there has been a shift in ownership of targets/problems to industry. However, once the profile of health and safety has been raised the reporting of accidents could increase.

| Rating | 6 |
**E3 Market Influence - The commercial and economic context affecting the industry.**

See P7 Company profitability.

If materials are supplied in a safer state (i.e. smaller bags of cement, or water-based gloss paint) then the market influence is positive. However, if market forces are driving profitability not health and safety then the market can be seen as being a negative influence. It was felt that the market has to be influenced rather than just being seen solely as an influencer.

The better companies may turn down high risk work thus leaving it to those companies who are least suited to manage those risks.

Up until the 1990s accidents reflected construction output. This trend has been broken now. However, it is difficult to identify whether there is still a link with new build work. The current buoyant market should help in absorbing any ‘extra’ costs associated with improvements in health and safety.

The current economics are such that knocking a structure down and rebuilding is cheaper than refurbishing the building. This is good in that new-build construction is probably safer than refurbishment. However, demolition does lead to tight sites as maintaining or increasing the lettable area is a key driver.

| Rating | 5 |

**E4 Societal Influence – Aspects of the community and society at large, which bear upon organisations and workers.**

The public will complain about construction sites particularly in residential areas. Environmental impact is the primary source of complaints. The public do not want new construction in their areas, particularly not new houses. HSE typically suggest that the public talk to the site manager first if there is a problem.

The public perception of construction industry organisations is one of ‘cowboys’. Bigger companies are just viewed as wealthier cowboys. Some companies really do care about their public profile, and have liaison officers. There is more concern now as the construction industry is gradually being influenced by societal concerns over health and safety. Some construction companies are even trying to attract school leavers into the industry.

Construction is viewed as involving amongst others: long hours, transitory work and not always being in work. The public are aware of construction health and safety but do not necessarily understand the issues.

| Rating | 3 |
4.3 INFLUENCE FACTOR WEIGHTINGS

Following discussion of the standards and issues reflected in current practice associated with each factor, the relative weight of influences were considered per Steps 8 to 10 of the Influence Network methodology in Section 3. The weightings from one level of the network to the level above are discussed in the following sections. The main comments from the group are drawn together to show where there was consensus on the relative influence of the factors and which were regarded as most important. Only those factors considered to have significant influences (high or high medium) on a factor at the level above are considered in detail. The full range of influences can be seen in Figure 5 to Figure 8 or tabulated together with the associated ratings in Appendix B.

4.3.1 Direct influences on construction health and safety

The weightings of the Direct influences on construction health and safety are shown in Figure 5.

The Direct level factors considered to have the highest influence on construction health and safety were judged to be Competence, Risk Perception, Communications and Information / Advice. At the next level of significance, Team Working, Compliance and Suitable Human Resources were judged to have a high-medium influence on construction health and safety. None of the factors was judged to have a low influence, but External Working Environment, Operational Equipment and Safety Equipment / PPE were judged to only be of medium-low significance, on the basis that it was considered that human failings were generally more significant than technical ones in determining the safety of workers in construction. However, for specific accident kinds, these hardware factors would be significant.

In general, the participants felt that many of the direct level factors were linked to each other and it was difficult to distinguish between them, for example, Competence, Suitable Human Resources and Team Working were perceived to be inter-related. Some discussion ensued with regard to the Health factor, as it was deemed that the Health of workers was critical with regard to the direct operational activities they engage in.

4.3.2 Organisational influences on Direct level

The weightings of the Organisational influences on the Direct level are shown in Figure 6.

The Organisational level factors with the highest influence on Competence were considered to be Recruitment and Selection, Training and Management and Supervision, with Safety Culture following at the next level. Pay and Conditions was considered to be an indirect influence on Competence, but not a key driver.

Motivation / Morale was considered to be influenced by Incident Management and Feedback, Management / Supervision, Health and Safety Culture and Pay and Conditions.

The most significant influences on Team Working are Recruitment and Selection, Management / Supervision, Communications, Health and Safety Culture followed by Training and Planning.
Situational Awareness / Risk Perception was felt to be highly influenced by only two factors, Training and Communications, with Recruitment and Selection, Incident Management and Feedback, Management / Supervision and Health and Safety Culture all being considered to have high-medium influences. It was felt that it is possible to select and train for greater awareness. Procedures were not considered to have an impact on awareness levels, as they are more directly related to Compliance rather than conveying an understanding of the risks.

None of the Organisational level factors was considered to have a high influence on Fatigue / Alertness, with only Procedures considered to have a high-medium influence.

Procedures and Equipment Purchasing were considered to have a high influence on Health, with Training, Incident Management and Feedback, Management / Supervision, Health and Safety Culture and Design for Safe Construction all considered to have a high-medium influence.

Communications are highly influenced by Recruitment and Selection, Communications and Health and Safety Culture with Management / Supervision at the next (HM) level.

Five factors were considered to have a high influence on Information / Advice. These were Training, Procedures, Incident Management and Feedback, Management / Supervision and Communications. Health and Safety Culture was considered to have a high-medium influence.

Compliance was judged to be highly influenced by Procedures, Management / Supervision and Health and Safety Culture, whilst Recruitment and Selection, Training and Communications were considered to have high-medium influences.

The availability of Suitable Human Resources was thought to be highly influenced by Recruitment and Selection, Training and Planning, followed by Management / Supervision and Health and Safety Culture.

Seven Organisational level factors were considered to be significant influences on Internal Work Environment, with Procedures, Planning, Management / Supervision, Equipment Purchasing and Design for Safe Construction considered to be highly significant, and Incident Management and Feedback and Health and Safety Culture considered to be of high-medium significance.

None of the Organisational level factors was considered to be high significance influences on External Working Environment. However, Planning, Health and Safety Culture and Design for Safe Construction were thought to have high-medium influences.

Not surprisingly, Equipment Purchasing was considered to have a high influence on Operational Equipment. In addition, Procedures, Planning and Inspection and Maintenance were all thought to have a high-medium influence.

Safety Equipment / PPE was thought to be highly influenced by both Equipment Purchasing and Inspection and Maintenance, with Procedures, Planning and Communications considered to be high-medium influences.
Overall, Management / Supervision and Health and Safety Culture were probably the most significant Organisational influences on the Direct level appearing repeatedly as strong influences on direct level factors. Recruitment and Selection, Training, Procedures and Communications can be considered as being the next most significant group of influences.

### 4.3.3 Policy influences on Organisational level

The weightings of the Policy influences on the Organisational level are shown in Figure 7.

**Recruitment and Selection** was thought to be highly influenced by Contracting Strategy and Health and Safety Management, with Company Culture and Organisational Structure following at the next level.

**Training** was considered to be dominated by influences from Company Culture, Organisational Structure and Health and Safety Management, with all of the other factors considered to be either medium or low influences.

**Procedures** were thought to be highly influenced by Organisational Structure and Health and Safety Management, with high-medium influence on Company Culture.

The key influences on Planning were judged to be Company Culture, Organisational Structure and Health and Safety Management, followed by Contracting Strategy.

**Incident Management and Feedback** was considered to be highly influenced by Organisational Structure and Health and Safety Management, with Company Culture and Labour Relations at the next level of significance. It was commented that some high profile clients may want to have feedback, therefore it would have an impact, even though Incident Management and Feedback does not currently have much impact from Ownership and Control.

Six of the seven Policy level factors were considered to have significant influences on Management / Supervision, with Contracting Strategy, Company Culture and Health and Safety Management considered to be highly significant, whilst Organisational Structure and Company Profitability were of high-medium significance. Good Labour Relations was considered to be needed for effective management.

**Communications** was considered to be highly influenced by the following four factors: Company Culture, Organisational Structure, Health and Safety Management and Labour Relations with the other three being considered to be of low to medium significance.

Contracting Systems were considered to vary with regard to the impact that they have on encouraging Communications, with some being more effective than others.

**Health and Safety Culture** had three primary influences; Ownership and Control, Company Culture and Health and Safety Management, with Labour Relations being considered to be a high-medium influence.

The only factor considered to have a high influence on Equipment Purchasing was Contracting Strategy, whilst three factors, Company Culture, Health and Safety Management, Company Profitability, were considered to have a high-medium influence.
Inspection and Maintenance was thought to be highly influenced by Health and Safety Management, with Company Culture and Company Profitability providing high-medium influences. It was also commented that some contracts may stipulate Inspection and Maintenance.

As may be expected, Pay and Conditions was thought to be highly influenced by Company Profitability followed by Labour Relations at the high-medium level.

The influences on Design for Safe Construction were fairly clear-cut. Four factors at the Policy level were considered to be highly influential. These were: Contracting Strategy, Ownership and Control, Company Culture and Health and Safety Management, whilst the other three factors were all considered to have a low influence. The comment was made that designers can either design for safety or they can’t.

Overall, Company Culture and Health and Safety Management are the most significant of the Policy level influences appearing repeatedly as strong influences on the organisational level factors. Contracting Strategy and Organisational Structure could be considered to be at the next level of significance overall as they had four and five high influences respectively but their influence was not universal, with significant numbers of medium to low influences in relation to certain aspects.

4.3.4 Environmental influences on Policy level

The weightings of the Environmental influences on the Policy level are shown in Figure 8.

Contracting Strategy, Ownership and Control, Labour Relations and Company Profitability were all considered to be highly influenced by the Market. Of these, Social influence was considered to have a high-medium influence on Ownership and Control and Labour Relations, medium with respect to Contracting Strategy and low for Company Profitability. It was commented that CDM potentially implies more client Ownership and Control suggesting a higher weighting to the regulator than the medium-low designation could be argued.

Company Culture was considered to be highly influenced by both the Regulatory and Social influences. Organisational Structure and Health and Safety Management were both considered to be highly influenced by the Regulator, with the other Environmental influences only considered to be between medium and low. It was generally felt that everyone in the industry wants a safe working environment.

Overall, the Market influence is probably the most significant, with the Regulatory and Social factors also being influential. The Regulatory influence was felt to be partly influenced by the wider Social influence. The Political influence, however, was considered to be largely insignificant never being the dominant influence and no weighting higher than a medium level being assigned.
Direct Influences on Construction health and safety

Figure 5  Variation in the weightings of the Direct level on construction health and safety
Organisational Influence on D1 (Competence)

Organisational Influence on D2 (Motivation / Morale)

Organisational Influence on D3 (Teamworking)

Organisational Influence on D4 (Situational Awareness / Risk Perception)

Organisational Influence on D5 (Fatigue / Alertness)

Organisational Influence on D6 (Health)

Organisational Influence on D7 (Communications)

Organisational Influence on D8 (Information / Advice)

Organisational Influence on D9 (Compliance)

Organisational Influence on D10 (Suitable Human Resources)

Organisational Influence on D11 (Internal Work Environment)

Organisational Influence on D12 (External Working Environment)

Organisational Influence on D13 (Operational Equipment)

Organisational Influence on D14 (Safety Equipment / PPE)


Figure 6 Variation in the weightings of the Organisational level on the Direct level
Policy Influence on O1 (Recruitment & Selection)

Policy Influence on O2 (Training)

Policy Influence on O3 (Procedures)

Policy Influence on O4 (Planning)

Policy Influence on O5 (Incident Management & Feedback)

Policy Influence on O6 (Management / Supervision)

Policy Influence on O7 (Communications)

Policy Influence on O8 (Health and Safety Culture)

Policy Influence on O9 (Equipment Purchasing)

Policy Influence on O10 (Inspection & Maintenance)

Policy Influence on O11 (Pay and Conditions)

Policy Influence on O12 (Design for Safe Construction)

Figure 7 Variation in the weightings of the Policy level on the Organisational level
Environmental Influence on P1 (Contracting Strategy)

Environmental Influence on P2 (Ownership & Control)

Environmental Influence on P3 (Company Culture)

Environmental Influence on P4 (Organisational Structure)

Environmental Influence on P5 (Health & Safety Management)

Environmental Influence on P6 (Labour Relations)

Environmental Influence on P7 (Company Profitability)

E1 – Political, E2 – Regulatory, E3 – Market, E4 – Societal

Figure 8  Variation in the weightings of the Environmental level on the Policy level
4.4 CONCLUSIONS FROM THE CAUSATION WORKSHOP

The conclusions from the workshop discussions are presented in the following sections for each of the levels of the Influence Network. Where the discussions indicated that there were common or inter-related themes, the factors have been grouped together.

4.4.1 Principal Direct level influences

*Competence, Training and Suitable Human resources*

Whilst being considered as an important factor, *Competence* was not considered to be the sole route for ensuring construction health and safety. There was felt to be a strong link between *Competence* and the need for *Training* (discussed at the *Organisational* level) given the current skills shortage, and the means by which construction workers have typically received training. The main concerns were:

- Competence in some cases, particularly with respect to health and safety matters can be quite low.
- Competence is not uniform, and is highly dependent on the type of worker (i.e. there are considerable differences between skilled workers and labourers), different types of work and the supervision available.
- Competence also varies geographically, with London and the South East suffering the worst problems due to skills shortages.
- The skills shortage leads to companies employing less skilled workers now, unlike in past.
- The skills shortage also leads to companies taking on work that they are not competent for as clients are desperate for someone to do the work.
- Better workers migrate to better employers leaving the worst employers with the worst workers.
- The construction industry has typically employed untrained workers who pick up skills and experience on the job. Unfortunately, many members of the ‘new’ workforce have a different safety culture, and are thus difficult to train.

*Motivation*

Historically, the main motivator in construction has been keeping your job (maintaining a pay packet). Health and Safety has not traditionally been the primary motivator for workers, getting the job done is. However, *Motivation* will vary depending on:
• The employer (the same company will perform differently on different sites).

• The supervision employed.

• The time spent on site (at the beginning motivation is quite bad, picks up during the project and then deteriorates towards the end of the project as the workforce wants to speed up and get onto the next job or is concerned about future work - Planning then becomes particularly challenging with numerous trades on site all wanting to work in the same area).

**Teamworking and Communications**

There are considerable ranges in performance for these factors across industry. Whilst each trade will work well together and communicate within their own trade/team, there is little interest in other trades or teams which can obviate team working / communication across a site. Teams work well within themselves, but this can be a vehicle for negative peer pressure with respect to safety typically revolving around getting the job done.

**Situational Awareness / Risk Perception and Culture**

This factor was felt to be particularly important. Workers were felt to know what the potential problems are (the hazards), but do not appreciate their significance (the risks). They overestimate their ability to deal with the problem and are generally confident in their abilities to improvise and work around problems without involving others. At smaller end of construction, particularly, the workers would ‘just get on with it’. The view is that ‘It won’t happen to me’, and complacency can also be at the root.

It was felt that developing a realisation of how things can go wrong but equally what can be done cost-effectively to eliminate or reduce the risk, was essential through the actions on other factors.

**Fatigue / Alertness and Health**

Construction can be a physically demanding occupation; therefore workers will get tired during the day and so physical health to an extent is self-selecting due to the nature of the work. Safety is a more immediate concern than health issues in terms of the effects of the job. The current claims climate leads towards there being negative driver.

With the current skills shortage, subcontractors are having to travel more. Also market concerns lead to time pressures result from clients being unwilling to commit capital for long periods. There is more stress now due to reduced staffing, fast track timetables, client pressures (more interference) and more expected of workers.

All these factors need to be accounted for and managed in terms of the consequent effects they may have on performance and safety.

**Information and advice**

There are two main sources of information:
• Written method statements (for site management / supervisors).

• Verbal communication (workers are told what to do on site).

The standard of method statements seems poor as:

• Some companies may go down the paper trail, but not necessarily appreciate what is required and for what practical purpose.

• Whilst the letter of the law is being complied with (box ticking), the spirit of the law is not always understood or followed through in terms of health and safety benefits.

• To demonstrate compliance with CDM in the course of inspection visits, some organisations will provide files of paperwork, but this paperwork is not at all user friendly with risk assessments being generic, impractical or for work that will not be done on that particular site.

• Method statements typically concentrate on the bulk of activity, and are not necessarily risk led.

• The opportunity for informal risk assessments by workers and their supervisors arises all the time as work is adapted to get the job done. It is essential that these thought processes are properly informed so that finding the safest solutions with least impact on health is ingrained.

Compliance

• Workers do not set out consciously to comply with the regulations. Their compliance comes if the site imposes health and safety rules, as the culture has an element of anti-regulation.

• If management / culture imposes requirements / rules that relate to job retention then workers will comply with them.

• When there are conflicting requirements, the workers will follow those that they perceive to be most important. Conversely, if rules seem pointless they may be ignored, thus the basis needs to be explained and understood.

• Compliance is self-perpetuating. Workers will generally adopt a production-orientated approach as it has been indoctrinated in the past.

• However, there is more compliance than there used to be and workers were able to get away with more in the past. Five years ago the question with regard to safety equipment was ‘do they have one on site?’ now it is ‘do they use it (properly)?’
**Internal and External Working Environment**

The working environment appears to be a feature of slip and trip accidents as:

- Site housekeeping is not that good, and is dependent on the management team and controls.

- Housekeeping is typically dealt with reactively, perhaps after an Inspector’s observation has been made.

- Ground workers are often working at the worst time of year when there is rain and mud or solid ground and necessitating hazardous work being done when there is little light. This scheduling can be to enable structural erection in good weather.

- Considerable development is taking place in London and other cities, with in-fill sites getting smaller generating significant safety problems due to the lack of space.

**Operational and Safety Equipment**

Equipment gets very hard use in construction due to the nature of the work and environment. Inspection tends to be carried out at end of the life of a piece of equipment rather than routinely during its life. The effort put into inspection and maintenance is likely to be directly proportional to the value of the equipment rather than the risk associated with operating it.

- Workers will also use their own equipment on some sites, and this equipment is therefore outside any inspection and maintenance system operating on the site.

- Workers need to be aware that some domestic ladders will not always take their weight let alone them plus materials or equipment.

- The vibration message has been getting through in the last year. However, companies will buy a new piece of machinery to solve the vibration problem rather than change the work process to eliminate the need for vibrating machinery.

- Noise is not seen as that important on sites, and is just treated as an occupational hazard.

- The introduction and widespread use of mobile elevating work platforms (MEWPs) has been major advance in recent years. However, MEWPs are seen used on unsuitable ground thus introducing another hazard.

- Speed and efficiency have been the main drivers for the introduction of new or improved equipment, but this can have safety knock-on benefits.

PPE is typically available on sites. This is a big improvement over the past. However, industry need to go further and understand how to use it and care for it and know when to replace it.
4.4.2 Principal Organisational level influences

Recruitment and Selection, and Training

The construction industry has typically (but not exclusively) employed untrained workers who pick up skills experience subsequently. This system is ceasing to work as:

- Many members of the ‘new’ workforce have different attitudes to health and safety.
- It is difficult to train some these workers particularly those who also have language difficulties (e.g. from Eastern Europe) or have skills / practices learnt to different standards elsewhere.
- Employment of workers is often based on a judgement of ‘do they look capable of doing a day's work?’. If they do then they are employed.
- The skills shortage leads to companies employing less skilled workers now, in comparison to the past.

Where recruitment was competence based, the concerns were that:

- Whilst some attention is paid to competence at recruitment, this is not necessarily the case in job assignment.
- Companies are typically interested in whether a worker has a ticket for a particular piece of plant rather than whether they have the necessary competencies / experience for the particular job.

Training was felt to be variable. In particular:

- Trade training has been reasonable - typically being associated with the core trade skills, but health and safety are addressed to variable extents.
- Site supervisors have low levels of training or experience in the tasks they now face, and are not necessarily competent to run a site and manage the risks.

Workers will need membership of the CSCS scheme if they wish to be employed on major sites. This should provide a driver for take up of the scheme. However CITB need to advertise that grants are available for training as it appears new/small firms are unaware of them.

Procedures and Planning

The delegates were critical of Procedures and Planning. Despite being an important area, it was felt that many companies were either ignoring Procedures and Planning or paying lip service to them as:

- Procedures tended to be paper-led exercises when they needed to be risk-led.
• Generic health and safety plans are typically printed out to satisfy the CDM regulations rather than to help anyone.

• The link between method statements and risk assessments is not obvious. They are often seen as two separate exercises rather than one informing the other.

• Site management are often left to sort out problems. Their input tends to be reactive schedule driven planning, done at the work face in order to get the job done, when there are potentially fewer practicable options available for risk control.

• CDM may have led to health and safety planning being seen as a separate exercise to project planning – whereas it should be an integral part of the process.

• Method statements and health and safety plans are often seen as a burden, rather than being useful and helpful.

The typical sources of the problems include:

• Coordination, timing and the overall timescale of projects.

• Financial pressures or market competition such that ‘white van man’ will do a job without, say, scaffolding and thus undercut other contractors.

Potential improvements to the situation were suggested to include:

• Organisations being asked to identify the 10 highest risk activities and write method statements for them as a first step.

• Preparing method statements for the difficult activities where people will need help, not the easy and obvious activities.

• Including health and safety information on drawings where it would be seen by more people who need to know.

**Incident Management and Feedback**

This was felt to be variable, where:

• The best organisations feed back information constructively to workers via toolbox talks.

• At the next level, the information may be fed to other site managers but not to workers.

• In other cases, the management will just sit on the information in fear of claims.
There is still a blame culture, and contractors may hide accidents due to their relation with the 
principal contractor. This therefore creates an impediment to the basic flow of information.

**Management / Supervision**

*Management and Supervision* were considered to be particularly critical to controlling the risk 
on a site. However, there are a number of issues that dilute site management impact including:

- Management having so many other issues to deal with in addition to health and safety.
- Supervisors working as well, and not leaving much time for supervision or oversight.
- Typically, sites do not have sufficient supervision to match the number of trades on 
site and the speed of the construction programme.

On a positive note:

- There has been a slight improvement recently, but supervision is still overstretched.
- There is a lot that can be learnt from the good practice on petrochemical sites and 
transferred into general construction.

**Communications**

Many accident investigations lead to poor *Communication* being cited as a significant issue. 
However, it is rare to find good *Communications* between parties through the construction 
chain. There are ways forward, including:

- Planning supervisors focusing in on responsibilities and how they are communicated 
down the chain in larger projects.
- Communicating health and safety information on drawings.

**Health and Safety Culture**

This was seen as one of the factors critical to improving health and safety on site. The larger 
organisations are adopting a *Safety Culture* as they see the social and financial benefits, but on 
the negative side:

- There is a long way to go for the approach to be transmitted down the supply chain.
- Image does not drive health and safety for most construction companies.

There have been improvements, but the can-do culture predominates rather than a health and 
safety culture. Thus, for the future:

- Being asked to report on safety performance when tendering for work is likely to have 
an impact as it impinges on a key driver, winning work.
• The culture needs to be directed to health and safety as a means of harnessing the ownership and creativity present in the construction industry

However, companies adapt to respond to different messages. They will tolerate extra safety effort for the larger clients if that is what is what these clients require. Once the company move to a different site they will either revert to their default culture or adopt the requirements of the next client.

**Equipment Purchasing, and Inspection and Maintenance**

These factors were not identified as being particularly significant in comparison to the people issues as they are more ingrained as an accepted part of safety. The main issues discussed included:

• Inspection being carried out at end of the life of a piece of equipment to see if its life can be extended, rather than during its life.

• The effort put into inspection and maintenance is likely to be directly proportional to the value of the equipment, rather than the risk associated with operating it.

• The need for maintenance and replacement of PPE is not appreciated. Just getting someone to wear some items of PPE is considered to be a success.

Speed and efficiency have been the main drivers for the introduction of new or improved equipment, but there can be safety knock-on benefits which need to be emphasised.

**Design for safe construction**

Designers were felt to have an acceptance of their responsibility, but want to keep their heads down. Improving this factor was viewed as being an uphill struggle as, for example:

• There was perceived to be a lack of interest amongst designers.

• It was felt that designers were talking a different language (aesthetics etc.) from construction, and that they would rather concentrate on the structure, than the individual components and details.

• It was felt to be difficult to detect the effect of CDM on designers.

However, as part of the major projects intervention, HSE is now undertaking planning visits to designers in part to examine how construction risks are being tackled, but also to proactively schedule site inspections through the project to coincide with relatively high risk or intensive periods of site activity. Such interventions are easier at the start of the project when the costs of changes are considerably less, and there is less resistance from the designers. Inspectors involved reported constructive and positive interactions.
4.4.3 Principal Policy level influences

Contracting Strategy and Procurement

There was felt to be little consideration of health and safety in standard forms of contract. If health and safety were included in a sensible way in standard contracts then:

- It is more likely that those clauses would be complied with as not only would there be a criminal liability but a civil liability (along with the lower level of proof required to establish guilt in a civil court).
- This may reduce the current tendency to pass liability down the supply chain.

Traditional contract routes allow control over whom you use to carry out construction work. However:

- Traditional contracts tend to be used by the less sophisticated clients.
- Newer type of contracts (management contracting) where the responsibility for selecting the other parties lies with one party tend to be used by those clients who do know what is going on. Integrated team, PPP/PFI arrangements are also bringing further sophistication and complexity.

Thus, the least sophisticated clients are taking on the greater workload (and responsibility).

Local authorities typically have preferred lists where the contractors have to fulfil a small number of criteria to get on the list (including safety performance), but from then on the selection is on price (particularly for maintenance work)

Ownership and Control

Ownership and Control was not really felt to be improving. The client was felt to be the key player as he is the one who pays for the works. The concerns expressed were that:

- Little can be done with small private clients unless either the contractor takes on ownership and responsibility, or a client’s agent is appointed.
- Health and safety works best in organisations that have a clear focus, purpose and business image/reputation. This is probably easier for private industry than local authorities or central government.

Company Culture

This was felt to be one of the key factors in improving health and safety in construction. Whilst safety culture is generally low in construction, it is improving. Culture is at least recognised as an issue now, whereas it may not have been in the past. However, the industry was felt to mitigate against improvements in culture as:
• Construction has so many other drivers including cost, conditions, time etc.

• Companies maybe so busy trying to meet deadlines and correcting snagging that it is difficult to break out of the cycle and focus on performing better.

• Company Culture grows with time, but the nature of short-term work does not provide such time.

On a more positive theme, it was noted that:

• Those sites that encourage cooperation amongst the workforce can be more effective than those with strict rules, as such rules need permanent policing by the site management.

• Some companies will impose their culture for the duration of the contract. However, when workers leave that culture (site) they typically revert back to their own default culture.

• Large projects allow culture to develop over time.

• Whilst some companies have a culture, the culture on site was considered to be more strongly a function of the site management.

In order to improve the situation:

• Companies need to see benefits of a particular culture. They see the benefit of a profit culture and this drives industry, so safety culture could be considered similarly.

• People need a feeling of belonging in order to develop a culture.

Organisational Structure

Where there is little staff turnover and a feeling of ownership a good structure can develop. However, this scenario is not common with construction because of the nature of the work.

Project structures are generally clear, at least within a contractor who may have good Organisational Structures, but this may not be mirrored horizontally to other contractors thus affecting the project overall.

Health and Safety Management

Along with Company Culture, Health and Safety Management was felt to be the most important Policy level factor. However, there was felt to be a greater need for a culture than a system, given that a safety management system (SMS) will follow from the culture. The key issues were considered to be that:
• There are more safety management systems now than in the past, but there are doubts over whether these systems are actually effective or not, in particular in terms of follow through to auditing, continuous development etc.

• The imposition of a safety management system needs to be full time in order to get the message over.

• Safety management at the lower end of the construction industry tends to be reactive.

• Safety management systems tend to be hardware oriented with few people or management issues yet addressed.

• Some principal contractors will delegate the safety management system out to health and safety consultants who may have little authority (but still have a responsibility). It is at this point that the system can break down.

**Labour Relations**

• Consultation with the workforce does occur on some sites.

• Consultation is typically through site meetings, which tend to be production oriented rather than driven by health and safety.

• Fragmentation, subcontracting and the ‘hire and fire’ culture all militate against good labour relations in the construction industry.

• Incentive schemes linked to safety can be negative.

**Company Profitability**

• Health and safety was felt to have less to do with *Profitability* than culture given that construction has never been overly profitable. The principal issues is to ensure health and safety are managed in the same way as other corporate issues such as finance, quality and productivity.
4.4.4 Principal Environmental level influences

**Political**

Health and safety has a high profile within Government as was evident from the Summit. It was also noted that the Government will have plenty of opportunity to show how seriously they take health and safety in construction, as:

- There is likely to be substantial Government expenditure on infrastructure in the future (in particular the road and rail networks).
- Public procurement contracts should address health and safety as part of the contract and require pre-planning input leading by example.

**Regulatory**

HSE is not the only *Regulator* affecting the construction industry. The environmental, planning and building control regulators also have an impact. However, there appears to be no common health and safety direction between the regulators. In terms of HSE:

- The new Construction Division should improve the focus.
- About 80% of the time spent on HSE inspections is spent on providing advice.
- There is a disparity in resources between HSE and the construction industry, but HSE are effective due to the approach taken
- Respect for HSE within the construction industry enables an impact to be made.
- There has been a change from an aggressive policing role to one of ‘this is an industry problem - how can HSE help you in sorting it out’.
- Construction sites are more concerned about whether HSE inspectors can impose delays than they are at addressing the lessons learnt.
- HSE is driven to reactive work in order to meet its public commitment addressing complaints, investigating accidents etc. A proactive approach would be better. Such an approach would also drive down the necessity for reactive work.
- SMEs have always been difficult to access - are builders merchants and plant hirers a route to ‘white van man’?
- Ideally, there should be general guidance with industry left to sort out the details for themselves, i.e. it should be the duty holder’s role to manage the risk.
- Guidance has been more user-friendly recently, not taking on ownership of the law but helping the industry comply with it.
**Market**

If Market forces are driving profitability not health and safety then the market can be seen as being a negative influence. The market has to be influenced as well as just being seen as an influencer.

Up until the 1990s accidents reflected construction output. This trend has been broken now.

**Social**

The public perception of construction is one of cowboys. Bigger companies are just viewed as wealthier cowboys. However, some companies really do care about their public profile and this governing influence can be used to positive effect.

4.4.5 Overall conclusions

The key conclusions from the workshop are considered to be:

- The construction industry is very much dominated by the ‘get it done’ culture, where reputations are made or lost on the ability to deliver.

- **Risk Perception** and **Situational Awareness** are heavily influenced by the underlying culture as workers were felt to know what the problem was, but did not appreciate its significance as ‘it won’t happen to me’.

- Changing the construction industry culture to include health and safety as an integral part was felt to be one of the key improvements needed.

- **Compliance** tends to be with what the workers consider to be the most important issue/culture. Typically, this is ‘get the job done by the deadline’ rather than ‘get the job done safely’.

- The skills shortage has lead to companies employing less skilled (or less suitable) workers than they did in the past leading to a subsequent dilution of skills on site. Thus some companies are taking on work that they do not have the necessary **Competencies** to undertake.

- **Procedures** and plans tend to be viewed as a burden to be completed to satisfy the client/HSE requirements rather than to help get the work done safely. Whilst the letter of the regulations (such as CDM) may be complied with, the spirit is generally not.

- Site management is typically left to sort out the problems in order to get the job done.

- **Management and Supervision** are considered to be critical to improving health and safety in construction. However, they tend to be impeded by a lack of **Training**,
experience and Competence; having so many other issues to deal with; having multiple trades working simultaneously; and the fact that there are so few supervisors for the work required.

• The Information and Advice getting to the workforce is poor. Information from risk assessments (assuming that they exist, and are relevant) does not make its way to the workforce.

• Poor Communications were often cited as being major contributors to accidents.

• Design for Safe Construction was felt to be poor with an apparent lack of engagement with the issue by designers. Improving this factor was felt to be an uphill struggle but an essential element of a safer and healthier industry.

• Clients need to exercise more influence by including health and safety requirements explicitly in contracts. Thus a civil liability would be introduced, and Compliance would be more likely. (The government would have a good opportunity to do this with forthcoming infrastructure projects).

• The construction industry has a multiplicity of drivers including cost, time and conditions. These dominate the thinking, and the situation is getting worse with the continual client pressure for reductions in construction time.

• Along with Company Culture, Health and Safety Management was felt to be the most important Policy level factor. However, there was felt to be a greater need for a culture more so than system, given that a safety management system will follow from the culture.

• There is a disparity in resources between HSE and the construction industry, but HSE are effective due to the approach taken and the respect for HSE within the construction industry.
5. ANALYSIS OF THE INFLUENCE NETWORK

5.1 INTRODUCTION

A careful record of the workshops is kept and the discussion synthesises to draw out key factors influencing performance and indicators of potential risk controls. In addition, some quantitative analysis is undertaken to help determine which controls have the potential for greatest impact.

The quantitative analysis of the Influence Network involves the following stages:

- Calculation of a risk index for health and safety in construction using the rating and weighting values assigned in the workshops. This is then used to explore the influences bearing on the current risk level and to ascertain the potential for improvements (see Section 5.3).

- Increasing the ratings of factors in a systematic way (i.e. making hypotheses regarding improvements to a factor) in order to get an indication of the effects that these increases have on the overall risk index. This process is then used to highlight the critical factors that may have the most potential to reduce the overall risk and to plot paths of influence through the network (see Section 5.4). Risk control measures are then concentrated on these factors in Section 6.

5.2 DEVELOPMENT OF THE INFLUENCE NETWORK MODEL

If the HSE risk control hierarchy is considered, then it can be seen that design issues largely determine the top three controls. Design for safe construction has the potential to eliminate the hazard or substitute a lesser hazard and might be expected to feature prominently in the list of the critical factors. Indeed this was reflected strongly across the workshop.

A fundamental review of the Influence Network methodology was undertaken in Reference 12, to test the extent to which the analysis results reflected the expert judgements. This indicated that Design at the Organisational level does not emerge as critical in the analysis of weightings and ratings due to the limited number of factors on which it has a strong influence at the Direct level. For example, the majority of factors at the Direct level involve predominantly human influences with only two that are more hardware oriented (Inspection / maintenance and Equipment operability) and only one reflecting external factors (Work environment). As such, there is less scope for Design for safe construction to make an impact in a quantitative sense compared with the human factors at the Organisational level (such as culture which impinges on many Direct level factors).

Based on a number of trials, the decision was taken to create a virtual factor Design for safe construction at the Direct level which was only influenced by the corresponding Organisational level Design factor. This had two distinct advantages in that: (a) no changes were required to the methodology as the changes merely involved the addition of an extra ‘virtual’ factor; and (b) no subjective judgement was required over and above the input at the workshop as the rating
was taken to be that assigned at the workshop for Design for safe construction at the Organisational level. Similarly, the weightings from Organisational to Direct and from Direct to health and safety in construction were both, by default, high but could be varied through medium to low to none depending on the relevance to the construction health or safety issue.

The model used for the analysis of the Influence Network is shown in Figure 9. The Design for safe construction factor is shown with a dashed line around the box to indicate that although the factor appears in the analysis, it is not a factor that has been addressed explicitly in the workshops.

![Figure 9 Revised Influence Network Model used for analysis](image)

### 5.3 CALCULATION OF THE RISK INDEX

As described in Section 3.2, a measure of the total strength and effectiveness of influences from a lower level can be determined as the sum of the product of the ratings and weightings. This calculated ‘rating’ of the higher level influence can then be compared with the direct assessment of the influence determined at the workshop. Where significant differences occur, this indicates either that other influencing factors have not been recognised or that there is a measure of uncertainty. The approach adopted to resolve these differences as a first step is to adopt the average of the sum of the influences from below and the direct evaluation of the rating. This moderated rating value is then used in the calculation at the level above. The difference (i.e. uncertainty) is carried forward in the calculation with the rating to assist in identifying where sensitivity studies should be performed. This process is carried out through the entire network to give an overall index which can be broadly related to risk. A spreadsheet program is used to carry out these calculations.
Risk indices were calculated for the causation workshop, and are summarised in Table 3. Some of the factors were rated as ranges in the workshops. In order to provide an indication of the resulting range of risk indices two analyses were undertaken for the workshop; one using the lowest rating for each of the factors where a range was given and the other using the highest rating for each of these factors. This reflects the range of performance judged by Inspectors.

Table 3  Range of risk indices obtained from the Influence Network workshops

<table>
<thead>
<tr>
<th>Issue</th>
<th>Risk index – lowest ratings</th>
<th>Risk index – highest ratings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Causation workshop</td>
<td>0.33</td>
<td>0.48</td>
</tr>
<tr>
<td>Roadworks</td>
<td>0.58 (Traffic management)</td>
<td>0.41 (General labour)</td>
</tr>
<tr>
<td>Construction Plant</td>
<td>0.47</td>
<td></td>
</tr>
<tr>
<td>Construction Goods delivery</td>
<td>0.20</td>
<td></td>
</tr>
<tr>
<td>Falls – fatal (Phase 1 pilot study)</td>
<td>0.36</td>
<td></td>
</tr>
<tr>
<td>Falls – new build construction</td>
<td>0.34</td>
<td>0.65</td>
</tr>
<tr>
<td>Falls – existing structures</td>
<td>0.29</td>
<td>0.51</td>
</tr>
<tr>
<td>HAVS (3 workshops)</td>
<td>0.25-0.32</td>
<td>0.28-0.42</td>
</tr>
</tbody>
</table>

This Inspectors’ workshop was one of a series of ten workshops held in relation to this study. The others were predominantly populated by industry representatives and dealt with particular health or safety issues or construction activities. Table 3 also includes indices for these workshops demonstrating that the values derived from an HSE perspective across the broad construction health and safety remit of the session are reasonably comparable in terms of order of significant figures within the overall 0 to 1 scale. If anything, the worst index falls at the low end of integrated construction activities which is perhaps not surprising given the poorer end of safety practices that Inspectors inevitably encounter in the course of reactive inspection work. This notwithstanding, it also indicates a degree of consistency and compatibility between HSE and industry views. This has further been examined in relation to the detailed ratings and weightings assigned by the HSE in comparison with the other workshops. Given the number of factors and complexity of the interrelations, the material is not contained in detail in this report. However, it is clear from the background work that the performance areas of concern and key patterns of influence seen by HSE and industry are aligned.

The index alone has no intrinsic meaning. However, were all the ratings of influencing factors to be at 10 (i.e. representing best conceivable practice), the risk index would be 1.0. Were performance at its very worst, the index would be 0.0. In this context a relationship with risk can be determined (see Section 7.2). In cases where there is a large range in the ratings, and the workshop delegates specifically note that the range is due to differences in practice, the highest ratings give an indication of what could be achieved if all stakeholders achieved the current better practice. In other cases, a small range merely indicates uncertainty about the exact rating.
5.4 APPROACH TO IDENTIFYING CRITICAL FACTORS INFLUENCING HEALTH AND SAFETY IN CONSTRUCTION

The Influence Network results from each workshop have been interrogated to identify critical influences on health and safety in construction and paths of influence through the network. This is done in terms of the potential of a factor to reduce the overall risk of health and safety in construction. The critical factors and paths from each workshop are compared in order to identify the strongest influences.

A set of improvements is postulated whereby the rating for one factor at each level is increased by 1 and the risk index is recalculated. This is carried out for every combination of factors and gives an indication of the potential impact of each combination of factors, thus showing critical paths of influence through the network. The analysis also assumes that only one factor in each layer is influenced by the factor below. However, the key objective of the analysis is to determine which factors when ‘improved’ in conjunction with other factors have the greatest impact on increasing the risk index.

The critical factor/path analysis for each workshop was carried out using different weighting models shown in Table 4. Model B has been used for the analyses described in the current report.

Table 4 Weighting models considered in the analysis of the Influence Network

<table>
<thead>
<tr>
<th>Model</th>
<th>Weighting for</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>L</td>
</tr>
<tr>
<td>A</td>
<td>1</td>
</tr>
<tr>
<td>B</td>
<td>1</td>
</tr>
<tr>
<td>C</td>
<td>1</td>
</tr>
<tr>
<td>D</td>
<td>1</td>
</tr>
<tr>
<td>E</td>
<td>1</td>
</tr>
</tbody>
</table>

The approach described is adopted to investigate areas where improvements may be targeted to improve health and safety in construction. It is to be expected that changes at the direct level will have the greatest impact as the effects of changes in more remote influences are dissipated by the repeated weighting and averaging through the network. However, the cumulative impact of the remote influences is likely to be stronger. For example, the Company culture emanating from the client at the Policy level may be expected to have an influence over many aspects of construction work, whereas the benefits of improved Inspection and maintenance of equipment would be much more limited.
5.5 DISCUSSION OF THE CRITICAL FACTORS INFLUENCING CONSTRUCTION HEALTH AND SAFETY

5.5.1 Introduction

The sensitivity analysis described in Section 5.4 has been carried out for the workshop to identify critical factors and paths of influence through the network where risk controls likely to be most effective in managing health and safety in construction can be identified. These are shown in Figure 10.

The relative rankings for each factor for the workshop are shown in Figure 10. Four factors were considered to be highly significant at the Direct level: Competence, Situational awareness / risk perception, Communications and Information / Advice. These significant factors at the Direct level appear to be well-defined in that four factors are highly significant, whereas the rest are of medium, medium-low or low significance. At the other three levels there is more of a spread, with factors of high and high-medium significance.

At the Organisational level, Management and supervision, Safety culture and Design for safe construction are the most significant followed by Training, Procedures and Communications. This implies that three main factors at the Organisational level influence the key factors at the Direct level, supported by a second tier of three factors. At the Policy level, Company culture and Health and safety management have been identified as the key factors followed by Contracting Strategy and Company profitability. At the Environmental level, the Market influence is considered to be the most significant followed by the Regulatory influence.

Inspection of the combinations of factors that lead to the highest index values indicate what the critical paths are through the network. Whilst those paths that give the highest index values start with the Market influence at the Environmental level, the primary concern in this project is what influence the Regulator may have. Hence, the critical paths emanating from the Regulator will be considered in Section 7.4. These actually follow the same paths at the Policy, Organisational and Direct level as those critical paths emanating from the Market influence. The full extent of the Market influences will need to be investigated as part of further studies.
Construction Health and Safety

Direct Level Influences
- Competence
- Motivation / Morale
- Team Working
- Awareness / Risk Perception
- Fatigue / Harassment
- Health
- Commitment
- Information / Advice
- Compliance
- Human Resources
- Internal Work Environment
- External Working Environment
- Operational Equipment
- Safety Equipment / PPE

Organisational Level Influences
- Recruitment & Selection
- Training
- Procedures
- Planning
- Incident Management & Feedback
- Management / Supervision
- Health and Safety Culture
- Equipment Purchasing
- Inspection & Maintenance Policy
- Pay & Conditions
- Design for Safety Construction

Policy Level Influences
- Contracting Strategy
- Ownership and Control
- Company Culture
- Organisational Structure
- Health & Safety Management
- Labour Relations
- Company Profitability

Environmental Level Influences
- Political Influence
- Regulatory Influence
- Market Influence
- Social Influence

Figure 10 Critical factors identified in the Workshop
6. INTERVENTION MECHANISMS WORKSHOP

6.1 INTRODUCTION

The workshop to explore the intervention mechanisms followed the causation Influence Network workshop and took place on 10 October 2002. In the end, not all attendees were able to stay on and the mix of HSE roles was not as wide as originally sought (e.g. no policy, technology, publications representatives etc). However, the coverage across inspection and sector issues was strong and the session therefore focused on relevant areas rather than offering the broader coverage for assessing the full range of interventions anticipated.

6.2 ISSUES FOR INTERVENTIONS

Once the Influence Network phase of the workshop had been completed, the participants then addressed the issues surrounding the HSE intervention mechanisms available to address health and safety in construction. The aim of this aspect of the Workshop was to use the experience and expertise of the HSE inspectors in order to obtain an insight into what works well and what lessons can be learnt such that this report can provide information on:

- The most appropriate interventions for different circumstances.
- Potential appraisal and evaluation options for intervention mechanisms.

The wide range of potential intervention measures discussed in Section 2 were considered by the workshop participants, and the following four generic groupings were proposed:

- **Traditional interventions** - regulations and enforcement.
- **Guidance mechanisms** - guidance, codes and standards, safety awareness days, participation in industry fora (including developing guidance with industry) and advice to intermediaries.
- **CDM goal-setting mechanisms** - mechanisms for complying with regulations from the health and safety at work act onwards and participation in design or site meetings.
- **Hardware regulations** – general and industry specific prescriptive regulations including CHSW, LOLER etc.

Each of these categories is discussed in the following sections. In addressing each of these categories and the potential that they have to offer based on past experience, the participants considered (where possible) the following issues:

- Key issues for each intervention mechanism
• Previous evidence
• Hazards addressed
• Potential impact (and means of measurement)
• Time taken for that impact
• Proportion of ‘market’ addressed
• HSE involvement (time, cost and industrial leverage)
• Stakeholders involved and affected
• Uncertainty.

6.3 IMPROVEMENTS ACHIEVED IN GENERAL

It was felt that there had been improvements in general, but not in small companies, in the following areas:

• Hand Arm Vibration Syndrome (HAVS).
• Falls from height.
• Welfare.
• Manual handling.

6.4 TRADITIONAL INTERVENTIONS

6.4.1 Enforcement

There is a fixed amount of effort available for traditional enforcement. A prosecution typically takes around 1-2 inspector months, and with each inspector typically having to deal with 5 to 6 cases per year there is little time left for other activities. Whilst there is some latitude in terms of interventions, the public interest expects traditional enforcement. The health and safety targets have to be weighed against public demands with a cadre of only 150 inspectors available.

The greatest influence that an inspector can have is at the beginning of a project as proactive measures are required to impose changes in the way health and safety is managed and influence the root causes of problems.
6.4.2 Regulations

Enforcement can only be used to enforce regulations. However, Policy considerations have not traditionally been linked with how a regulation may be enforced. This can lead to regulations being difficult to enforce, as it is difficult to get sufficient evidence to prove that a breach has taken place. Regulations have typically implemented directives rather than been designed for enforcement. CDM has some areas that are difficult to enforce and consultation on potential revisions to the CDM regulations is expected to take place within the next two years.

Unenforceable regulations undermine the morale of those who have the role of enforcing the regulations. However, it does not affect those who understand the spirit of the regulations. There is thus a need for goal-setting regulations that reflect the structure of the construction industry with prescriptive elements which are much easier to enforce.

The further down the contractual line, the less the regulations penetrate. There is an awareness among larger firms, but the impression is that smaller firms are not geared up. Some organisations are not operating with regard to regulations. They are unlikely to know what the up-to-date regulations are, let alone their requirements, unless they are influenced by another party.

Most organisations typically have mechanisms for doing the job, not for addressing the health and safety issues whilst doing that job. CDM is a mechanism for approaching a project with health and safety in mind, not a guide on how to do it. The industry has voiced a preference for prescription.

6.4.3 Blitzes

Rolling blitzes keep the momentum going, and perhaps keeps the pressure on companies. This is an improvement over past practice where one-off blitzes were used with no follow up. There are warnings that the blitzes will take place. Typically, there are adverts in the local press indicating that HSE will be visiting sites the following week. The threat of blitzes is not enough on its own, as many faults are still found on sites where they are aware of the forthcoming blitz.

Blitzes can affect standards for a month or so, but this effect tails off if there is no follow-up to keep the pressure on. Targeting of specific issues was felt likely to have an impact, as targeting is more effective than a scattergun approach. In London, falls from height and welfare were targeted earlier in the year. Such an approach drives home two key messages.

More may be gained from specific blitzes if some suppliers were able to see the targeted blitzes as an opportunity to sell new items of safety equipment that address the targeted areas.

6.5 GUIDANCE

6.5.1 Risk assessments

The primary risks for small companies include:

- Falls from height
• Manual handling
• Cement
• Badly maintained equipment
• Electrical issues
• Welfare
• COSHH.

However, these organisations would not necessarily know how to do a risk assessment and there needs to be awareness of practical ‘risk assessment’ which is appropriate and proportionate to the extent of risks faced.

The professionals in construction also need health and safety and risk assessment education, both when entering the profession and subsequent continuing professional development (CPD). Risk assessment really ought to be taught here, so the need is removed from the lower end of the labour market.

At the lower end of the labour market the ‘Absolutely Essentials’ booklet is a good mechanisms for getting the message across. Risk assessments are not included in this booklet as they are not considered appropriate for the intended audience. The source of the ‘Absolutely Essentials’ booklet was HSG 150 with updates to reflect the most important aspects.

The ‘Five steps to risk assessment’ is reasonable for fixed premises, but not necessarily so for construction sites. Risk assessments need to be considered with regard to the specific work circumstances.

A new initiative subsequent to the workshop described here is a ‘High 5’ focus with a leaflet and co-ordinated action reinforcing the messages in relation to site tidiness & welfare, falls from height, manual handling, transport, and asbestos.

6.5.2 Working Well Together

Greater awareness of the Working Well Together (WWT) web site is needed and work is planned to include more graphical content.

6.5.3 Guidance for smaller organisations

Builders merchants and hire shops offer potential routes to reach smaller companies, particularly the hire shops as there are only a few major hire firms to target. An approach may be to get inspectors to be involved with hire companies in their area.

Any approach is only as useful as information that is there. The information needs to be up-to-date, with enough copies available. Even with web-based information, keeping it up-to-date is a problem.
Local associations and media may be a good route for communicating and publicising information, particularly for prosecutions in local courts. HSE can send out press notices but what is published is quite standard.

There are situations where HSE know what to target but not how to target the relevant organisations. For example, perhaps Customs and Excise could provide a means of identifying small construction companies, as VAT registration is required at a relatively low declared turnover. Manufacturing firms who use small construction companies for maintenance work may also provide a potential conduit for influence.

One of the key issues though, is that companies need to be convinced of the direct benefits of improving their health and safety performance.

6.5.4 Safety Awareness Days

Safety Awareness Days (SADs) are a potential means of targeting the smaller companies. Targeting could be via local contractors. The local media also has a potential role to play in raising awareness of the SADs with coverage perhaps also on radio and television, and at GP’s surgeries.

Time is money for companies in particular the lost time and the cost of travel to SADs. Evening meetings are reasonable in large catchment areas such as London where little transport is required. However, such a meeting would require around 200 small sites to be leafleted.

In order to get a good attendance at an evening meeting or SAD, there is a need for the cooperation of a target organisation / trade association / network to act as a contact distribution point. Unfortunately, not everyone is a member of such organisations, associations or networks. This leaves the smaller organisations still in need of targeting. Options include using building control or even targeting every site. Once the F10 form has been received, it is usually too late to make a significant impact. However, the biggest problem in relying on receipt of the F10 form is that there are many who do not notify their site through ignorance, intent or just the small size of the work. The planning stage, however, is probably too early.

One problem identified with SADs is that potentially they can be preaching to the partially converted, in that those that attend have already bought into the key messages.

Safety Awareness Days (SADs) have the advantage of avoiding the legislation issue and may serve to get the message over. In addition to guidance / advice, the SADs also provide educational content. The extension of SADs to Designer Awareness Days was noted.

6.5.5 Computers

Computers are likely to be used by most companies to some degree, for accounting etc. The younger owners / workers, and those with children are likely to be more receptive to the use of computers as a means of obtaining information. Computer aided learning devices on CD ROM may be an effective means of communicating a message. These provide a pseudo text book and can be used for undergraduate health and safety learning.
6.5.6 Prescription

Prescription is welcomed in many areas of the industry as it makes the requirements of the organisation fairly obvious, organisations know where they stand and can compete on a level playing field. Prescription in, say, five areas (selected in terms of hazard) was felt likely to offer a route to raising standards.

6.5.7 Targeting trade associations

Trade associations such as the Federations of Master Builders (FMB) have been engaged in the delivery of health and safety messages, guidance etc. However, they still only represent a small proportion of the construction industry. Insurance costs are probably the main concern at the moment and it was thought this could perhaps be used as a lever.

6.5.8 Codes and Standards

Standards are generally not viewed as effective, however there are variations. Some codes and standards were felt to get ‘watered down’ at the international level, and effort was continually required to keep international standards at UK standards. Being on standards committees was felt to provide useful contacts and thus potential routes for influence. However, whilst codes and standards were felt to be reasonable for those who know what they are doing, many codes and standards only deal with hardware issues and where problems do occur, codes and standards would not necessarily address the problem (e.g. at the low end of the market).

6.5.9 Management and Supervision

Management and supervision were felt to be an underpinning issue, lacking at every level of the industry, for different reasons. This leads to the need for different messages and vehicles to deliver those messages for different levels.

Double and triple tasking is reducing the time available for management and supervision. However, at the bottom end of the market management and supervision are probably not as important as risk identification, assessment and control. The market will not take extra management costs and, as such, culture and contracting strategy will need to be targeted.

There appears to be an acceptance that if you do not do the work properly there will be cost implications i.e. snagging etc. Hence, contingencies are built into the cost in order to cover potential problems rather than management and supervision costs being built in in order to prevent the problems in the first place. The focus is on acute not chronic problem solving. Other problems occur when management and supervision has been thrown at a problem but without due consideration of what is actually required. There is a need, therefore, to know how to use management and supervision for different requirements.

6.6 CDM GOAL SETTING MECHANISMS

This intervention is primarily being applied to larger projects initially, and is looking at the project from concept through into use. Designer and design-build organisations fall readily into this type of intervention. Vertical and horizontal approaches are used i.e. a company’s
headquarters are contacted first with follow-up visits in their regional offices. Other HSE sectors will also devote some effort into construction-like activities in their industries (particularly those that tie in with the Construction Priority Programme).

Another possible mechanism is the Management Audit approach. This has typically been used in services and manufacturing type organisations due to the long-term, repetitive nature of their work. Such audits have been shown to improve company culture through long-term involvement and through the lack of emphasis on enforcement, they have had a positive effect. However, these audits do require a large upfront investment of HSE resources as the HSE must visit again within 6 months of the initial audit in order to demonstrate that the system is working and that they are serious about it. Models are available for construction intervention based on the services approach. However, this is more difficult in construction than other sectors, for example, as there is no organised form of employee consultation.

The typical approach for these management audits was to interview the Chief Executive on their own and explore with him / her what they consider their role to be. This would then be followed by the next level down in order to establish objectives and roles etc. The health and safety officer is then interviewed in order to, amongst other things; suggest others who the HSE may like to speak to. Accident investigations are followed up back up to board level in order to see how the system is working. There are always interviews with the workforce. The same feedback is also given to both the workforce and the management. Each layer of the organisation is examined for its structures and how well personnel all work together, as well as how communication is exchanged up and down across the hierarchy. HSE obviously needs cooperation from the company being audited. However, if there is no cooperation then the audit team will carry out their work in another way. It was felt to be difficult to hide things, and even without cooperation the problems would be discovered.

6.7 HARDWARE ISSUES

There have been some successes in using hardware-oriented regulations in order to improve health and safety in addition to changes effected with guidance and industry co-operation under goal setting provisions. These successes include:

- Roll over protection seat belts.
- Size of cement bags.
- Water instead of solvent based paints.

However, the hierarchy of fall protection in the CHSW ‘hardware-oriented’ regulations effectively excludes nets, air bags etc and it is Approved Codes of Practice or Guidance which provide a route for their use to be addressed. If such measures are put into regulations, and they are subsequently found to be wrong, then severe problems could result.

Manufacturers need to be encouraged to take a more proactive approach. If it is possible to align health and safety priorities with their commercial priorities then there is a much higher
chance of success. For instance, manufacturers can make more profit from less fragile roof lights and, hence, they are supportive of change.

The move to lighter blocks has raised a number of issues. However, people do wonder why they cannot use a 27kg block when they are able to carry 25kg bags of cement. In the majority of instances, lightweight blocks have become accepted as alternatives as they have more or less the same properties as the heavier blocks, although they do cost more. The 27kg blocks are becoming cheap as no one wants to use them now unless sound or radiation are quoted as key issues. Therefore, there was a feeling that contractors will go for the cheap 27kg blocks if given the opportunity to specify them.

The penetration of hardware regulations is very wide, affecting all stakeholders. However, there tends to be the need for a HSE ‘champion’ to work with manufacturers on each issue.

If manufacturers do not cooperate then HSE can force the manufacturers to issue information with their products indicating that certain material require two-man lifts or lifting equipment, for example, or other materials require wet cutting and PPE. Such information may well put off potential purchasers; hence the commercial pressures for cooperation are raised.

The HSE effort required can be large. It was felt to be most effective to target one or two key areas, allow the market to settle and then move on. Any changes to regulations do need to be followed-up with an enforcement strategy. Inspectors initially advise on a new issue, and after six months or so they then step up to enforcement. However, it is essential to make sure that compliance is both feasible and cost effective.

With regard to PPE, the average person does not know what type to use and how to use it and input into this area can take a long time. Focus can be placed on a few areas and an enforcement strategy can be used to follow up.
7. RISK CONTROLS AND THEIR RELATIONSHIP WITH HSE INTERVENTION MECHANISMS

7.1 INTRODUCTION

As set out in Table 1, the Government, HSE and in particular the industry has adopted targets for significant improvement in the safety and health performance in construction. In order to contribute to meeting these targets, a series of risk control measures is required which need to be targeted at the construction industry in the most effective manner. As such, potential risk control measures relating to health and safety in construction have been generated in relation to the Influence Network factors.

A number of approaches have been taken in order to identify potential risk control measures including:

- Seeking suggestions from workshop delegates as to what is current good practice both in construction and by looking at other industries / hazards and controls, and what improvements could be made in the future.

- Interrogating the Influence Network to identify the critical factors influencing health and safety in construction (see Section 5.5).

- Identifying risk controls related to HSE intervention mechanisms.

Each of these approaches is discussed in the following sections, following discussion on the relation between risk and the Influence Network risk index.

7.2 RISK AS RELATED TO THE RISK INDEX

As noted in Section 5.3, the index alone has little intrinsic meaning. However, were all the ratings of influencing factors to be at 10 (i.e. representing best conceivable practice), the risk index would be 1.0. Were performance at its very worst, the index would be 0.0. In this context a relationship with risk can be determined by postulating that the difference between overall best and worst possible practice is equivalent to three orders of magnitude of risk. Three orders of magnitude are selected on the basis that individual risks span $10^3$ from the border of tolerability to the level where society currently places no demand for further risk reduction however low the cost. This can be represented by the following algebraic relationship:
\[
\frac{R_{\text{rco}}}{R_o} = 10^{3(Irco-Io)}
\]  

Where:  
\(Io\) = base index  
\(Irco\) = revised index obtained by using risk control options  
\(Ro\) = base risk measure  
\(Rrco\) = revised risk measure obtained by using risk control options

In this case the base index can be taken as that for the lowest ratings, whilst the revised index can be taken as that for the highest ratings. In cases where there is a large range in the ratings, and the workshop delegates specifically note that the range is due to differences in practice, the highest ratings give an indication of what could be achieved if all stakeholders achieved the current better practice. In other cases, a small range merely indicates uncertainty about the exact rating. The present workshop had a broad remit and was presenting a view on the construction industry from the perspective of Inspectors. Table 3 showed the range of indices derived.

To explain the association with risk in more detail, Figure 11 illustrates the case where the change in influence network index from 0 to 1 (very worst to very best practice) gives a reduction in risk by three orders of magnitude. Superimposed on the diagram is the calculated index \(Io\) in the present context of falls from height for which the corresponding risk measure is \(Ro\). If risk control options (rco) are introduced which improve the network index (to \(Irco\)) the reduced risk is \(Rrco\). The target indices required to achieve the 20\% and 50\% risk reductions, for example, are shown in Figure 11.
By using Figure 11 and Equation 1 estimates can be made of the number of falls accidents for each value of the risk index. Inspection of Figure 11, it would suggest that improving the risk index from the current value of 0.33 to its highest possible value (1.0) would imply a reduction of two orders of magnitude in the number of accidents. Conversely, taking the index to its worst possible value (0.0) would imply an increase of an order of magnitude in the number of accidents.

The methodology described above is not intended to provide precise projections. However, it does provide a reasonable framework for estimating the potential for relative risk reduction offered by various risk control options.

### 7.3 RISK CONTROLS IDENTIFIED AT THE CAUSATION WORKSHOP

Potential risk controls have been generated in this study as part of the Influence Network workshop. These risk controls have been gathered in the following ways:

- When it was apparent from discussion that a factor was important in terms of health and safety in construction the workshop delegates were asked to consider what improvements could be made.

- Certain risk controls naturally followed on from some of the discussions on causative factors and these were noted.

Some of the risk controls identified during the workshop discussions are summarised in Table 5. These potential rating increases will be used in Section 7.6 in order to make estimates of potential reductions in risk.
<table>
<thead>
<tr>
<th>Influence Network factor / Risk Control</th>
<th>Current rating</th>
<th>Potential risk controls</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Direct level</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| D1 Competence                         | 3-8            | • Serious and universal application of CSCS and affiliated schemes.  
|                                       |                | • Toolbox talks that do not put the emphasis on the ‘short cut’.       |
| D2 Motivation / Morale                | 7-8            | • Harness industry ‘creativity’ to more positive health and safety outcomes as other than getting the job done as quickly and cheaply as possible.  
|                                       |                | • Awareness of fluctuating morale through jobs                        |
| D3 Team working                       | 5              | • Encourage cross-trade toolbox talks.  
|                                       |                | • Address coordination between teams in design and planning.           
|                                       |                | • Encourage greater use of partnering at all levels.                   |
| D4 Situational Awareness / Risk Perception | 3-9          | • Show the Summit video to a wider audience as it has the potential to affect individuals.  
|                                       |                | • Raise awareness through popular media.                               |
| D5 Fatigue                            | 5              | • Long-distance travel to site should be included when considering fatigue. |
| D6 Health                             | 5-8            | • Insurance drivers to improve the health care of workers.             |
| D7 Communications                     | 3              | • To overcome literacy problems, instigate pre-start inductions or meetings.  
|                                       |                | • Encourage cross-trade toolbox talks.                                 |
| D8 Information / Advice               | 0-5            | • Encourage risk-led method statements.  
|                                       |                | • Ensure that the ‘Absolutely essentials ‘ booklet is made more widely available. |
| D9 Compliance                         | 3              | • Provide clear / explained rules in order to make compliance easier – and enforce |
| D10 Suitable Human Resources          | 4              | • Training required by contractors to address skills shortage.  
|                                       |                | • Initiatives are required to make the industry more attractive to potential recruits.  
|                                       |                | • Encourage companies to take on and train potential workers.           |
| D11 Internal Work Environment         | 5              | • Proactive housekeeping.                                               |
| D12 External Working Environment      | 3-4            | • Cooperation between enforcement bodies to reduce the risks to the public.  
|                                       |                | • Encourage consideration of weather conditions in planning such that critical work is not scheduled for periods of inclement weather. |
| D13 Operational Equipment             | 5              | • Raise the awareness of the need for inspection and maintenance of equipment to be risk-led.  
<p>|                                       |                | • Make workers aware of the operational and weight limits of domestic ladders. |</p>
<table>
<thead>
<tr>
<th><strong>Influence Network factor</strong></th>
<th><strong>Current rating</strong></th>
<th><strong>Potential risk controls</strong></th>
</tr>
</thead>
</table>
| D14 Safety Equipment / PPE  | 4-6               | • Encourage good selection and specification of equipment.  
                              |                   | • Promote the speed and efficiency benefits of the better operational equipment if such equipment also has health and safety benefits.  
                              |                   | • Raise awareness of the need for and correct specification and use of dust masks, ear defenders and goggles.  
                              |                   | • Encourage greater participation of workers in the selection of safety equipment such that suitable equipment is selected, and there is greater buy-in of the workforce.  
                              |                   | • Focus on correct use, care and replacement needs. |

**Organisational level**

| **O1 Recruitment and Selection** | 6 | • Competence should be one of the criteria for work assignment as well as recruitment.  
                                 |   | • Encourage greater take-up of CSCS cards etc. |
| **O2 Training** | 2 | • Improved training of site supervisors.  
                      |   | • CITB need to make the industry more aware of the availability of training grants.  
                      |   | • Ensure meaningful / useful health and safety content of training. |
| **O3 Procedures** | 2 | • Get organisations to identify the 10 highest risk areas, and produce method statements for them.  
                          |   | • Raise awareness of the link between risk assessments and method statements.  
                          |   | • Explain basis of procedures and communicate clearly and concisely. |
| **O4 Planning** | 3-4 | • Make health and safety part of the overall planning process.  
                       |   | • Consider health and safety issues at the pre-plan / design stage.  
                       |   | • Ensure essence of risk assessment is conveyed at all levels. |
| **O5 Incident Management & Feedback** | 0-6 | • Encourage cross-company ‘ownership’ of incidents and positive approach to solutions.  
                             |   | • Ensure litigation fears do not suppress responsible action and account being taken. |
| **O6 Management / Supervision** | 3 | • More effective management and supervision required on sites – with time to take overview and address health and safety.  
                             |   | • Use the Engineering Construction Industry Association members as examples of good practice and source of learning to be transferred into other construction projects. |
| **O7 Communications** | 4 | • Reinforce the communication duties implicit on CDM duty holders.  
<pre><code>                         |   | • Encourage the use of health and safety information on drawings. |
</code></pre>
<table>
<thead>
<tr>
<th>Influence Network factor</th>
<th>Current rating</th>
<th>Potential risk controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health and Safety Culture</td>
<td>4</td>
<td>• Use builders merchants as a means of communicating with ‘white van man’.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Reinforce the social and financial benefits of good health and safety.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Encourage duty holders to see the responsibility for accidents as a shared one.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Respect for people</td>
</tr>
<tr>
<td>Equipment Purchasing</td>
<td>4-6</td>
<td>• See D13</td>
</tr>
<tr>
<td>Inspection and Maintenance Policy</td>
<td>4-6</td>
<td>• See D14</td>
</tr>
<tr>
<td>Pay and Conditions</td>
<td>1-7</td>
<td>• Hot running water on sites /drying facilities</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Ensure pay mechanism does not put undue pressure on workers to take short cuts.</td>
</tr>
<tr>
<td>Design for safe construction</td>
<td>1</td>
<td>• Pre-planning visits to designers’ offices by HSE.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Engagement of designers in considering health and safety aspects of construction processes.</td>
</tr>
</tbody>
</table>

**Policy level**

<table>
<thead>
<tr>
<th>Policy level</th>
<th>Current rating</th>
<th>Potential risk controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contracting Strategy</td>
<td>0-8</td>
<td>• Mobilise the influence of planning and building control.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Incorporate health and safety into more standard contracts, not just those for larger projects – roles, responsibilities and performance.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Public procurement to take a lead.</td>
</tr>
<tr>
<td>Ownership and Control</td>
<td>2</td>
<td>• Encourage chief executives to state clear health and safety objectives for their organisations and ensure that each member of the board works to a consistent health and safety agenda.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Learn from motivation in private companies (reputation etc) to similarly engage public sector.</td>
</tr>
<tr>
<td>Company culture</td>
<td>0-8</td>
<td>• Appropriate culture needs to be imposed from the top down.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• The benefits of health and safety need to be communicated in terms that have corporate resonance.</td>
</tr>
<tr>
<td>Organisational Structure</td>
<td>4</td>
<td>• Ensure clarity of roles and responsibilities in respect of health and safety between contracted parties.</td>
</tr>
<tr>
<td>Safety Management</td>
<td>4</td>
<td>• Develop from culture.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Reinvent SMS focusing on risk management control not paperwork tomes.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Follow through to audit / improvement.</td>
</tr>
<tr>
<td>Labour Relations</td>
<td>2</td>
<td>• Worker consultation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Fairness in hire and fire wrt health and safety rules.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Careful attention to incentive schemes to avoid division / information concealment.</td>
</tr>
<tr>
<td>Company Profitability</td>
<td>5</td>
<td>• Demonstrate health and safety link to finance, quality and productivity.</td>
</tr>
<tr>
<td>Influence Network factor</td>
<td>Current rating</td>
<td>Potential risk controls</td>
</tr>
<tr>
<td>--------------------------</td>
<td>---------------</td>
<td>------------------------</td>
</tr>
<tr>
<td><strong>Environmental level</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| E1 Political Influence   | 6             | - Address health and safety issue via government procurement.  
|                          |               | - Encourage the use of best value, with health safety as an integral part of the evaluation process. |
| E2 Regulatory Influence  | 6             | - Improve cooperation between regulators.  
|                          |               | - Support goal-setting regulations with focused guidance.  
|                          |               | - Demonstrate benefit of proactive interventions and ensure appropriate balance is retained. |
| E3 Market Influence      | 5             | - Collective working by industry to address market issues – resisting market pressures and under-cutting by unsafe practitioners. |
| E4 Social Influence      | 3             | - Change public perception of industry and its workers – create recognition of skills and value. |

### 7.4 RISK CONTROLS IDENTIFIED BY THE INFLUENCE NETWORK

Although consideration of the effects of improvements to a factor in isolation is a useful indicator of where to concentrate efforts, it is not a particularly realistic measure. The main reason for this is that a factor will be influenced by changes to factors at the level below and will influence other factors at the level above (and, indeed, there will also be horizontal influences at the same level). The Influence Network session has allowed identification of the factors where improvement offers the greatest potential to reduce construction health and safety risks (see Figure 10 in Section 5.5) and thus generated a potential set of risk control measures. The Influence Network can now be used to assess which risk control measures offer improvements in individual factors, or groups of factors, which would yield the greatest reduction in risk.

In order to illustrate these effects it is useful to consider the critical paths which were identified by systematically increasing the rating of one factor at each level by 1 (as considered in Section 5.4). Thus, the Influence Network has effectively identified critical factors and paths of influence in construction and indicated which factors present the greatest opportunity to control the risk. The critical paths identified by back-analysing the causation workshop are shown in Figure 12. These essentially fall into two categories:

- **Risk perception / Situational awareness, Communications and Information/Advice on site** (shown in red).
- **Design for safe construction** (shown in blue).

97
The routes of influence for these two categories are shown as being via the Regulator influencing Contracting strategy, Company Culture and Health and safety management in order to influence Management / supervision and Safety culture or Design for safe construction.

It is important to note that improvement is not confined to the risk controls identified in this study as others may have the potential to contribute significantly. However, there is a good match between the critical factors and the sets of risk controls with greatest potential (compare Figure 10 and Figure 12). The critical factors can be seen as priority areas and the associated risk controls are an effective starting point in the process. This is addressed in Section 7.6, where the potential risk control measures are consolidated.

Figure 12  Critical paths identified for construction health and safety

7.5 RISK CONTROLS IDENTIFIED AT THE INTERVENTION MECHANISMS WORKSHOP

The discussions during the intervention mechanisms workshop highlighted a series of current, future and potential risk controls. Those potential risk controls that are either not included explicitly in the intervention strategy or would supplement one or more of the themes in the intervention strategy are summarised below:

- Consider enforcement strategies as a part of the development of regulations and policy - in order to make subsequent regulations easier to enforce.
• Proactive intervention with designers at the beginning of a project - when it is easier to make a substantial impact and the designer is less resistant to change.

• Consider suppliers as a means of leveraging extra effort into blitzes etc. – i.e. if falls from height are being targeted then encourage follow-up by suppliers of relevant equipment (and services).

• Communicate the direct (financial) benefits of good health and safety - organisations need to be communicated with in terms compatible with their (cost) culture.

• Utilise computer-aided learning (CAL) - as a means of communicating health and safety information to undergraduates (as part of their education) and professionals (as part of their initial and continuous professional development).

• Use insurance - as a lever to improve health and safety performance.

• Utilise codes and standards – as a means of influence, to aid enforcement and to make relevant stakeholder contacts.

• Incorporate greater flexibility in future regulations (and possibly guidance) - in order to avoid excluding potentially effective equipment.

• Improvement in the selection, use and maintenance of equipment – follow through from manufacture and supply - whilst the equipment itself is typically of reasonable quality, the difficulty is in knowing that such equipment exists, which equipment is most appropriate for a particular job, actually specifying that equipment, getting it used (properly) and maintaining it in use.

• Improvements in Management and supervision – better understanding of value of role and potential as a means of targeting ‘get it right first time’.

• Management audits of companies and supply chains - as a means of assessing their overall approach to health and safety.

• Measures to identify and target smaller companies including:
  - Use of Customs and Excise as a means to identify smaller companies involved in construction or maintenance work via VAT returns.
  - Use Builders merchants and hire shops as a route to disseminating information to smaller companies.
  - Use manufacturing and other companies who employ small maintenance companies as a route to target these smaller enterprises (either as a means of
disseminating information or including health and safety in the contract procurement strategy).

Consider prescription/risk assessment for small companies, say targeted at seven or so key high risk areas (to make it easier for them to understand and comply).

7.6 CONSOLIDATED OPTIONS FOR RISK REDUCTION

7.6.1 Options

Drawing together the discussions from the previous sections, it is apparent that there are five potential routes for risk control that could be considered in addition to or in support of the intervention strategy outlined in Section 2. It is suggested that these are:

1 – Improvements in Design for safe construction

Given that designers are a key stakeholder with the opportunity to eliminate hazards or reduce the risks associated with them, their input needs to be mobilised. The following multi-phase approach is suggested:

1a - Education and Training for designers

- **Education of undergraduates** – by universities in conjunction with industry and HSE as part of the curriculum on higher education courses.

- **Initial and Continuing Professional Development for designers** – by the professional institutions, other industry bodies and on-the-job training in order to raise awareness both of the problems and practical solutions.

- **Provision of suitable information and advice** - to underpin the education and training initiatives this could be achieved by a combination of industry-HSE guidance and by requiring health and safety issues to be addressed explicitly in codes of practice.

1b - Client influence on designers

- **Educate clients** - as to the costs, benefits and legal implications of health and safety via HSE influence on client bodies.

- **Include health and safety provisions in contracts** - this will both raise awareness of health and safety, and impose a civil liability on the parties to the contract. For public procurement contracts, this requires joined-up government.
1c – Regulatory influence on designers

- Audits of designers’ compliance with CDM – this will provide HSE with the opportunities both to identify the typical problems that designers have, and provide guidance to designers on how they should be discharging their duties under CDM.

- Proactive intervention at the beginning of a project - when it is easier to make a substantial impact and the designer is less resistant to change.

- Utilise computer-aided learning (CAL) - as a means of communicating health and safety information to undergraduates (as part of their education) and professionals (as part of their initial and continuous professional development).

2 – Targeting of smaller companies

Given that there are so many smaller companies in the construction industry, there is a need to try to influence them in as many ways as are reasonably practicable. Some of the difficulties have been who to contact, how to contact them and what message to promote. The Safety Awareness Days will address these issues to some extent, but there will still be a significant number of smaller companies who remain untouched by the SADs.

- Use of Customs and Excise as a means to identify smaller companies involved in construction or maintenance work via VAT returns.

- Use Builders merchants and hire shops as a route to disseminating information to smaller companies.

- Use manufacturing and other companies who employ small maintenance companies as a route to target these smaller enterprises (either as a means of disseminating information or including health and safety in the contract procurement strategy).

- Consider prescription/risk assessment for small companies, say targeted at seven or so key areas (to make it easier for them to understand and comply).

3 - Demonstrate the economic benefits of better health and safety

Cost is an integral part of the current construction culture in the UK, and any messages about health and safety need to recognise this. As such, the economic benefits of good health and safety need to be demonstrated to those who do not currently appreciate this. Real life case studies and examples are required in order to demonstrate what the real costs and benefits are. In this way, health and safety can be communicated in a way compatible with the prevailing culture. This could go some way to improving Company culture and thus drive down an influence from the top of organisations.
4 – Raising awareness of the intent of health and safety duties and appropriate controls

Until organisations appreciate what they need to be doing, it will be difficult to get them to actually fulfil those duties. There is a need for the spirit of the regulations to be complied with as well as the letter i.e. relevant risk assessments leading to meaningful method statements applicable to the hazardous elements of the work to be carried out. The proposed actions could be incorporated into the advice, inspection and enforcement activities of the Construction Division, in particular when concentrating on the specific health or safety themes noted in Section 2.

- Raise awareness of the purpose of risk assessments and where they should be carried out (i.e. for the hazardous activities rather than the easier activities).
- Raise awareness of the link between risk assessments and method statements.
- Take a tougher line on the use of generic risk assessments and method statements that bear little relevance to the key hazards on a project.

5 – Increasing Risk perception and Competence among workers

Action is required at several levels in order to tackle the Risk perception and Compliance issues. Action is required at board level in order to underpin actions further down the chain and set the overall culture. This implies a staged process. Obviously, this highly complex and difficult area requires considerable attention in its own right. The following suggestions are presented to highlight the issues that would need to be addressed.

5a – Modifying Company culture

Political and Regulatory input are required in order to get the health and safety message over at Duty Holder board level. Communication is required in a language that will be understood, i.e. the financial and legal implications of poor health and safety performance in the context of the modernising industry and respect for people. Without buy-in at the top, it will be difficult to cascade the health and safety priorities throughout an organisation. The messages must be clear and unambiguous both within an organisation and in its contractual relationships with other Duty Holders.

5b – Improving Health and Safety culture

Management and supervision are key to developing a positive Health and Safety culture. This will involve leading by example, by actions such as: providing the appropriate information to workers; not tolerating unsafe behaviour by others or practising it themselves; ensuring that the right equipment is available and used. This is highly dependent on the Management and supervision actually having the support with their own Company culture. Given that Management and supervision have been systematically reduced over the years, Management and supervision needs to be viewed in its broadest sense, with organisations identifying the points at which decisions are made and directions are given and with effective organisational Communication.
5c – Improving Risk perception / Situational awareness

Improving Risk perception / Situational awareness requires the provision and Communication of appropriate Information and Advice to the work force such that they appreciate the risks and do not persist thinking that ‘it won’t happen to me’. This, in conjunction with the underlying improvements in culture, should encourage compliance, as both the relevance and necessity of Compliance will be more apparent.

7.6.2 Risk reduction

The Influence Network can be used to assess potential risk controls in terms of their effect on the risk index and therefore their potential for risk reduction. Such interrogation of the Influence Network can help to identify factors where effort can best be targeted. The companion study on HAVS\(^{(12)}\) used the Influence Network in this way and through risk control workshop activities combined critical factors identified from the IN analysis on an iterative basis with judgement and experience of practitioners. In this way, a series of risk control measures was devised targeting improvement through key factors on paths with critical influence, and the extent of improvement to be achieved in each could be quantified against the rating scale.

Whilst the present study has determined critical areas of influence to reduce construction risks, it has not had the benefit of follow up interaction on specific aspects to develop bespoke risk control measures with meaningful quantification. To demonstrate the principles for quantifying and comparing risk reduction, simple estimates have been made of the potential improvements for unit increases in each of the relevant factors.

The factor rating increases relating to each of the individual components of the risk controls (1a to 1c, 2, 3, 4, and 5a to 5c) are shown in Table 6 along with corresponding estimates of the potential reductions in risk. For illustrative purposes, the base rating has been taken as the lowest rating from the causation workshop. An indicative increase in rating of one has been assumed for each of the factors to be improved but these can, and should, be refined in specific cases so that improvements more accurately reflect the circumstances and level of effort envisaged. For risk controls 1 and 5, once the individual components have been combined together, the potential rating increases will be greater than one for those factors that appear more than once. However, the extent of impact depends on the degree of effort and investment ultimately committed and, properly quantified, this assessment provides some indicators of the most effective combinations.

The illustrations given in Table 6 indicate that potential risk reductions of around 30% can be obtained from improving Design for safe construction. This would give a broad figure for the construction industry as a whole, and will obviously greater or lesser potential reductions in risk would be expected in specific circumstances.

The potential risk reductions for targeting smaller companies obviously need to be considered in the light of the number of small companies that exist and can be targeted.
# Table 6 Potential risk reductions associated with the proposed risk controls

<table>
<thead>
<tr>
<th>Influence network factor</th>
<th>Base rating</th>
<th>Risk control measure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1a</td>
<td>1b</td>
</tr>
<tr>
<td><strong>Direct level</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D1 Competence</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>D2 Motivation / Morale</td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>D3 Team working</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>D4 Situational Awareness</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>D5 Fatigue</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>D6 Health</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>D7 Communications</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>D8 Information / Advice</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>D9 Compliance</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>D10 Suitable Human Resources</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>D11 Internal Work Environment</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>D12 External Work Environment</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>D13 Operational Equipment</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>D14 Safety Equipment / PPE</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>D15 Design – virtual factor</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><strong>Organisational level</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>O1 Recruitment and Selection</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>O2 Training</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>O3 Procedures</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>O4 Planning</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>O5 Incident Man’t &amp; Feedback</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>O6 Management/Supervision</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>O7 Communications</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>O8 Health &amp; Safety Culture</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>O9 Equipment Purchasing</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>O10 Inspection and Maintenance</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>O11 Pay and Conditions</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>O12 Design for safe construction</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><strong>Policy level</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P1 Contracting Strategy</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>P2 Ownership and Control</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>P3 Company culture</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>P4 Organisational Structure</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>P5 Safety Management</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>P6 Labour Relations</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>P7 Company Profitability</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td><strong>Environmental level</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E1 Political Influence</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>E2 Regulatory Influence</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>E3 Market Influence</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>E4 Social Influence</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Potential risk reduction %</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Combined potential risk reduction %</td>
<td>20</td>
<td>10</td>
</tr>
</tbody>
</table>
The risk reduction associated with demonstrating the costs and benefits of health and safety may be considered alongside steps to raise awareness of the organisation’s health and safety responsibilities. Using the former as a means of underpinning the latter, potentially greater risk reductions may be possible.

The risk control aimed at improving Risk perception / Situational awareness offers potential for substantial risk reduction. However, this may be one of the most difficult improvements to achieve in the short-term, as it requires cultural change.

It should be noted that the potential risk reductions from individual measures are not directly additive due to overlap and synergies. In addition, the rating changes are clearly indicative and much more meaningful assessment can be made when developing specific measures with defined resources, extent of coverage etc. These analyses, however, despite minimal levels of improvement postulated, serve to demonstrate the potential these controls offer for further development.
8. USE OF THE IN MODEL TO SUPPORT STRATEGY, PLANNING AND PERFORMANCE MEASUREMENT

8.1 INTRODUCTION

The methodology for use of the Influence network has been described in Reference 16 for the evaluation of the Construction Priority Programme.

Implementing the Construction Priority Programme and in particular considering the need for evaluation, requires a number of key questions to be addressed:

- What are the objectives?
- How is it expected that proposed interventions will work to bring about an improved outcome?
- Are there any aspects where better data on cause and effect may be instructive for future actions / decisions?

If it were already known how different interventions worked, these could be mapped onto the objectives so that option selection would be straightforward and there would be no need for evaluation other than for confirmatory purposes. The reality, however, is that the root causes of the myriad problems across the construction industry have not been isolated scientifically, neither are there data on the effectiveness of particular solutions for particular stakeholders to deal with particular hazards.

The absence of data is countered by innumerable theories from both within HSE and externally at all levels of the industry, informed (and inevitably biased) by experience and some research. The magnitude of the problems in construction are such that it is not defensible to postpone action until hard data are gathered and trialing and testing theories on cause and effect (i.e. evaluation) have to be part of the programme from the outset. This in turn means that good insight to the success of interventions is needed early so that if, after a reasonable period, specific approaches are not as effective as anticipated, resources can be redeployed. However, the first step, despite the lack of data, has been to select a promising mix of interventions. The aforementioned theories provide the principal (albeit unsatisfactory) source. Such theories generally present an association between a problem somewhere in the supply chain and some scenario based detriment to health and / or safety performance. However, what is needed is a clear logic for the way in which, and to what extent, an intervention might work, what assumptions this is dependent on and what the wider implications might be. Faced with only a range of theories, a consistent, coherent and logical approach to option selection may seem all but impossible.

It is against this backdrop that the Influence Network was introduced to offer a more structured approach than previously available.

Figure 13 illustrates the subsidiary elements of the Regulator’s influence, the relative effectiveness of which impact evaluation may seek to address.
In Section 6, the intervention mechanisms workshop was described in which aspects of the subsidiary regulator elements highlighted in Figure 13 was explored. Unfortunately the mix of the group and availability meant that some aspects received less attention than others and it was not therefore possible to refine the modelling of these devices on an even basis. With better definition, the Influence Network remains a powerful route for assessing impact as described below.

8.2 OPTION APPRAISAL AND EVALUATION

The Influence Network has been proposed and applied as a tool to help in preliminary option appraisal and evaluation in relation to the Construction Priority Programme. This section describes how it can be used and the advantages over alternatives currently available.

8.2.1 Option Appraisal

The Construction Priority Programme intervention strategy focuses on principal areas of construction, key stakeholders and high risk activities as evidenced by RIDDOR data, insofar as the recording systems provide a meaningful interpretation for construction. Thus it has been
necessary even at this stage for judgements to be combined with the ‘hard’ evidence base, particularly in respect of new approaches.

In order to bring about health and safety outcome improvements, a series of interventions has been devised, drawing on experience and internal and external consultation. Each is based on a supposition that engaging with a stakeholders in a particular way will directly or indirectly have a positive impact. Almost all are (necessarily) judgement based, to a greater or lesser extent with some uncertainty surrounding the intervention logic involving a mix of outputs and outcomes. Whereas the extent of the problem (e.g. falls from height) can be generally stated, it is difficult to assess the impact that may be anticipated or, indeed, alternatives that might be considered to achieve the same end. In the absence of hard data from prior and relevant evaluations, there might be considered to be little alternative to this judgement based approach to option appraisal and selection.

The Influence Network can, however, help improve the situation in the following ways:

- Mapping each intervention onto the Influence Network enables the influences and stakeholders intentionally affected to be distinguished. Judgements can be made about the cost, timing and extent of influence, thereby highlighting key assumptions. Quantification is only as good (or poor) as the judgements but is more systematic (and open to subsequent review and challenge) than overall judgements alone.

- Mapping all interventions onto the Influence Network with a consistent perspective, provides a basis for quantitative comparison and banding (as opposed to individual ranking) of options. Considering the relative share of risk being addressed, the associated costs etc, enables the anticipated impact and value for money to be reflected. The banding can also account for uncertainty / variability in the revised rating judgements.

An additional feature is option identification:

- By back analysing the IN, critical influences and paths of influence can be identified where it appears relatively modest improvements in rating can have particular impact at the outcome level. These can be translated back into potential interventions to be appraised alongside the original options (see Section 7.4).

It should be noted, however, that assessing potential impact is not the only criterion for option selection and issues regarding the coverage with respect to stakeholders, the desire to try new (albeit potentially riskier) approaches which are already embodied in the strategy will play a part.

8.2.2 Evaluation

Having appraised and selected intervention options, there is the need to select useful and meaningful aspects to subject to formal evaluation.
The role of the Influence Network as a tool to guide evaluation is as follows:

- The individual mapping of interventions to the Influence Network for option appraisal requires the intervention logic, influence to influence, to be worked through. It helps distinguish monitoring points where indicators of change may be anticipated even before intermediate objectives and ultimate outcomes are achievable.

- Comparing the Influence Network mapping for the range of interventions may highlight confounding factors (e.g., where indirect influences from one intervention may add to the intended effect of others) or may reveal key linkages on which the effectiveness of several measures depends and is therefore a candidate for evaluation.

Once formal evaluation is designed and underway, either for complete interventions or elements of activity, the Influence Network provides a framework where:

- Evidence from monitoring or process evaluation can be used to update the initial assumptions possibly revising the projection for the intervention being evaluated and/or with a cut across to other interventions for which evaluation may not have been practicable or affordable. Whilst some degree of stability must be allowed for interventions to take effect, the framework may provide a basis for changing processes or priorities, in itself contributing to overall programme effectiveness.

The constraints which inevitably prevent formal evaluation of all activities are recognised. Nevertheless the consequence is that it will not be possible to aggregate evaluation findings rigorously to demonstrate effectiveness for all interventions or the combined elements of the Construction Priority Programme. Again it is suggested that the Influence Network could offer an intermediate step somewhat beyond the partial evaluation/no data position:

- Where interventions are not being (fully) evaluated, a group of relevant stakeholders (including the HSE team) could be taken through a structured Influence Network session (as described in Section 3.2) to capture views and ratings and also to at least qualitatively address issues more rigorously addressed in formal evaluation, such as the perceived counterfactual, monitoring of actions taken, what processes did/did not work, what impact was achieved and what might be learned for the future.

- Considering the programme as a whole and the concept of the whole being more than the sum of the parts, Influence Network sessions, taking a broad view of the industry, may provide a barometer of where behaviours and practices are changing (rather than a hard quantitative evaluation of what works and why). Such sessions should capture both changes in rating and changes in weighting as the structure and mechanisms at play in the industry change. Such sessions would inevitably provide a combined view of the parallel industry- and HSE-propelled changes but careful structuring could tease out views (from an appropriately balanced group) of the relative contributions of HSE (interventions).
These last suggestions should not be read as an alternative to formal evaluation of key aspects of the Construction Priority Programme – indeed such evaluations will be important to the development of the construction model itself. However, they are proposed as a pragmatic approach to plugging what would otherwise be gaps in the assessment. The judgements will, inevitably, reflect some imprecision and bias, but the structured approach embodied by the Influence Network provides for a systematic assessment, a stage on from merely gathering consolidated feedback on which interventions worked and why, or from looking back at the resulting trend in accident statistics.

In summary, the Influence Network has a useful role in ensuring a systematic, thorough and reasoned approach is taken to option appraisal and evaluation and offers a logical, structured and utilitarian methodology in the current situation.

The success of the method as a catalyst for structured and meaningful discussion leading to the identification of potential risk controls has been demonstrated through this Phase 2 construction research (12, 13, 14 etc).
9. CONCLUSIONS

In relation to the initial objectives, the following conclusions can be drawn from the work undertaken in this project:

Objective 1 - In the context of the construction industry, define HSE interventions / activities taking account of the intervention strategy.

1. The current and future HSE interventions have been identified from the published intervention strategy for the Construction Division.

2. The interventions will be aimed at the following key safety themes, for example:
   - Falls from height.
   - Transport.

3. The interventions will be aimed at the following key health themes, for example:
   - Cement dermatitis.
   - Hand arm vibration syndrome.
   - Exposure to noise.
   - Exposure to musculoskeletal injury.

4. The interventions will be aimed at the following key stakeholders:
   - Government – as a client.
   - Clients, designers and planning supervisors – particularly on larger projects.
   - SMEs and sole traders – to raise awareness and improve competence.
   - The workforce - to raise awareness and improve competence.
   - Manufacturers of formwork and falsework – to reduce risks through design and ensure provision of suitable information.

5. Discussions at the Intervention mechanisms workshop concentrated on the previous intervention mechanisms used in relation to construction. These could broadly be categorised as being:
   - Traditional interventions – including regulations and enforcement.
   - Guidance mechanisms – guidance, code and standards, safety awareness days, industry forums and advice.
CDM goal setting mechanisms – mechanisms for complying with the health and safety at work act, and participation in design or site meetings.

Hardware regulations – prescriptive regulations including CHSW.

Whilst these remain part of the HSE approach, consideration was given to the additional effectiveness of some of the new ways of working contained in the Intervention Strategy for 2002/3 and beyond.

Objective 2 - Convene an HSE workshop comprising Construction Division staff to agree the definition and extent of HSE functions, the current rating and relative weighting / significance on stakeholders within the construction industry.

6. A two-day accident and ill-health causation workshop was held with members of the Construction Division, and an Influence Network was quantified along with discussions of the underlying reasoning and attention to the intervention mechanisms.

7. Much of the construction industry is dominated by the ‘just get it done’ culture, where reputations are made or lost on the ability to deliver.

8. Risk Perception and Situational Awareness are heavily influenced by the underlying culture as workers were felt to know what the problem was, but did not appreciate its significance thinking ‘it won’t happen to me’.

9. Changing the construction industry culture to include health and safety was felt to be one of the key improvements needed.

10. Compliance tends to be with what the workers consider to be the most important issue/culture. Typically, this is ‘get the job done by the deadline’ rather than ‘get the job done safely’.

11. The skills shortage has lead to companies employing less skilled (or suitable) workers than they did in the past leading to a subsequent dilution of skills on site. Thus some companies are taking on work that they do not have the necessary competencies to undertake.

12. Procedures and plans tend to be viewed as a burden to be completed to satisfy the client/HSE requirements rather than to help get the work done. Whilst the letter of the regulations (such as CDM) may be complied with, the spirit is not recognised, understood or necessarily acted upon.

13. Site management is typically left to sort out the problems in order to get the job done.

14. Management and Supervision are considered to be critical to improving health and safety in construction. However, they tend to be impeded by a lack of Training, experience and Competence; having so many other issues to deal with; having multiple trades working simultaneously; and the fact that there are so few supervisors for the work required.
15. The *Information and Advice* getting to the workforce is poor. Information from risk assessments (where they exist, and are relevant) does not make its way to the workforce.

16. Poor *Communications* were often cited as being major contributors to accidents.

17. *Design for Safe Construction* was felt to be poor with a lack of interest amongst designers. Improving this factor was felt to be an uphill struggle.

18. Clients need to exercise more influence by including health and safety requirements explicitly in contracts. This way a civil liability would be introduced, and *Compliance* would be more likely. (The government would have a good opportunity to do this with forthcoming infrastructure projects).

19. The construction industry has a multiplicity of drivers including cost, time and conditions. These dominate the thinking, and the situation is getting worse with the continual client pressure for reductions in construction time.

20. Along with *Company Culture, Health and Safety Management* was felt to be the most important *Policy* level factor. However, there was felt to be a greater need for a culture as opposed to a ‘system’, given that a safety management system will follow from the culture.

21. There is a disparity in resources between HSE and the construction industry, but HSE were felt to be effective due to the approach taken and the respect for HSE within the construction industry.

**Objective 3 - Analyse the Influence Network to identify areas where changes may be particularly effective but incorporating a measure to ensure balance and reflect statutory duties. Compare with historic experience.**

22. Both quantitative and qualitative analyses of the Influence Network have been undertaken in order to identify potential areas for change.

23. There are five risk control measures selected that appear to offer the potential for reducing the hazards and risks associated with construction when used in addition to, or to underpin, the components of the intervention strategy. These measures are:

- Improvements in design for safe construction
- Additional routes to targeting smaller companies
- Demonstrate the economic benefits of better health and safety
- Raising awareness of the intent of health and safety duties and appropriate controls
- Increasing Risk perception and Competence among workers.
Objective 4 - Report, documenting use of model to support strategy planning and performance measurement.

24. A methodology has been presented indicating how the Influence Network model can be used to support strategy planning and performance measurement.

25. The quantified Influence Network model developed during this project can be used to monitor and test the effectiveness of specific health or safety improvement actions.
10. RECOMMENDATIONS

10.1 GENERAL RECOMMENDATIONS

The following recommendations are presented as offering the greatest potential to reduce the hazards and risks associated with construction:

Consideration should be given to implementing the following five risk control measures in addition to, or to underpin, the components of the proposed intervention strategy.

1. Improvements in Design for safe construction

A three-pronged approach is required in order to address:

- Education and Training for designers
- Client influence on designers
- Regulatory influence on designers

**Education and Training for designers** requires:

- *Education of undergraduates* – by universities in conjunction with industry and HSE as part of the curriculum on higher education courses.

- *Initial and Continuing Professional Development for designers* – by the professional institutions, other industry bodies and on-the-job training in order to raise awareness both of the problems and practical solutions.

- *Provision of suitable information and advice* - to underpin the education and training initiatives this could be achieved by a combination of industry-HSE guidance and by requiring health and safety issues to be addressed explicitly in codes of practice.

Mobilising **Client influence on designers** requires the following issues to be addressed:

- *Education of clients* - as to the costs, benefits and legal implications of health and safety via HSE influence on client bodies.

- *Inclusion of health and safety provisions in contracts* - this will both raise awareness of health and safety, and impose a civil liability on the parties to the contract. For public procurement contracts, this requires joined-up government.
Enhancing the Regulatory influence on designers requires the following issues to be addressed:

- Audits of designers compliance with CDM – this will provide HSE with the opportunities both to identify the typical problems that designers have, and provide guidance to designers on how they should be discharging their duties under CDM.

- Proactive intervention at the beginning of a project - when it is easier to make a substantial impact and the designer is less resistant to change.

- Utilise computer-aided learning (CAL) - as a means of communicating health and safety information to undergraduates (as part of their education) and professionals (as part of their initial and continuous professional development).

2. Targeting of smaller companies

Additional means of targeting smaller companies include:

- The use of Customs and Excise as a means to identify smaller companies involved in construction or maintenance work via VAT returns.

- Use Builders merchants and hire shops as a route to disseminating information to smaller companies.

- Use manufacturing and other companies who employ small maintenance companies as a route to target these smaller companies (either as a means of disseminating information or including health and safety in the contract procurement strategy).

- Consider prescription/risk assessment for small companies, say targeted at seven or so key areas (to make it easier for them to understand and comply).

3. Demonstrate the economic benefits of better health and safety

Cost is an integral part of the current construction culture in the UK, and any messages about health and safety need to recognise this. As such, the economic benefits of good health and safety need to be demonstrated to those who do not currently appreciate this. Real life case studies and examples are required in order to demonstrate what the real costs and benefits are. In this way, health and safety can be communicated in a way compatible with the prevailing culture. This could go some way to improving Company culture and thus drive down an influence from the top of organisations.
4. **Raising awareness of the intent of health and safety duties and appropriate controls**

Until those with high-level responsibility within organisations appreciate what they need to be doing, it will be difficult to get them to actually fulfil those duties. There is a need for the spirit of the regulations to be complied with as well as the letter i.e. relevant risk assessments leading to meaningful method statements applicable to the hazardous elements of the work to be carried out. The proposed actions could be incorporated into the advice, inspection and enforcement activities of the Construction Division, in particular when concentrating on the specific health or safety themes noted in Section 2.

- Raise awareness of the purpose of risk assessments and where they should be carried out (i.e. with particular focus for the hazardous activities rather than the straightforward activities).
- Raise awareness of the link between risk assessments and method statements.
- Take a tougher line on the use of generic risk assessments and method statements that bear little relevance to the key hazards on a project.

5. **Increasing Risk perception and Competence among workers**

Action is required at several levels in order to tackle the Risk perception and Compliance issues. Action is required at board level in order to underpin actions further down the chain and set the overall culture. This implies a staged process. Obviously, this highly complex and difficult area requires considerable attention in its own right in order to understand the underlying cultural driver. However, Inspectors could be used to promote the message as part of their duties. The following issues that would need to be addressed:

- Modifying Company culture - Political and Regulatory input are required in order to get the health and safety message over at Duty Holder board level. Communication is required in terms that will be understood and significant to the businesses (see Recommendation 3).
- Improving Safety culture - Management and supervision are key to developing a positive Safety culture, but are highly dependent on having the support from the overall Company culture.
- Improving Risk perception / Situational awareness - Improving Risk perception / Situational awareness requires the provision and Communication of appropriate Information and Advice to the work force such that they appreciate the risks and do not persist thinking that ‘it won’t happen to me’.
10.2 RECOMMENDATIONS FOR FURTHER WORK

1. Further work is required to understand the situation relating to Design for safe construction, in particular, what the key levers are to improving the treatment of health and safety in design.

2. Further work is required to investigate the routes to improving the Safety culture within the construction industry. Such work would need to address the underlying drivers for both organisations and individuals in order to understand the complex human and organisational issues that underpin cultural change. Experience from other industries could be drawn on to demonstrate the sequence of cause and effect in terms of wider influences on factor which it has been shown have a bearing on health and safety (e.g. motivation / morale, retention of suitable human resources etc).

3. Having identified the ‘Market influence’ as being of fundamental important in this work, there is a significant need to explore sub-influences such as economics and finance and their inter-relation in generating risk using the Influence Network, in order that more strategic policy areas for risk management and control can be identified in relation to potential HSE interventions. In particular the insurance influence with potential for positive or negative impact needs to be explored with some urgency. Similarly there is the ability to anticipate the impact of market fluctuations and ensure health and safety progress is insulated appropriately.

4. This work has highlighted the potential to delineate the role and contribution of different aspects of HSE activity on construction industry health and safety. The workshop group however, by virtue of its composition, focused primarily on Inspector and Sector activities and it is strongly recommended that a broader group is convened to take this approach forward. Within the context of seeking comprehensive and effective coverage in deploying resources and demonstrating of value for money, this insight will provide a firm basis for confirming effectiveness and assessing alternative strategies.
11. REFERENCES


APPENDIX A

DETAILED DEFINITIONS OF THE INFLUENCE NETWORK FACTORS
# A. FACTOR DEFINITIONS

## A.1 DIRECT LEVEL FACTORS

### D1 – Competence

The skills, knowledge and abilities required to perform particular tasks safely.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>0</td>
<td>Workers cannot perform a task without direct instruction and supervision. They have little or no knowledge of equipment functioning. They have little or no understanding of their job role or responsibilities.</td>
</tr>
<tr>
<td>Moderate</td>
<td>5</td>
<td>Workers can perform routine tasks with speed and efficiency, but need assistance with complicated or novel situations. They are able to utilise equipment only in normal operations. They have a basic understanding of their role and responsibilities.</td>
</tr>
<tr>
<td>Excellent</td>
<td>10</td>
<td>Workers can perform complicated tasks with speed and efficiency and can problem-solve efficiently in novel situations. They are considered experts in their trade/profession, able to deal with a range of conditions. They are completely familiar with their role and responsibilities as well of those of any junior personnel.</td>
</tr>
</tbody>
</table>

### D2 - Motivation / Morale

Workers incentive to work towards business, personal and common goals.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>0</td>
<td>Workers' morale may be low for a number of reasons including poor terms and conditions, an industry downturn, the lack of opportunity for them to use their skills, little discretion for them over how work is performed or a poor safety record which they feel they have no control over. As a result, they express negative and pessimistic views about their jobs and motivation towards health and safety issues is low.</td>
</tr>
<tr>
<td>Moderate</td>
<td>5</td>
<td>Workers are mostly neutral about their jobs and conditions. They perform their duties with care and attention most of the time because they have some control over the work. They are motivated to look at health and safety issues if they can be presented as important enough.</td>
</tr>
<tr>
<td>Excellent</td>
<td>10</td>
<td>Workers are positive and optimistic about their jobs and conditions and are proactive in relation to health and safety. They demonstrate high levels of commitment to high quality work and improving health and safety.</td>
</tr>
</tbody>
</table>
**D3 - Teamworking**

The extent to which individuals work in teams and look out for each other's interests.

<table>
<thead>
<tr>
<th>Level</th>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>0</td>
<td>People work on individual work fronts and rarely interact to talk about health and safety. There is negative peer pressure (with respect to health and safety) in that people are expected to get on with work irrespective of risks and well-intended advice is perceived as interference.</td>
</tr>
<tr>
<td>Moderate</td>
<td>5</td>
<td>People work in teams some of the time. They will sometimes discuss health and safety and may look out for each other in terms of certain hazards.</td>
</tr>
<tr>
<td>Excellent</td>
<td>10</td>
<td>There is positive interaction within teams, with people actively looking out for each other’s health and safety. There is positive peer pressure and advice is welcomed.</td>
</tr>
</tbody>
</table>

**D4 - Situational Awareness/Risk Perception**

The extent to which workers are aware of hazards and risks.

<table>
<thead>
<tr>
<th>Level</th>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>0</td>
<td>Lack of awareness of hazards and disregard of the risks.</td>
</tr>
<tr>
<td>Moderate</td>
<td>5</td>
<td>Acknowledgement of hazards and risks but little effort towards behaviour modification.</td>
</tr>
<tr>
<td>Excellent</td>
<td>10</td>
<td>Clear recognition of hazards and risks with appropriate behaviour modification to compensate.</td>
</tr>
</tbody>
</table>

**D5 - Fatigue/Alertness**

The degree to which performance is degraded, for example, through sleep deprivation, or excessive / insufficient mental or physical activity, or drugs / alcohol.

<table>
<thead>
<tr>
<th>Level</th>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>0</td>
<td>People are inactive, drowsy or tired leading to poor judgements and unnecessary risks.</td>
</tr>
<tr>
<td>Moderate</td>
<td>5</td>
<td>People are generally alert and vigilant. Capacity for work is normal, although certain situations (such as prolonged periods of excessive activity) may temporarily affect capacity for work and increase risks.</td>
</tr>
<tr>
<td>Excellent</td>
<td>10</td>
<td>People are exceptionally alert, vigilant and attentive and always make good decisions in order to minimise the risks.</td>
</tr>
</tbody>
</table>
**D6 - Health**
The well being of body and mind of the workforce.

<table>
<thead>
<tr>
<th>Level</th>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>0</td>
<td>There are relatively high levels of poor physical/mental health, e.g. musculoskeletal disorders, which increases the risk of accidents and occupational illness.</td>
</tr>
<tr>
<td>Moderate</td>
<td>5</td>
<td>Any physical or psychiatric conditions are minor or transient and will only temporarily affect capacity for work.</td>
</tr>
<tr>
<td>Excellent</td>
<td>10</td>
<td>Physical and psychiatric conditions are low. Capacity for work is at its peak.</td>
</tr>
</tbody>
</table>

**D7 - Communications**
The extent to which the frequency and clarity of communications are appropriate for ensuring effective task and teamwork.

<table>
<thead>
<tr>
<th>Level</th>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>0</td>
<td>Communication is unclear, unreliable or too infrequent resulting in poor task/team work.</td>
</tr>
<tr>
<td>Moderate</td>
<td>5</td>
<td>Communication is usually clear, timely, and reliable, but deteriorates occasionally.</td>
</tr>
<tr>
<td>Excellent</td>
<td>10</td>
<td>Communication is always clear, reliable, timely and appropriate for those who require the information, resulting in effective task/team work.</td>
</tr>
</tbody>
</table>

**D8 - Information / Advice**
The extent to which people can access information that is accurate, timely, relevant and usable.

<table>
<thead>
<tr>
<th>Level</th>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>0</td>
<td>Information is too frequent or infrequent, unobtainable, irrelevant, incomplete or difficult to interpret.</td>
</tr>
<tr>
<td>Moderate</td>
<td>5</td>
<td>Information is obtainable and relevant, but at times is difficult to interpret or too infrequent.</td>
</tr>
<tr>
<td>Excellent</td>
<td>10</td>
<td>Information is accessible, understandable, relevant, complete and timely.</td>
</tr>
</tbody>
</table>

**D9 - Compliance**
The extent to which people comply with rules, procedures or Regulations.

<table>
<thead>
<tr>
<th>Level</th>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>0</td>
<td>Rules, procedures and Regulations are frequently violated or not followed at all.</td>
</tr>
<tr>
<td>Moderate</td>
<td>5</td>
<td>Rules, procedures and Regulations are followed without consideration of their appropriateness to the context.</td>
</tr>
<tr>
<td>Excellent</td>
<td>10</td>
<td>Rules, procedures and Regulations are complied with and due consideration to the appropriateness of the context is always given.</td>
</tr>
</tbody>
</table>
### D10 - Suitable Human Resources

The relationship of supply to need for suitable human resources. Relates to the appropriate mix and number of workers in terms of experience, knowledge and qualifications.

<table>
<thead>
<tr>
<th>Rating</th>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>0</td>
<td>There is a lack of workers with the necessary experience and knowledge required by the industry. As a result, people will be stressed, and / or experience excessive workload.</td>
</tr>
<tr>
<td>Moderate</td>
<td>5</td>
<td>Workers with knowledge and experience are available most of the time but occasionally people are overstretched.</td>
</tr>
<tr>
<td>Excellent</td>
<td>10</td>
<td>There is a stable and regular supply of workers that possess the appropriate experience and knowledge required by the industry.</td>
</tr>
</tbody>
</table>

### D11 - Internal Work Environment

The level of noise, temperature, congestion, light and vibration existing in the place of work.

<table>
<thead>
<tr>
<th>Rating</th>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>0</td>
<td>Noise levels are damaging, temperature is extreme, workplace is congested, lighting levels are extreme, and motion or vibration is persistent and of high frequency.</td>
</tr>
<tr>
<td>Moderate</td>
<td>5</td>
<td>Occasionally and transiently one environmental factor is extreme.</td>
</tr>
<tr>
<td>Excellent</td>
<td>10</td>
<td>All environmental factors are at an optimal level, with infrequent and minor deviations from this level.</td>
</tr>
</tbody>
</table>

### D12 - External Working Environment

The conditions external to the site which impact on construction activity e.g. weather, public proximity, external distractions etc.

<table>
<thead>
<tr>
<th>Rating</th>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>0</td>
<td>Night time, strong winds, poor visibility, heavy rain, muddy conditions, public proximity.</td>
</tr>
<tr>
<td>Moderate</td>
<td>5</td>
<td>Dull conditions, intermittent rain and light wind, occasional site disturbances etc.</td>
</tr>
<tr>
<td>Excellent</td>
<td>10</td>
<td>Day time, dry, light, warm, protected site.</td>
</tr>
</tbody>
</table>
**D13 - Operational Equipment**

The extent to which OPERATIONAL equipment and materials are available, conform to best practice, meet the usability needs of the operator and are inspected and maintained.

<table>
<thead>
<tr>
<th>Poor</th>
<th>0</th>
<th>Equipment and materials are of poor quality/grade and never or rarely inspected, serviced or maintained. This can create difficulties which can increase the risk of an accident or incidence of ill health.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderate</td>
<td>5</td>
<td>Equipment and materials are generally reliable; manufacture is quality assured, but quality may not be consistent and maintenance is not always to a reasonable standard. This means that sometimes work is made more difficult and the risk of accidents or ill health are increased.</td>
</tr>
<tr>
<td>Excellent</td>
<td>10</td>
<td>Equipment and materials are always available and are of high quality and reliability which is conducive to safe working. Manufacture is of the highest quality, is consistent and is continuously being improved. The end user has been involved in informing the design process.</td>
</tr>
</tbody>
</table>

**D14 - Safety Equipment / PPE**

The extent to which SAFETY equipment / PPE is available, conforms to best practice, meets the usability needs of the worker and is inspected and maintained.

<table>
<thead>
<tr>
<th>Poor</th>
<th>0</th>
<th>Safety equipment / PPE is either absent, of poor quality or impractical and are never or rarely inspected, serviced or maintained.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderate</td>
<td>5</td>
<td>Safety equipment / PPE is usually available and is of reasonable quality/usability although quality may not be consistent and maintenance is not always to a reasonable standard. This means that sometimes health and safety are compromised.</td>
</tr>
<tr>
<td>Excellent</td>
<td>10</td>
<td>Safety equipment / PPE is always available and is of high quality and usability which gives maximum protection to workers. The equipment is reliable and performs consistently. Inspection and maintenance are carried out to a high standard.</td>
</tr>
</tbody>
</table>
### A.2 ORGANISATIONAL LEVEL FACTOR DEFINITIONS

#### O1 - Recruitment and Selection
The system that facilitates the employment of people that are suited to the job demands.

<table>
<thead>
<tr>
<th>Level</th>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>0</td>
<td>There are no clear selection criteria for jobs: recruitment is informal and discriminatory; selection is subjective and casual. There are no defined competencies to inform worker selection.</td>
</tr>
<tr>
<td>Moderate</td>
<td>5</td>
<td>There are selection criteria but they do not conform to best practice and are likely to be subjective, albeit formal; people are unlikely to be selected on the basis of their match to the demands of the job. There are broad competencies to inform worker selection.</td>
</tr>
<tr>
<td>Excellent</td>
<td>10</td>
<td>Guidelines for selecting people are clear and up to date. Best practice is conformed to such that people are selected on the basis of their ability to perform the job. The competencies required to perform the job are clearly set out.</td>
</tr>
</tbody>
</table>

#### O2 - Training
The system that ensures the skills of the workforce are matched to their job demands.

<table>
<thead>
<tr>
<th>Level</th>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>0</td>
<td>There is no budget or system for identifying personnel training needs or assuring competence e.g. no appraisal system. There is no investment in the workforce.</td>
</tr>
<tr>
<td>Moderate</td>
<td>5</td>
<td>There is a system for training personnel that is based on minimum legal requirements, but does not target individual needs. There is minimum investment in the workforce.</td>
</tr>
<tr>
<td>Excellent</td>
<td>10</td>
<td>There is a system of training based on individual training needs and resources are made available to ensure that the competence of the workforce is continually assured. There is considerable investment in the workforce.</td>
</tr>
</tbody>
</table>

#### O3 - Procedures
The system that ensures that the method of conducting tasks and/or operations is explicit and practical.

<table>
<thead>
<tr>
<th>Level</th>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>0</td>
<td>There are no procedures in place to guide or inform people. Any such procedures do not represent actual tasks or are so poorly presented / inaccessible as to render them ineffective.</td>
</tr>
<tr>
<td>Moderate</td>
<td>5</td>
<td>There are procedures but they are of inconsistent quality; e.g. they do not require the level of detail required.</td>
</tr>
<tr>
<td>Excellent</td>
<td>10</td>
<td>Procedures are systematically updated involving people whose responsibility it is to perform the tasks. They are informed by risk assessments and are well presented, organised and effective in guiding operations.</td>
</tr>
</tbody>
</table>
### O4 - Planning
The system that designs and structures work activities

<table>
<thead>
<tr>
<th>Grade</th>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>0</td>
<td>Planning is reactive and schedule driven with no regard to safe methods. Risk assessments are not undertaken as part of work planning.</td>
</tr>
<tr>
<td>Moderate</td>
<td>5</td>
<td>Basic planning exists but with little regard for how different activities may be affected. Risk assessments are only undertaken sporadically.</td>
</tr>
<tr>
<td>Excellent</td>
<td>10</td>
<td>Planning is proactive and interactive for different work activities. Risk assessments are an integral part of the work.</td>
</tr>
</tbody>
</table>

### O5 - Incident Management + Feedback
The system of incident management that ensures high quality information is available for decision-making when and where it is required, including the collection, analysis and feedback of incident and near-miss data.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>0</td>
<td>There are no procedures for recording information on incidents that can be used to prevent further occurrences.</td>
</tr>
<tr>
<td>Moderate</td>
<td>5</td>
<td>Information on incidents is recorded but may be poor in quality and not be disseminated. Near miss data is not given high priority.</td>
</tr>
<tr>
<td>Excellent</td>
<td>10</td>
<td>Good quality information about incidents is recorded in a clear and comprehensible manner and is effectively disseminated. Information on incidents enables steps to rectify and prevent further occurrences. Near miss data is actively used in decision-making and feedback.</td>
</tr>
</tbody>
</table>

### O6 - Management / Supervision
The system that ensures human and hardware resources are adequately managed/supervised.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>0</td>
<td>There is poor management and supervision of work activity. Human and hardware resources are often used inappropriately which increases risks.</td>
</tr>
<tr>
<td>Moderate</td>
<td>5</td>
<td>There are management procedures for some aspects of health and safety and supervision is helpful although seldom proactive.</td>
</tr>
<tr>
<td>Excellent</td>
<td>10</td>
<td>Management and supervisors are proactive in controlling the risks to the health and safety of workers. To this end, resources (human and hardware) are used appropriately.</td>
</tr>
</tbody>
</table>
### O7 - Communications
The system that ensures that appropriate information is communicated clearly to its intended recipients.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>0</td>
<td>Information on health and safety hazards and risks is not collected or communicated.</td>
</tr>
<tr>
<td>Moderate</td>
<td>5</td>
<td>There are systems in place for gathering and communicating health and safety information, but breakdowns occur and little thought is given to information requirements.</td>
</tr>
<tr>
<td>Excellent</td>
<td>10</td>
<td>There is a system in place to ensure the effective collation and dissemination of practical health and safety information. This information is received and understood by those who need it when it is required.</td>
</tr>
</tbody>
</table>

### O8 - Health and Safety Culture
Product of individual and group values, attitudes, competencies and patterns of behaviour in relation to health and safety.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>0</td>
<td>Health and safety is given little or no priority. There is apathy towards accidents and incidents or ill health which stifles the sharing of relevant information. Control of health and safety is generally regarded as someone else's responsibility and people are resistant to new ideas for improvement.</td>
</tr>
<tr>
<td>Moderate</td>
<td>5</td>
<td>Health and safety only has a high priority to the extent it maintains image. The sharing of information is not encouraged and often ignored. Responsibility for health and safety is confined to a few people. People are only proactive now and again and this is not always well received.</td>
</tr>
<tr>
<td>Excellent</td>
<td>10</td>
<td>Health and safety has a high priority and is openly addressed. Information is actively sought and dissemination is encouraged, responsibility is shared, sub-standard performance leads to inquiries without blame and new ideas for improvement are welcomed.</td>
</tr>
</tbody>
</table>

### O9 - Equipment Purchasing
The system that ensures that the appropriate range of equipment is available.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>0</td>
<td>There is no budget and no thought is given to specifying and acquiring new equipment which would help to improve health and safety. Money that is available is used for the purchase of the cheapest available equipment that rarely suits what is required.</td>
</tr>
<tr>
<td>Moderate</td>
<td>5</td>
<td>Equipment for minimising risks is obtained but it does not necessarily meet user or task requirements.</td>
</tr>
<tr>
<td>Excellent</td>
<td>10</td>
<td>There is a purchasing policy for equipment which results in purchases of high specification with appropriate levels of functionality that meet user's current requirements, and pre-empt, to some extent, future requirements.</td>
</tr>
</tbody>
</table>
## O10 - Inspection + Maintenance

The system that ensures equipment and materials are maintained in good working order.

<table>
<thead>
<tr>
<th>Level</th>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>0</td>
<td>There is nothing to ensure the inspection and maintenance of equipment and materials essential for good health and safety at work. The operational life of equipment is frequently exceeded. Any repairs are aimed at maintaining working progress but not at preventing further equipment degradation.</td>
</tr>
<tr>
<td>Moderate</td>
<td>5</td>
<td>Inspection and maintenance conforms to minimum requirements in terms of safe working and good health but equipment may be maintained past its operational life to avoid new purchases.</td>
</tr>
<tr>
<td>Excellent</td>
<td>10</td>
<td>Systems of inspection and maintenance for health and safety surpass minimum requirements. Equipment is replaced or maintained to a high standard as and when required. Procedures cover long-term planning and contingency management.</td>
</tr>
</tbody>
</table>

## O11 - Pay + Conditions

The remuneration package and benefits in the context of working hours and conditions and welfare facilities. Also welfare facilities.

<table>
<thead>
<tr>
<th>Level</th>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>0</td>
<td>Lower than average rates of pay or piece work payment, long working hours.</td>
</tr>
<tr>
<td>Moderate</td>
<td>5</td>
<td>Average pay rates, bonuses linked to productivity, reasonable working hours.</td>
</tr>
<tr>
<td>Excellent</td>
<td>10</td>
<td>Above average pay rates, bonuses linked to safety performance as well as productivity.</td>
</tr>
</tbody>
</table>
### O12 - Design for Safe Construction

The process of design to ensure buildability of new structures, and operability and safety during maintenance, repair, and refurbishment of existing structures (both in relation to the existing structure and the design of any repair, maintenance or refurbishment scheme).

<table>
<thead>
<tr>
<th>Rating</th>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>0</td>
<td>Designs are difficult to maintain and require a considerable amount of time to be spent exposed to hazards such as working at height or vibrating tools. There is no coordination between designers, nor explicit recognition of the risk factors involved in building or working on a structure once it is built.</td>
</tr>
<tr>
<td>Moderate</td>
<td>5</td>
<td>The design process is carefully managed, but there are still difficulties in building new structures or maintaining them once they are built. Attempts are made by designers to address safety issues in as far as their knowledge of construction, maintenance/repair and operational activities allows them to deliver.</td>
</tr>
<tr>
<td>Excellent</td>
<td>10</td>
<td>Designs can be built and maintained in a way which requires minimal exposure to hazards. Designers take full account of how a structure will be constructed and maintained once it is completed by identifying hazards, assessing the risks and then eliminating the hazards or reducing the risks at the design stage. There is coordination between designers of all disciplines and consultation with the end-users.</td>
</tr>
</tbody>
</table>
### A.3 POLICY LEVEL FACTOR DEFINITIONS

<table>
<thead>
<tr>
<th>P1 - Contracting Strategy</th>
<th>Poor 0</th>
<th>Moderate 5</th>
<th>Excellent 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>The extent to which health and safety is considered in contractual arrangements and the implications.</td>
<td>Contracts meet no more than minimum legal requirements on health and safety. There is no consideration of health and safety in contractor evaluation or award criteria. The overarching strategy is for minimum cost and avoidance of liability. Attempts are made to pass responsibility for health and safety as far down the contractual chain as possible. Contracting is fragmented with multiple levels of subcontracting without clear lines of responsibility and accountability for health and safety. Those carrying out the work, particularly the self-employed or small organisations, are unclear of their health and safety responsibilities. As such, contractors still take little or no measures to minimise the risks.</td>
<td>Contract procurement specifications explicitly address health and safety requirements. Safety is included in contractor evaluation criteria, but may be secondary to cost. Whilst no attempt is made to ‘offload’ responsibility for health and safety, it is not clear what the responsibilities of each party are.</td>
<td>There is a strong emphasis on health and safety through contract procurement and these considerations affect contracting strategy. Health and safety requirements are identified for all stakeholders and include recognition of interface issues and change control. Health and safety is a primary consideration in contractor evaluation and contract award (in respect of contractor proposals and health and safety record). The contractual arrangements are such that the responsibility for health and safety of each party is appropriate to their role. The communication of responsibility is clear and obvious.</td>
</tr>
</tbody>
</table>
### P2 - Ownership and Control

The extent to which ownership and control is taken over sustained health and safety performance.

<table>
<thead>
<tr>
<th>Level</th>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>0</td>
<td>Managers/directors are disinterested in taking responsibility for health and safety either within their own organisation or in working with clients or contractors.</td>
</tr>
<tr>
<td>Moderate</td>
<td>5</td>
<td>Managers/directors delegate responsibility for health and safety but take little direct interest and do not always provide the resources needed to tackle specific issues. Regulatory targets are followed but there is little or no proactive activity.</td>
</tr>
<tr>
<td>Excellent</td>
<td>10</td>
<td>Managers/directors have clear roles and responsibilities regarding the control of health and safety. Health and safety responsibilities are embraced and industry initiatives are welcomed. Targets and initiatives are set and contractors/clients are expected to adopt these. Cooperation at all levels is expected and encouraged. A commitment to health and safety is visible and transparent.</td>
</tr>
</tbody>
</table>

### P3 - Company Culture

Culture within an organisation consists of assumptions about the way work should be performed; what is and what is not acceptable; what behaviour and actions should be encouraged and discouraged and which risks should be given most resources.

<table>
<thead>
<tr>
<th>Level</th>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>0</td>
<td>The style of behaviour that is accepted is aggressive or defensive. Management style is either laissez-faire or autocratic. Decision-making is top down or is disorganised and confused. Short-term profit policies prevail to the extent of ignoring risks.</td>
</tr>
<tr>
<td>Moderate</td>
<td>5</td>
<td>Practices are pursued that have a minimum detriment to profits, comply with the law and seek to maintain a clean public image, but fail to address specific risks.</td>
</tr>
<tr>
<td>Excellent</td>
<td>10</td>
<td>Decision-making is by consultation and management style is empowering and delegating. Investment is seen as key to securing long-term goals. There is a strong emphasis on the value of employees, mutual respect and concerns for health and safety, with commensurate standards for behaviour and continuing goals for improvement.</td>
</tr>
</tbody>
</table>
### P4 - Organisational Structure

The extent to which there is definition of health and safety responsibility within and between organisations

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>0</td>
<td>Roles and responsibilities for health and safety are not clearly defined, with no regard to communication issues or cooperation. Relationships are confrontational and competitive.</td>
</tr>
<tr>
<td>Moderate</td>
<td>5</td>
<td>There is some definition of roles and responsibilities for health and safety but there may be gaps particularly in respect of communication issues.</td>
</tr>
<tr>
<td>Excellent</td>
<td>10</td>
<td>Roles and responsibilities for health and safety are clearly defined, with explicit consideration of communication and cooperation issues. Relationships are open and constructive encouraging continuous improvement.</td>
</tr>
</tbody>
</table>

### P5 - Health and Safety Management

The management system which encompasses health and safety policies, the definition of roles and responsibilities for health and safety, the implementation of measures to promote health and safety and the evaluation of health and safety performance.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>0</td>
<td>There are no clearly written roles and responsibilities in relation to health and safety. Health and safety management either does not exist or fails to implement measures such as risk assessments etc. There are no management procedures for monitoring/evaluating health and safety performance.</td>
</tr>
<tr>
<td>Moderate</td>
<td>5</td>
<td>Health and safety measures are implemented at a basic level. The main aim of health and safety management is compliance with the regulations. Health and safety management is not actively maintained and review is infrequent.</td>
</tr>
<tr>
<td>Excellent</td>
<td>10</td>
<td>There are clearly defined roles and responsibilities for health and safety. Health and safety management is evident in all aspects of the operations by workers and management at all levels. Health and safety management is comprehensive, is audited and reviewed for continuous improvement on an ongoing basis. Not only is compliance with the regulations sought, but a positive effort is made to go beyond the minimum requirements.</td>
</tr>
</tbody>
</table>
### P6 - Labour Relations

The extent to which there is a harmonious relationship between managers/directors and the workforce. It also concerns the extent to which there is the opportunity for workers to affiliate with associations active in defending and promoting their welfare, and the extent to which there is a system in place for pay negotiation.

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>0</td>
</tr>
<tr>
<td>Moderate</td>
<td>5</td>
</tr>
<tr>
<td>Excellent</td>
<td>10</td>
</tr>
</tbody>
</table>

### P7 - Company Profitability

The extent to which companies are subject to competition over market share and constrained as to the price that they can charge.

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>0</td>
</tr>
<tr>
<td>Moderate</td>
<td>5</td>
</tr>
<tr>
<td>Excellent</td>
<td>10</td>
</tr>
</tbody>
</table>
A.4 ENVIRONMENTAL LEVEL FACTOR DEFINITIONS

### E1 - Political Influence
The profile of, and practices within, Government related to safety in the industry.

<table>
<thead>
<tr>
<th>Level</th>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>0</td>
<td>Political instability and/or detachment from important issues within the industry. No active measures to influence health and safety.</td>
</tr>
<tr>
<td>Moderate</td>
<td>5</td>
<td>Stable political environment and/or recognition of the industry under the pretext of 'public interest'.</td>
</tr>
<tr>
<td>Excellent</td>
<td>10</td>
<td>Elevated profile for the industry. High-level political involvement and resulting empowerment of the regulator. Fiscal policies support prosperity of the industry and emphasise health and safety.</td>
</tr>
</tbody>
</table>

### E2 - Regulatory Influence
The framework of Regulations and guidance governing the industry and the profile and actions of the Regulator.

<table>
<thead>
<tr>
<th>Level</th>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>0</td>
<td>Guidance pertaining to health and safety in construction is weak and does not impinge on the day-to-day practices for all stakeholders. The inspectorate is under-resourced and thus unable to influence health and safety.</td>
</tr>
<tr>
<td>Moderate</td>
<td>5</td>
<td>There is guidance covering many aspects of health and safety in construction for which compliance is checked but the Regulator is under-resourced or unwilling to take effective actions, thus rules are inconsistently subscribed to, implemented or enforced.</td>
</tr>
<tr>
<td>Excellent</td>
<td>10</td>
<td>Guidance relating to health and safety in construction is effective and focuses industry attention with a strong and proactive inspectorate encouraging improvements and strong enforcement deterring transgressions. Regulatory policy is pro-active and pre-empts potential problem areas.</td>
</tr>
</tbody>
</table>

### E3 - Market Influence
The commercial and economic context affecting the industry.

<table>
<thead>
<tr>
<th>Level</th>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>0</td>
<td>Conditions such that, due to work overload or so little work, margins are squeezed, and corners are cut with respect to health and safety. Greater willingness to take on high risk work, and at low cost.</td>
</tr>
<tr>
<td>Moderate</td>
<td>5</td>
<td>Some application of health and safety measures and risk evaluations but inadequate time or financial margins for substantial investment. High risk work not addressed adequately.</td>
</tr>
<tr>
<td>Excellent</td>
<td>10</td>
<td>A commercial environment with a balance of workload / availability and return to enable investment in health and safety to be made. If high risk work is taken on it is at a cost that allows reasonable risk control and prevention measures to be taken.</td>
</tr>
</tbody>
</table>
### E4 - Societal Influence

Aspects of the community and society at large, which bear upon organisations and workers.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>0</td>
<td>Low public regard for industry and / or low concern for the welfare of workers.</td>
</tr>
<tr>
<td>Moderate</td>
<td>5</td>
<td>Neutral attitude to industry and welfare of the workers.</td>
</tr>
<tr>
<td>Excellent</td>
<td>10</td>
<td>Highly valued industry with respect for the skills and societal contribution, and concern for workers' welfare.</td>
</tr>
</tbody>
</table>
APPENDIX B

DETAILS OF THE

INFLUENCE NETWORK WEIGHTINGS
B. FACTOR WEIGHTINGS

B.1 ENVIRONMENTAL INFLUENCES ON POLICY LEVEL

Table 1 Environmental influences on the Policy level factors

<table>
<thead>
<tr>
<th>Policy level influences affected</th>
<th>Ratings</th>
<th>E1 Political</th>
<th>E2 Regulatory</th>
<th>E3 Market</th>
<th>E4 Societal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ratings</td>
<td></td>
<td>6</td>
<td>6</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>P1 Contracting strategy</td>
<td>1-8</td>
<td>ML</td>
<td>L</td>
<td>H</td>
<td>M</td>
</tr>
<tr>
<td>P2 Ownership / control</td>
<td>2</td>
<td>M</td>
<td>ML</td>
<td>H</td>
<td>HM</td>
</tr>
<tr>
<td>P3 Company culture</td>
<td>0-8</td>
<td>M</td>
<td>H</td>
<td>ML</td>
<td>H</td>
</tr>
<tr>
<td>P4 Organisational structure</td>
<td>4</td>
<td>L</td>
<td>H</td>
<td>M</td>
<td>L</td>
</tr>
<tr>
<td>P5 Safety management</td>
<td>4</td>
<td>M</td>
<td>H</td>
<td>ML</td>
<td>M</td>
</tr>
<tr>
<td>P6 Labour relations</td>
<td>2</td>
<td>M</td>
<td>M</td>
<td>H</td>
<td>HM</td>
</tr>
<tr>
<td>P7 Company profitability</td>
<td>5</td>
<td>M</td>
<td>L</td>
<td>H</td>
<td>L</td>
</tr>
</tbody>
</table>
### B.2 POLICY INFLUENCES ON ORGANISATIONAL LEVEL

**Table 2** Policy influences on the Organisational level factors

<table>
<thead>
<tr>
<th>Organisational level influences affected</th>
<th>Active policy level influences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rating</td>
<td>P1 - Contracting Strategy</td>
</tr>
<tr>
<td></td>
<td>P2 - Ownership + Control</td>
</tr>
<tr>
<td></td>
<td>P3 - Company Culture</td>
</tr>
<tr>
<td></td>
<td>P4 - Organisational Structure</td>
</tr>
<tr>
<td></td>
<td>P5 - Health + Safety Management</td>
</tr>
<tr>
<td></td>
<td>P6 - Labour Relations</td>
</tr>
<tr>
<td></td>
<td>P7 - Company Profitability</td>
</tr>
<tr>
<td>Rating</td>
<td>0-8</td>
</tr>
<tr>
<td>O1 - Recruitment and Selection</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>H</td>
</tr>
<tr>
<td></td>
<td>L</td>
</tr>
<tr>
<td></td>
<td>HM</td>
</tr>
<tr>
<td></td>
<td>HM</td>
</tr>
<tr>
<td></td>
<td>H</td>
</tr>
<tr>
<td></td>
<td>L</td>
</tr>
<tr>
<td></td>
<td>M</td>
</tr>
<tr>
<td>O2 - Training</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>M</td>
</tr>
<tr>
<td></td>
<td>L</td>
</tr>
<tr>
<td></td>
<td>H</td>
</tr>
<tr>
<td></td>
<td>H</td>
</tr>
<tr>
<td></td>
<td>L</td>
</tr>
<tr>
<td></td>
<td>M</td>
</tr>
<tr>
<td>O3 - Procedures</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>M</td>
</tr>
<tr>
<td></td>
<td>ML</td>
</tr>
<tr>
<td></td>
<td>HM</td>
</tr>
<tr>
<td></td>
<td>H</td>
</tr>
<tr>
<td></td>
<td>H</td>
</tr>
<tr>
<td></td>
<td>L</td>
</tr>
<tr>
<td></td>
<td>L</td>
</tr>
<tr>
<td>O4 - Planning</td>
<td>3-4</td>
</tr>
<tr>
<td></td>
<td>HM</td>
</tr>
<tr>
<td></td>
<td>L</td>
</tr>
<tr>
<td></td>
<td>H</td>
</tr>
<tr>
<td></td>
<td>H</td>
</tr>
<tr>
<td></td>
<td>L</td>
</tr>
<tr>
<td></td>
<td>M</td>
</tr>
<tr>
<td>O5 - Incident Management + Feedback</td>
<td>0-6</td>
</tr>
<tr>
<td></td>
<td>L</td>
</tr>
<tr>
<td></td>
<td>M</td>
</tr>
<tr>
<td></td>
<td>HM</td>
</tr>
<tr>
<td></td>
<td>H</td>
</tr>
<tr>
<td></td>
<td>H</td>
</tr>
<tr>
<td></td>
<td>HM</td>
</tr>
<tr>
<td></td>
<td>L</td>
</tr>
<tr>
<td>O6 - Management / Supervision</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>H</td>
</tr>
<tr>
<td></td>
<td>L</td>
</tr>
<tr>
<td></td>
<td>H</td>
</tr>
<tr>
<td></td>
<td>HM</td>
</tr>
<tr>
<td></td>
<td>H</td>
</tr>
<tr>
<td></td>
<td>M</td>
</tr>
<tr>
<td></td>
<td>HM</td>
</tr>
<tr>
<td>O7 - Communications</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>M</td>
</tr>
<tr>
<td></td>
<td>L</td>
</tr>
<tr>
<td></td>
<td>H</td>
</tr>
<tr>
<td></td>
<td>H</td>
</tr>
<tr>
<td></td>
<td>H</td>
</tr>
<tr>
<td></td>
<td>H</td>
</tr>
<tr>
<td></td>
<td>L</td>
</tr>
<tr>
<td>O8 - Health Culture</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>M</td>
</tr>
<tr>
<td></td>
<td>H</td>
</tr>
<tr>
<td></td>
<td>H</td>
</tr>
<tr>
<td></td>
<td>M</td>
</tr>
<tr>
<td></td>
<td>H</td>
</tr>
<tr>
<td></td>
<td>HM</td>
</tr>
<tr>
<td>O9 - Equipment Purchasing</td>
<td>4-6</td>
</tr>
<tr>
<td></td>
<td>H</td>
</tr>
<tr>
<td></td>
<td>L</td>
</tr>
<tr>
<td></td>
<td>HM</td>
</tr>
<tr>
<td></td>
<td>ML</td>
</tr>
<tr>
<td></td>
<td>HM</td>
</tr>
<tr>
<td></td>
<td>L</td>
</tr>
<tr>
<td>O10 - Inspection + Maintenance</td>
<td>4-6</td>
</tr>
<tr>
<td></td>
<td>M</td>
</tr>
<tr>
<td></td>
<td>ML</td>
</tr>
<tr>
<td></td>
<td>HM</td>
</tr>
<tr>
<td></td>
<td>ML</td>
</tr>
<tr>
<td></td>
<td>H</td>
</tr>
<tr>
<td></td>
<td>ML</td>
</tr>
<tr>
<td>O11 - Method of Pay</td>
<td>1-7</td>
</tr>
<tr>
<td></td>
<td>ML</td>
</tr>
<tr>
<td></td>
<td>L</td>
</tr>
<tr>
<td></td>
<td>M</td>
</tr>
<tr>
<td></td>
<td>L</td>
</tr>
<tr>
<td></td>
<td>M</td>
</tr>
<tr>
<td></td>
<td>HM</td>
</tr>
<tr>
<td>O12 - Design for Safe Construction</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>H</td>
</tr>
<tr>
<td></td>
<td>H</td>
</tr>
<tr>
<td></td>
<td>H</td>
</tr>
<tr>
<td></td>
<td>L</td>
</tr>
<tr>
<td></td>
<td>H</td>
</tr>
<tr>
<td></td>
<td>L</td>
</tr>
<tr>
<td></td>
<td>L</td>
</tr>
</tbody>
</table>
### B.3 ORGANISATIONAL INFLUENCES ON DIRECT LEVEL

**Table 3  Organisational influences on the Direct level factors**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Rating</td>
<td></td>
<td>6</td>
<td>2</td>
<td>2</td>
<td>3-4</td>
<td>0-6</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>4-6</td>
<td>4-6</td>
<td>1-7</td>
<td>1</td>
</tr>
<tr>
<td>D1 - Individual Competence</td>
<td>3-8</td>
<td>H</td>
<td>H</td>
<td>M</td>
<td>ML</td>
<td>M</td>
<td>H</td>
<td>M</td>
<td>HM</td>
<td>L</td>
<td>L</td>
<td>M</td>
<td>L</td>
</tr>
<tr>
<td>D2 - Motivation</td>
<td>7-8</td>
<td>HM</td>
<td>M</td>
<td>L</td>
<td>ML</td>
<td>H</td>
<td>H</td>
<td>HM</td>
<td>H</td>
<td>ML</td>
<td>L</td>
<td>H</td>
<td>ML</td>
</tr>
<tr>
<td>D3 - Team working</td>
<td>5</td>
<td>H</td>
<td>HM</td>
<td>M</td>
<td>HM</td>
<td>M</td>
<td>H</td>
<td>H</td>
<td>H</td>
<td>L</td>
<td>L</td>
<td>ML</td>
<td>L</td>
</tr>
<tr>
<td>D4 - Situational Awareness/R P</td>
<td>3-9</td>
<td>HM</td>
<td>H</td>
<td>M</td>
<td>L</td>
<td>HM</td>
<td>HM</td>
<td>H</td>
<td>HM</td>
<td>L</td>
<td>L</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>D5 - Fatigue / Alertness</td>
<td>5</td>
<td>L</td>
<td>ML</td>
<td>HM</td>
<td>L</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>L</td>
<td>M</td>
<td>User</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>D6 - Health (Lifestyle)</td>
<td>5-8</td>
<td>M</td>
<td>HM</td>
<td>H</td>
<td>ML</td>
<td>HM</td>
<td>M</td>
<td>HM</td>
<td>H</td>
<td>M</td>
<td>ML</td>
<td>M</td>
<td>HM</td>
</tr>
<tr>
<td>D7 - Communications</td>
<td>3</td>
<td>H</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>HM</td>
<td>H</td>
<td>H</td>
<td>H</td>
<td>L</td>
<td>L</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>D8 - Information / Advice</td>
<td>0-5</td>
<td>L</td>
<td>H</td>
<td>H</td>
<td>M</td>
<td>H</td>
<td>H</td>
<td>H</td>
<td>HM</td>
<td>M</td>
<td>L</td>
<td>L</td>
<td>M</td>
</tr>
<tr>
<td>D9 - Compliance</td>
<td>3</td>
<td>HM</td>
<td>HM</td>
<td>H</td>
<td>L</td>
<td>M</td>
<td>H</td>
<td>HM</td>
<td>H</td>
<td>M</td>
<td>ML</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>D10 - Suitable Human Resources</td>
<td>4</td>
<td>H</td>
<td>H</td>
<td>M</td>
<td>H</td>
<td>LM</td>
<td>HM</td>
<td>M</td>
<td>HM</td>
<td>M</td>
<td>L</td>
<td>M</td>
<td>ML</td>
</tr>
<tr>
<td>D11 - Internal Work Environment</td>
<td>5</td>
<td>User</td>
<td>M</td>
<td>H</td>
<td>H</td>
<td>HM</td>
<td>H</td>
<td>M</td>
<td>HM</td>
<td>H</td>
<td>L</td>
<td>User</td>
<td>H</td>
</tr>
<tr>
<td>D12 - External Working Environment</td>
<td>3-4</td>
<td>User</td>
<td>User</td>
<td>ML</td>
<td>HM</td>
<td>L</td>
<td>ML</td>
<td>L</td>
<td>HM</td>
<td>User</td>
<td>User</td>
<td>User</td>
<td>HM</td>
</tr>
<tr>
<td>D13 - Operational Equipment</td>
<td>5</td>
<td>L</td>
<td>L</td>
<td>HM</td>
<td>HM</td>
<td>L</td>
<td>ML</td>
<td>ML</td>
<td>ML</td>
<td>ML</td>
<td>H</td>
<td>HM</td>
<td>User</td>
</tr>
<tr>
<td>D14 - Safety Equipment / PPE</td>
<td>4-6</td>
<td>L</td>
<td>L</td>
<td>HM</td>
<td>HM</td>
<td>ML</td>
<td>M</td>
<td>HM</td>
<td>ML</td>
<td>H</td>
<td>H</td>
<td>User</td>
<td>M</td>
</tr>
</tbody>
</table>
## B.4 DIRECT INFLUENCES ON CONSTRUCTION HEALTH AND SAFETY

### Table 4  Direct influences on construction health and safety

<table>
<thead>
<tr>
<th>Influence affect on construction health and safety</th>
<th>D1 Individual Competence</th>
<th>D2 Motivation / Morale</th>
<th>D3 Team working</th>
<th>D4 Situational Awareness / Risk Perception</th>
<th>D5 Fatigue / Alertness</th>
<th>D6 Health</th>
<th>D7 Communication</th>
<th>D8 Information / Advice</th>
<th>D9 Compliance</th>
<th>D10 Suitable Resources</th>
<th>D11 - Internal Work Environment</th>
<th>D12 - External Working Environment</th>
<th>D13 - Operational Equipment</th>
<th>D14 - Safety Equipment / PPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ratings</td>
<td>3-8</td>
<td>7-8</td>
<td>5</td>
<td>3-9</td>
<td>5</td>
<td>5-8</td>
<td>3</td>
<td>0-5</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>3-4</td>
<td>5</td>
<td>4-6</td>
</tr>
<tr>
<td>Construction health and safety</td>
<td>H</td>
<td>M</td>
<td>HM</td>
<td>H</td>
<td>M</td>
<td>M</td>
<td>H</td>
<td>H</td>
<td>HM</td>
<td>HM</td>
<td>M</td>
<td>ML</td>
<td>ML</td>
<td>ML</td>
</tr>
</tbody>
</table>