Falls from height - Prevention and risk control effectiveness

Prepared by **BOMEL Limited**
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RESEARCH REPORT 116

Falls from height - Prevention and risk control effectiveness

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This report describes a pan-industry study into the underlying influences on, and control of, falls from height.

The falls accidents reported via RIDDOR have been analysed for the last five years. The construction industry has the highest number of high falls, but agriculture and construction have similar fatality rates. There are few fatalities due to low falls, but low falls make up around 60% of the overall number of falls, with service industries having the highest number of accidents but the lowest accident rate. Construction has the highest rate of low falls.

Influence Network workshops were held with a wide range of delegates representing key stakeholders in Agriculture, Construction, Roofing, Specialists/Utilities and Transport. Analyses have given an insight into: the underlying organisational and human factors influencing falls from height; risk control measures; and their potential effectiveness.

These indicate that there are many similarities pan-industry with human, cultural and organisational issue dominating. Of the Direct influences on falls from height, Competence, Situational awareness/risk perception, Compliance and Operational equipment are primary influences. Of the Organisational factors, Process design, Training, Management/supervision and Safety culture are significant. At the Policy level, key factors are Company culture and Safety management. The Regulator and the Market are considered to be the primary Environmental influences on falls.

Key areas for risk reduction and management were also identified. The biggest improvements are required in Compliance and Process design. Awareness needs to be raised of the risks associated with low-level falls given that there are so many if them. The economic benefits of better health and safety need to be demonstrated such that they can be communicated to industries where the culture is dominated by cost. A toolkit has been provided in order to provide a framework for selecting effective risk control measures, setting performance targets and monitoring improvement.

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CONTENTS

			Page No.
1.	**INTRODUCTION**		**1**
	1.1	BACKGROUND	1
	1.2	CONTEXT OF THE STUDY	1
	1.3	OBJECTIVES	2
	1.4	SCOPE OF WORK AND APPROACH	3
	1.5	SCOPE OF THIS REPORT	4
2.	**CURRENT STATE OF KNOWLEDGE**		**5**
	2.1	INTRODUCTION	5
	2.2	IMPLICATIONS	6
	2.3	WHERE AND HOW FALLS FROM HEIGHT OCCUR	6
	2.4	TYPICAL RISK CONTROL AND PREVENTION MEASURES	9
	2.5	UK PRACTICE	11
	2.6	INTERNATIONAL PRACTICE	19
3.	**SOURCES OF ACCIDENT DATA**		**25**
	3.1	INTRODUCTION	25
	3.2	RIDDOR REPORTING	25
	3.3	NATIONAL ACCESS AND SCAFFOLDING CONFEDERATION	31
	3.4	INDUSTRIAL ROPE ACCESS TRADE ASSOCIATION	33
4.	**ACCIDENT RATES FOR FALLS FROM HEIGHT**		**35**
	4.1	INTRODUCTION	35
	4.2	ALL FALLS FROM HEIGHT	36
	4.3	HIGH LEVEL FALLS	39

4.4 LOW LEVEL FALLS 40

4.5 SUMMARY 42

5. FALLS FROM HEIGHT ACCIDENT DATA 45

5.1 INTRODUCTION 45

5.2 AGRICULTURE 46

5.3 CONSTRUCTION 61

5.4 HIGH LEVEL FALLS 68

5.5 EXTRACTION AND UTILITY SUPPLY 76

5.6 MANUFACTURING 91

5.7 SERVICES INDUSTRIES 106

5.8 DISCUSSION OF ALL SECTORS 121

6. ACCIDENT CAUSATION INFLUENCE NETWORK WORKSHOPS 123

6.1 INTRODUCTION 123

6.2 OVERVIEW 123

6.3 INFLUENCE NETWORK MODEL 124

6.4 ADAPTING THE INFLUENCE NETWORK FOR FALLS FROM HEIGHT 128

6.5 ANALYSIS OF INFLUENCE NETWORK - OVERVIEW 129

6.6 CALCULATION OF THE RISK INDEX 129

6.7 APPROACH TO IDENTIFYING CRITICAL FACTORS INFLUENCING FALLS FROM HEIGHT 130

6.8 RISK AS RELATED TO THE RISK INDEX 131

6.9 TRANSLATION OF RISK REDUCTION TARGETS TO INFLUENCE NETWORK INDEX 133

7. AGRICULTURE WORKSHOP 135

7.1 ATTENDEES 135

7.2 CUSTOMISING THE APPROACH FOR AGRICULTURE 135

	7.3	INFLUENCE FACTOR DISCUSSIONS	137
	7.4	INFLUENCE FACTOR WEIGHTINGS	137
	7.5	WORKSHOP CONCLUSIONS	137
	7.6	IDENTIFICATION OF CRITICAL FACTORS INFLUENCING FALLS FROM HEIGHT IN AGRICULTURE	139
	7.7	INDUSTRY SPECIFIC RISK CONTROLS	144
8.	**CONSTRUCTION WORKSHOPS – NEW BUILD & EXISTING STRUCTURES**		**147**
	8.1	ATTENDEES	147
	8.2	CUSTOMISING THE APPROACH FOR CONSTRUCTION	148
	8.3	INFLUENCE FACTOR DISCUSSIONS	149
	8.4	INFLUENCE FACTOR WEIGHTINGS	149
	8.5	WORKSHOP CONCLUSIONS	153
	8.6	FURTHER DEVELOPMENT OF THE INFLUENCE NETWORK MODEL	157
	8.7	CRITICAL FACTORS INFLUENCING FALLS FROM HEIGHT IN CONSTRUCTION	159
	8.8	INDUSTRY SPECIFIC RISK CONTROLS	165
9.	**ROOFING WORKSHOP**		**169**
	9.1	ATTENDEES	169
	9.2	CUSTOMISING THE APPROACH FOR ROOFING	169
	9.3	INFLUENCE FACTOR DISCUSSIONS	170
	9.4	INFLUENCE FACTOR WEIGHTINGS	170
	9.5	WORKSHOP CONCLUSIONS	171
	9.6	CRITICAL FACTORS INFLUENCING FALLS FROM HEIGHT IN ROOFING	172
	9.7	INDUSTRY SPECIFIC RISK CONTROLS	175
10.	**SPECIALIST OCCUPATIONS WORKSHOP**		**179**

10.1 ATTENDEES 179

10.2 CUSTOMISING THE APPROACH FOR SPECIALIST OCCUPATIONS 179

10.3 INFLUENCE FACTOR DISCUSSIONS 180

10.4 INFLUENCE FACTOR WEIGHTINGS 180

10.5 WORKSHOP CONCLUSIONS 181

10.6 CRITICAL FACTORS INFLUENCING FALLS FROM HEIGHT IN SPECIALIST OCCUPATIONS / UTILITIES 183

10.7 INDUSTRY SPECIFIC RISK CONTROLS 186

11. TRANSPORT WORKSHOP 187

11.1 ATTENDEES 187

11.2 CUSTOMISING THE APPROACH FOR TRANSPORT 187

11.3 INFLUENCE FACTOR DISCUSSIONS 188

11.4 INFLUENCE FACTOR WEIGHTINGS 188

11.5 WORKSHOP CONCLUSIONS 189

11.6 CRITICAL FACTORS INFLUENCING FALLS FROM HEIGHT IN TRANSPORT 190

11.7 INDUSTRY SPECIFIC RISK CONTROLS 193

12. CROSS INDUSTRY ANALYSIS 197

12.1 INTRODUCTION 197

12.2 COMPARISON OF RATINGS 198

12.3 COMPARISON OF WEIGHTINGS 207

12.4 CROSS-SECTOR CONCLUSIONS 213

13. RISK CONTROL AND PREVENTION MEASURES WORKSHOP 215

13.1 INTRODUCTION 215

13.2 ATTENDEES 216

13.3 APPROACH 216

13.4 RESULTS OF THE DISCUSSIONS 217

13.5 FOCUSING ON RISK CONTROL 220

13.6 RISK CONTROL INFLUENCE NETWORKS 220

13.7 RISK CONTROL EFFECTIVENESS 227

14. COST-BENEFIT ANALYSIS OF RISK CONTROL AND PREVENTION METHODS 231

14.1 INTRODUCTION 231

14.2 OVERVIEW 231

14.3 THE INDIVIDUAL 233

14.4 EMPLOYERS 235

14.5 NATIONAL LEVEL 241

14.6 SUMMARY 245

15. RISK CONTROL TOOLKIT 247

15.1 INTRODUCTION 247

15.2 TOOLKIT METHODOLOGY 247

16. CONCLUSIONS 251

17. RECOMMENDATIONS 263

17.1 GENERAL RECOMMENDATIONS 263

17.2 RECOMMENDATIONS FOR FUTURE WORK 264

18. REFERENCES 267

APPENDIX A – ACCIDENT CAUSATION WORKSHOP BRIEFING NOTE

APPENDIX B – RISK CONTROL WORKSHOP BRIEFING NOTE

APPENDIX C – AGRICULTURE WORKSHOP - DETAILED DISCUSSIONS

APPENDIX D – CONSTRUCTION WORKSHOPS - DETAILED DISCUSSIONS

APPENDIX E – ROOFING WORKSHOP - DETAILED DISCUSSIONS

APPENDIX F – SPECIALIST OCCUPATIONS WORKSHOP - DETAILED DISCUSSIONS

APPENDIX G – TRANSPORT WORKSHOP - DETAILED DISCUSSIONS

EXECUTIVE SUMMARY

INTRODUCTION AND OBJECTIVES

This report has been prepared by BOMEL Limited for the Technology Division of the Health and Safety Executive and describes a study on the underlying influences on and control of falls from height.

The work described in this report follows on from the successful completion of the project ‘Improving Health and Safety in Construction - Phase 1’ which comprised a pilot study trialing an Influence Network technique to understand the organisational and human factors influencing fatal falls from height in the construction industry. The approach not only provided new insight to 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 overall objectives of the study are to:

1. To provide a definitive baseline for measuring improvements in the incidence rate of falls from height across a variety of sectors.

2. To provide a quantified model of the influences affecting falls from height covering human, hardware and external factors for a variety of sectors.

3. To consult with key stakeholders through workshops to obtain a consensus view on the key issues relating to falls from height and the measures available to prevent and control those risks.

4. Identify and compare the effectiveness of alternative measures to prevent and control the risk of falls from height in order that efforts can be targeted most appropriately.

5. To provide a toolkit for selecting effective measures, setting performance targets and monitoring improvement.

SCALE OF THE FALLS FROM HEIGHT PROBLEM IN INDUSTRY

In October 2000, the HSC established eight ‘Priority Programmes’ within its Strategic Plan. Four of these priority programmes are ‘Falls from height’, ‘Agriculture’, ‘Construction’ and ‘Workplace Transport’. These decisions acknowledged the high risks of work at height in particular, and the high risks associated with three of areas where falls from height are most prevalent: agriculture, construction and transport.

Over the last five years around 31% of fatal injury accidents in UK industry occurred as a result of falls from height. Falls from height also accounted for around 20% of the major injury accidents over the last five years. Thus, a 10% reduction in the number of falls from height in industry would lead to a reduction of around 3% in the overall number of fatal injury accidents and around 2% in major injury accidents. A major reduction in accidents and injuries resulting from falls from height would make a significant contribution to achieving the Re*vital*ising targets.

The RIDDOR accident data for falls from height has been analysed for the period 1996/97 to 2000/01. Within the bounds of the under-reporting of accidents, a baseline of accidents resulting from falls from height can be derived from this data.

UNDERLYING CAUSES AND INFLUENCES

Three Influence Network (IN) workshops have been held successfully with a wide range of delegates representing the key stakeholders. These workshops generated significant input and discussion, which has been analysed to gain an insight into the underlying influences on falls from height and potential risk control measures. The Influence Network technique provides a means of collating the views of a range of stakeholders to identify the causation of falls from height. It also provides a means of identifying critical factors to be addressed as potential risk controls. The generic Influence Network used for falls from height is shown in Figure 1.

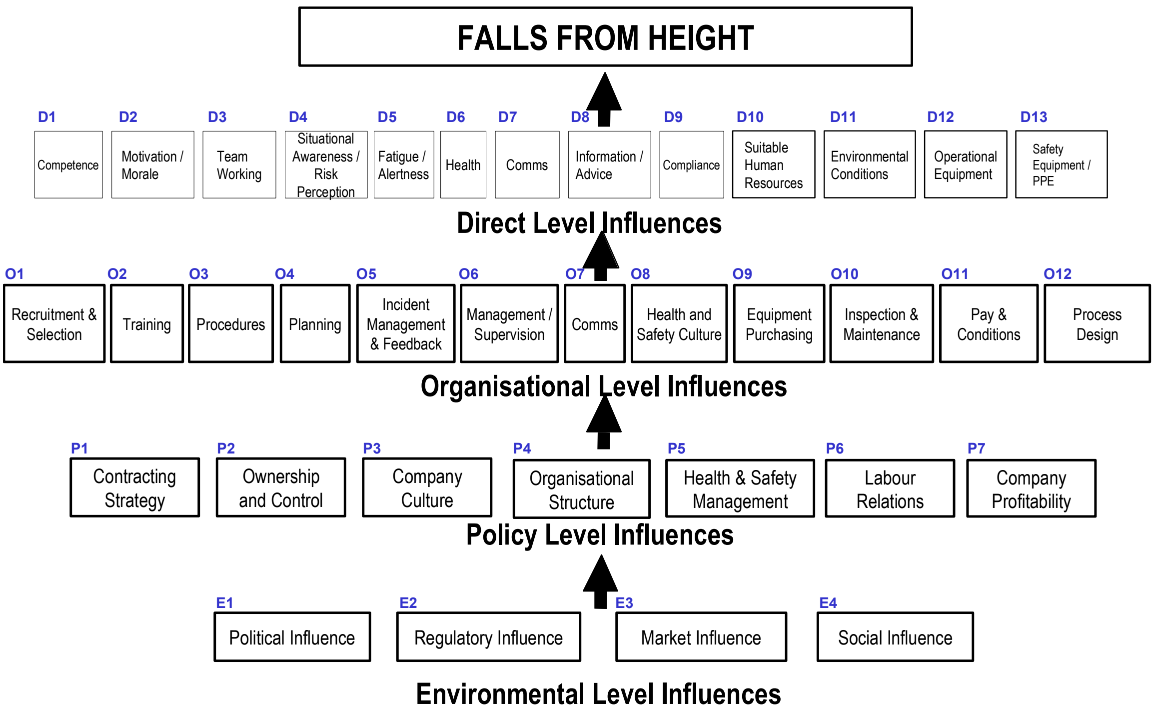

Figure 1 Influence Network for falls from height

Based on the analysis of the accident data, and consideration of specific risk profiles and industry issues, it was decided to hold Influence Network workshops for: Agriculture, Construction (including separate workshops for 'new build' and 'existing structures'), Specialist/Utilities, Roofing and Transport. It was felt that these represented the two sectors with the worst falls problems (Agriculture and Construction), the work process leading to most fatalities (Roofing), a significant cross-sector low fall problem (Transport/Goods delivery) and cross-sector areas of good practice (specialist rope access and utilities).

Study of the underlying causes indicated that:

- There are essentially two parallel issues: low-level work and high-level work. Whilst the profile of falls during high-level work is high, this is not the case for low-level work.

- The phrase that best sums up the typical view of falls from height is: 'it won't happen to me'.

For the **agricultural** sector, study of the underlying influences indicated that:

- As many farmers are self employed owners there is not a distinct *Policy* level above them. Instead, there is effectively only one layer of organisation / management / culture in farming which may encompass factors normally found at the *Policy* level such as *safety management*, *company culture*, *contracting* and *labour relations*. The network was, therefore, further customised after the workshop to better represent the structure of farming

- For farmers, at the *Direct* level, *competence, situational awareness / risk perception, suitable human resources* and *operational/safety equipment / PPE* emerge as the important factors. At the *Organisational* level, *training, planning, management / supervision* and *ownership and control* are most significant followed by *safety culture* and *contracting. Market* and *regulatory* influence stand out at the *Environmental* level.

- For agricultural contractors and for arborists the factors at the *Organisational* and *Policy* levels of the Influence Network were considered to be relevant.

- The factors identified to be most important for agricultural contractors and arborists match those for farming at the *Direct* and *Organisational* levels. At the *Policy* level (not applicable to farming), *company culture* and *safety management* were highlighted as significant influences. As with farming, the *market* and the *regulator* were deemed to have most influence at the *Environmental* level.

For the **construction** industry, study of the underlying influences indicated that:

- Of the factors that have a *Direct* influence on falls from height, *competence*, *situational awareness / risk perception* and *compliance* have been readily identified as being amongst the most significant factors. These are followed by *operational equipment*, *safety equipment / PPE* and *environmental conditions*.

- Of the *Organisational* level factors, the primary influence on falls from height are *training*, *management and supervision* and *process design* stand out as the most significant factors at the *Organisational* level, followed by *planning*, *communications* and *safety culture*.

- Of the *Policy* level factors, *company culture* and *health and safety management* stand out as the most significant influences. Given the discussions at all three workshops about the potential (and need) for the client to exert influence over health and safety, *contracting strategy* can be considered as following at the next level of significance.

- Of the *Environmental* level factors, the *regulatory* and *market* influences are far more significant than the *political* or *social* influences overall. However, it was difficult to obtain a consensus view between the workshops as to the specific influence of the *market*.

For **roofwork**, study of the underlying influences indicated that:

- At the *Direct* level, *competence, situational awareness / risk perception, communications, information / advice, conditions* and *equipment operability* were judged to have a high influence.

- At the *Organisational* level, *training* and *safety culture* are the most significant followed by *procedures, planning, management / supervision* and *organisational communication.*

- The *Policy* factors with the greatest significance are *contracting strategy, company culture* and *safety management.*

- At the *Environmental* level, the *Regulatory* and *market* influences were judged to be most significant.

For the **specialist / utility** industries, study of the underlying influences indicated that:

- There are distinctions between the specialised rope access organisations and the utility companies. As such, ratings were recorded for each, with variations for other parts of the industry such as powered access noted where appropriate.

- The ratings tended to fall into two groups with professional rope access companies towards the high end of the scale and certain parts of utilities and smaller operators at the other end of the scale.

- At the *Direct* level, *competence, situational awareness* and *information/advice* were thought to have a high potential influence followed by *operational equipment* and *safety equipment/PPE*. None of the other *Direct* factors were regarded as having a significant influence since they were judged to have low weightings in the workshop.

- At the *Organisational* level, *training, planning* and *management / supervision* emerge as the most important factors with *communications* and *safety culture* following behind.

- These factors are underpinned by *contracting strategy, company culture* and *safety management* at the *Policy* level.

- The *market* and *regulatory* influences were ranked as having most influence at the *Environmental* level.

- The factors which appear to have the most positive influence on the excellent safety record in specialist occupations are considered to be:

  - ➢ The strict system of *training* workers for rope access which ensures a high level of *competence* and *supervision* throughout the industry.

  - ➢ The nature of rope access work which means that often workers have no option but to *comply* with procedures i.e. unless they follow the method statement they cannot reach the place of work. This makes it easier to build safety into the work.

  - ➢ Rope access work seems to give workers a better appreciation of the hazards involved with working at height. People have a strong interest in what they do and their personal safety and this has helped to build a good *safety culture*.

  - ➢ Rope access workers have a firm understanding of which *equipment* should be used for particular jobs and how this equipment should be looked after.

  - ➢ Rope access companies take strong *ownership* of safety and often demand higher standards than the client. Safety is used as a marketing tool and is part of the *contractual arrangements* to ensure roles and responsibilities are clearly defined.

For **transport / goods delivery** industries, study of the underlying influences indicated that:

- At the *Direct* level, *competence, situational awareness / risk perception, communications, information / advice, conditions* and *equipment operability* were judged to have a high influence with no other factors close.

- At the *Organisational* level, *training* and *safety culture* are the most significant followed by *procedures, planning, management / supervision* and *organisational communication.*

- The *Policy* level factors with the greatest significance are *contracting strategy, company culture* and *safety management.*

- At the *Environmental* level it is the *regulatory* and *market* influences which are thought to be strongest.

Considering **all** of the workshops, and taking a **pan-industry** view:

- Based on a combination of the workshop discussions and analyses, it has been possible to identify the factors, at each level, most commonly being significant in the incidence of falls from height across all industry. Whilst there were obviously sector-specific issues, there was considerable commonality between the sectors.

- At the *Direct* level, *competence*, *risk perception*, *compliance* and *operational equipment* regularly appear as being the most significant factors.

- At the *Organisational* level, *training*, *management / supervision*, *safety culture* and *process design* were regularly judged as being significant.

- At the *Policy* level, *company culture* and *safety management* were considered most significant.

- At the *Environmental* level, the *market* was considered to be most significant. However, the *regulator* was considered to offer the greatest potential for influence.

Perhaps the key points to come from this pan-industry view were that the majority of the problems were similar across all sectors. These largely revolved around people not being aware of the potential risks and thus doing little to address those risks.

RISK PREVENTION AND CONTROL MEASURES

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

- Seeking suggestions from workshop delegates as to what is current good practice 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 falls from height.

- Identifying specific examples of good practice already in use in industry both from experience and the literature.

Over a hundred individual risk control measures were generated from these approaches, and these have been condensed down into detailed risk controls for each sector. These are described in the relevant sections.

For the **agricultural** sector, potential risk control measures include:

- Improving *situational awareness* / *risk perception* such that farmers (and their families) are aware of the risks that they face.

- Developing a *safety culture* among farmers such that safety is a primary consideration.

- Developing a *company culture* among agricultural companies such that safety is on the agenda at all levels.

- Improving the availability of *operational* and *safety equipment*, perhaps through machinery rings such that farmers have ready access to suitable equipment rather than improvising with the equipment that they have.

- Using insurance policies as a driver to discourage farmers from working on roofs.

The provision of suitable information and the role of HSE as instigator underpin these potential risk control measures.

For the **construction** industry, the potential risk control measures include:

- The need to take action to raise the *situational awareness* and improve the *risk perception* of workers.

- Achieving *compliance* on site such that if safe methods of working are provided, they are used.

- Recruiting *suitable workers* into the industry, particularly in London and the South-east where the skills shortage is most chronic.

- Improved selection, use and maintenance of *safety* equipment. Whilst suitable equipment is available on the market, the key issue is ensuring that companies are aware of the equipment, select the right equipment for the job, actually use that equipment (properly) and then maintain it in working order.

- Providing a better *trained* workforce perhaps through the uptake of schemes as the CSCS scheme.

- Better *planning* and appropriate method statements such that the work process is thought through beforehand and the risks managed in the most appropriate way.

- Improving the *safety culture* of the construction industry (both individuals and organisations). This is obviously a major long-term undertaking that would not be easy. However, the current *culture* was felt to underpin many of the current problems and thus needed modification.

- Using better *design* to eliminate hazards and reduce risks. *Designers* are the only stakeholders who have the ability to eliminate the hazards and reduce the risks significantly. They were felt to have a significant role to play, but were not currently doing so.

The role of the Regulator underpins many of the potential risk controls. In addition, it was felt that HSE had a major role to play in general, including further information, advice and best practice along with greater prescription and tougher enforcement.

For **roof work**, the potential risk control measures include:

- The need to take action to raise the *situational awareness* and improve the *risk perception* of workers.

- Achieving *compliance* on site such that when safe methods of working are provided, they are used.

- Improved selection, use and maintenance of *safety* equipment. Whilst suitable equipment is available on the market, the key issue is ensuring that companies are aware of the equipment, select the right equipment for the job, actually use that equipment (properly) and then maintain it in working order.

- Encourage the use of more relevant *procedures* with the right level of appropriate detail.

- Improve *supervision* as a means of improving *compliance* and *safety culture*.

- Using better *design* to eliminate hazards and reduce risks. *Designers* are the only stakeholders who have the ability to eliminate the hazards and reduce the risks significantly. They were felt to have a significant role to play, but were not currently doing so.

- Encourage better client *ownership* such that health and safety are considered in contracts.

Training, and the role of the *Regulator* were felt to be cross-cutting issues that underpinned the potential risk control measures.

For the **specialist / utility** industries, the potential risk control measures were primarily those measures that were identified as leading to the good safety record of the specialists, and thus have potential for transfer to other sectors. These include:

- Raising the levels of *competence*.

- Raising the levels of *situational awareness / risk perception*.

- Improving the standard of *information and advice*.
- Improving the quantity and quality of *management*.
- Improving *incident reporting* and information flow.

For the **transport / goods delivery** industries, the potential risk control measures include:

- Encouraging a greater take-up of *training* particularly among smaller operators.
- Raising the *situational awareness* of drivers.
- Improving *communications* between haulage firms and the destination site to ensure that adequate provisions are in place for unloading.
- Improving *design* and use of equipment including vehicle lock-ins at loading bays, unloading tankers from the bottom and access/egress from cabs and trailers.
- Improving *safety culture* such that health and safety are always on the organisational agenda and at the forefront of people's minds.

Considering a **pan-industry** view, six key issues for risk control were identified: *competence* and *training*; *risk perception*; *compliance*; *management and supervision*; *process design*; and *safety culture*. *Equipment* issues were not selected as one of the key issues as it was felt that the quality of equipment was good, but there was an issue as to whether the correct equipment was specified, used (properly) and maintained.

The six key issues essentially reduce to two key themes: achieving *Compliance,* and *Process design*. Using the Influence Network, it is possible to plot the routes of influence for these two themes. Improvements can potentially lead to risk reductions of around 30%.

Considering *Compliance*, the following three areas need to be addressed:

- Direct *political* and *regulatory* influence.
- Compliance through *management*.
- Improving *compliance* through *culture* and *risk perception*.

Considering *process design*, the following three areas need to be addressed:

- *Political* and *regulatory* influence on *designers*.
- Client influence on *designers*.
- Improvements in designer *training*, *information* and *communications*.

An 11-step *Toolkit* has been provided in which the work undertaken in this project is drawn together in order to provide a framework for selecting effective risk control measures, setting performance targets and monitoring improvement. The 11-step *Toolkit* is generic applicable both pan-industry and to the Regulator. The *Toolkit* is suitable for use by individual companies, industry trade associations for their member companies or sectors, or by the Regulator for either industry sectors or industry as a whole. It is suitable for identifying and evaluating a broad range of risk control measures, ranging from chosing equipment through to Regulatory Policy setting.

RECOMMENDATIONS FOR INDUSTRY

Specific recommendations have been made for each of the industrial areas. The key recommendations are aimed at addressing the following four key pan-industry themes:

1. Improvements need to be made in *Compliance*

There appears to be sufficient guidance and equipment available. The difficulty is ensuring that people are aware of the potential risks, and actually use the guidance and equipment that are available.

This appears to be a **pan-industry problem**, with each industry requiring its own solutions tailored to the particular problems and the overall cultures, structures and influence paths of those industries. **Implementation plans** need to be developed in conjunction with the HSE Inspectors in the relevant sectors in order to see how the **sector stakeholders can be mobilised** to address the specific risk controls presented in this report.

2. Improvements should be made in *Process design*

Designers appear to be the **only stakeholders** who are able to **eliminate the hazard or significantly reduce the risks** associated with these hazards. The feeling in the workshops was that designers are not currently making these contributions.

Not only does the HSE need to exert its influence on designers, but clients need to be brought on board such that they can demand that designers consider safety in their work. In addition to this influence, designers need to be helped by the provision of suitable information and training at all stages of their career such that they are aware of the implications of their decisions and the potential options.

3. Awareness needs to be raised of the risks associated with low-level falls

Low falls have contributed around 60% of the non-fatal accidents and injuries due to falls over the last five years. A large number of these falls occur when working off **ladders** and **platforms**, going up and down **stairs** or working on or around goods vehicles. Whilst work at high level has a high profile, low level work is seen as everyday activity with little associated risk. A two-prong approach is required. Firstly, specific industry sectors with significant numbers of low-level falls need to be targeted and understood. Secondly, awareness of the potential risks needs to be raised such that the relevant industries are encouraged to tackle the problems.

4. The economic benefits of better health and safety need to be demonstrated

There have been numerous mentions in this report of the need to address industry culture such that health and safety are high on the agenda. However, this may take some time.

Cost is an integral part of the **current 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. A *Toolkit* has been presented in this report for carrying out cost-benefit analyses, and this should be used in conjunction with a number of pan-industry examples 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.

1. INTRODUCTION

1.1 BACKGROUND

This report has been prepared by BOMEL Limited for the Technology Division of the Health and Safety Executive (HSE) as research contract 4334/R72.070, and describes a pan-industry study into the underlying influences on, and control of, falls from height.

The work described in this report follows on from the successful completion of the project 'Improving Health and Safety in Construction - Phase 1'[1] which comprised a pilot study trialing an Influence Network technique to understand the organisational and human factors influencing fatal falls from height in the construction industry. The approach not only provided new insight to 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 'Improving health and safety in construction' 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. The 'Improving health and safety in construction' project 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. However, falls from height are not confined to the construction industry. Other sectors have both similar and different problems to construction depending on the particular work process, and there is the potential for technology transfer between sectors.

One of the key objectives of this project has been to ensure robustness of the technique as an active tool for safety improvement across a variety of industries.

1.2 CONTEXT OF THE STUDY

In June 2000 the Deputy Prime Minister and the Health and Safety Commission (HSC) launched the Re*vital*ising 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.

Table 1 Re*vital*ising health and safety (RHS) targets

Target	*By 2004/5*	*By 2009/10*
Reduction in incidence rate of fatalities and major injury accidents	-5%	-10%
Reduction in incidence rate of cases of work-related ill-health	-10%	-20%
Reduction in number of working days lost per 100,000 workers from work related injury and ill-health	-15%	-30%

In October 2000, the HSC established eight 'Priority Programmes' within its Strategic Plan(3). Four of these priority programmes are 'Falls from height', 'Agriculture', 'Construction' and 'Workplace Transport'. These decisions acknowledged the high risks of work at height in particular, and the high risks associated with three areas where falls from height are most prevalent: agriculture, construction and transport.

Table 2 indicates that over the last five years around 31% of fatal injury accidents in UK industry occurred as a result of falls from height. Falls from height also accounted for around 20% of the major injury accidents over the last five years. Thus, a 10% reduction in the number of falls from height in industry would lead to a reduction of around 3% in the overall number of fatal injury accidents and around 2% in major injury accidents. A major reduction in accidents and injuries resulting from falls from height would make a significant contribution to achieving the Re*vital*ising targets.

Table 2 Fatal, major and over 3-day injury accidents occurring in UK industry as reported via RIDDOR between 1996/97 and 2000/01

Accident status	*All accidents in UK industry*	*Falls from height in UK industry (% of all accidents)*
Fatal injury accidents	1,276	397 (31%)
Major injury accidents	142,050	27,779 (20%)
Over 3-day injury accidents	664,645	43,109 (7%)
Total	807,971	71,285 (9%)

1.3 OBJECTIVES

The overall objectives of the study are:

1. To provide a definitive baseline for measuring improvements in the incidence rate of falls from height across a variety of sectors.

2. To provide a quantified model of the influences affecting falls from height covering human, hardware and external factors for a variety of sectors.

3. To consult with key stakeholders through workshops to obtain a consensus view on the key issues relating to falls from height and the measures available to prevent and control those risks.

4. To odentify and compare the effectiveness of alternative measures to prevent and control the risk of falls from height in order that efforts can be targeted most appropriately.

5. To provide a toolkit for selecting effective measures, setting performance targets and monitoring improvement.

1.4 SCOPE OF WORK AND APPROACH

This purpose of this work is to assess the influence of a wide range of human, hardware and external factors on the incidence of falls from height in UK industry. Once an understanding of the underlying causes of falls from height is attained, then appropriate risk control and prevention measures may be generated for application in practice to reduce falls from height across a number of industries. The approach adopted to achieve this is the Influence Network methodology. The specific steps involved in the work are as follows:

- **Gather background information** – this involves the establishment of a falls from height baseline, and determining sources of risk and accepted risk controls from available statistics, research and case studies. This ensures that the project focuses on key activities where the greatest impact is required. It also provides a reference baseline from which progress in future years can be measured.

- **Workshops to identify the underlying causes of falls from height in construction and identify potential risk prevention and control measures** – these workshops represent the experience and judgement of relevant stakeholders such as those from construction clients, principal contractors, specialist trades subcontractors, trade associations, farmers, specialists, equipment manufacturers and the regulator. The sessions are structured using the Influence Network (IN) technique in order that participants' experience is systematically focused on the underlying causes of falls from height accidents in the various industries. These workshops also allowed stakeholders the opportunity to identify 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 specifically aimed at risk controls allowed the delegates to consider the way forward.

- **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 'environmental' factors (political, social and commercial), through the corporate policy and organisational influences to the factors directly influencing the likelihood and consequence of accidents within the workforce. The reporting must clearly explain the risk estimates made in order to ensure that the results are fully justified and can be used confidently as a basis for development of intervention strategies.

1.5 SCOPE OF THIS REPORT

Section 2 contains a review of the current situation relating to work at height addressing such issues as the definitions of low and high level work, what the regulatory context is, what guidance is available, what the key issues are and what risk controls are available. Whilst aimed at the UK, this review calls on overseas work and guidance where available.

In Section 3 the available sources of accident data on falls from height are reviewed. In Section 4 the yearly accident rates per 100,000 workers are presented for the Agriculture, Construction, Extractive/utilities, Manufacturing and Services industrial sectors as categorised by HSE. The RIDDOR accident data is then analysed in greater depth for each of these five sectors in Section 5. Together, these analyses provide:

- A baseline from which future improvements may be measured.
- A means of informing and targeting the Influence Network workshops.
- An insight into the areas where future risk control measures and interventions may be best targeted.

The Influence Network technique is introduced in Section 6, leading to a customised Influence Network for falls from height.

The following sections contain a summary of the discussions from the accident causation workshops, detailed analyses of the workshop findings and discussion of potential risk control measures based on a combination of industry best practice, views of workshop delegates and interrogation of the Influence Network. This is addressed for Agriculture (Section 7), Construction 'New build' and 'Existing structures' (Section 8), Roofing (Section 9), Specialist / Utilities (Section 10) and Transport (Section 11).

A cross-sector comparison of the findings from these workshops is then presented in Section 12. The cross-sector risk control workshop is then introduced and discussed in Section 13.

Cost-benefit analyses are introduced in Section 14, and discussed in relation to the individual, organisations and society as a whole. The preceding sections are then drawn together in the form of a *Toolkit* described in Section 15 which provides a means of selecting effective risk control measures, setting performance targets and monitoring improvement.

The conclusions drawn from this work are presented in Section 16, followed by the recommendations in Section 17.

The references used in this work are given in Section 18, and the appendices contain example workshop briefing notes for the accident causation and risk control workshops.

2. CURRENT STATE OF KNOWLEDGE

2.1 INTRODUCTION

The information presented in this section is based on a review of a selection of the available literature. This has been carried out in order to set the context, inform the study and provide background material for presentation and discussion at the workshops.

In accident reports, falls are generally classified as high falls when a person falls more than 2m and low falls when a person falls less than 2m. Low-level falls tend not to be fatal. However, high-level falls tend to result in significant numbers of fatal and major injuries.

In this chapter the current situation in terms of falls from height is reviewed in terms of typical causes, and risk control and prevention measures for a cross-section of UK industry. UK and international practice are then considered in terms of their regulatory framework and source of information and best practice.

By considering UK industry as a whole, it is possible to identify those issues that are generic and those that are specific to one sector. The possibilities for technology transfer between sectors is considered later in the report when risk control and prevention measures are discussed.

In this report the standard industry classification (SIC) system is used to define the following sectors as considered by HSE:

- Agriculture.
- Construction.
- Extraction and utility supply.
- Manufacturing.
- Services.

These are fairly broad classifications, and one would expect there to be considerable variations within the specific sectors that go to make up each of these industry categories. This is recognised in this report, and where data or examples are available from these specific sectors reference is made.

2.2 IMPLICATIONS

The implications of accidents resulting from falls from height are far reaching. In addition to the immediate effects on the families and friends of the victim, other implications may manifest themselves as:

- Revulsion by society as a whole.
- Reduced morale in the organisation.
- Costs of temporary closures.
- Costs of remedial measures.
- Reductions in efficiency and profitability.
- Impaired organisational image.
- Difficulties in winning further work.
- Difficulties in recruitment.

2.3 WHERE AND HOW FALLS FROM HEIGHT OCCUR

It is important to differentiate between the 'where and how' and the 'why' causes of falls from height. 'Where and how' causes are considered to be related to issues such as was the fall from a roof, a ladder or through a hole. The 'why' causes are considered to relate to ergonomic and human factors, and are typically not addressed in the literature, hence the need for workshops to address the 'why' issue.

Some of the 'where and how' causes of falls from height are generic and occur in all industries such as falls from ladders whilst others are specific to particular industries. The common causes of falls from height in various industries implied from the literature are summarised in Table 3.

Table 3 Typical cause of falls from height in various industries

Industry	*Typical causes of falls from height*
Agriculture	• Roofs – through holes, fragile materials or roof lights • Trees
Construction	• Excavations • Ladders • Roofs – during erection • Roofs – through holes, fragile materials or roof lights • Scaffolding – collapse of • Scaffolding – falls from
Extraction and utility supply	• Excavations • Lattice towers / pylons
Manufacturing	• Forklift – from forks or working platform • Ladders • Lorries • Machinery / plant • Warehouse racking
Services	• Window cleaning • Lorries during loading or unloading

The accident profile and risk control measures within a specific industry sector are likely to be a function of the methods of operation within that sector. For instance, some industries will require work at height throughout the life of a process whereas in others the need for work at height is likely to be transitory. Typical issues that are likely to influence various industries are identified in Table 4.

Table 4 Issues that may influence falls from height in various industries

Industry	*Issues relating to method of operation*
Agriculture	• Roofs – temporary access during construction • Roofs - periodic maintenance and repair during the life of a structure • Tree maintenance – occasional at specific sites • Tree maintenance – regularly on various sites by specific individuals
Construction	• Construction - temporary work at height for various trades during the construction of the works • Maintenance and inspection – temporary working at height • Demolition – temporary working at height
Extraction and utility supply	• Construction of lattice towers / pylons • Periodic access to lattice towers / pylons • Periodic inspection of plant • Regular sampling of products • Regular maintenance of plant
Manufacturing	• Periodic inspection of plant • Regular cleaning • Regular sampling • Regular maintenance of plant • Frequent loading and unloading of vehicles • Frequent access to warehouse racking
Services	• Regular window cleaning • Periodic maintenance

The key issues that can be identified from Table 4 are:

- Is the need to work at height a one-off or is it required during the life of the works.
- What is the frequency of the need to work at height.
- How long is the work at height likely to last.

These issues are likely to influence both the number of accidents expected and the approach to risk control and prevention. If daily access is required to plant for sampling for the life of the plant then it would seem reasonable to design out the need to work at height by allowing sampling from ground level. If this were not practicable then it would seem reasonable to incorporate permanent access from day one. If only temporary access is required for instance to erect a roof then it would seem reasonable to minimise the amount of work required at height and provide the necessary risk control measures for that work that is required at height. Where periodic maintenance is required, permanent access measures or anchorage points for temporary access may be designed in.

2.4 TYPICAL RISK CONTROL AND PREVENTION MEASURES

In order to reduce the risk of falls from height to a level that is as low as is reasonably practicable, risk assessments are required to identify suitable risk control and prevention measures. The following generic measures may be used either in isolation or combination:

- Eliminate the need to work at height at the design stage.
- Design in permanent measures to permit safe work at height.
- Provide temporary access to permit safe work at height.
- Provide global protective equipment in areas where working at height is necessary.
- Provide personal protective equipment to personnel working at height.

In addition to these generic measures other measures include:

- Certification schemes for those regularly working at height.
- Training.
- Providing information and guidance.
- Increasing awareness of the risks of working at height.

A range of guidance documents has been published for a variety of industries in a variety of countries. These document are discussed in detail in Sections 2.5 and 0. The risk control and prevention measures are summarised in Table 5 where it can be seen that the primary emphasis appears to be in terms of the hardware recommended.

Table 5 Typical risk control and prevention measures identified in the literature

Category	*Risk control and prevention measures*
Eliminate the need to work at height at the design stage	• Modify the design to reduce areas where dust and dirt can collect and thus eliminate the need for cleaning at height. • Clean from ground level using jet washers. • Design plant such that checking, sampling and maintenance can be done from ground level. • Design plant to extract dust and fumes effectively rather than deposit them in areas that will need cleaning. • Design for buildability. • Design to minimise manual handling at height. • Design plant and structures so that the erection work can be done at ground level with the unit being craned into its final location.
Design in permanent measures to permit safe work at height.	• Where maintenance has to be done at height design in permanent access. • Design in permanent anchor points for temporary access. • Provide permanent lifelines for vehicle loading and unloading.
Provide temporary access to permit safe work at height.	• Scaffolding. • Roof ladders. • Work platforms and crawler boards. • Secure means of getting on and off a roof. • Inflatable bags and platforms. • Mobile platforms (scissor lifts and cherry pickers).
Provide global protective equipment	• Hole covers. • Inflatable bags. • Safety netting. • Edge protection.
Provide personal protective equipment to personnel working at height.	• Fall arrest systems. • Fall prevention / travel restriction systems. • Harnesses. • Lanyards. • Ropes. • Boatswain's chair.
Other measures	• Use specialists for rope access and abseiling. • Do not work on exposed roofs in bad weather. • Demarcation of safe areas. • Supervision and monitoring. • Plan the tasks and deliveries such that work is carried out in the most logical and safe order. • Plan the construction and / or installation so that the permanent means of access are in place as early as possible. • Communicate hazards. • Issue permits to work to prevent unauthorised access.

2.5 UK PRACTICE

UK practice is defined by a hierarchy of information ranging from regulations that define what must be done to good practice guides that provide suggestions on what should be done. UK practice is defined by the following:

- Regulations
- UK and European Codes and standards
- HSE guidance, approved codes of practice and information
- Industry guidance and good practice

These documents set the framework within which all industries have to work. Each of these is discussed in the following sections in order to demonstrate how UK practice is defined and to provide direction to where further information may be obtained.

2.5.1 Regulations

The basis of health and safety law in the UK is the Health and Safety at Work Act 1974[4] (HASAWA). This sets out the general duties that employers have towards employees and members of the public, and also the duties that employees have to themselves and to each other. This act applies to all work activities.

The role of regulations is described in Reference 5. Regulations are law and approved by Parliament. Regulations may be based on EC Directives. They are usually made under the HASAWA following proposals from the Health and Safety Commission (HSC).

The HASAWA is essentially a goal-setting act. It sets out what must be achieved, but not how it must be done. HSE Guidance and Approved Codes of Practice give advice, but employers are free to take other measures providing that they do what is reasonably practicable. However, there are some risks that are so great, or the risk control measures are so costly, that it would not be appropriate to leave it to the employer's discretion to decide what to do about them. In these situations, regulations identify these risks and set out specific action that must be taken.

The Management of Health and Safety at Work Regulations 1992[(6)] provide more explicit information on what employers are required to do to manage health and safety under HASAWA. These regulations also apply to all work activities.

In addition to these general regulations, regulations have been produced to address particular industries where hazards are particularly high (e.g. construction) or to address particular hazards (e.g. lifting operations and equipment).

The regulations governing safety in UK industry with specific relevance to falls from height are summarised in Table 6.

Table 6 UK Regulations governing safety and relating to falls from height

Regulation	*Comments*
Health and Safety at Work etc Act 1974[4] (HASAWA)	This sets out the general duties that employers have towards employees and members of the public, and also the duties that employees have to themselves and to each other. This act applies to all work activities. These duties are qualified by the principle 'so far as is reasonably practicable'.
Management of Health and Safety at Work Regulations 1999[6] (MHSWR)	The main requirement of relevance is for employers to carry out risk assessments.
Provision and Use of Work Equipment Regulations 1998[7] (PUWER 98)	PUWER 98 applies to all work equipment including lifting equipment. Under PUWER 98 you are required to select suitable work equipment in terms of: • Its construction and design. • Where it is to be used. • The purpose for which it is to be used.
Lifting Operations and Lifting Equipment Regulations 1998[8] (LOLER)	LOLER applies to any equipment that lifts or lowers loads and includes its attachments used for anchoring, fixing or supporting it. For example: • Rope access equipment including anchor points. • Ropes, karabiners, harnesses and strops. • Rigging systems. • Mobile elevating work platforms. • Cranes. The term 'load' includes a person.
Construction (Health, Safety and Welfare) Regulations 1996[9] (CHSWA)	Regulations 6 and 7 have requirements to: • Prevent falls from height by physical precautions or, where this is not possible, provide equipment that will arrest falls. • Ensure that there are physical precautions to prevent falls through fragile materials. • Erect scaffolding, access equipment, harnesses and nets under the supervision of a competent person. • Ensure there are criteria for using ladders.
Workplace (Health, Safety and Welfare) Regulations 1992 (WHSWA)	
Construction (Design and Management) Regulations 1994[10] (CDM)	These regulations require that health and safety is taken into account and managed throughout the whole life cycle of a project i.e. from concept, design, planning, construction, maintenance and repair. The regulations apply to most building and civil engineering works. The CDM regulations require that: • Health and safety plans are prepared for use both before and during the construction phase. • Designers consider foreseeable health and safety risks during construction, cleaning and maintenance of a structure. Where possible hazards should be designed out. If they cannot be designed out then the risks should be minimised and information should be provided about the remaining risks. • Designers should cooperate with Planning Supervisors in communicating any assumptions that they have made on the construction methodology.

Regulation	*Comments*
	• When planning the project the contractor identifies the hazards and assesses the risks risk associated with them.
Temporary Work at a Height Directive[11] (TWAHD)	The Directive sets a hierarchy for the selection of equipment for temporary work at a height and minimum requirements for the use of that equipment. It contains specific requirements on ladders, scaffolding and rope access equipment. Member States have until 19 July 2004 to transpose the Directive into national law and a further, optional 2 year transitional period – until July 2006 – before the new requirements need to come fully into force.

2.5.2 British and European codes and standards

Codes and standards have different roles. Codes of practice tend to be suggested best practice for procedures such as the design of temporary works such as scaffolds and falsework. Standards tend to be mandatory and apply to equipment such as personal protective equipment (PPE). Equipment will generally comply with the requirements of a particular British Standard (BS). Specifications can then include requirements for equipment to comply with a BS. With greater European harmonisation many codes and standards are, or will be, written in conjunction with, and applicable to, other European countries. These codes of practice are known as Eurocodes (EC) whilst standards are known as Euronorms (EN). Codes of practice relevant to falls from height are listed in Table 7. The relevant standards are listed in Table 8. These standards relate primarily to PPE and scaffolding. The comments relating to the current status of these codes and standards are taken from the BSI web site (www.bsi-global.com).

Table 7 UK codes of practice relating to falls from height

Code of practice	*Title*	*Comments*
BS 5973:1993	Code of practice for access and working scaffolds and special scaffold structures in steel.	Current – will be replaced by EN 12811 (see Table 8)
BS 5974:1990	Code of practice for temporarily installed suspended scaffolds and access equipment.	Current
BS 5975:1996	Code of practice for falsework.	Current - work in hand
01/105834 DC	BS 8411. Code of practice for safety nets on construction sites and other works.	Draft for public comment

Table 8 UK and European standards relating to falls from height

Standard	*Title*	*Comments*
Personal protective equipment		
BS EN 341:1993	Personal protective equipment against falls from a height. Descender devices.	Current
BS EN 353-1:1993	Personal protective equipment against falls from a height: guided type fall arresters. Specification for guided type fall arresters on a rigid anchorage line.	Current - work in hand
BS EN 353-2:1993	Personal protective equipment against falls from a height: guided type fall arresters. Specification for guided type fall arresters on a flexible anchorage line.	Current - work in hand
BS EN 354:1993	Personal protective equipment against falls from a height. Lanyards.	Current - work in hand
BS EN 355:1993	Personal protective equipment against falls from a height. Energy absorbers.	Current - work in hand
BS EN 358:2000	Personal protective equipment for work positioning and prevention of falls from a height. Belts for work positioning and restraint and work positioning lanyards.	Current
BS EN 360:1993	Personal protective equipment against falls from a height. Retractable type fall arresters.	Current - work in hand
BS EN 361:1993	Personal protective equipment against falls from a height. Full body harnesses.	Current - work in hand
BS EN 362:1993	Personal protective equipment against falls from a height. Connectors.	Current - work in hand
BS EN 363:1993	Personal protective equipment against falls from a height. Fall arrest systems.	Current - work in hand
BS EN 364:1993	Personal protective equipment against falls from a height. Test methods.	Current
BS EN 365:1993	Personal protective equipment against falls from a height. General requirements for instructions for use and for marking.	Current - work in hand
BS EN 795:1997	Protection against falls from a height. Anchor devices. Requirements and testing.	Current
BS EN 813:1997	Personal protective equipment for prevention of falls from a height. Sit harnesses.	Current
BS EN 1868:1997	Personal protective equipment against falls from a height. List of equivalent terms.	Current
BS EN 1891:1998	Personal protective equipment for the prevention of falls from a height. Low stretch kemmantel ropes.	Current
BS EN 60068-2-32:1993	Environmental testing. Test methods. Test Ed. Free fall.	Current
97/541504 DC	Personal protective equipment for prevention of falls from a height. Work positioning systems. Rope adjustment devices (prEN 12841).	Draft for public comment
97/541830 DC	Personal protective equipment for protection against falls from a height anchorage devices. Single-point.	Draft for public comment

Standard	*Title*	*Comments*
99/566209 DC	Personal protective equipment for protection against falls from a height. Descender devices not complying with BS EN 341.	Draft for public comment
01/560917 DC	BS EN 365. Personal protective equipment and other equipment for protection against falls from a height. General requirements for instructions for use, maintenance, periodical examination, repair, marking and packaging.	Draft for public comment
Scaffo lding		
01/102769 DC	BS 1139-6. Metal scaffolding. Guide for the design of prefabricated tower scaffolds outside the scope of BS 1139-3, but utilizing components from such systems.	Draft for public comment
BS 1139-1.2:1990	Metal scaffolding. Tubes. Specification for aluminium tube.	Current
BS 1139-2.1:1991, EN 74:1988	Metal scaffolding. Couplers. Specification for steel couplers, loose spigots and base-plates for use in working scaffolds and falsework made of steel tubes.	Current
BS 1139-2.2:1991	Metal scaffolding. Couplers. Specification for steel and aluminium couplers, fittings and accessories for use in tubular scaffolding.	Current
BS 1139-3:1994	Metal scaffolding. Specification for prefabricated mobile access and working towers.	Current
BS 1139-4:1982	Metal scaffolding. Specification for prefabricated steel splitheads and trestles.	Current
BS 1139-5:1990, HD 1000:1988	Metal scaffolding. Specification for materials, dimensions, design loads and safety requirements for service and working scaffolds made of prefabricated elements.	Current - work in hand
BS 2482:1981	Specification for timber scaffold boards.	Current
BS EN 39:2001	Loose steel tubes for tube and coupler scaffolds. Technical delivery conditions.	Current
BS EN 846-7:2000	Methods of test for ancillary components for masonry. Determination of shear load capacity and load displacement characteristics of shear ties and slip ties (couplet test for mortar joint connection).	Current
BS EN 1263-1:1997	Safety nets. Safety requirements, test methods.	Current - work in hand
94/714451 DC	Mobile elevating work platforms. Design calculations, stability criteria, construction. Safety, examination and tests (prEN 280).	Draft for public comment
97/102972 DC	prEN 12810-1. Facade scaffolds made of prefabricated elements. Part 1. Product specifications.	Draft for public comment
97/102973 DC	prEN 12810-2. Facade scaffolds made of prefabricated elements. Part 2. Methods of particular design and assessment.	Draft for public comment
97/102974 DC	prEN 12811. Scaffolds. Performance requirements and general design.	Draft for public comment – will replace BS 5973 (see Table 7)

2.5.3 HSE guidance, approved codes of practice and information

The HSE publishes guidance on a range of subjects specific to the health and safety problems in a specific industry or to a particular process used in a number of industries. Reference 5 describes the purposes of guidance as being:

- To interpret the law.
- To help people comply with the law.
- To give technical advice.

Following guidance is not compulsory, and employers are free to take other action. However, if they do follow the guidance they will normally be doing enough to comply with the law.

Reference 5 describes the purpose of Approved Codes of Practice (ACOP) as being:

- To offer practical examples of good practice.
- To give advice on how to comply with the law by providing a guide as to what is reasonably practicable.

Approved Codes of Practice have a special legal status. If an employer is prosecuted for a breach of health and safety law and it can be proven that they have not followed the relevant provisions of the ACOP a court can find them at fault unless they can show that they have complied with the law in some other way.

Guidance and ACOP are often provided in the same document as the regulations that they apply to. Those documents relevant to falls from height are listed in Table 9.

Table 9 HSE Guidance and Approved Codes of Practice relevant to falls from height

Guidance / Approved Code of Practice	*Comments*
Management of health and safety at work – ACOP and Guidance	Provides support to Management of Health and Safety at Work Regulations 1999
Safe use of lifting equipment	Lifting Operations and Lifting Equipment Regulations 1998
Managing construction for health and safety – ACOP and Guidance[10]	Construction (Design and Management) Regulations 1994
Health and safety in construction[12]	This guidance document is primarily aimed at providing technical advice on areas such as: organising the site; construction work (including working at height); and health and safety management and the law.
Health and safety in roof works[13]	Detailed information on roof work.

In addition to the guidance and ACOP documents, HSE also publishes information sheets for various industries including the agriculture, construction, entertainment and food industries. The information sheets generally contain the note: ‘This leaflet contains notes on good practice which are not compulsory but which you may find helpful in considering what you need to do'. Those information sheets relevant to falls from height are listed in Table 10.

Table 10 HSE information sheets relevant to falls from height

HSE Information sheet	*Comments*
AIS 30 - LOLER: How the Regulations apply to Arboriculture[14]	Provides information on: • Avoiding work at height • Mobile work platforms • Rope access.
AIS 32 - Preventing falls from fragile roofs in agriculture[15]	Provides information on: • Which roofs may be fragile • Assessing risks, precautions needed to work on fragile roofs • Fall arrest equipment • Training
CIS 10 – Tower scaffolds[16]	
CIS 49 - General access scaffolds and ladders[17]	Provides information on: • Protecting the public • Safe use of scaffolds • Scaffold inspection • Ladders • Stepladders and trestles • Legal requirements
EIS 6 – Working at heights in the broadcasting and entertainment industries	Provides references to other HSE publications on: • Risk assessment • Precautionary measures for falls and falls from collapsing structures • Temporary access equipment • Scaffolding • Tower scaffolds • Ladders, step ladders and trestles
FIS 30 - Preventing Falls From Height in the food and drink industry[18]	Provides information on preventing falls from height during: • Cleaning • Sampling or checking • Maintenance • Access to warehouse racking

2.5.4 Industry guidance and best practice

In addition to the more formal information published by government and standards organisations, various industry groups and professional institutions also publish information. This information typically falls into the following categories:

- Certification schemes
- Training
- Best practice guides

- Briefing sheets

A variety of sources have been identified, and these are summarised in Table 11.

Table 11 Sources of industry guidance and best practice relevant to falls from height

Organisation	***Guidance / Best practice***	***Comments***
Institution of Civil Engineers (ICE)	• Briefing sheet – Working at height	• Three page sheet highlighting hazards, risks, statistics and mitigation.
Industrial Rope Access Trade Association (IRATA)	• Operates a certification scheme with three levels of rope technician • Techniques are defined • Each site has to have a level 3 supervisor • Publishes annual report on accident statistics • Publication - IRATA Guidelines provide advice and recommendations for safe use of rope access. This publication is compulsory for membership. • Publication – General requirements for certification of personnel engaged in industrial rope access methods • Publication - The international working at height handbook	• HSE provides input to IRATA • IRATA Guidelines are commended by HSE.
National Federation of Roofing Contractors (NFRC)	• Safety in roofing awards	
National Access and Scaffolding Federation (NASC)	• Strict code of conduct backed by disciplinary procedures • Annual membership audit • Publish annual safety report containing comprehensive safety statistics • Training pack (CD, training programme and certificates) • Publication - The use of fall arrest equipment whilst erecting, altering and dismantling scaffolding • Publication - Basic independent tied scaffolding check guide • Publication - Putlog scaffolding check guide	• NASC members account for around 80% of the access and scaffolding work undertaken in the UK. • NASC provides a means of ensuring that its membership adopts best practice by both communication and compliance. • Obtain and provide accident data to establish baseline and allow benchmarking.

2.6 INTERNATIONAL PRACTICE

The section is presented for two reasons: to give a comparison with UK practice; and to highlight where other information, such as guidance or best practice, is available that may be of relevance to the UK.

2.6.1 North America

The US department of Labor Occupational Safety and Health Administration (OSHA) has a section on its web site devoted solely to fall protection (www.osha-slc.gov/SLTC/fallprotection.html). OSHA notes that, each year, falls consistently account for the greatest number of fatalities in the construction industry and are always a major concern in other industries.

OSHA publishes a number of useful documents, all of which are available for free down load from their web site. Those deemed to be most relevant are summarised in Table 12.

Table 12 OSHA publications relevant to falls from height

OSHA document	***Comments***
OSHA Construction Resource Manual[19]	This is a substantial document covering a wide range of safety-related issues in the construction industry in the form of a standard. It brings together the generic requirements and those specific to construction (Part 1926). Subpart M addresses fall protection and covers the following areas: • Scope application and definitions • Duty to have fall protection • Fall protection systems criteria and practices • Training requirements
Fall protection in construction[20]	This document provides an overview of the requirements in the OSHA standard for fall protection and sets down in detail the measures that need to be taken to satisfy the standard. It comments on all of the issues in the standard that relate to falls from height, not just those in subpart M.
Fall protection – It's a snap[21]	This 'Employer information kit' was developed to raise awareness of fall hazards within the construction industry and to comply with the OSHA fall protection standards. The kit is available from an OSHA web page and consists of the following: • Statistics on falls • Costs of accidents • Summaries of OSHA regulations and guides • Guides on scaffolds, ladders and steel erection • 31 case studies
Stairways and ladders[22]	

Information is available from a number of other sources within North America including many of the individual states, other government departments and various societies. A selection of these sources of information is summarised in Table 13.

Table 13 Other North American sources of information relevant to falls from height

Source of information	*Comments*
American Society of Safety Engineers (www.asse.org)	• The society addresses a number of specialist areas including fall protection. • The society publishes: 'Introduction to fall protection' 3rd edition, a 450 page volume.
International Society for Fall Protection (www.isfp.org)	• International membership-based society focussing on all aspects of falls including falls from height.

2.6.2 New Zealand

New Zealand has produced particularly clear and informative guides on working at height. A summary sheet[23] was published in 1998 followed by two guidance documents. These are summarised in Table 14. Practice in New Zealand is largely based on domestic regulations, codes, standards and guides. However, reference is also made to Australian, European and UK codes and standards.

Table 14 Sources of information from New Zealand relevant to falls from height

Source of information	*Comments*
Guidelines for the Prevention of Falls To Meet the Requirements of the Health and Safety in Employment Act 1992 and Regulations 1995[24]	Clear and well-illustrated document. It is applicable to situations where an employee can fall 3m or more. It provides guidance and reference to relevant NZ regulations, codes, standards and guides and is applicable to a wide range of industries. The contents include: • Design and organisational requirements • General safety • Permanent fixed access and platforms • Temporary non-fixed access and platforms • Scaffolding • Mechanical plant for the support of personnel • Safety nets • Safety lines, belts and harnesses • Roped-access systems • Building construction and plant maintenance • Structural steel erection • Roof erection and fixing • Fall prevention in the electricity supply industry • Broadcast and telecommunication structures

Source of information	*Comments*
Working at Height Safety Guide - Best Practice Guidelines for Working at Height – for Residential, Commercial & Civil Construction, and all associated trades[25]	Another clear and well-illustrated guide that provides solutions to the key issues. This is aimed primarily at the construction industry and addresses: • The job ahead • Basic safety when working at height • Safe ladder use • Scaffolding • Mechanical plant for supporting personnel • Working on roofs • Fall protection systems / safety harnesses • Other areas to consider

2.6.3 Australia

The literature located from Australia has a different emphasis to that located from Canada, New Zealand or North America. Instead of the usual emphasis on hardware, the emphasis in the Australian literature appears to be on spotting the hazards, assessing the risks and then acting accordingly. A summary of the documents reviewed is given in Table 15.

Table 15 Sources of information from Australia relevant to falls from height

Source of information	*Comments*
Mine safety matters – Working at height[26]	Six page fold-out leaflet that conveys the message of: 'Spot the hazard'; 'Assess the risk'; and 'Make the changes'. It contains sections on: • The hazard • What can happen • Safe working practices
Working at height - A guide to reducing the risks of injury while working at height[27]	The emphasis is very much on hazard identification and risk assessment, a checklist being provided for these activities. A list of the appropriate legislation and further sources of information. The document contains sections on: • Who is at risk? • How to manage the risks of falls from height • Hazard control sequence • What else do I need to know? • Hazard identification/risk assessment checklist • Where to go for more information and advice The following hierarchy of risk control is recommended in descending order of effectiveness: • Eliminate the hazard • Substitute the hazard – with a safer alternative • Isolate the hazard • Use engineering controls • Use administrative controls • Use personal protective equipment
Code of Practice No. 10 - Safe work on roofs (excluding villa construction)[28] and amendment Code of Practice No. 22[29]	This emphasis in this Code of Practice is more on the hardware and precautions to be taken. The Code of Practice contains sections on: • Design planning

Source of information	*Comments*

	• Builder planning
	• Roof contractor planning
	• Preparation
	• Protection against injury through falling
	  o Safety mesh
	  o The use of scaffolding
	  o Safety nets
	  o Guardrails
	  o Individual fall arrest systems
	  o Prefabrication
	  o Purlin trolleys
	• Access
	• Fragile roofs
	• Asbestos cement removal
	• Training and supervision

Draft Occupational Health and Safety (Prevention of Falls) Regulations 2000[30]	These Regulations apply to a task at a workplace that involves the potential for a person to fall more than 2 metres in any industry. The emphasis is on the employer's duties and the need for hazard identification and risk assessment. The Regulations contain sections on:
	• Identification of tasks and control of risks
	• Hazard identification and risk assessment
	  o Employer's duty to identify tasks involving a fall hazard
	  o Employer's duty to undertake risk assessment
	  o Employer's absolute duty to implement controls in certain circumstances
	• Risk control
	  o Employer's duty to undertake control of risk
	  o Hierarchy of control of risk
	  o Where only administrative controls are used
	  o Employer's duty with respect to control measures selected and used
	  o Control measures to be properly used and maintained
	  o Employer's duty when plant or equipment is used to control risk
	  o Emergency procedures
	• Additional requirements relating to the use of ladders
	• Selection and maintenance of ladders
	• Safe use of ladders
	• Consultation

Code of Practice -Prevention of Falls at Workplaces[31]	This Code of Practice combines the hazard identification and risk assessment approach with information on hardware issues. The Code of Practice contains sections on:
	• General principles for managing the prevention of falls in workplaces
	  o Legislative framework in Western Australia
	  o The meaning of practicable
	  o Access to act, regulations and other relevant documents
	  o The general duties - an overview
	  o Hazard identification, risk assessment and risk control
	• Design and planning

Source of information	*Comments*

	• Access to and egress from work stations
	• Possible means of reducing the risk
	  o Edge protection
	  o Building maintenance units
	  o Scaffolding
	  o Other types of working platforms
	  o Fall arrest systems and devices
	  o Ladders
	  o Training
	  o Supervision
	  o Assistance of another person
	  o Other means
	• Inspection of fall-arrest systems and devices
	• Inspection of anchorages
	• Protection at holes and openings
	• Protection at edges
	• Working on or from fragile material
	• Safety mesh
	• Safety nets
	• Emergency evacuation procedure

2.6.4 Discussion

The issues addressed in the international literature appear to be very similar to those addressed in UK practice, in particular:

- The information appears to be very construction-oriented.
- Falls from roofs appear to be the predominant focus.
- Whilst hazard identification and risk assessments are considered, the emphasis is very much on the hardware and precautions except in the Australian literature.
- The generic risk control measures suggested are very similar i.e. edge protection, roof ladders, mobile platforms and PPE.

The quality of the information is very high, with some good examples of clear and well thought out documents. Despite the quality of individual documents, the means of communicating the information tended to be piecemeal. In most cases several separate documents are required to convey an integrated picture of hazard identification, risk assessment, risk control measures and legislation. Perhaps the best example of an integrated approach applicable to most industries is the Code of Practice for Prevention of Falls at Workplaces[31] produced by the Government of Western Australia.

Whilst the UK and other countries have produced information recommending risk control measures, there appears to be little information available on accident causation, comparisons between various industries or why particular risk control measures are recommended. Various countries appear to have reached similar conclusions on risk control measures. Without having this understanding of the underlying problems, it is difficult to make judgements on the effectiveness of particular risk control measures.

3. SOURCES OF ACCIDENT DATA

3.1 INTRODUCTION

This section contains descriptions of the three main sources of data on accidents and injuries. The primary official source of accident data is that reported under the RIDDOR system (discussed in Section 3.2). Industry bodies such as NASC and IRATA also collect accident data from their members. These data are discussed in Sections 3.3 and 3.4.

3.2 RIDDOR REPORTING

3.2.1 Introduction

HSE collect data from accident reports which are required under the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations, 1995 (RIDDOR 95). These Regulations define incidents in the workplace which must be reported by law. Data are gathered from a number of fields including activity at time of accident, time of accident and age of injured person.

RIDDOR 95 is intended to consolidate and simplify the law by applying a single set of accident reporting requirements to all work activities in Great Britain. The main purpose of the Regulations is to generate reports to the Health and Safety Executive (HSE) and to local authorities. The reports provide data which can be used to indicate where and how risks arise and to show up any trends. This allows the enforcing authorities to target their activities and to advise employers on strategies to help prevent injuries, ill health and accidental loss.

Reporting of the fatal, major or minor (over three days off work) injury accidents to workers associated with workplace activities is a statutory requirement of the RIDDOR regulations. This section provides a brief overview of the RIDDOR data as collected by HSE and subsequently processed and analysed by BOMEL. For definitive information see References 32 and/or 33.

In the period 1996/7 to 2000/01 to which the current project activity relates, RIDDOR forms, once completed, were sent to the local HSE offices where the information on them was coded with reference to the FOCUS manual[(34)], and entered into the central HSE FOCUS database by trained clerical staff. As of April 2001, a central Incident Contact Centre (ICC) has been established where dedicated staff also deal with telephone notifications, as well as coding and entry of all RIDDOR report forms.

Fatal, major and over 3-day injury accident records from FOCUS were supplied to BOMEL in separate files for each of the five years 1996/97 to 2000/01, together with 'look-up' tables cross-correlating the FOCUS codes to short and long descriptions as contained in the FOCUS Manual[(34)].

The FOCUS coding system uses the standard industry classification (SIC) coding system in order to classify the industry and sector that an injured person was working in. Table 16 summarises the industries included within each of the sectors.

Table 16 Industries included on the SIC definitions

Sector	***Industries included in sector***
Agriculture, hunting, forestry and fishing	• Agriculture • Forestry and logging related activities • Fishing
Construction	• Demolition • Construction • Highways
Extractive and utility supply	• Mining and quarrying of energy producing materials • Other mining and quarrying e.g. limestone, slate and gravel • Electricity supply • Gas supply • Water supply
Manufacturing	• Food products, beverages and tobacco • Textiles • Leather • Wood • Pulp, paper and printing • Coke, refined petroleum products and nuclear fuel • Chemicals, chemical products and man-made fibres • Rubber and plastic products • Non-metallic mineral products • Basic and fabricated metal products • Other machinery and equipment • Electrical and optical equipment • Transport equipment
Total services	• Wholesale • Retail • Sale and repair of motor vehicles • Hotels and restaurants • Transport, storage and communication (land, air, water and post) • Financial • Real estate and renting • Other businesses (accountancy, legal, consultancy etc.) • Public administration and defence (fire, police) • Education • Health and social work • Other services

3.2.2 BOMEL RIDDOR database

The RIDDOR data as supplied by HSE was processed by BOMEL using the following steps in accordance with Reference 35:

- The raw accident data as received from HSE was imported into a Microsoft Access database.

- The data was validated and anomalies were resolved in conjunction with HSE SASD.

- Analysis of the accident data was carried out using Excel spreadsheet Pivot Tables and Charts.

Figure 2 shows the layout of the BOMEL RIDDOR database. There are three main tables in the database, containing the information on:

- Accidents / Injuries.

- Investigations.

- Reports.

The primary table used for this study is the Accidents / Injuries table. The data contained in this table are summarised in Table 17. The tables contain the numerical FOCUS codes rather than the text descriptions. The associated look-up tables shown in Figure 2 provide access to these textual descriptions as required for meaningful analyses.

It is important to note that inv_no (investigation number) is the field linking the principal tables. Furthermore the term 'event' is misleading in that each person injured constitutes an 'event' even when there are multiple injuries resulting from an accident.

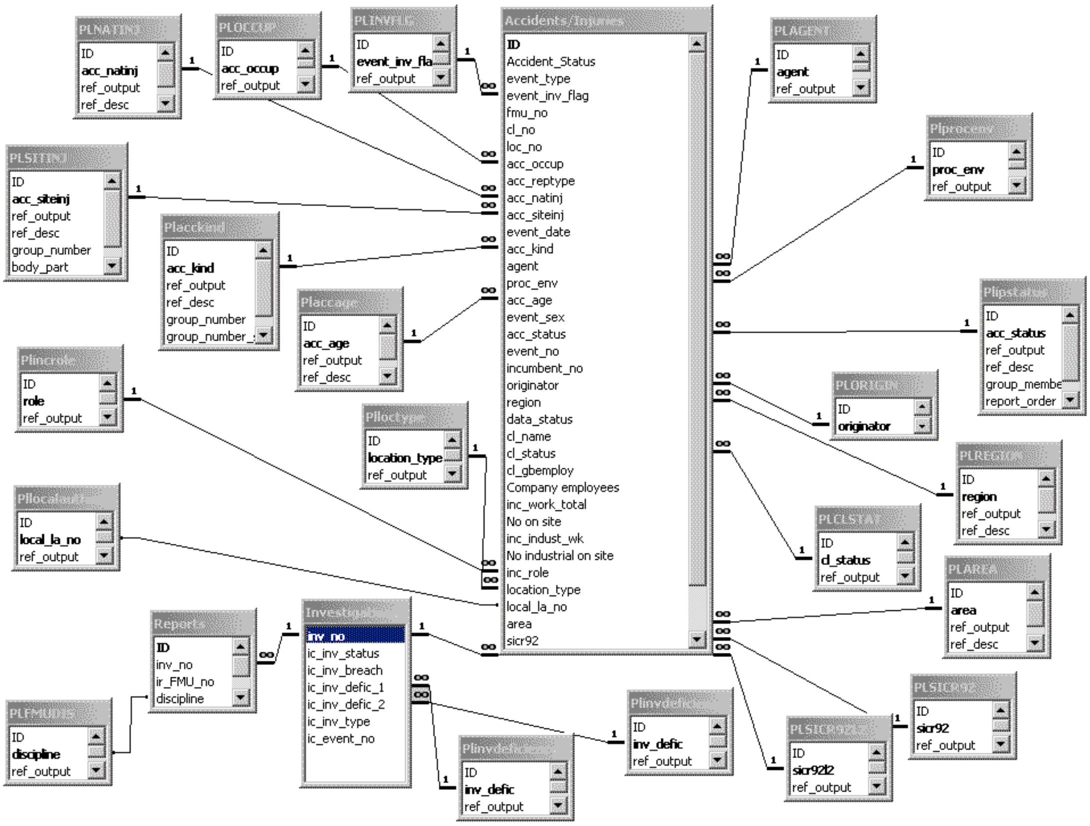

Figure 2 Data table relationships in the BOMEL RIDDOR database

Table 17 Accident / injuries table

Name	*Description*
ID	Unique System ID for this entry
Accident_Status	F=Fatality, M=Major, O=Over 3-days
event_type	Type of event e.g. A for accident
event_inv_flag	Flag to indicate if investigation required
fmu_no	Field management unit enforcing in HSE office
cl_no	Client identification number
loc_no	Location identification number
acc_occup	Occupation of injured person
acc_reptype	Accident report type e.g. fatal, major, over 3-days
acc_natinj	Nature of injury e.g. fracture, burn
acc_siteinj	Site on body of injury e.g. back, leg
event_date	Date of accident
acc_kind	Kind of accident e.g. slip, fall, drown
agent	Agent associated with the kind e.g. ladder, fragile roof etc.

Name	*Description*
proc_env	Work process taking place at time of accident
acc_age	Age of injured person
event_sex	Gender
acc_status	Employment status of injured person e.g. employee
event_no	Serial number of the accident
incumbent_no	Incumbent (client at location) identification number
originator	HSE Directorate/Divison or local authority identification field
region	HSE region (7 regions)
data_status	Year in which the accident occurred
cl_name	Name of client
cl_status	Status of the client e.g. private company, NHS
cl_gbemploy	Number employed by client in GB
inc_work_total	Number employed by client at particular location
inc_indust_wk	Number of industrial workers employed by client at location
inc_role	Role of the client at location e.g. designer, landlord
location_type	Type of location e.g. fixed, quarry, roadside
local_la_no	Local authority identification number
area	HSE area office (old type areas 1-21 exc 4)
sicr92	Industry classification
sic92l2	Industry Classification Group e.g. Agriculture, Construction, Extractive/Utilities, Manufacturing or Services
loc_la_name	Name of local authority
inv_no	Investigation number
casualty_name	Name of the injured party

3.2.3 Robustness of the RIDDOR data

Table 18 gives an indication of the potential robustness of the RIDDOR data as incorporated into the FOCUS database. Only the fields of interest to determine the nature of accidents occurring and / or for which a link with causation factors may be found are considered in Table 18. A preliminary and qualitative categorisation of robustness which sets out robustness criteria has been made. Each of the principal fields of interest has been assigned one of these categories.

Those fields marked with an asterisk in Table 18 are not completed in the FOCUS database when the reports are received via Local Authorities (LA). It is notable that the robustness of these data fields is questioned in Table 18 anyway, because of the degree of interpretation involved. The LA records where these data are absent comprise 5.4% of the fatalities in the database supplied and 18.3% of the major injury accidents. This is unfortunate as the Agent and Process environment (work process) provide two of the key parameters for understanding accident causation i.e. what work was the injured person doing, and what agent was involved in the accident (e.g. dumper, ladder etc.). These fields are shown as ‘Blank’ in the subsequent analyses.

In the cases where HSE investigates specific incidents, additional information is entered by Inspectors to record any breaches of legislation and up to two deficiencies are identified. For each investigation a number of reports may be entered by different HSE Inspectors and each report record comprises a report summary and an indicator for the Inspector’s discipline. It is considered that the data are robust as the categorisation is assigned and entered directly by trained Inspectors on the basis of their investigations. However, the data are limited to non LA-reportable incidents and of the HSE enforced incidents, only those that were investigated have report data.

Table 18 Indication of the robustness of FOCUS data

Category	*Criteria*	*FOCUS Fields*	*Justification*
1. Robust	Definitive data transposed	ACC_AGE EVENT_SEX ACC_REPTYPE ACC_KIND REGION	Clear to person completing form and direct use by data entry person
2. Reasonable	Some subjectivity in description and / or reliant on interpretation / selection by HSE	EVENT_DATE DATA_STATUS	Generally as 1. except for LA data in 1996/7 and 1997/8 where data are entered dated 1st of month. Unclear whether date relates to month of accident or entry in month following.
		SICR92	Selection from 645 categories - whilst specific selection may be debatable sector and subsector categories may be more robust
		ACC_STATUS	Subject to ambiguity in user completion / understanding of status
		ACC_NATINJ	Selection from 16 categories against which description may not correlate
		ACC_SITEINJ	Selection from 22 categories against which description may not correlate
		ACC_OCCUP *	Selection from 206 categories against which description may not correlate
		CL_STATUS *	Inferred from Client name and put in one of 8 categories
3. Doubtful	Reliant on free format information which may / may not be	AGENT *	May / may not be mentioned in description – 611 categories
		PROC_ENV *	Ditto – 540 categories

Category	*Criteria*	*FOCUS Fields*	*Justification*
	provided and interpretation / selection by HSE	LOC_TYPE *	Ditto – 8 categories
4. Unreliable	Unclear provenance of data with gaps and anomalies	CL_GBEMPLOY * INC_WORKTOTAL * INC_INDUST_WK *	Frequently zero, source unclear, anomalies of one field relative to others

* Fields absent in accident records reportable to LAUs

3.3 NATIONAL ACCESS AND SCAFFOLDING CONFEDERATION

The National Access and Scaffolding Confederation publish annual safety reports[36, 37] based on returns from their membership. These reports provide full details for the current year, summary data for all accidents for the preceding years back to 1975, and summary data for falls back to 1991. Unfortunately, all of the falls-related accidents are grouped together for the preceding years making it impossible to distinguish between fatal, major, over 3-day and other accidents. The total number of falls each year as reported by NASC members is shown in Figure 3 expressed as a rate in terms of the number of accidents per 100,000 workers. This shows an impressive five-fold reduction in the accident rate between 1991 and 2000.

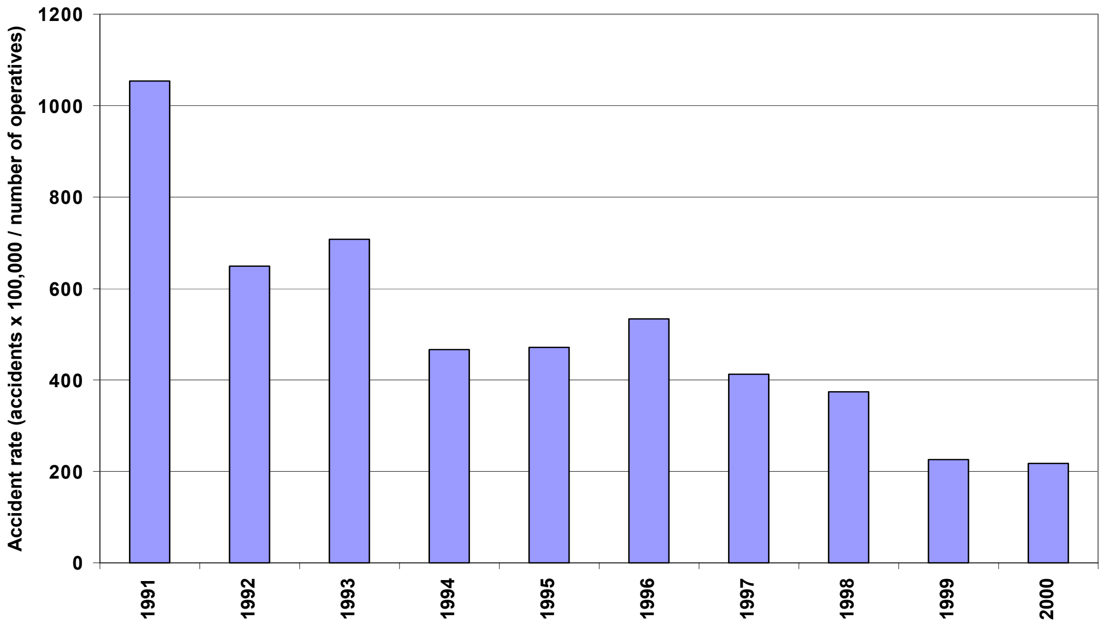

Figure 3 The variation in accident rate with time for NASC member companies

A comparison of the NASC accident rate with both industry overall, and the construction industry in particular, is shown in Table 19. Direct comparisons are not really possible as data would be needed for non-NASC workers carrying out the same tasks (and facing the same hazards) and such data is not available. What Table 19 does potentially indicate, is the hazardous nature of the conditions faced by NASC workers in comparison to other industries.

Table 19 Comparison of accident rates for falls in various industries

Fall accident injury		*NASC 2000*	*UK Industry 1999/2000*	*Construction 2000*
	Number of workers	10,779	27,542,500	1,962,500
Fatal	Number	1	68	42
	Rate per 100,000	9.3	0.3	2.1
Major	Number	18	5708	1779
	Rate per 100,000	167	21	91
Over 3-day	Number	37	8986	1495
	Rate per 100,000	343	33	76

Note: The UK and construction industry accident data are those reported under the RIDDOR system.

The main agents involved in falls involving workers from NASC member companies are shown in Figure 4. For the few falls that occurred, the primary agents appear to be scaffolding and working platforms (including gangways and trestles). ‘Other’ agents (including falls from walls, roofs, ropes and lorries) account for around 20 accidents a year, whilst ladders account for less than 10 accidents each year. The main problem appears to be when working off of a platform or scaffold.

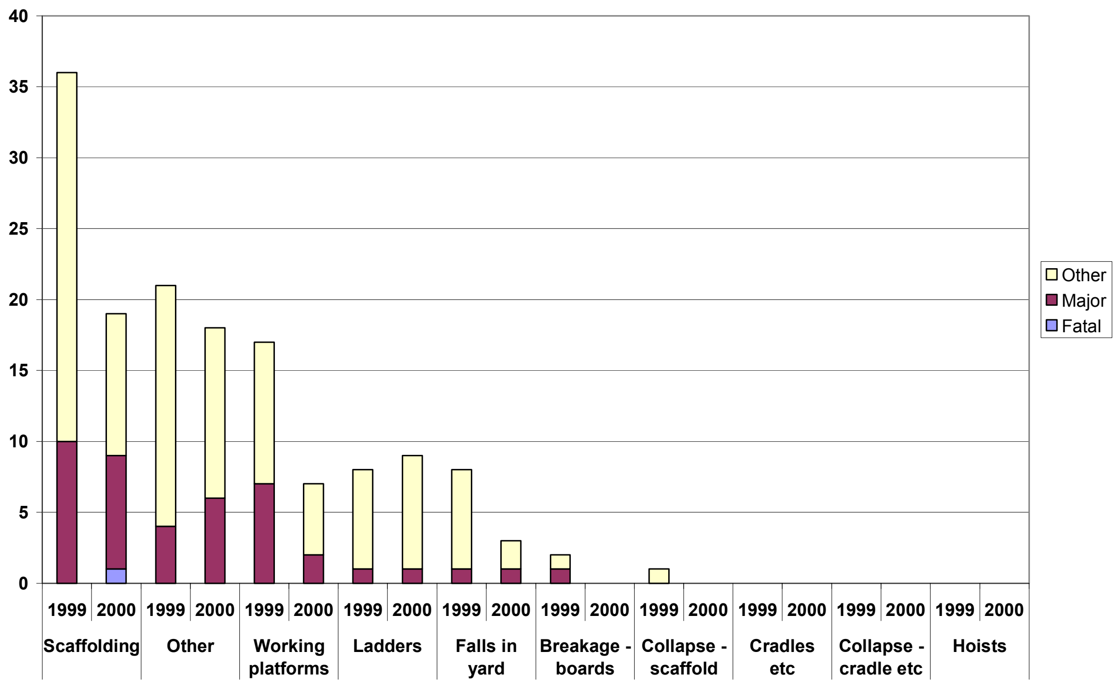

Figure 4 Summary of the agents involved in falls involving workers from NASC member companies in 1999 and 2000

3.4 INDUSTRIAL ROPE ACCESS TRADE ASSOCIATION

The Industrial Rope Access Trade Association (IRATA) also produce annual reports on accident statistics[38, 39, 40]. The IRATA reports also contain historical accident data going back to 1989. These data are shown in Figure 5 for accidents and incidents occurring whilst working on ropes, where it can be seen that only 1 major-injury accident and 24 over 3-day injury accidents occurred to IRATA members. These figures are particularly low, and whilst the number of incidents and accidents has increased in later years, the rate has been reported to remain similar due to the increased umber of hours worked on ropes.

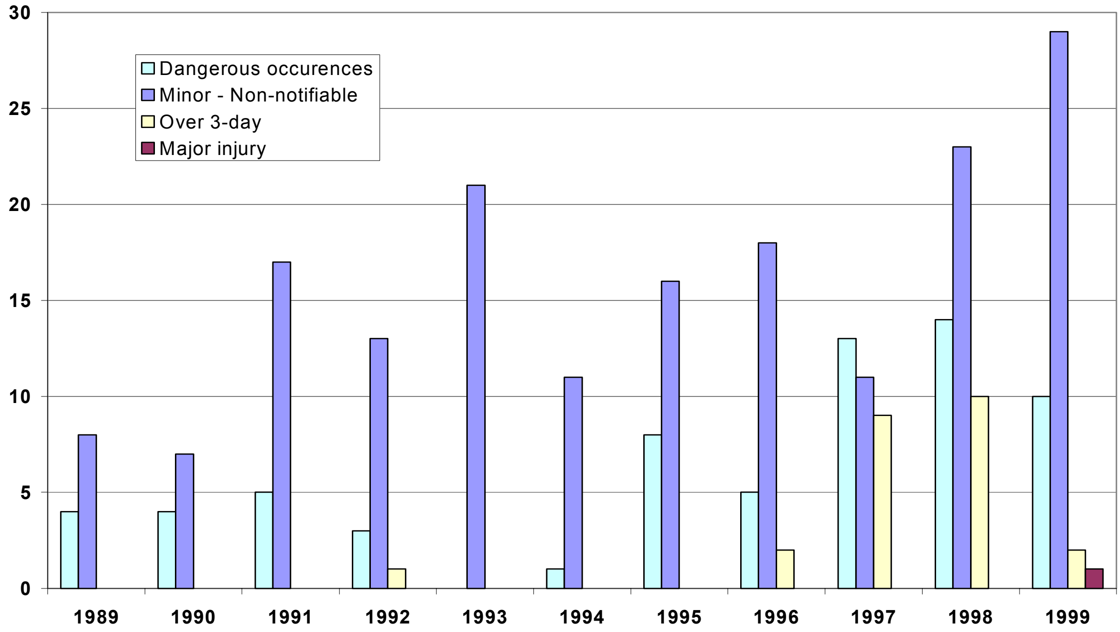

Figure 5 Accidents and incidents involving IRATA members working on ropes between 1989 and 1999

It should be pointed out that not all of the accidents and incidents shown in Figure 5 involved falls from height, although all occurred whilst working at height. In order to get an indication of what proportion of these accidents involved falls, the detailed accident data from 1997 to 1999 have been plotted in Figure 6. This shows that falls (or slips) form a relatively small proportion of the overall number of accidents or incidents, with the surrounding environment providing greater risk of an accident.

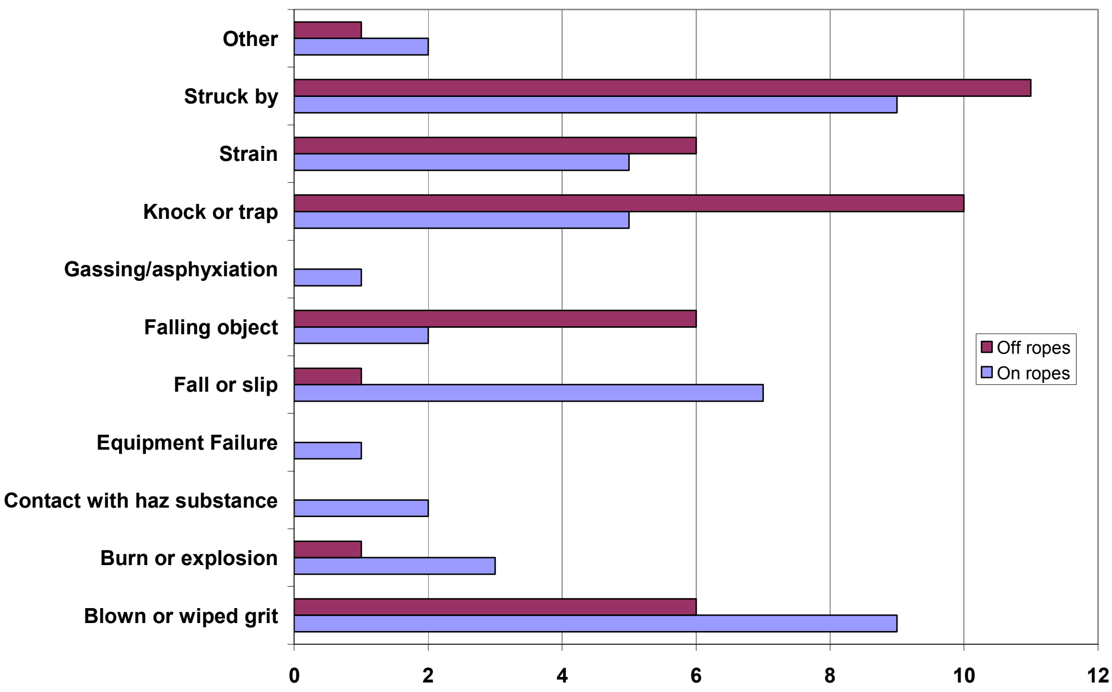

Figure 6 Summary of accidents and incidents involving IRATA members between 1997 and 1999

4. ACCIDENT RATES FOR FALLS FROM HEIGHT

4.1 INTRODUCTION

Using the RIDDOR data, the frequency of different types of accidents over a given period of time can be derived in order to measure the level of accidents during that time. If this information is combined with associated population data conclusions can be drawn about accident rates in relation to the number of people exposed to the risk. This allows assessment of the relative risk of an accident in comparison to the absolute number of accidents and enables the comparison of risk between different groups.

Accident rates are calculated by dividing the number of accidents in a period by the number of people at risk during the same period and multiplying by a number in order to normalise the results. It is HSE practice to express the accident rate as the number of people per 100,000 and this has been adopted in the current study. Accident rates can help to show whether or not an increase or decrease in the absolute number of accidents is significant for a given population. A baseline can be established from which performance can be measured. Targets for accident reduction can be set and performance can be measured against the baseline to evaluate the success of accident prevention strategies.

For assessing the relative risks of falling from height, population data are available according to industry sector for employed and self employed workers. This comes from the Labour Force Survey (LFS) carried out by the Office for National Statistics (ONS) which involves a sample survey carried out by interviewing people about their personal circumstances and work. Details of labour force characteristics are collected from around 120,000 people aged 16 and over living at some 61,000 private addresses. The quarterly population data for each of the relevant years have been downloaded from the ONS web site (www.statisitics.gov.uk).

The industry sectors used in the LFS data are agriculture and fishing, energy and water, manufacturing, construction and services. These categories are based on the Standard Industrial Classification (SIC) also used by HSE to categorise RIDDOR data and so accident rates for all workers in these industries can be calculated. Rates can also be compared between employed and self employed workers in each industry except for energy and water where the sample size is too small for a reliable estimate (see Section 5). The average population from adjacent LFS calendar years was used in the calculation of rates since the HSE reporting year runs from April to March (i.e. the average LFS population for 1996 and 1997 was used to calculate accident rates for HSE year 1996/1997).

The next section presents the number and rate of falls from height for each industry sector according to whether they are high or low falls and whether they result in fatalities or major injuries. In each chart the number of accidents is represented by the histogram with the scale on the left hand axis and the rate is represented by the line plot with the scale on the right hand axis.

4.2 ALL FALLS FROM HEIGHT

The number and rate of all fatal falls from height by industry sector is shown in Figure 7 with a full breakdown in Table 20. It can be seen that the vast majority of these accidents are in construction which consistently accounts for around 50 to 60% of all falls from height which lead to fatalities. The next highest number occurs in the service industries averaging about 20% of fatal falls across the years.

The highest rates of fatal falls from height are found in construction and agriculture. Construction has the highest rate in more years but the rate in agriculture is a little higher in 1998/99 and 2000/01 despite the relatively low number of accidents in this sector. Although services generally account for the second highest number of fatal falls from height, the rate in this sector is very low and is consistently the lowest of all sectors. Indeed, in 2000/01 the rates in services, manufacturing and extraction/utilities are all extremely low and are at their lowest over the period (there were no fatalities in extraction/utility supplies).

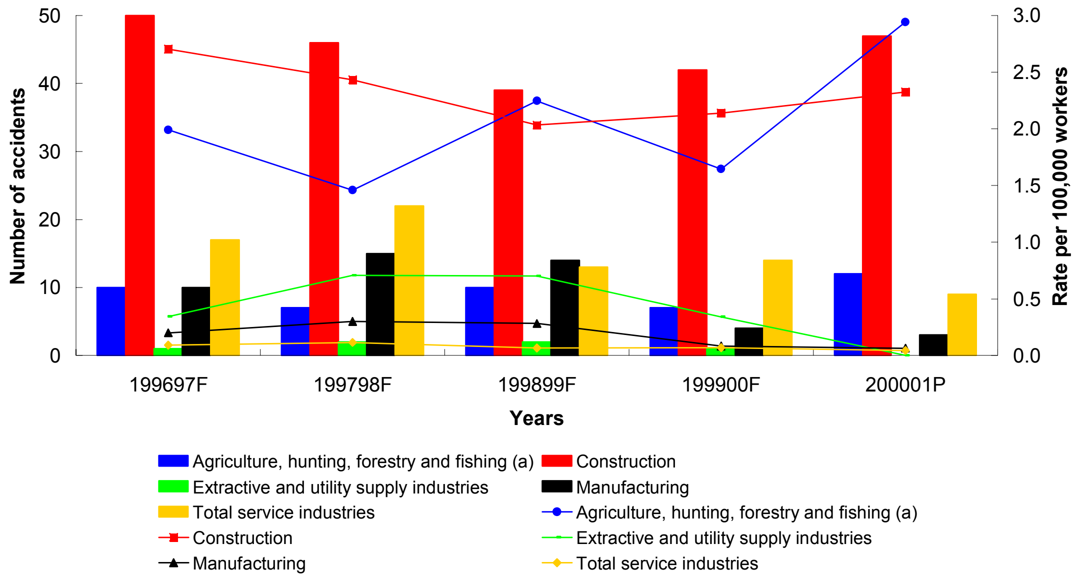

Figure 7 Number and rate of all fatal injury falls by industry sector

Table 20 Number (rate per 100,000 workers) of fatal falls by industry sector

Industry Sector	*1996/97F*		*1997/98F*		*1998/99F*		*1999/00F*		*2000/01P*	
Agriculture, hunting, forestry and fishing	10	(1.99)	7	(1.46)	10	(2.25)	7	(1.65)	12	(2.94)
Construction	50	(2.70)	46	(2.43)	39	(2.03)	42	(2.14)	47	(2.33)
Extractive and utility supply industries	1	(0.34)	2	(0.71)	2	(0.70)	1	(0.34)	0	(0)
Manufacturing	10	(0.20)	15	(0.30)	14	(0.28)	4	(0.08)	3	(0.06)
Total service industries	17	(0.09)	22	(0.11)	13	(0.07)	14	(0.07)	9	(0.04)
Total number	88		92		78		68		71	

Figure 8 shows the number and rate of all fall from height accidents leading to major injuries as defined by RIDDOR with a full breakdown in Table 21. Figure 8 shows that the greatest number of falls from height leading to major injury accidents are related to services which accounts for about 45% of these accidents every year. The percentage of major injury falls attributable to each sector remains fairly constant across the years. About 30% of major injury falls are in construction followed by around 20% in manufacturing. However, as with fatalities, when rates are considered, construction presents the highest risk and services the lowest. In construction the rate is around 90 workers in every 100,000 which is approaching 1 in every 1000 construction workers having a reported major injury fall. Agriculture has the second highest rate despite only contributing about 3% of the total number of major injury falls every year.

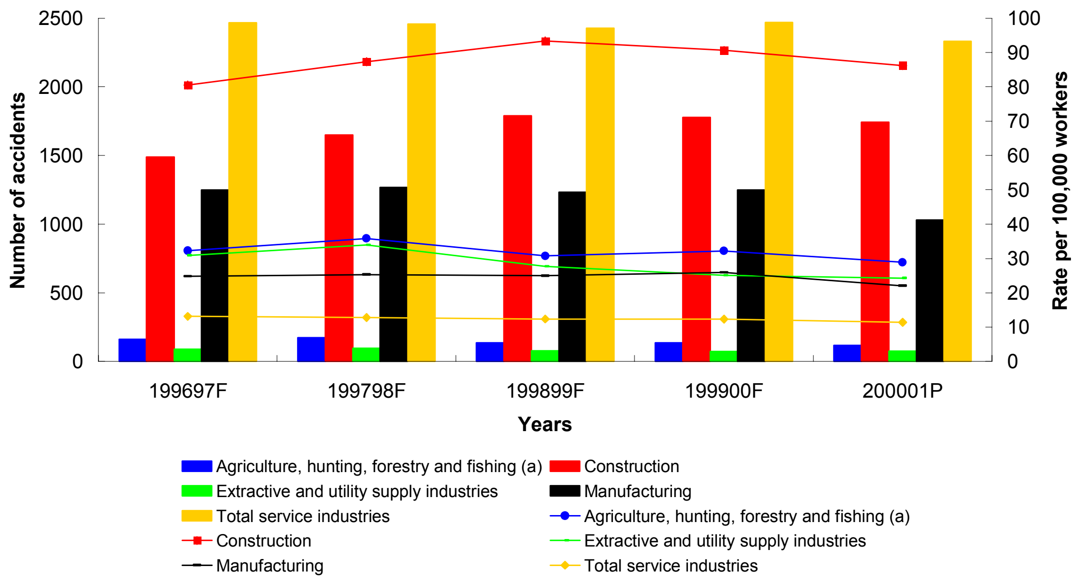

Figure 8 Number and rate of all major injury falls by industry sector

Table 21 Number (rate per 100,000 workers) of major injury falls by industry sector

Industry Sector	*199697F*	*199798F*	*199899F*	*199900F*	*200001P*
Agriculture, hunting, forestry and fishing	162 (32.2)	172 (35.8)	137 (30.8)	137 (32.2)	118 (28.9)
Construction	1489 (80.5)	1651 (87.3)	1791 (93.4)	1779 (90.6)	1742 (86.2)
Extractive and utility supply industries	90 (30.9)	96 (33.9)	79 (27.7)	74 (25.1)	75 (24.3)
Manufacturing	1249 (24.8)	1269 (25.3)	1234 (24.9)	1249 (26.0)	1030 (22.1)
Total service industries	2467 (13.1)	2459 (12.8)	2428 (12.4)	2469 (12.3)	2333 (11.4)
Total number	5457	5647	5669	5708	5298

Figure 9 shows the number and rate of all fall from height accidents leading to over 3-day injuries as defined by RIDDOR with a full breakdown in Table 22.

Figure 9 shows that whilst construction only has the third highest number of falls accidents leading to over 3-day injury, it has by far the highest rate. The services industries have the highest number of falls leading to over 3-day injuries, but the lowest rate due to the large number of workers in the sector. The manufacturing industries have a similar number of over 3-day falls to construction, but manufacturing has about half the rate. Agriculture has a similar rate to manufacturing.

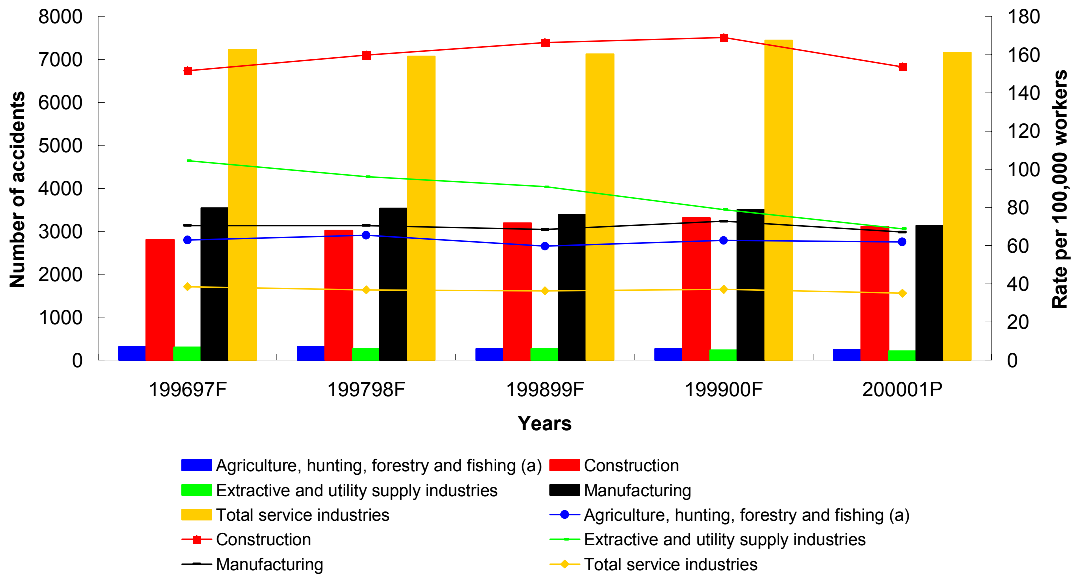

Figure 9 Number and rate of all over 3-day injury falls by industry sector

Table 22 Number (rate per 100,000 workers) of over 3-day injury falls by industry sector

Industry Sector	*199697F*	*199798F*	*199899F*	*199900F*	*200001P*
Agriculture, hunting, forestry and fishing	316 (62.9)	314 (65.4)	266 (59.8)	267 (62.7)	253 (62.0)
Construction	2805 (151.7)	3023 (160)	3191 (166)	3316 (169)	3107 (153.7)
Extractive and utility supply industries	304 (104.5)	272 (96.1)	259 (90.9)	233 (79.0)	213 (68.9)
Manufacturing	3548 (70.5)	3535 (70.6)	3385 (68.4)	3503 (72.8)	3133 (67.1)
Total service industries	7233 (38.5)	7075 (36.8)	7128 (36.4)	7443 (37.1)	7163 (35.0)
Total number	14206	14219	14229	14762	13869

4.3 HIGH LEVEL FALLS

The number and rate of high fatal falls (>2m) is shown in Figure 10. This graph is similar to the one for all fatal falls (Figure 7) since nearly all fatalities result from a high as opposed to a low fall. As such, the construction sector has the highest number and rate of fatal high falls. One difference of note is that when fatal low falls are not considered, the rate in agriculture reduces slightly and only exceeds construction in 1998/99.

The number of fatal falls from height in agriculture is relatively low compared with other sectors (excluding extractive and utility supply industries). However, these accidents turn out to be significant due to the relatively small number of people who work in agriculture.

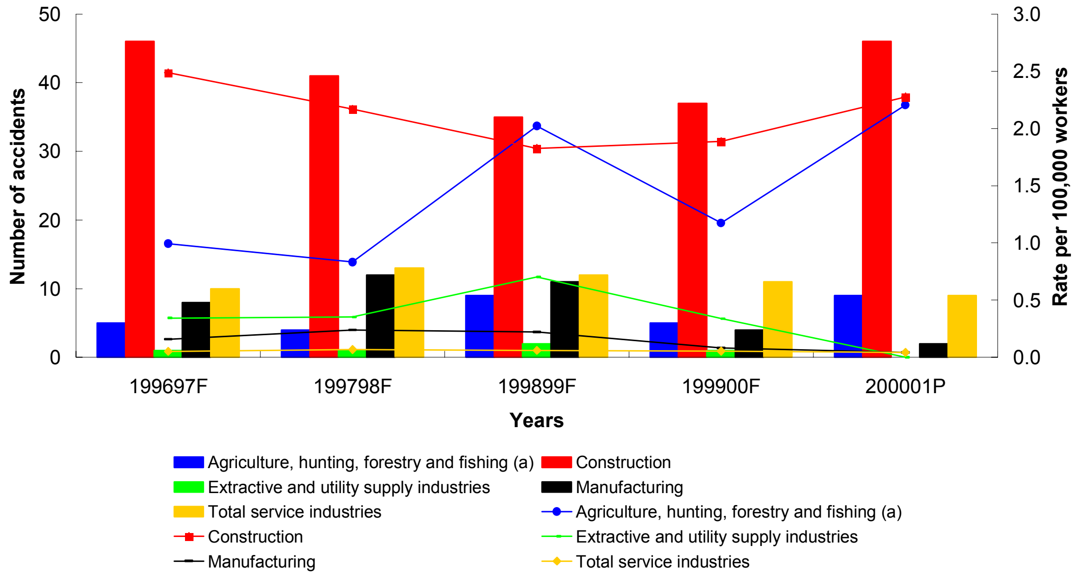

Figure 10 Number and rate of fatal injury high-level falls by industry sector

When major injury falls are split into high and low fall accidents it is seen that the majority of high major injury falls are in construction whereas low major injury falls occur most in services. Figure 11 shows that the construction sector typically accounts for around half of all high major injury falls and also has the highest rate of these accidents by a considerable margin. Services have the second highest number of high major injury falls with an average of 27% of the total every year but again this sector has the lowest rate. The agriculture sector has a relatively low number of these accidents but the second highest rate.

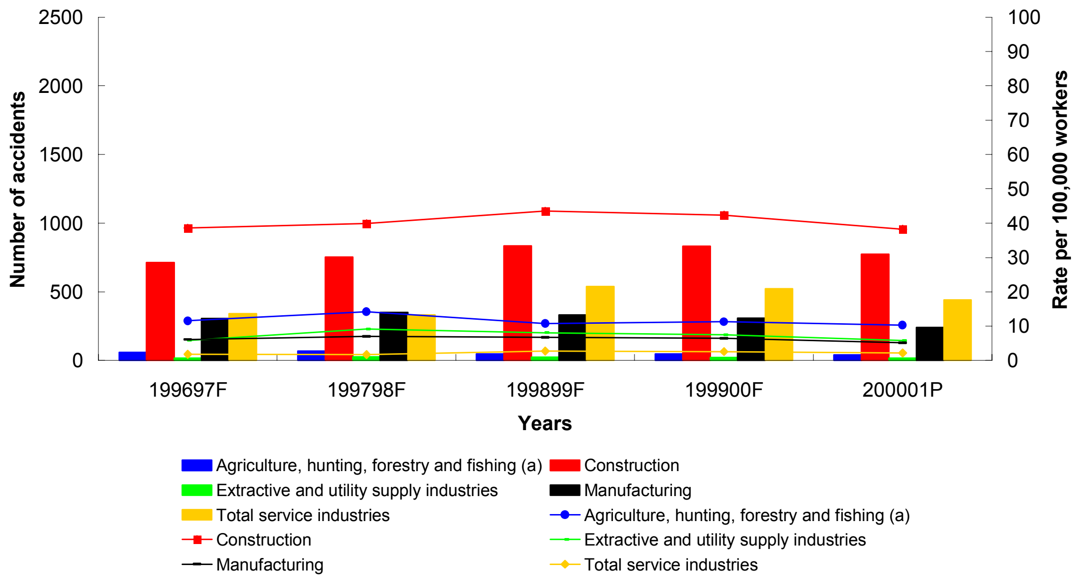

Figure 11 Number and rate of major injury high-level falls by industry sector

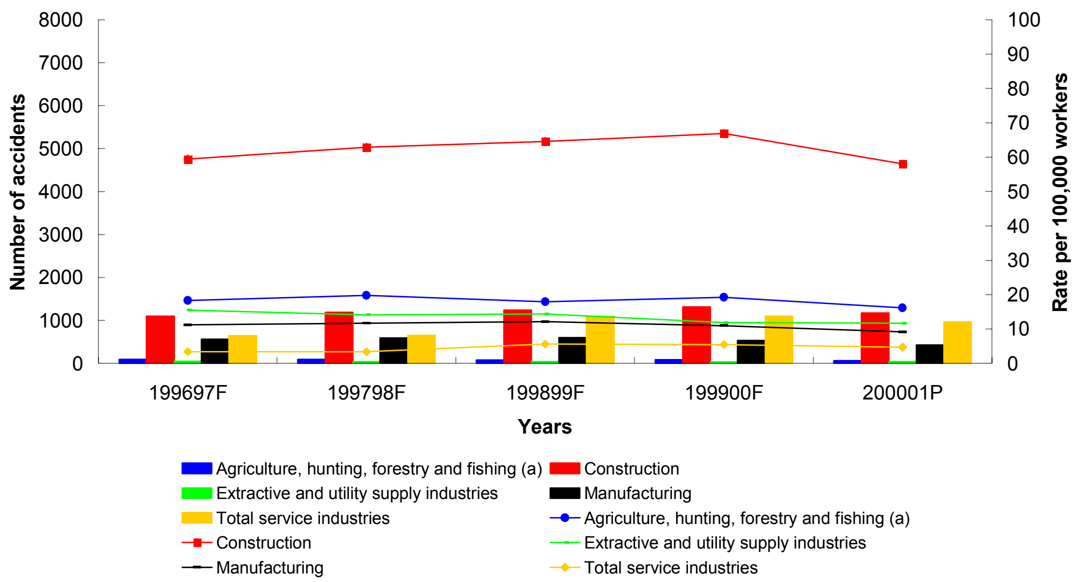

Figure 12 Number and rate of over 3-day injury high-level falls by industry sector

4.4 LOW LEVEL FALLS

Figure 13 shows the number and rate of fatal low falls (<2m) by sector (and plotted to the same scale as the figures for all and high falls). The number of these accidents is relatively low with typically only one to three fatalities in each sector per year. Most low fall fatalities have occurred in agriculture which also has the highest rate for these accidents.

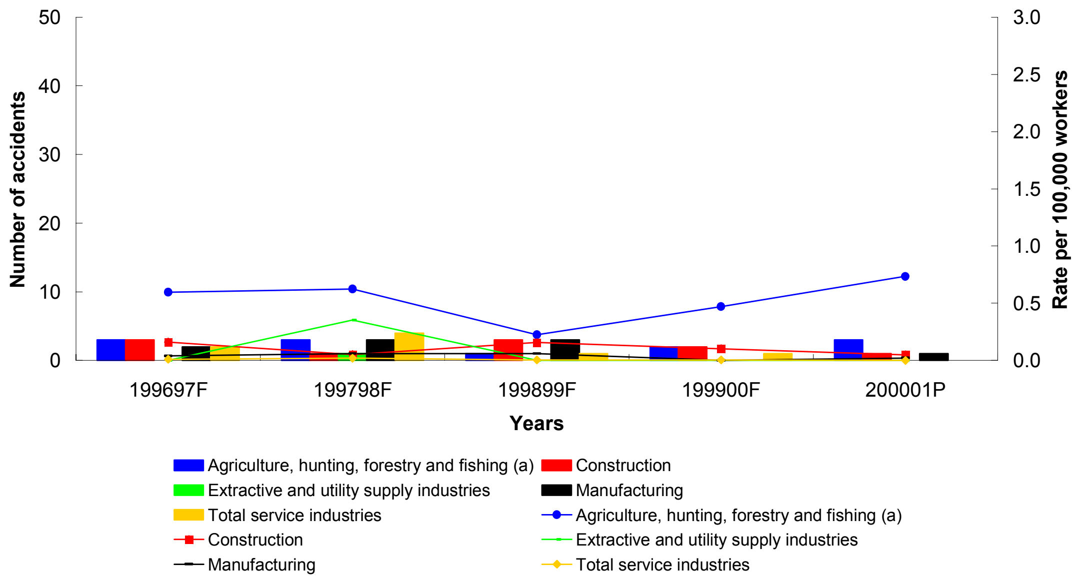

Figure 13 Number and rate of fatal injury low-level falls by industry sector

Figure 14 shows that the service industries account for between 40 and 50% of all major injury low-level falls every year with construction and manufacturing each providing around 20% of the total. The highest rate of these accidents remains within construction by a clear margin. Services, again, show the lowest rate with the rates for manufacturing, agriculture and extraction/supplies around the same level even though the numbers in the latter two sectors are relatively small compared to the former.

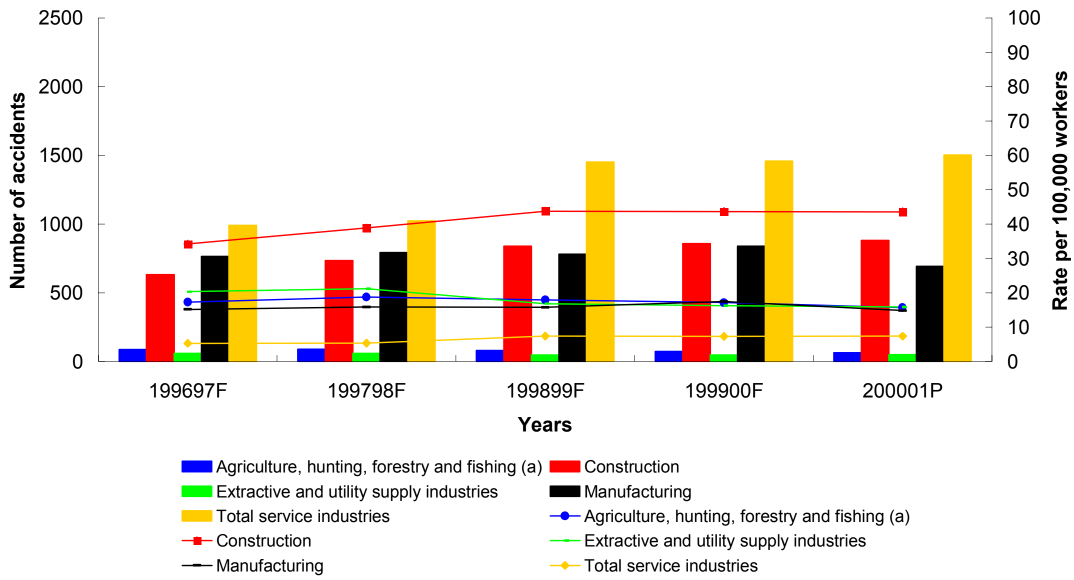

Figure 14 Number and rate of major injury low-level falls by industry sector

Figure 15 shows a similar pattern to Figure 14 with the services industries having the highest number of over 3-day low fall injuries and construction having the highest rate. Whilst the accident rate in construction, manufacturing and services has risen over the five-year period, the rate for the extractive/utilities industries has actually shown a consistent year on year fall.

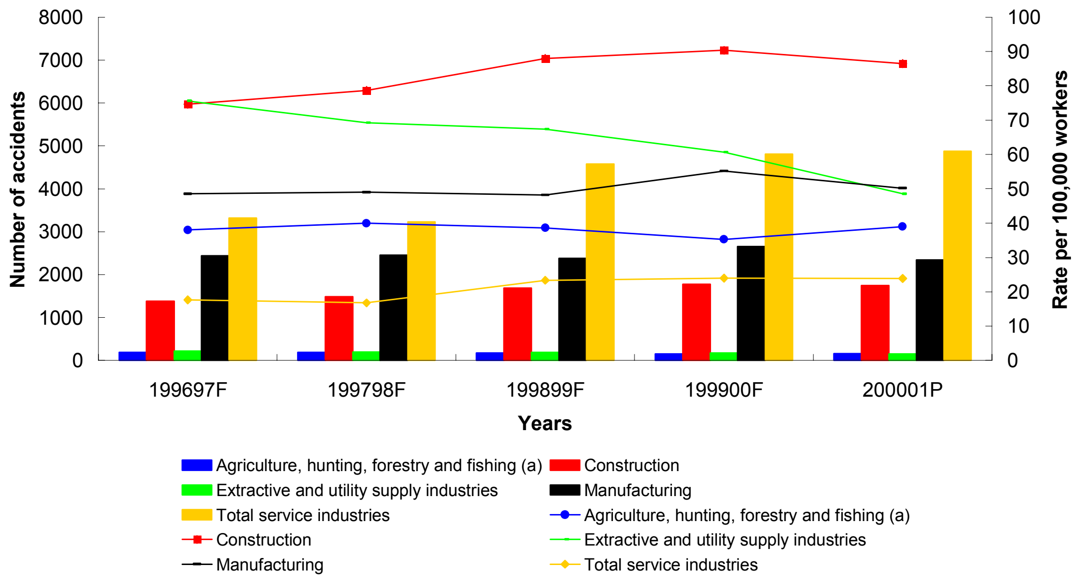

Figure 15 Number and rate of over 3-day injury low-level falls by industry sector

4.5 SUMMARY

It is clear that the construction industry carries the greatest risk of being injured due to a fall from height. The rate for falls from height whether they be high or low falls and whether they lead to fatal, major or over 3-day injuries is almost always highest in construction. The only exception is the rate for low fatal falls which is highest in agriculture but this is less significant given the relatively small number of accidents involved. For fatalities the average rate in construction is around two deaths per 100,000 workers every year. For major injuries this becomes around 90 major injury accidents per 100,000 workers in a year. It is important to note that differences in rate may well be due to the prevalence of the hazards as well as standards of risk control.

The agriculture sector presents the second greatest risk of being injured due to a fall from height after construction. When all fatal falls are considered, the rate in agriculture twice peaks above that for construction in the five-year period even though there are far fewer of these accidents in agriculture. Indeed, agriculture accounts for the most low fatal falls over the period and has the highest rate for these accidents even though the numbers are relatively small. In addition, for major injury high falls, agriculture has the second highest rate after construction and has a consistently higher rate compared with other sectors.

The services industries account for the greatest number of falls leading to major injury accidents. When this is looked at in more detail it is found that the majority of these are low falls of less than 2 metres, with the majority of high major injury falls being in construction. Despite the high number of major injury falls in the services industries, the rate is the lowest of any sector at around 10 per 100,000 workers for these accidents. This is compared to about 90 in construction and between 20 and 30 in the other sectors. Indeed, services industries consistently show the lowest rate irrespective of the height of the fall or the consequences.

The number of high level falls in the manufacturing sector is typically around half of those in the construction or services sectors. The number of low level falls in the manufacturing sector is about half of that of the services sector, but around 50% higher than in the construction sector. The accident rates for the manufacturing and extractive/utilities sectors are similar, and typically higher than the services sector but lower than agriculture.

5. FALLS FROM HEIGHT ACCIDENT DATA

5.1 INTRODUCTION

The available data on accidents due to falls from height have been analysed in order to provide:

- A baseline from which future improvements may be measured.
- A means of informing and targeting the Influence Network workshops.
- An insight into the areas where future risk control measures and interventions may be best targeted.

A variety of different information about accidents can be obtained from RIDDOR data. For example, fields such as work process, agent involved in the accident, occupation and age of injured person can be assessed to outline the basic circumstances of an accident. Analysis has been carried out separately for high and low falls in each industrial sector leading to fatal, major and over 3-day injury accidents. These analyses are described in the following sections.

The figures in the following sections contain data on fatal, major and over three-day injury accidents. The following legend is used in the figures to denote the accident types:

- **O** – over three-day injury.
- **M** – major injury accident.
- **F** – fatal accident.

In the following sections, the data for low and high level falls are discussed separately. The data for unspecified falls are not reviewed.

5.2 AGRICULTURE

5.2.1 Low level falls in agriculture

There are very few fatal injury accidents due to low falls (typically 1 to 3 per year). Figure 16 shows how the number of major-injury low fall accidents in agriculture has been falling over the last five years, whilst the number of over 3-day injuries has remained more or less constant. This leads to an overall trend of small year-on-year reductions. However, there is likely to be a considerable level of under-reporting in agriculture due to the nature of the industry with many self-employed farmers, and the number of major and over 3-day injuries are likely to be considerably larger than the values shown here.

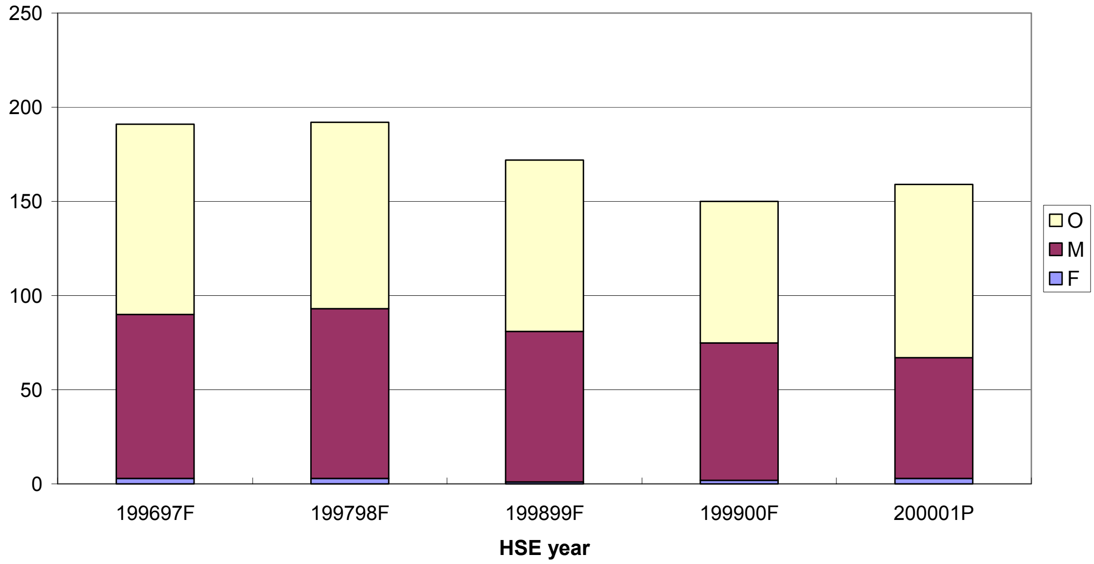

Figure 16 Low level falls in agriculture between 1996/97F and 2000/01P by HSE year

The primary industry sector affected by low falls is shown in Figure 17 to be mixed farming. Mixed farming is very much a catch-all category, and perhaps not too much should be read into this.

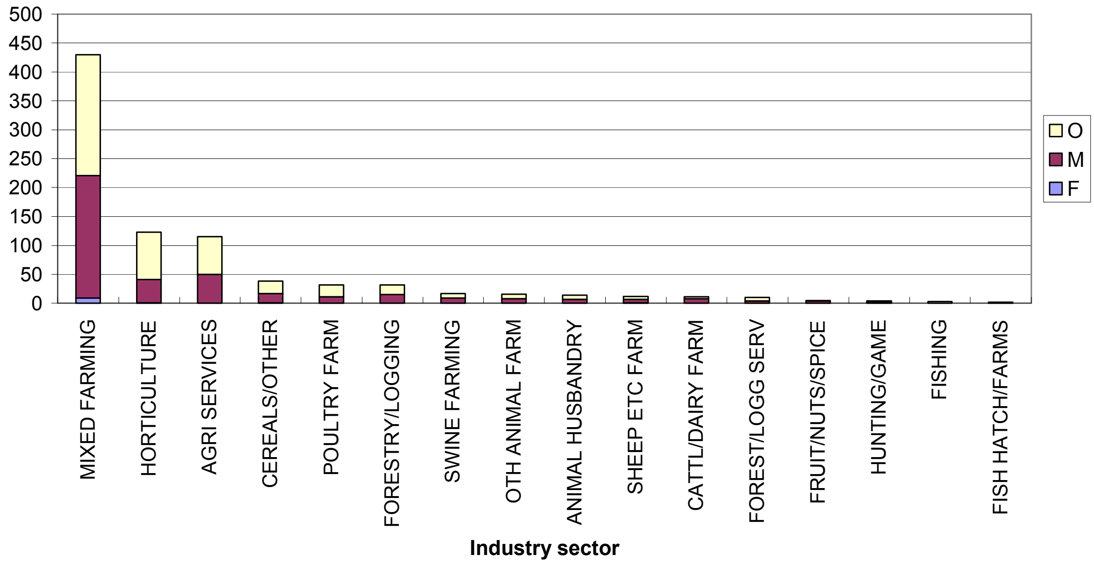

Figure 17 Low level falls in agriculture between 1996/97F and 2000/01P by industry sector

Figure 18 shows that the majority of low falls are suffered by workers ('Farm worker' and 'Oth agriculture'). However, agricultural managers (presumably owners in many cases) appear to have had a similar number of fatal injury accidents, although they have suffered (reported) considerably less major and over 3-day accidents. Goods drivers also feature highly, presumably due to unloading activities at farms (see Figure 19).

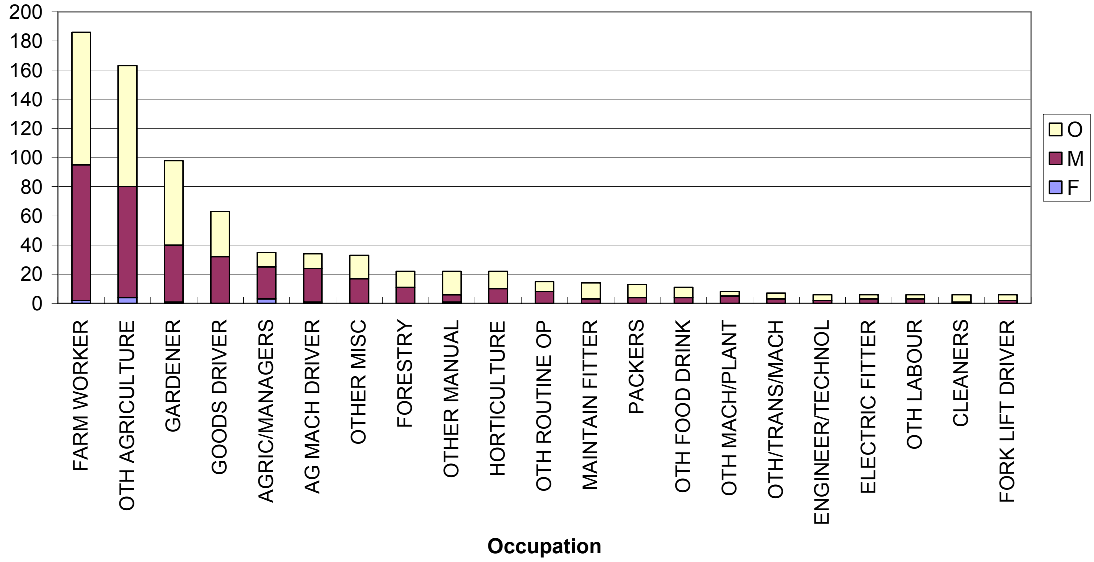

Figure 18 Low level falls in agriculture between 1996/97F and 2000/01P by occupation

When the work process involved in the low fall accidents are considered in Figure 19, on-site transfer can be seen to be the most common work process. On-site transfer is a very general term relating to people moving about the farm getting on with their business. Loading/unloading and general maintenance are the next most significant work processes.

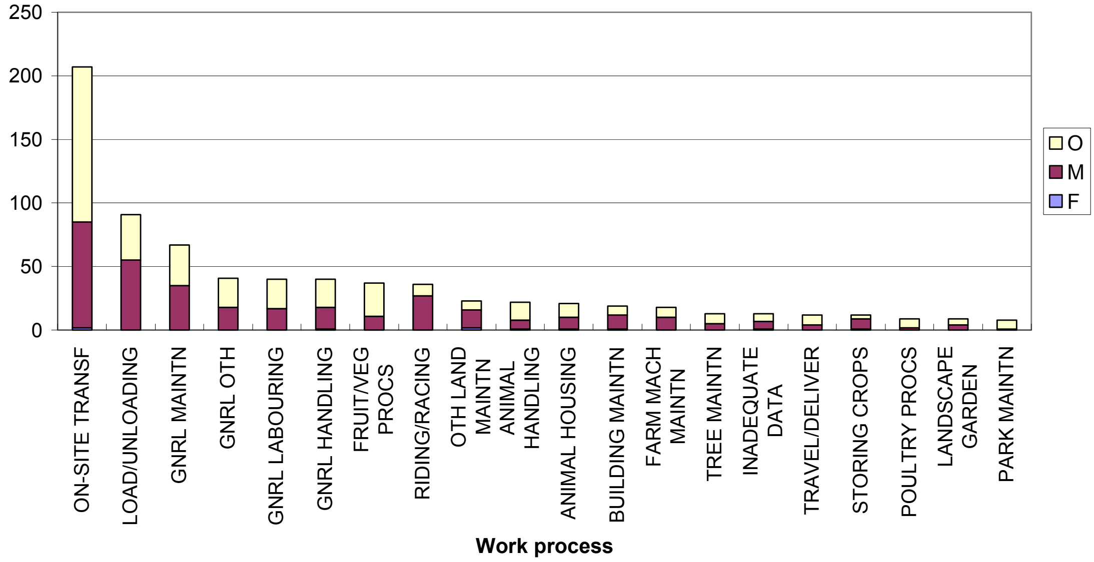

Figure 19 Low level falls in agriculture between 1996/97F and 2000/01P by work process

Ladders and vehicles are the most common agent shown in Figure 20. This reflects ladders being used for both access and as work platforms, and highlights the dangers of falling off farm vehicles.

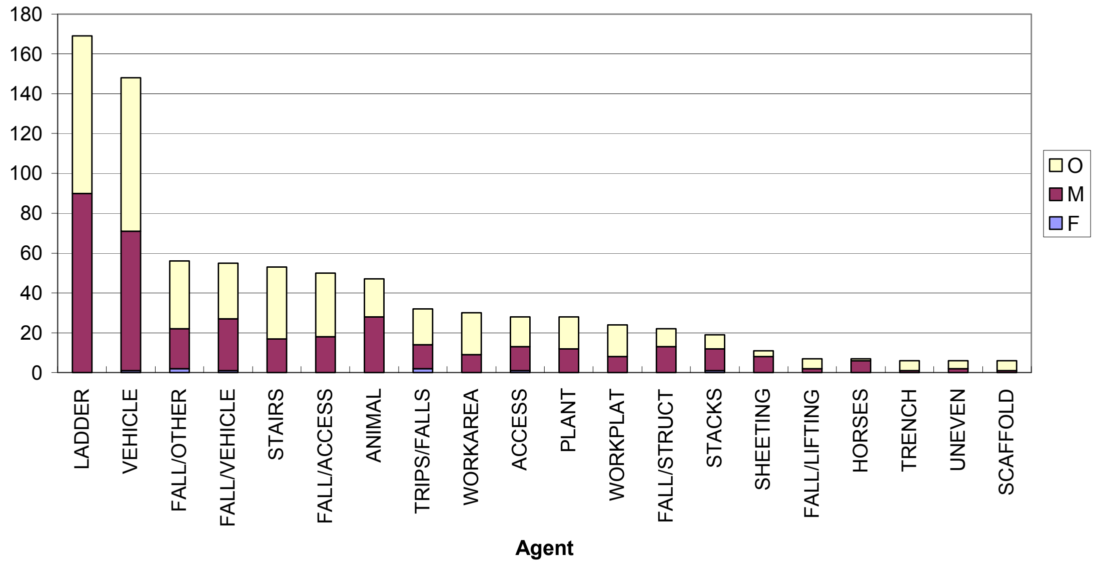

Figure 20 Low level falls in agriculture between 1996/97F and 2000/01P by agent

The age distribution of low fall accidents is shown in Figure 21. There is little variation in the total number of accidents between 20 and 65. However, most of the fatal injury accidents occur to those aged 50 to 65 (and upwards). This could be due to a number of reasons including an ageing workforce, reducing agility with age, and a greater chance of being seriously injured during an accident than a younger worker.

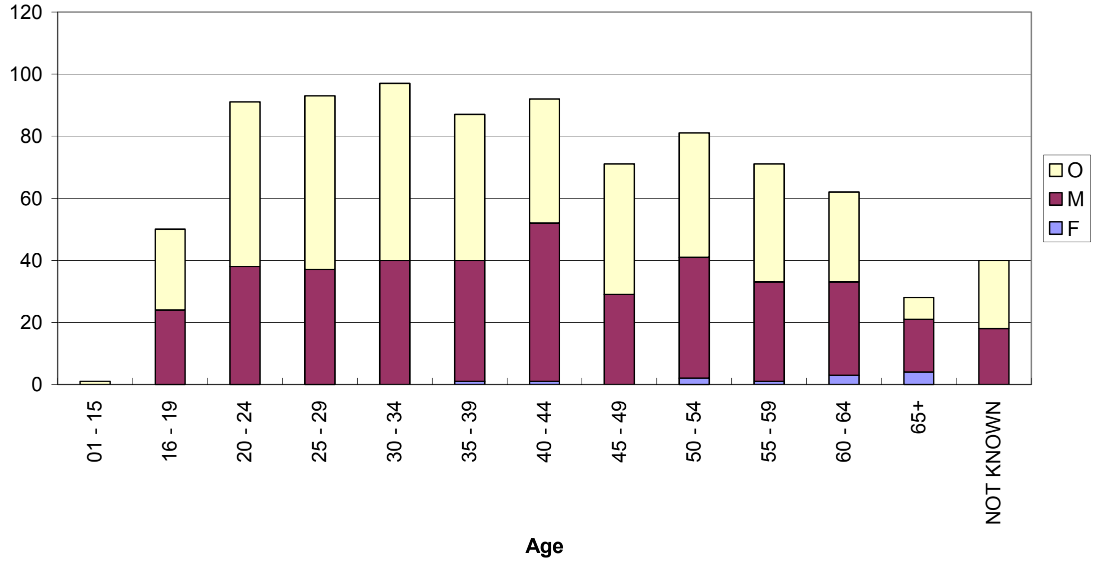

Figure 21 Low level falls in agriculture between 1996/97F and 2000/01P by age

Figure 22 shows the number of reported low fall accidents in agriculture as a function of employment status. This shows that employees have more low-fall accidents than the self-employed by a factor of around sixteen to one. However, the potential for different standards in accident reporting need to be considered before conclusions on risk exposure can be drawn.

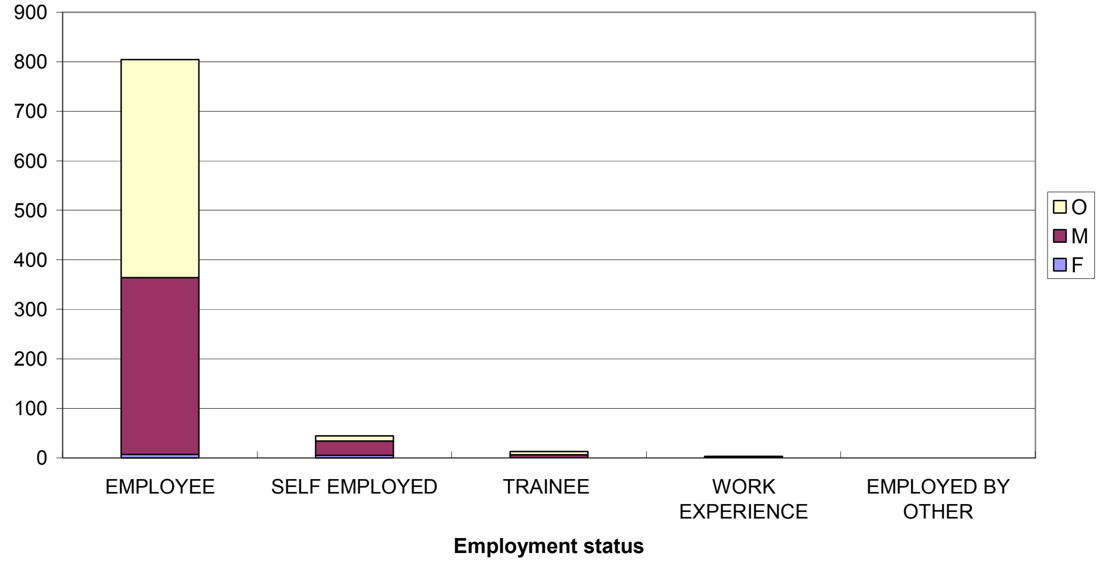

Figure 22 Low level falls in agriculture between 1996/97F and 2000/01P by employment status

5.2.2 High level falls in agriculture

The number of high-level falls in agriculture over the last five years is shown in Figure 23. This shows that whilst the overall number of reported accidents from high-level falls has been reducing with time, the number of fatalities typically varies between 5 and 10 each year. The number of over 3-day injuries is relatively low. This could be due to a combination of high falls typically leading to more serious injuries, and a reluctance to report such injuries.

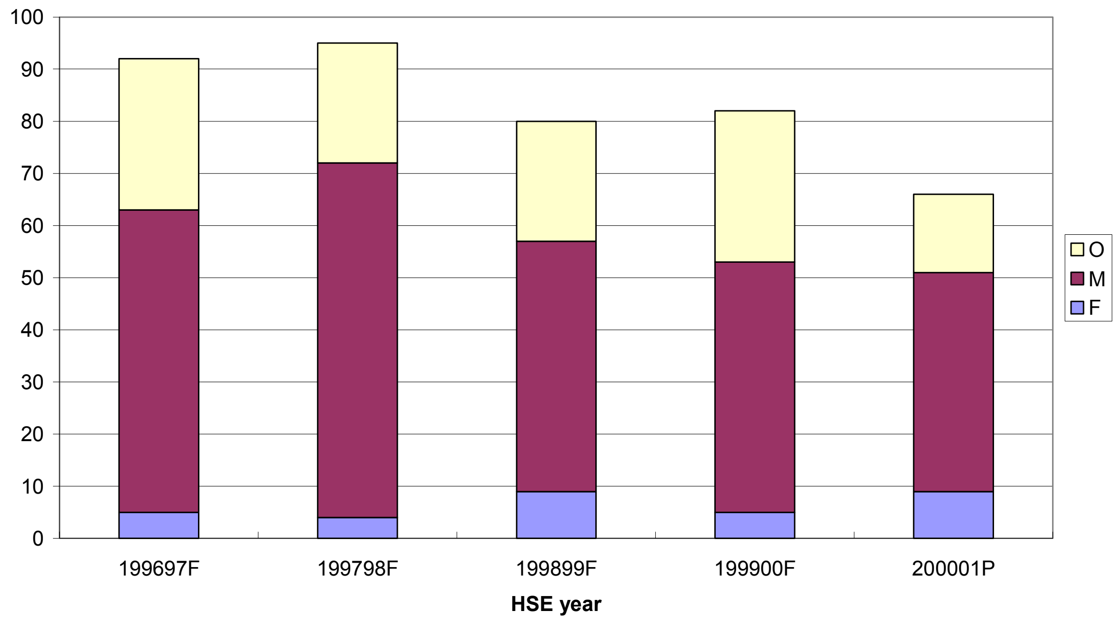

Figure 23 High level falls in agriculture between 1996/97F and 2000/01P

Figure 24 indicates that, as with fatal falls in agriculture, the vast majority of major injury high falls occur in mixed farming with around half of these accidents occurring in this area each year. Agricultural service activities (agric services) and forestry/logging related activity account for the next most significant at around 11% and 13% per year respectively.

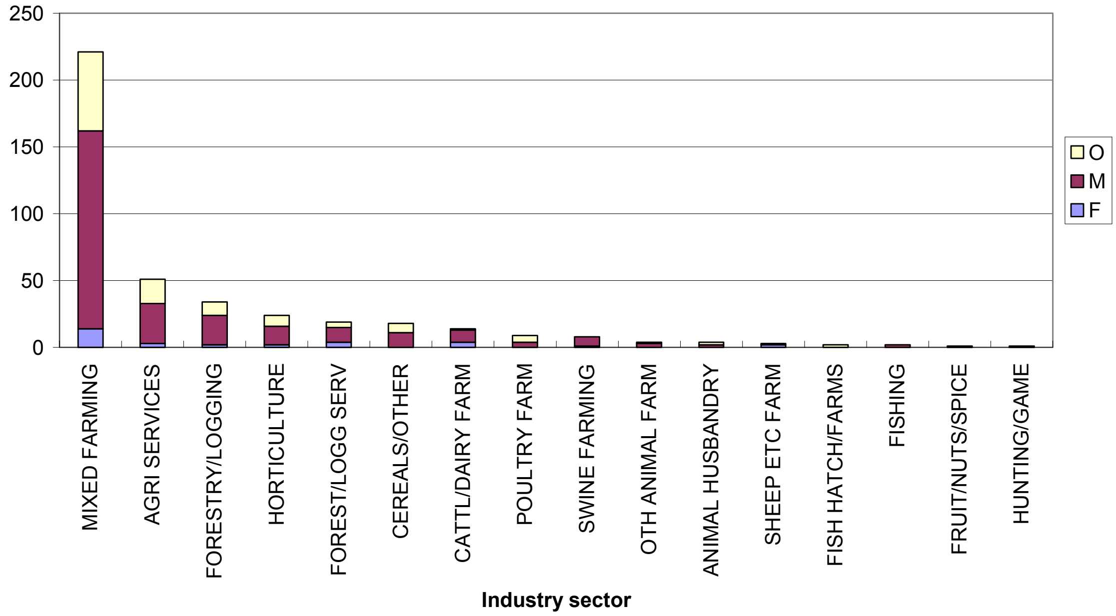

Figure 24 High level falls in agriculture between 1996/97F and 2000/01P by industry sector

Figure 25 shows the most prominent occupational groups in agriculture involved in high falls. Farm workers, forestry workers and farm owners/managers (agric/managers) are the most prominent groups. Gardeners and agricultural machine operators (ag mach driver) also show a considerable number.

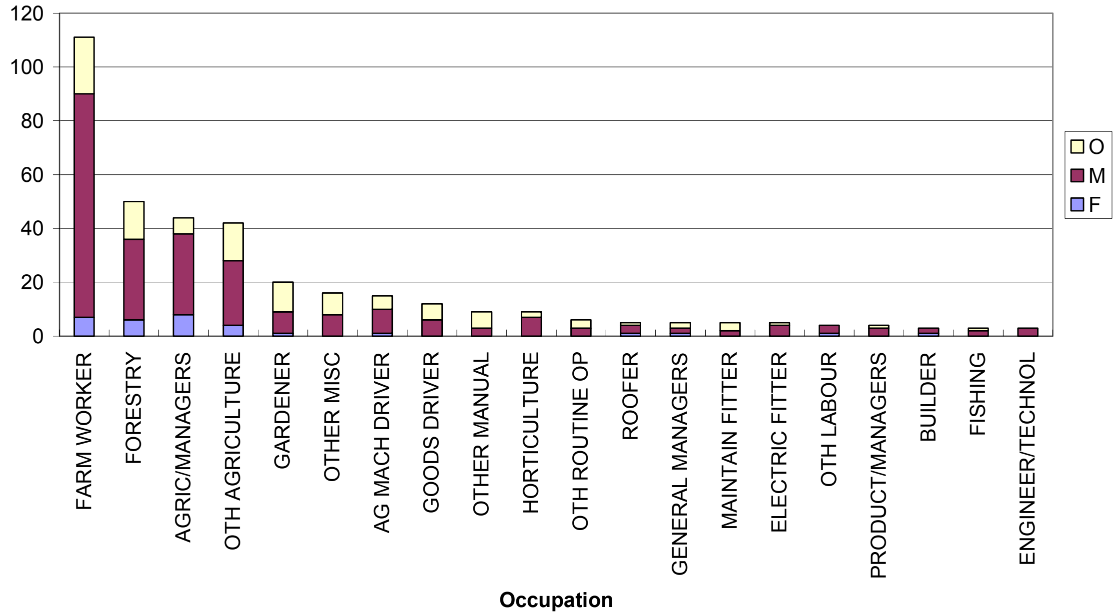

Figure 25 High level falls in agriculture between 1996/97F and 2000/01P by occupation

Figure 26 shows high falls in agriculture according to work process. Tree maintenance is the most prominent work process. General maintenance, on site transfer, building maintenance and loading/unloading also feature highly, but on-site transfer and loading/unloading did not feature in any fatal injury accidents.

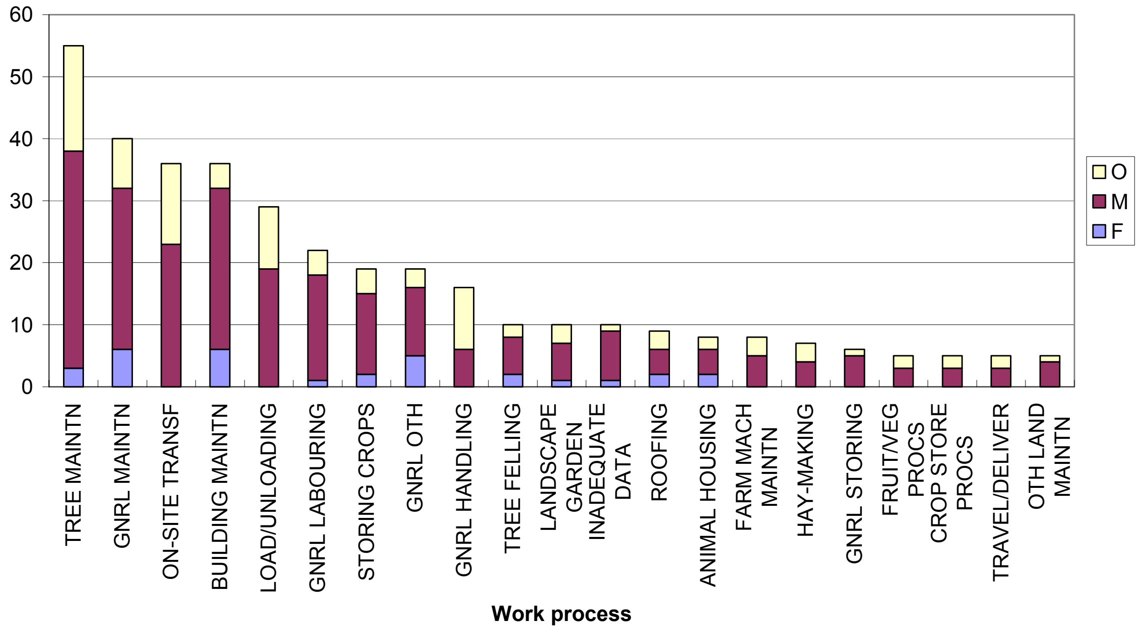

Figure 26 High level falls in agriculture between 1996/97F and 2000/01P by work process

The agents involved in high falls are shown in Figure 27. Ladders have been the agent in around a third of all such accidents between 1996 and 2001. However, roof related agents ('fragile', 'roofedge' and 'fall/struct') have been associated with the most fatalities over that period. Falls from farm vehicles ('vehicle', 'plant' and 'fall/vehicle') account for a significant number of high falls.

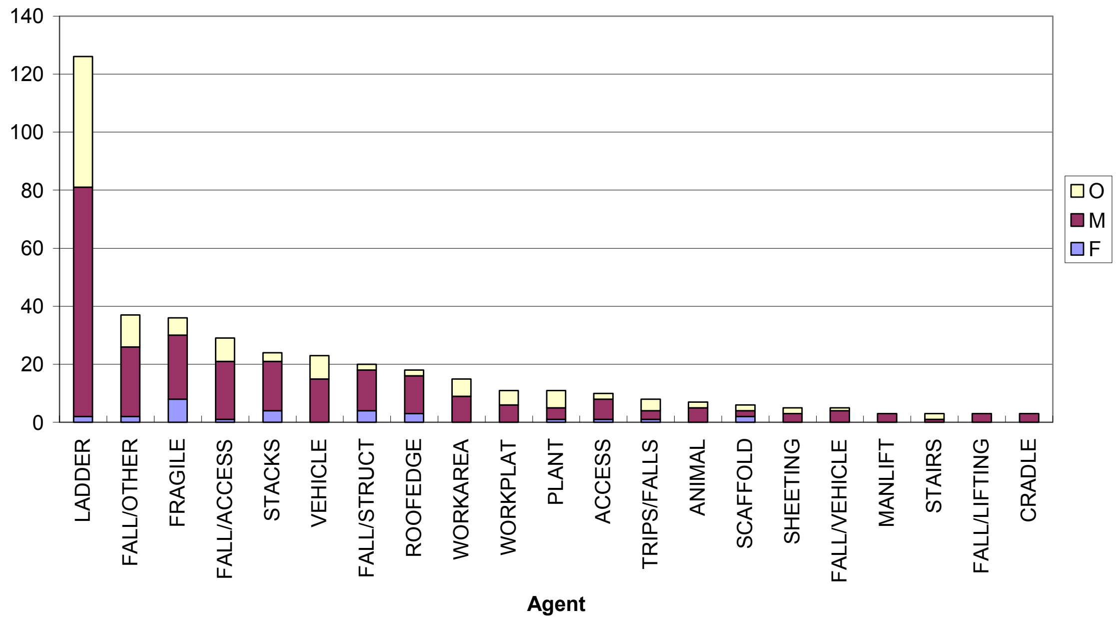

Figure 27 High level falls in agriculture between 1996/97F and 2000/01P by agent

The age groups of those involved in high-level falls in agriculture are shown in Figure 28. The age groups which stand out in terms of the overall numbers of accidents are 30-34, 45-49 and 50-54 year olds. However, the older workers (60 and beyond) are significant both for the number of fatalities and the fact that such workers are still working in hazardous situations at that age (unlike other sectors where there are fewer workers past the official retirement age).

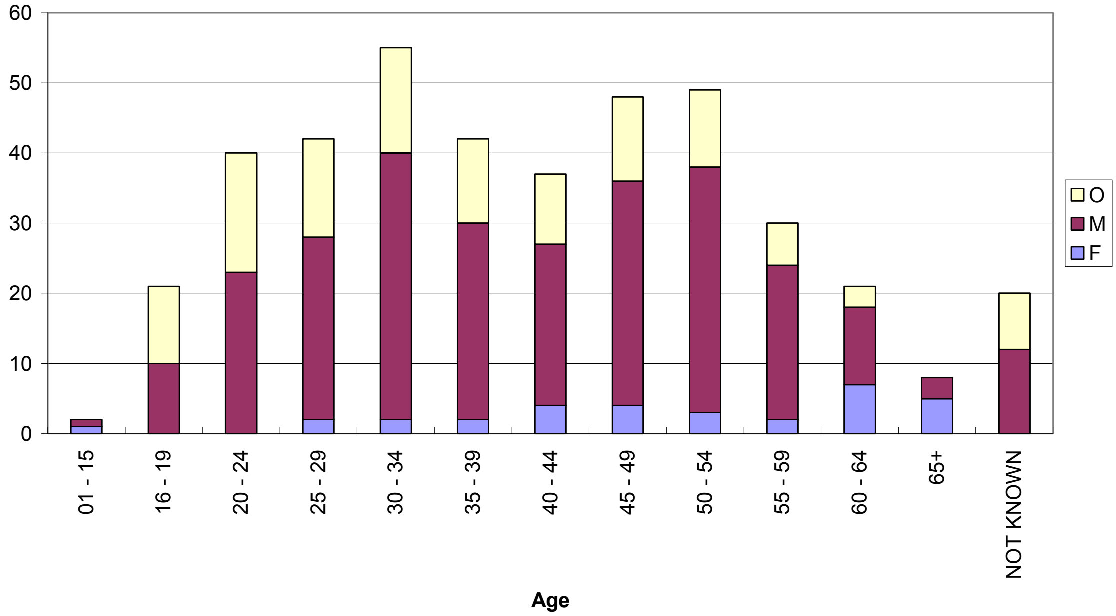

Figure 28 High level falls in agriculture between 1996/97F and 2000/01P by age

Figure 29 shows the number of high fall accidents in agriculture as a function of employment status. Employees have around four times as many reported accidents in total as the self-employed. However, the self-employed have suffered around twice as many fatalities as employees over the same period suggesting that, perhaps, there is some underlying reason why the self-employed are suffering more fatalities.

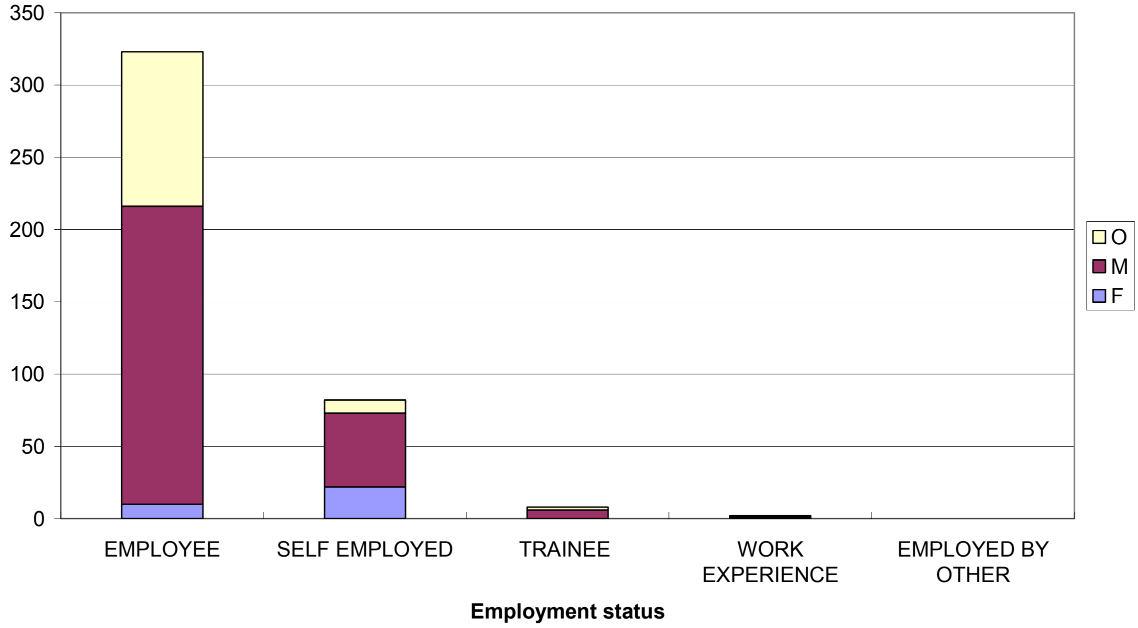

Figure 29 High level falls in agriculture between 1996/97F and 2000/01P by employment status

5.2.3 Summary

There are several common threads throughout falls in agriculture irrespective of height or consequence. Mixed farming (i.e. animals and crops) is the area where most falls occur and on the whole, farm workers are mostly involved. For fatalities however, farm owners/managers and forestry workers emerge as being at particular risk. Maintenance activities are most strongly related to the high falls in agriculture with on-site transfer being broadly associated with the majority of low falls. Ladders are being used in the largest proportion of all major injury falls whilst falling through fragile roofs accounts for several fatalities. Accidents involving vehicles appear an important cause of low falls.

In terms of sectors and workers, the factors associated with low fall accidents in agriculture are similar to those related to high fall accidents. More than half of the low falls have occurred in mixed farming which is around the same proportion as for high falls. Farm workers are the group involved in most low falls and again this matches what was found for the equivalent high fall accidents.

In terms of age, those over 60 years have the most fatal falls which appears to be a significant age effect unique to agriculture. Finally, employees have considerably more reported fall-related accidents than the self-employed. However, the self-employed have suffered more fatalities from high falls.

5.3 CONSTRUCTION

Construction is clearly the industry with the highest number and rate of high fall accidents. Construction also has the highest rate of low fall accidents (although not the highest number), but there are not a significant number of low fall fatalities.

5.3.1 Low level falls

All of the accidents resulting from low falls are shown in Figure 30 on a year-by-year basis. There are so few fatalities, that it is not possible to discern any trends. However, the major injury accidents have shown a steady rise over the last five years from around 630 in 1996/97 to around 880 in 2000/01. The over 3-day injury accidents showed a steady rise in the four years between 1996/97 and 1999/2000, but have since shown a reduction in 2000/01. (This data does need to be viewed in the light of the volatility of construction work in the period considered). Given that a similar low fall accident in one circumstance may result in a major injury but in another may result in an over 3-day injury, more meaningful trends are likely to result from combing the two together (along with the few fatalities). This has been done in all of the subsequent figures.

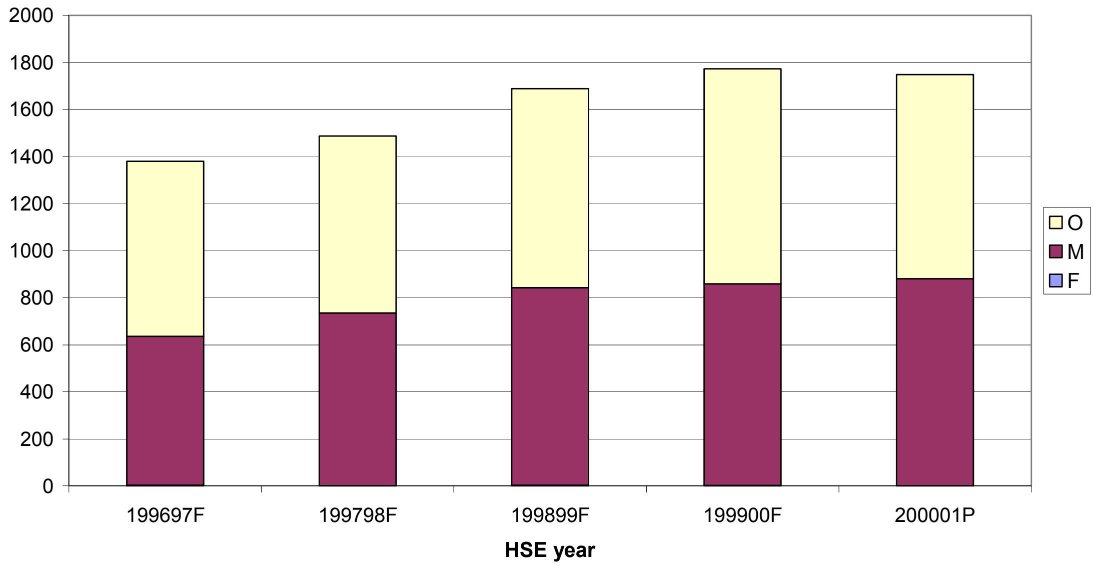

Figure 30 Low fall fatal, major and over 3-day injury accidents in construction between 1996/97 and 2001/02 by HSE year

The key industry sector where most of the accidents occur is shown in Figure 31 to be 'construction bld' which is a general description that encompasses most building and civil engineering work. It is interesting to note the number of accidents occurring in the sectors involving fit-out trades such as wiring, plumbing, painting/glazing, insulation and plastering. Each of these amounts to several hundred accidents over the six-year period.

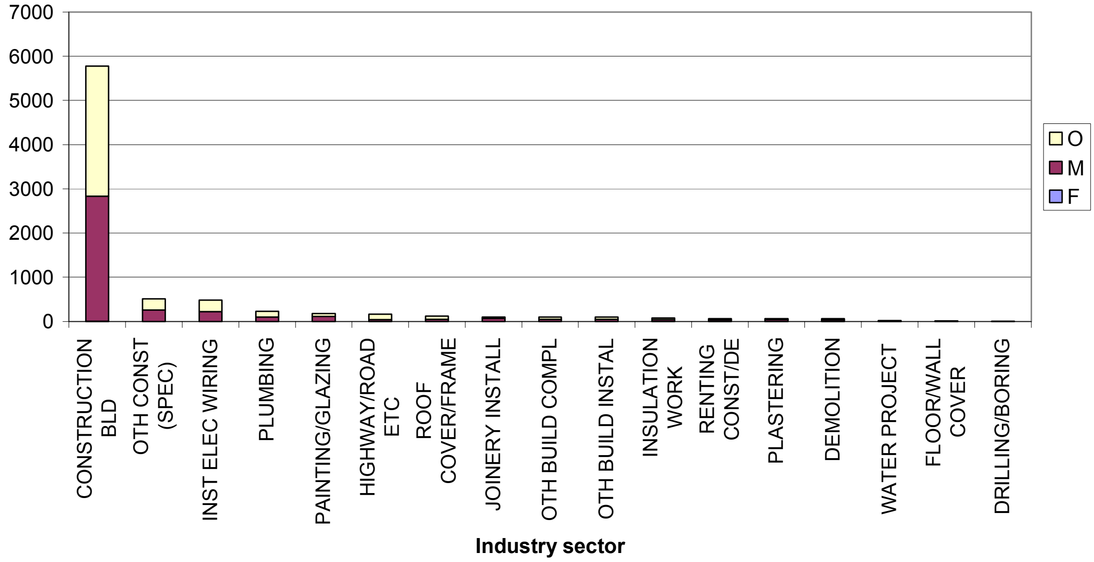

Figure 31 Low fall accidents in construction between 1996/97 and 2001/02 by industry sector

The occupations of the workers who had the accidents are shown in Figure 32. General construction workers (‘oth construction’) and carpenters / joiners are the occupations suffering most accidents with in excess of 800 accidents. The occupations with the highest number of low fall accidents also includes electrical fitters, bricklayers/masons, painters/decorators and plasterers. This indicates that it is probably the fit-out occupations that are having more low fall accidents than some of the more ‘traditional’ construction occupations.

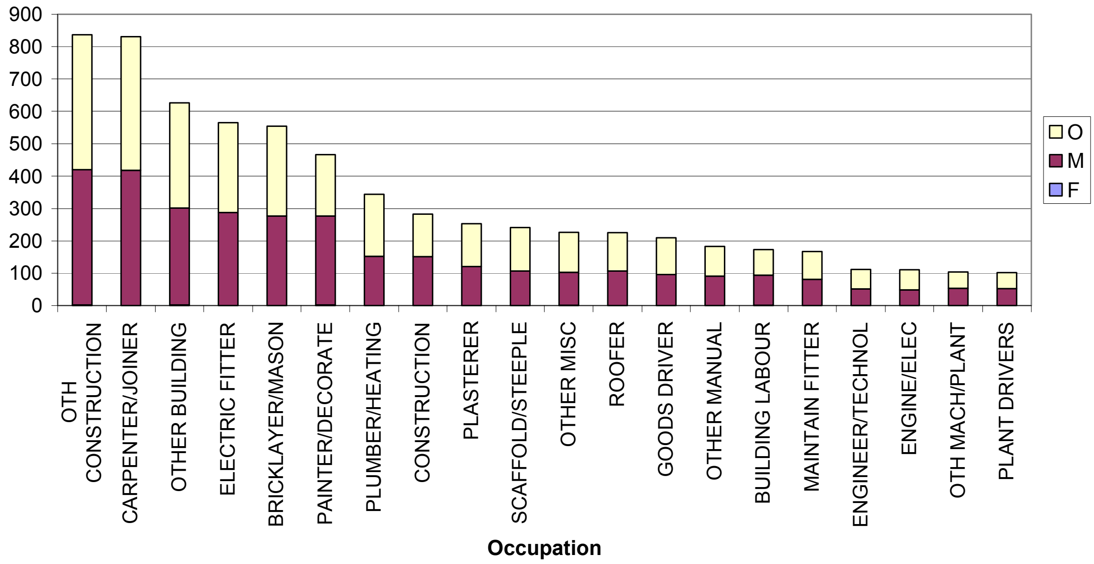

Figure 32 Low fall accidents in construction between 1996/97 and 2001/02 by occupation

The work processes being undertaken at the time of the accident are shown in Figure 33. On site transfer is the dominant work process. This is a very generic category, defined in the HSE FOCUS Manual(34) as: 'Transfer (on site) (inc movement of persons, patients walking, materials or part finished items between processes by pump, conveyor; manual or mechanical means)'. This could apply to many of the low fall activities that occur on site. The general activities ('gnrl labouring', 'gnrl oth' and 'general jobbing') probably also fall into a similar category. Loading and loading constitute the most readily identifiable grouping accounting for over 400 accidents. These are likely to be associated with falls from or around vehicles during the unloading process. Finishing processes, carpentry and electrical works typically involve working less than 2m above the ground, and have resulted in around 350 accidents.

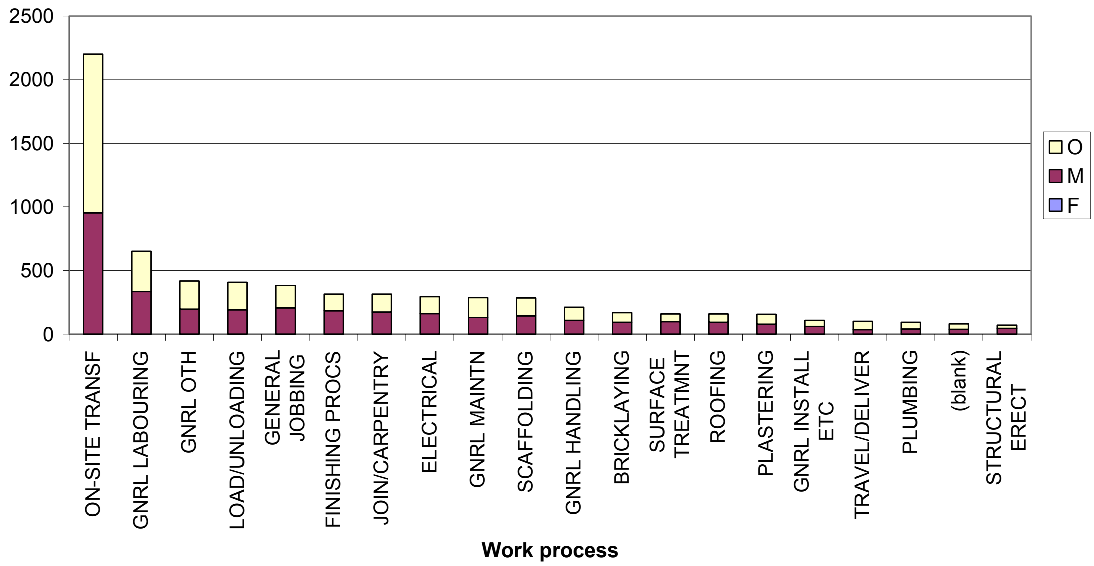

Figure 33 Low fall accidents in construction between 1996/97 and 2000/01 by work process

The agents involved in the accidents are shown in Figure 34. Falling off of a ladder is by far and away the most significant agent, being associated with over 2500 accidents. This would appear to be compatible with the fit-out occupations identified in Figure 32 who are likely to use ladders as work platforms. Falling from vehicles ('vehicle' and 'fall/vehicle') account for nearly 1000 accidents, possibly resulting from the unloading of goods delivery vehicles when they reach site.

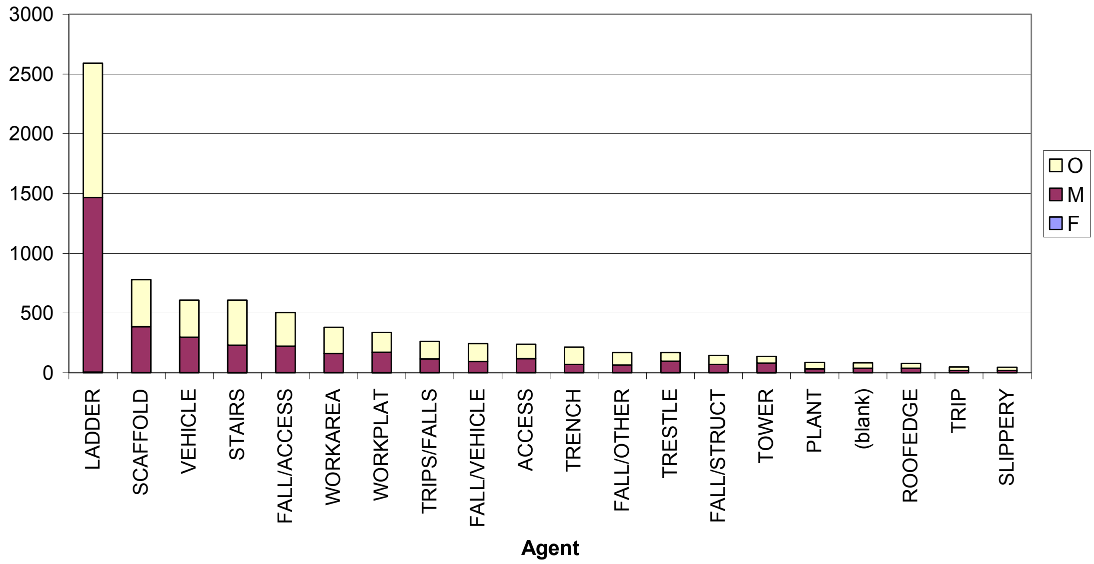

Figure 34 Low fall accidents in construction between 1996/97 and 2000/01 by agent

The age profile of the workers involved in the accidents is shown in Figure 35. This indicates two distinct peaks: the primary one between 25 and 39; and the secondary one involving workers between 40 and 54.

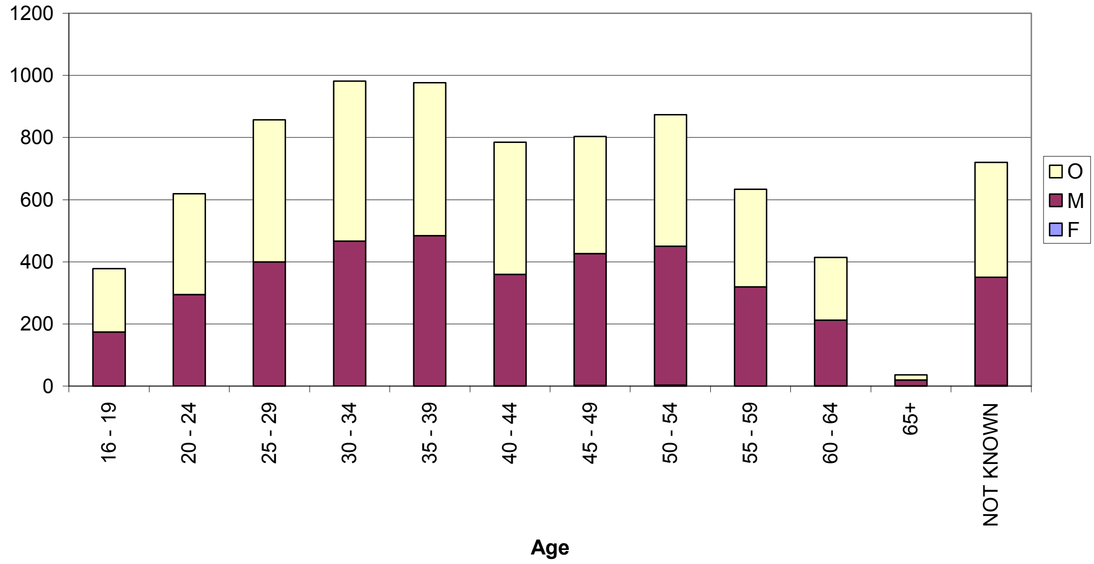

Figure 35 Low fall accidents in construction between 1996/97 and 2000/01 by age

Figure 36 shows the number of low fall accidents by employment status, with employees outnumbering the self-employed within the reported accidents by around seven to one. The proportion of over 3-day injuries affecting the self-employed is smaller than that for employees. This may possibly reflect differences in reporting between the two groups.

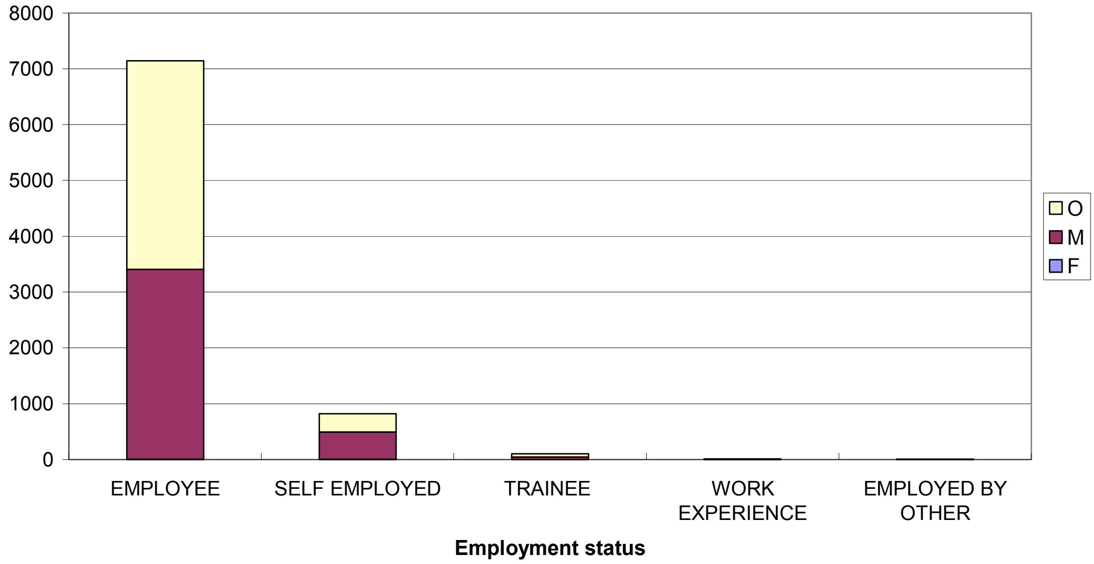

Figure 36 Low fall accidents in construction between 1996/97 and 2000/01 by employment status

5.4 HIGH LEVEL FALLS

All of the accidents resulting from high falls are shown in Figure 37 on a year-by-year basis. The fatalities were showing a steady reduction from 1996/97 to 1998/99. However, they have since risen, returning to the 1996/97 level in 2000/01. However, the major injury accidents have shown the opposite pattern, reaching a peak in 1998/99 and subsequently reducing to close to the 1996/97 level. The over 3-day injuries have remained reasonably steady, averaging around 350 accidents a year.

As with the low falls, the severity of the injury is likely to be a function of which part of the body hits the ground. As such, more meaningful trends are likely to result from analysing the three severities of injury together. This has been done in the subsequent figures.

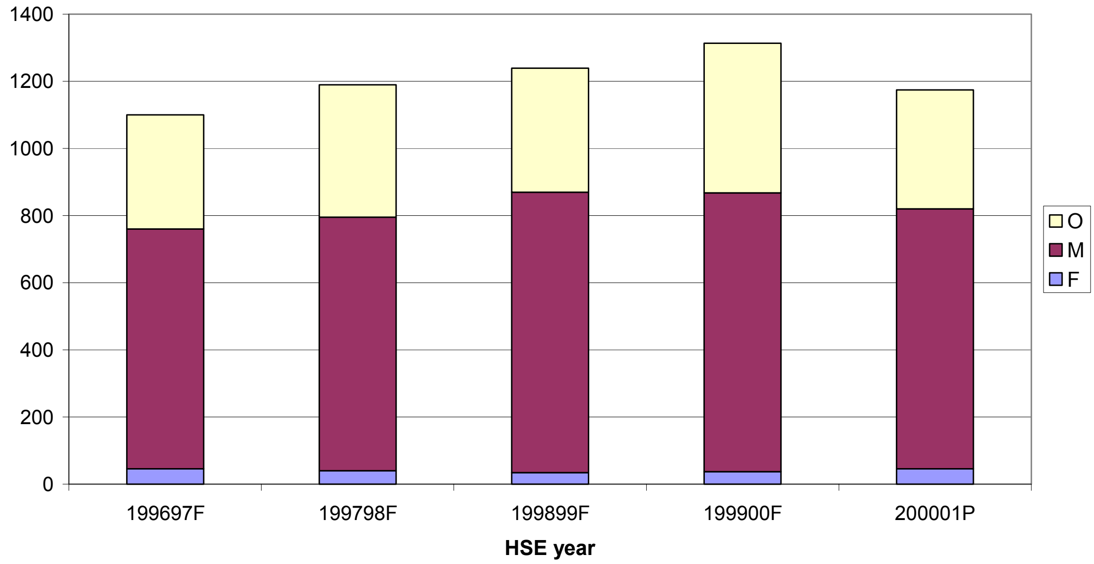

Figure 37 High fall fatal, major and over 3-day injury accidents in construction between 1996/97 and 2000/01 by HSE year

As expected, the key industry sector where most of the accidents occur is shown in Figure 38 to be ‘construction bld’ which encompasses most building and civil engineering work. As with low falls, the fit-out sectors are again suffering several hundred accidents. Roofwork is also prominent, as the majority of roofwork is carried out at heights greater than 2m.

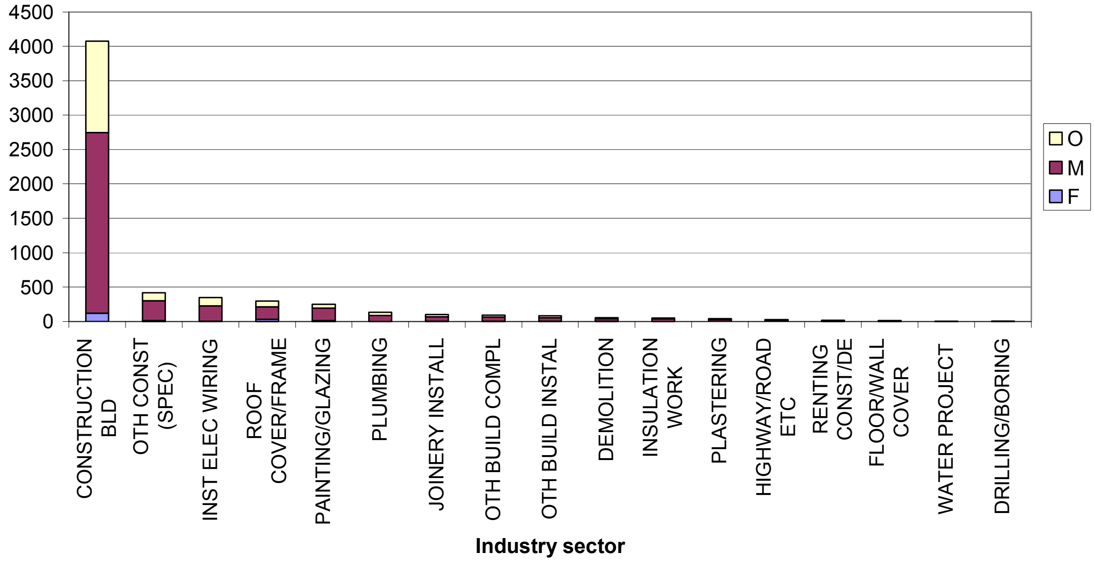

Figure 38 High fall accidents in construction between 1996/97 and 2001/02 by industry sector

The occupations of the workers who had the accidents are shown in Figure 39. General construction workers are the biggest group ('construction', 'oth construction' and 'oth building') with around 1500 accidents in total. Of the more specific occupations, there appears to be two distinct groups: those associated with regular work at height ('roofer' and 'scaffold/steeple') and those associated with what are essentially fit-out trades ('carpenter/joiner', 'painter/decorator', 'electrical fitter' and 'plumber/heating'). With the first group, work at height is their main task. However, with the second group their main tasks are carpentry, painting, electrical fitting and plumbing, and work at height is a by-product of this work.

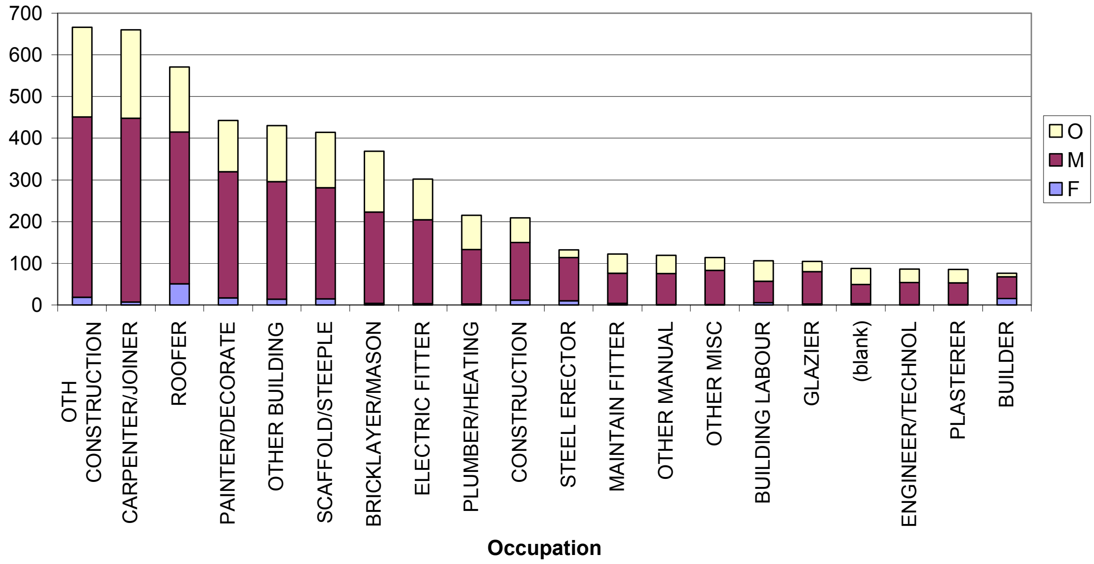

Figure 39 High fall accidents in construction between 1996/97 and 2000/01 by occupation

The work processes being undertaken at the time of the accident are shown in Figure 40. As with low falls, on site transfer is the dominant work process. This is a very generic category, defined in the HSE FOCUS Manual[34] as: 'Transfer (on site) (inc movement of persons, patients walking, materials or part finished items between processes by pump, conveyor; manual or mechanical means)'. This could apply to many of the high fall activities that occur on site. The general activities ('gnrl labouring', 'general jobbing' and 'gnrl oth') probably also fall into a similar category. Of the readily identifiable work processes, 'roofing' and 'scaffolding' are the most significant, accounting for around 520 and 450 accidents respectively. It is evident from Figure 40 that accidents involving 'roofing' lead to a significant number of fatalities, 48 fatalities out of a total of 535 reported accidents.

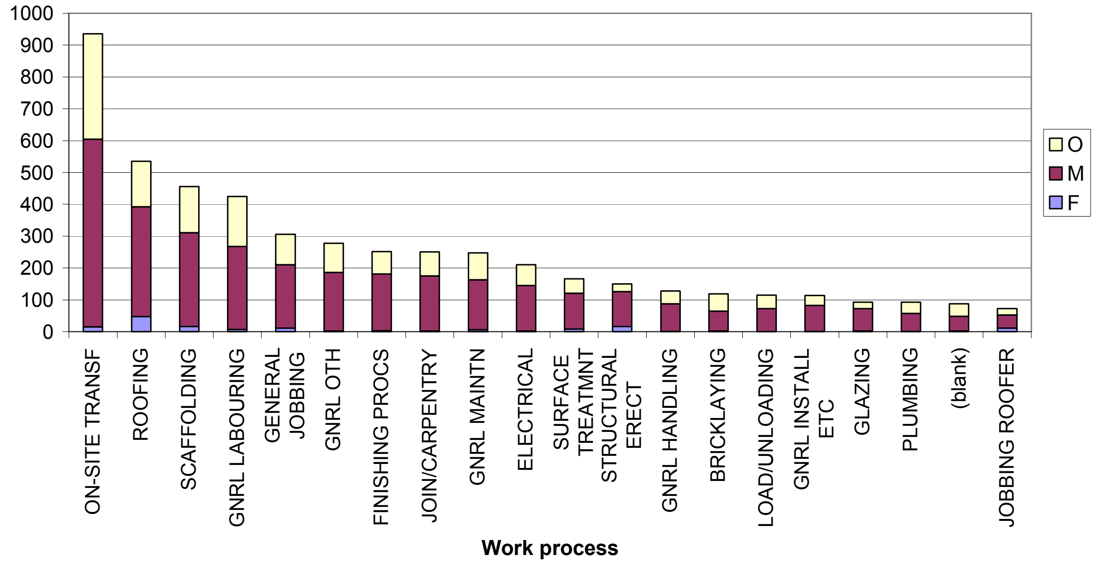

Figure 40 High fall accidents in construction between 1996/97 and 2000/01 by work process

The agents involved in the accidents are shown in Figure 41. As with low falls, ladders are involved in the largest number of accidents, followed by scaffolding. Roofs are involved in the third largest number of accidents with workers either falling from the edges of roofs ('roofedge') or falling through fragile roof materials ('fragile'). Work areas ('work area') and platforms ('workplat') are involved in around 800 accidents, whilst means of access ('fall/access' and 'access') such as gangways, catwalks etc. were involved in around 500 accidents.

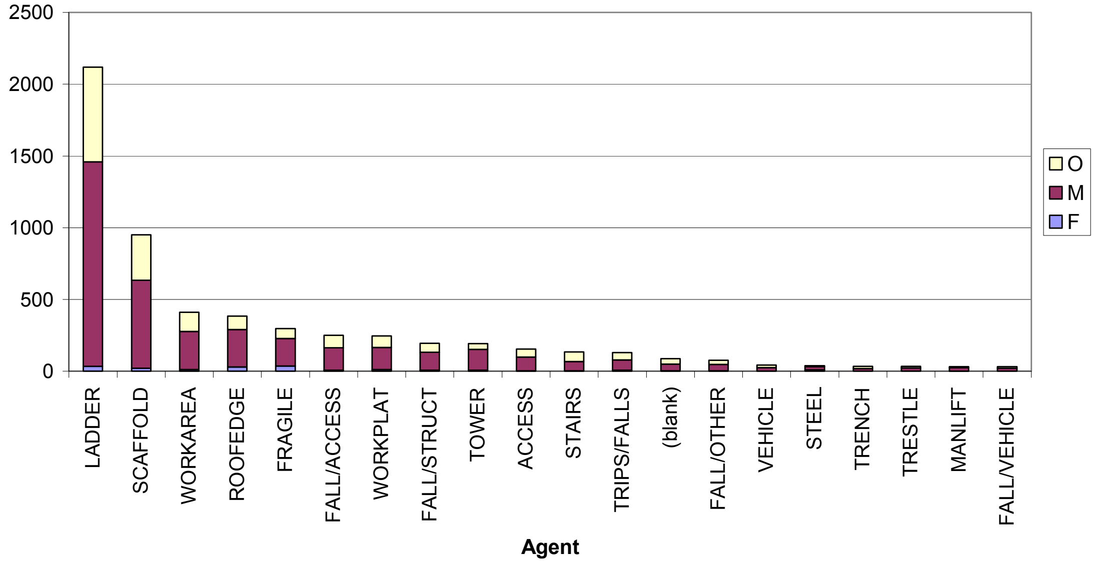

Figure 41 High fall accidents in construction between 1996/97 and 2000/01 by agent

The age profile of the workers involved in the accidents is shown in Figure 42. This is broadly similar to that for low fall accidents. Whilst the total number of accidents reaches its peak between 25 and 39, the number of fatalities reach their peak between 45 and 54. Given that there are likely to be less construction workers in the 45 to 54 age band, the fatality rate per 100,000 workers is likely to be significantly higher than for younger workers.

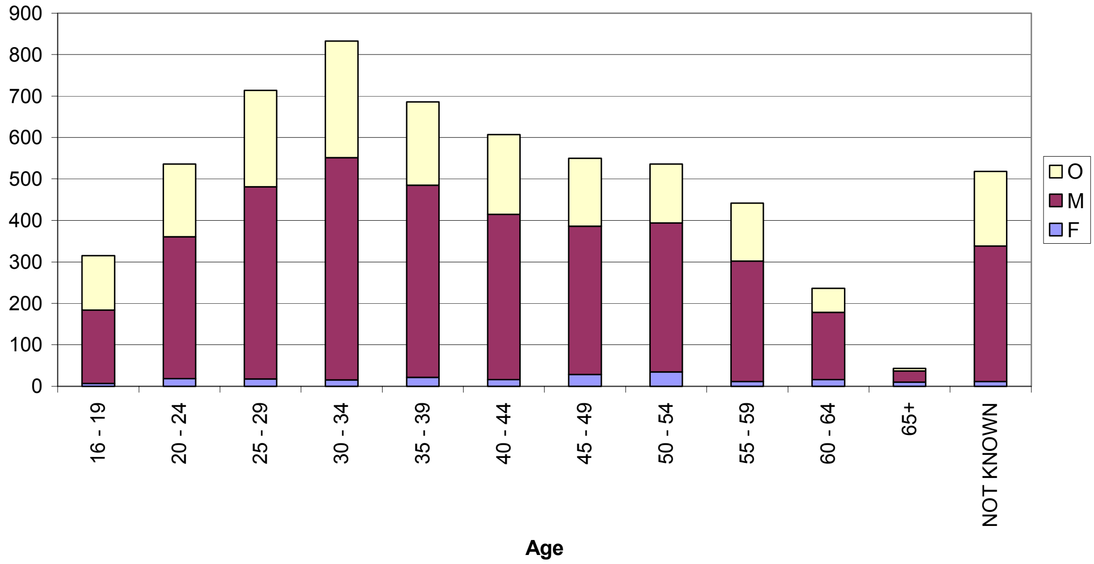

Figure 42 High fall accidents in construction between 1996/97 and 2000/01 by age

Figure 43 shows the number of high fall accidents in construction according to employment status. Employees typically account for around two thirds of fatal high falls with self-employed people involved in the rest, but over 80% of the overall number of high falls. Trainees account for a very small number of falls.

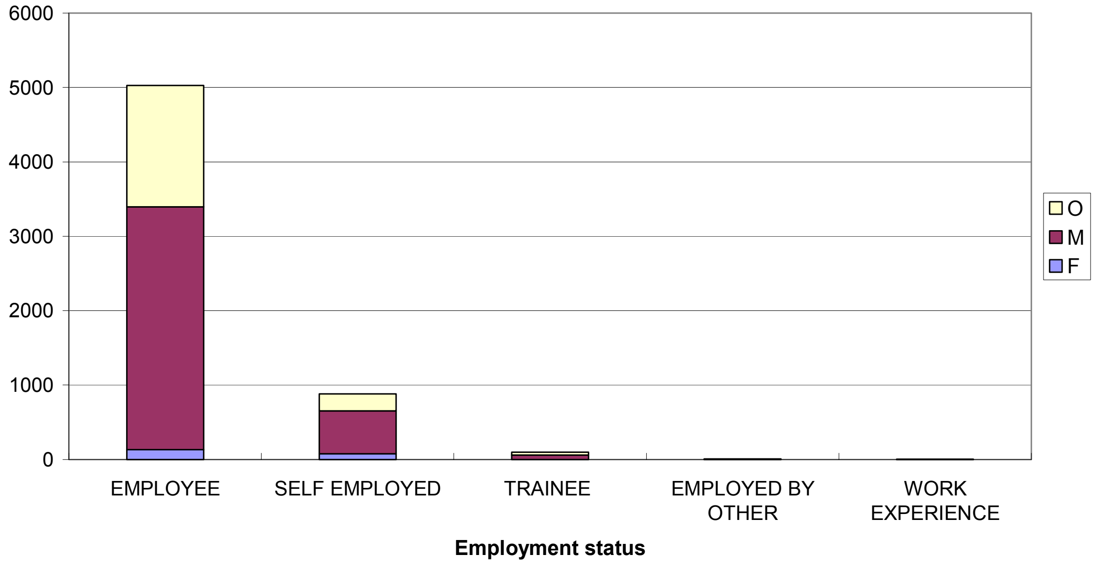

Figure 43 High fall accidents in construction between 1996/97 and 2000/01 by employment status

5.4.1 Summary

Similar sectors, occupations, work processes and agents are involved in both low and high falls, with roofing (high falls) and vehicles (low falls) being the primary exceptions.

Carpenters and joiners appear to have the most fall accidents. The work process with the largest number of falls is on-site transfer, followed by roofing for high falls. Ladders and scaffolds are most common agents for both low and high falls.

The highest proportion of fall accidents occur among occupations that would not necessarily be associated with working at height i.e. painter, plasterer, glazier, plumber. Given that these trades are well represented in the data for both low and high falls whilst doing the same job, it would suggest that perhaps some of the high fall accidents involving fit-out workers are occurring at heights not much greater than 2m. Whilst the self-employed are involved in a significant number of falls, employees typically outnumber the self-employed in the reported accidents. However, the self-employed do seem to be involved in proportionally more fatal high falls than employees when considered as a proportion of the total number of accidents.

Whilst construction industry activity surveys indicate that around half the construction industry is employed in work on existing structures (e.g. repair, maintenance and refurbishment activities), it is not possible to ascertain the breakdown of accidents between these two groups of activities from the RIDDOR data. This is an important omission as the risk profiles are likely to be significantly different, and worthy of investigation.

5.5 EXTRACTION AND UTILITY SUPPLY

The extraction and utility supply industries have the lowest number of fatal and major injury falls from height of all industry sectors. However, due to the small population of workers in this group, a small number of accidents can push the rate above that of other sectors such as services and manufacturing. Most falls in this sector are from low level resulting in major injuries.

There have been only one or two fatal falls in extraction/utility supplies in each of the years under consideration with a total of six. Five were due to high falls with only one being a low fall. In 2000/01 there were no fatal falls in this sector.

5.5.1 Low level falls

Figure 44 shows the number of accidents due to low-level falls over the last five years. Whilst the number of major injury accidents has remained reasonably constant at around 50 a year, the number of over 3-day injury accidents has been showing a steady decline.

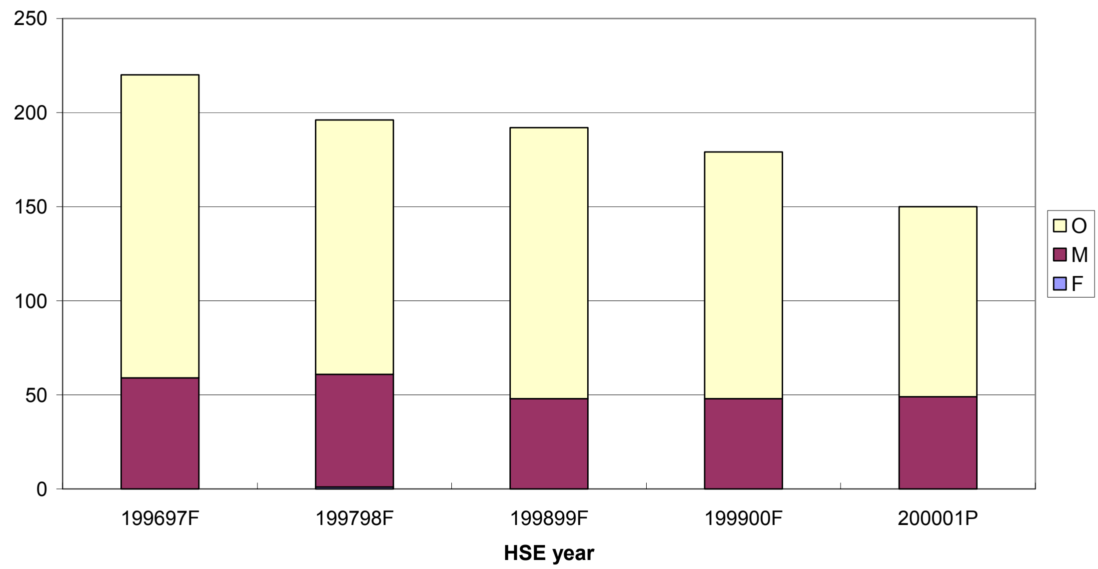

Figure 44 Low level falls in the extraction/utility industries between 1996/97 and 2000/01 by HSE year

Figure 45 shows that water collection and distribution was the industry sector with the highest number of low fall accidents over the last five years, followed by stone quarrying. The electrical utilities have been split into two, with the generation and transmission parts of the sector both having around 100 low fall accidents over the last five years. Gas manufacturing / distribution also shared a similar number of accidents.

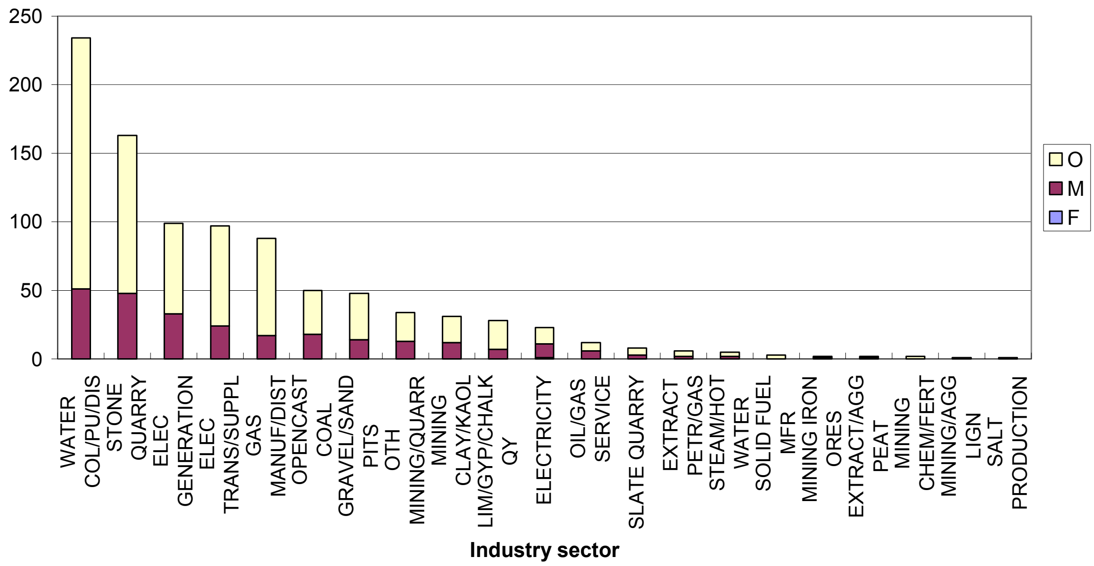

Figure 45 Low level falls in the extraction/utility industries between 1996/97 and 2000/01 by industry sector

The low falls accidents in extraction/utility supplies are spread across a number of occupations. The most common occupational categories are shown in Figure 46, which indicates that those working in mining/quarrying have been involved in the highest proportion of these accidents, with most of these workers being in stone quarrying. The second highest proportion is found to be among goods drivers, closely followed by water/sewage workers. Whilst the majority of occupations are dominated by over 3-day injury accidents, plant drivers are notable for the fact that there is an approximately equal split between major and over 3-day injury accidents perhaps indicating that a fall from plant is more likely to result in a serious injury.

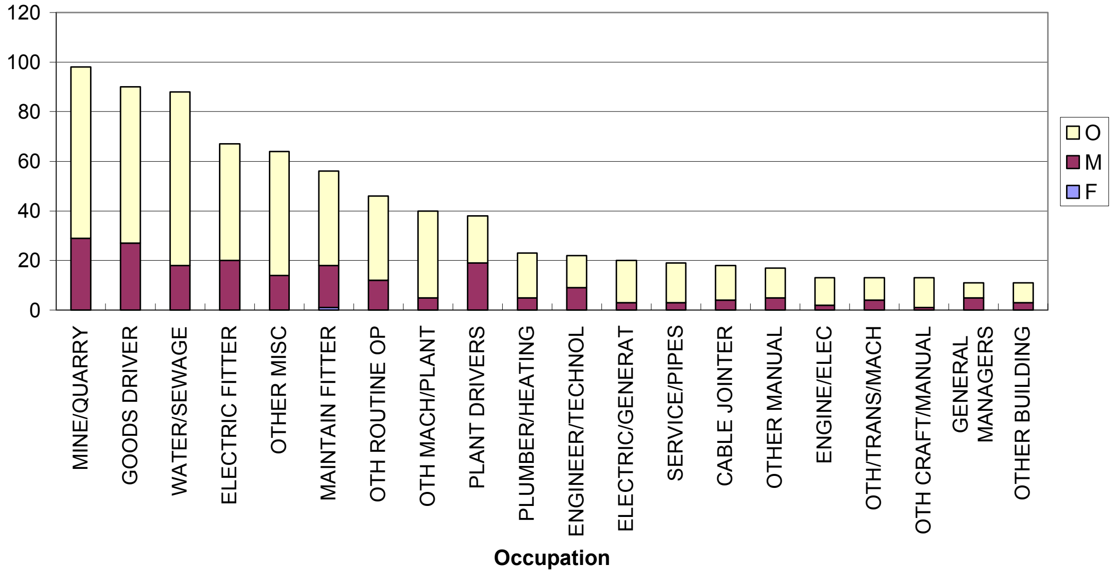

Figure 46 Low level falls in the extraction/utility industries between 1996/97 and 2000/01 by occupation

From Figure 47, it can be seen that on-site transfer is by far the most common work process associated with low falls in extraction/utility supplies, with nearly 350 accidents over the last five years. Given that this is a fairly generic work process involving going between places of work, it is difficult to draw definitive conclusions. Loading/unloading is in second place, and is a common work process across all sectors, with the unloading tasks being particularly hazardous.

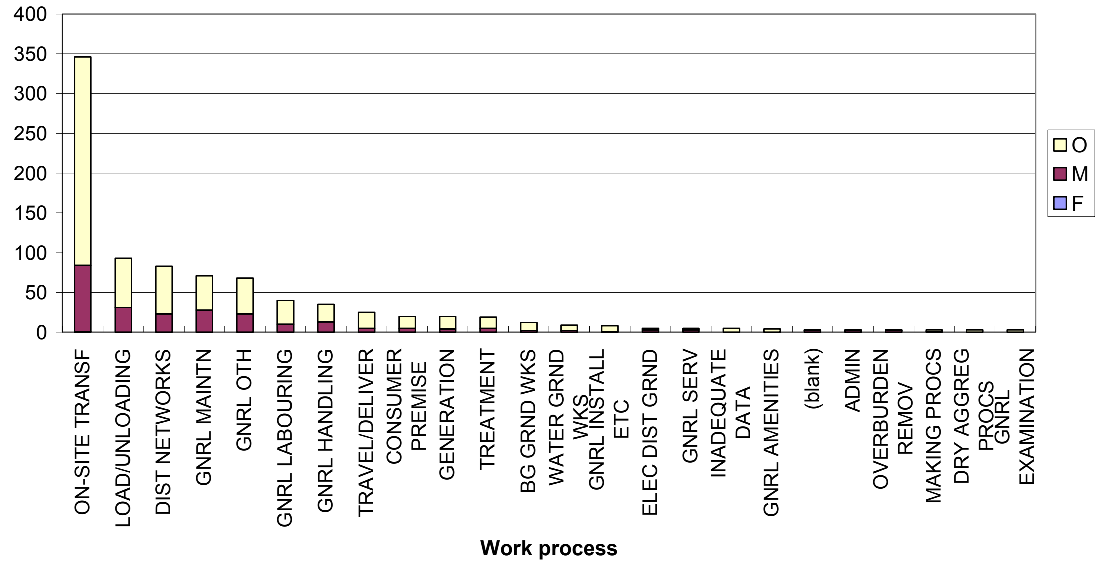

Figure 47 Low level falls in the extraction/utility industries between 1996/97 and 2000/01 by work process

Figure 48 shows the agents involved in low falls in extraction/utility supplies. Again, in keeping with what has already been found, vehicles are related to the largest proportion of these accidents over the five year period. Stairs and ladders are also involved in significant (and similar) numbers of accidents. However, ladders are involved in a larger number of major injury accidents whilst low fall accidents on stairs result in a larger number of over 3-day accidents.

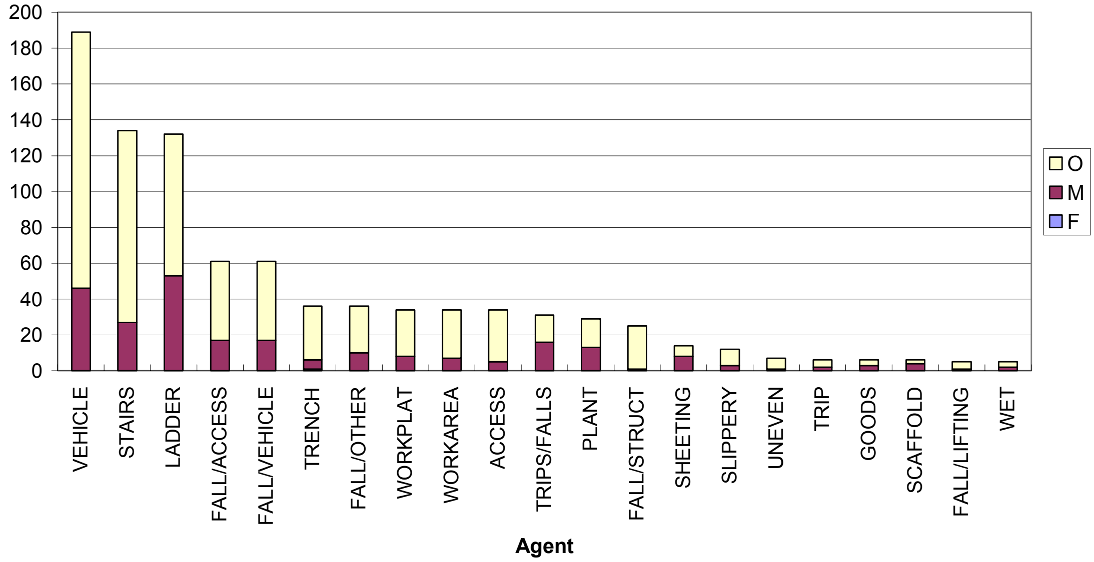

Figure 48 Low level falls in the extraction/utility industries between 1996/97 and 2000/01 by agent

Figure 49 shows the low falls in extraction/utility supplies by age group. The age profile follows a fairly normal distribution.

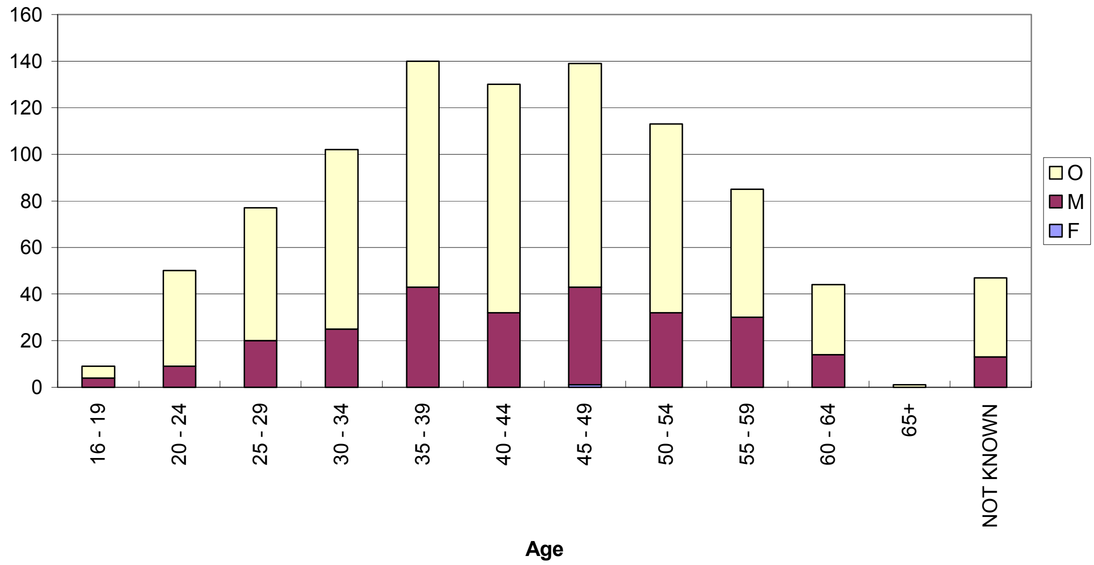

Figure 49 Low level falls in the extraction/utility industries between 1996/97 and 2000/01 by age

Figure 50 shows the number of low fall accidents in the extraction/utility supply industries by employment status. This clearly shows that these accidents occur almost exclusively to employees. This is likely to be because there are relatively few self-employed people in these industries. Unfortunately, the number of self employed people in this sector is too small for an estimation of the population of this group and so comparisons of rates between employees and the self employed is not possible.

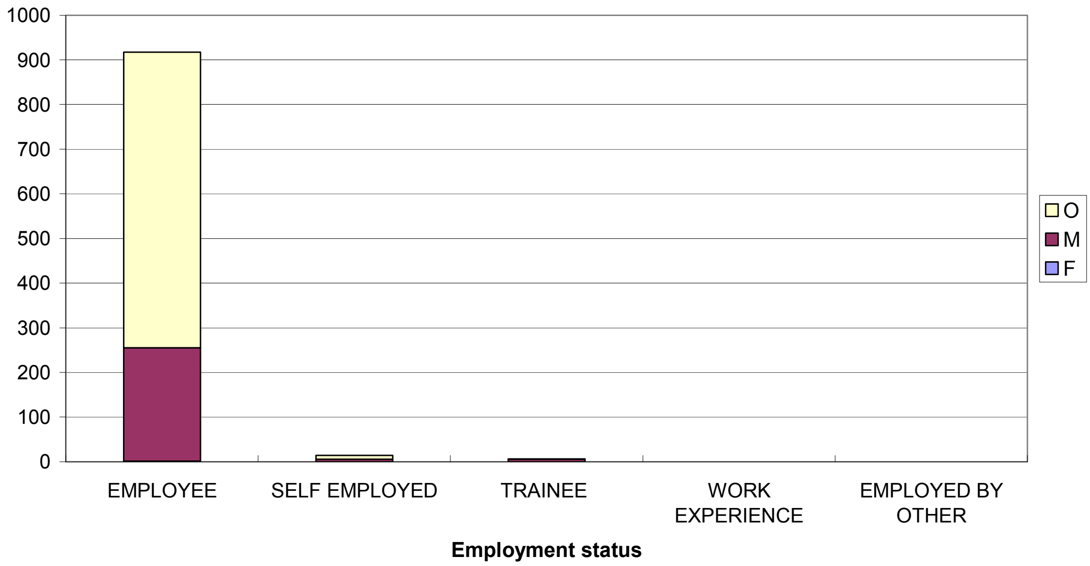

Figure 50 Low level falls in the extraction/utility industries between 1996/97 and 2000/01 by employment status

5.5.2 High level falls

The number of accidents resulting from high level falls in the extraction/utilities sector over the last five years is shown in Figure 51. Although there appears to be a broadly reducing trend in the accident figures, there appears to be considerable variability (perhaps due to the small numbers).

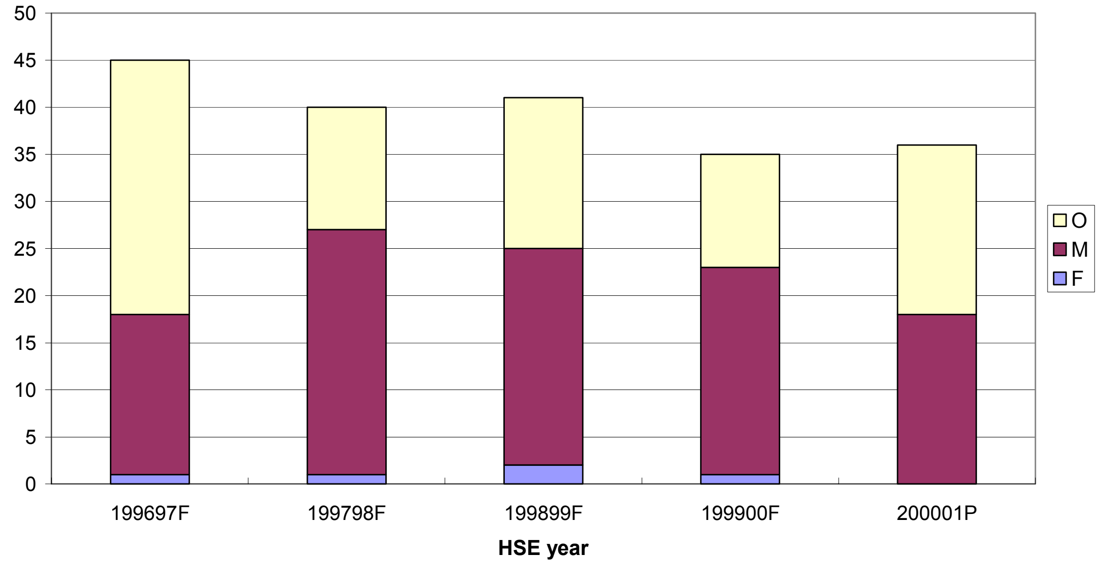

Figure 51 High level falls in the extraction/utility industries between 1996/97 and 2000/01 by HSE year

The main sectors of the extraction/utility industries where high fall accidents occur are shown in Figure 52. The top four is made up of the same sectors as for low falls, with the main exception being that the stone quarrying sector has the highest number of high fall accidents in total and also the highest number of fatal and major and over 3-day injury accidents.

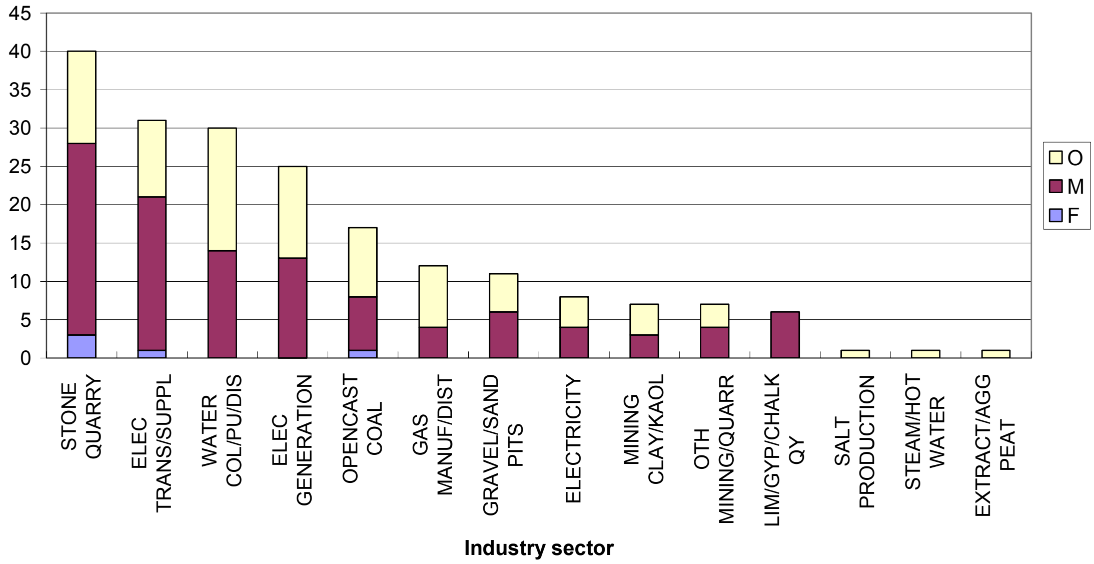

Figure 52 High level falls in the extraction/utility industries between 1996/97 and 2000/01 by industry sector

Figure 53 shows that mining/quarrying and goods driver occupations have had the largest number of high fall accidents in the last five years. However, the accident profile is different, with most of the high fall accidents in mining/quarrying resulting in either fatal or major injuries, whilst with goods drivers there was an approximately equal chance of the injury being either a major or over 3-day injury. Electrical fitters are the other occupation with large numbers of accidents and the majority of these result in major injuries.

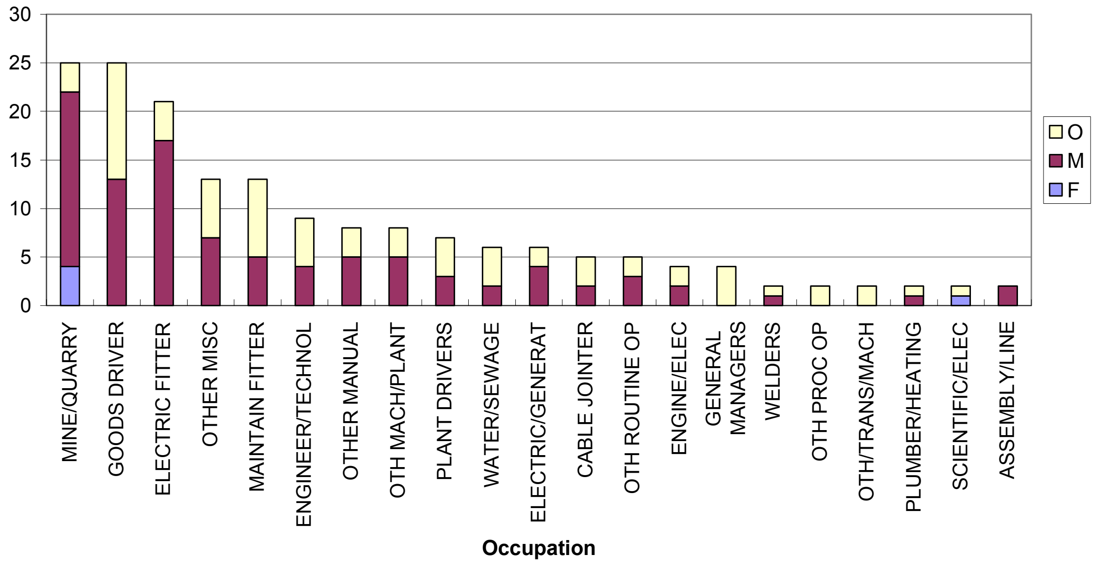

Figure 53 High level falls in the extraction/utility industries between 1996/97 and 2000/01 by occupation

As with low falls, Figure 54 indicates that on-site transfer was the work process with the highest number of high fall accidents. However, the situation is not as clear-cut as with low falls, as work on general maintenance, loading/unloading and distribution networks follow close behind.

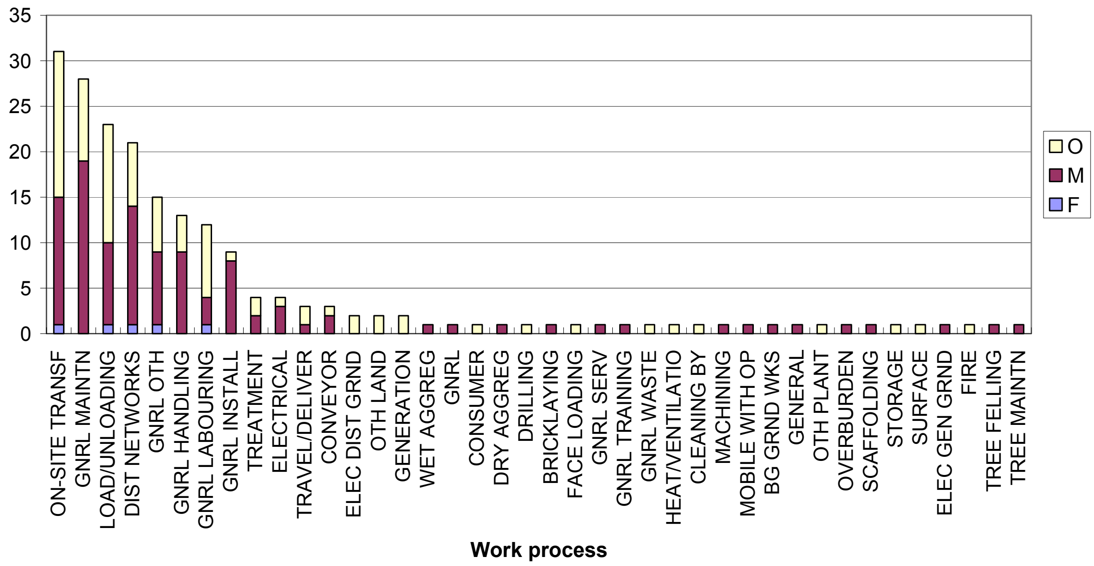

Figure 54 High level falls in the extraction/utility industries between 1996/97 and 2000/01 by work process

The agents involved in high falls are shown in Figure 55. Unlike low falls, ladders dominate, being involved in the most high fall accidents. However, there were no fatal injuries involving ladders, with most of the fatalities involving 'fall/other' (i.e. the agent was not classified).

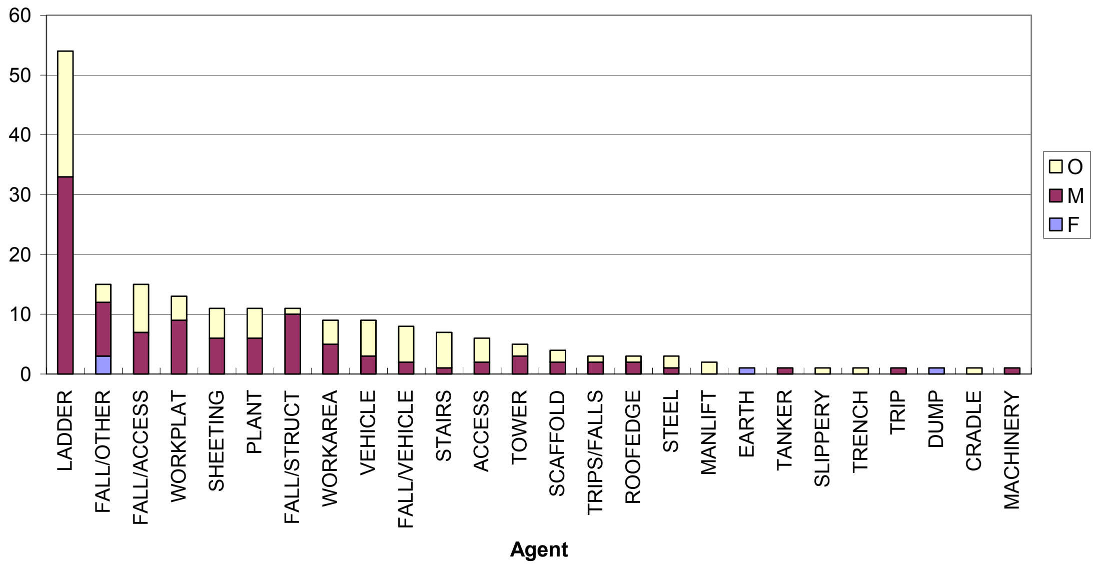

Figure 55 High level falls in the extraction/utility industries between 1996/97 and 2000/01 by agent

Figure 56 shows a broadly similar type of normal distribution to that for low falls for the ages of the injured persons, with most of the accidents happening to those aged between 30 and 55.

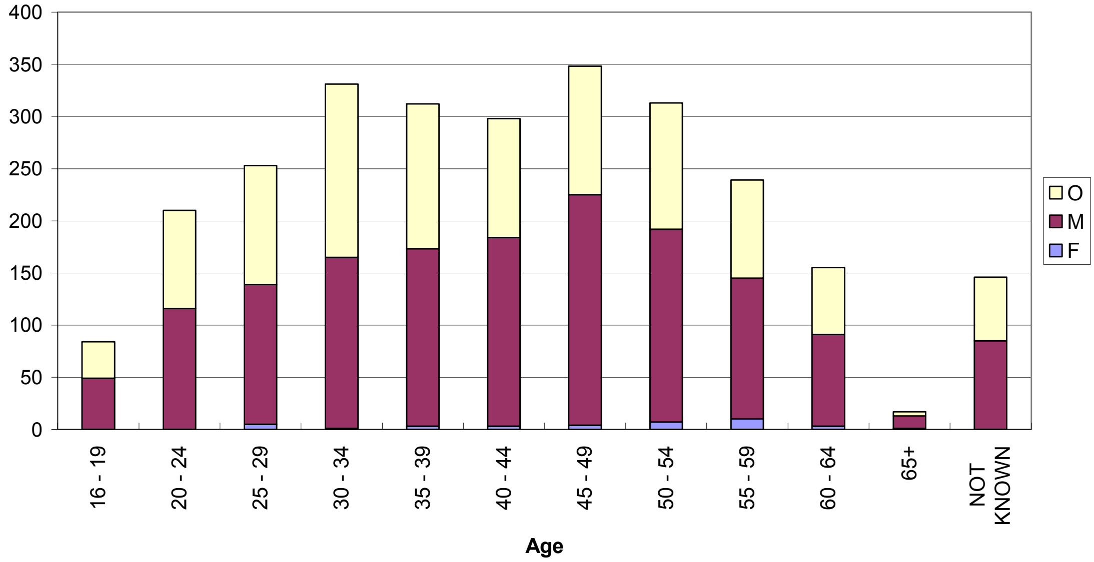

Figure 56 High level falls in the extraction/utility industries between 1996/97 and 2000/01 by age

Figure 57 shows the breakdown of high fall accidents by employment status. As with low falls, virtually all of the reported accidents occurred to employees.

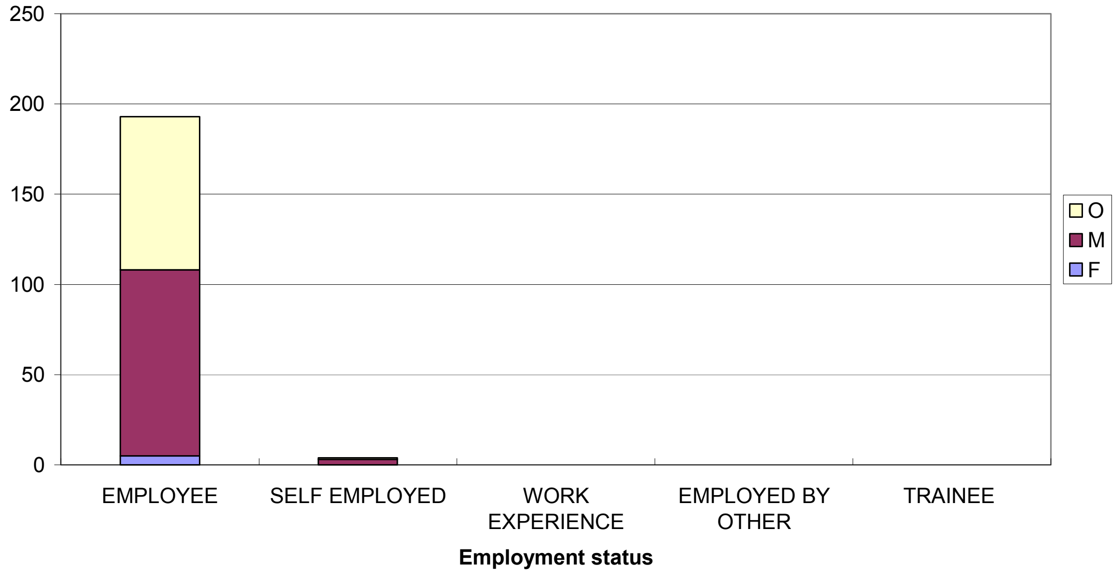

Figure 57 High level falls in the extraction/utility industries between 1996/97 and 2000/01 by employment status

5.5.3 Summary

There are relatively few fatal falls in the extraction/utility supply industries. However, it is clear that there are certain areas which carry more risk of falls than others. Six fatal falls have occurred in the two industries which have the highest number of falls, stone quarrying and electricity distribution and supply.

The primary work process involved in low falls is on-site transfer, with the most significant agents being vehicles followed by ladders and stairs. High falls primarily occur in on-site transfer followed by maintenance work and loading/unloading. Ladders are the primary agent involved.

5.6 MANUFACTURING

The manufacturing industry has been responsible for a small number of fatalities from fall accidents every year, typically around 5 to 15, with major injury falls totalling more than one thousand per year. The rate of these accidents is relatively low however and the number has generally dropped in recent years. Major injury low falls make up the majority of the accidents and show a higher rate than major injury high falls and so the former group of accidents is used as a focal point in this section.

5.6.1 Low level falls

The number of low level falls occurring in the manufacturing industries over the last five years are shown in Figure 58. There are no discernable trends in the accident figures overall, as they seem to hover around 2500 per year with a little variability

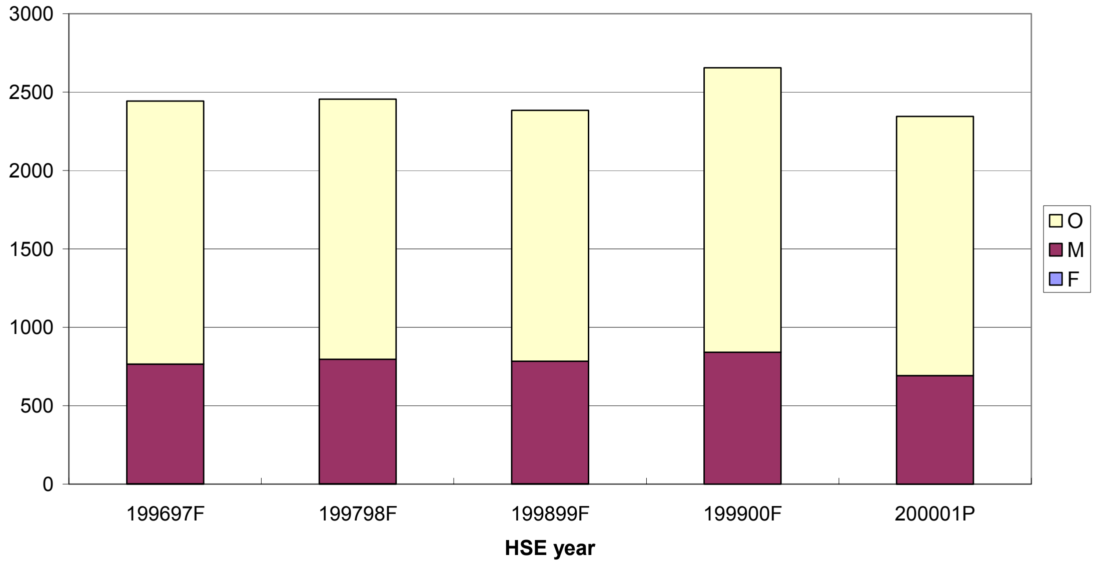

Figure 58 Low level falls in the manufacturing industries between 1996/97 and 2000/01 by HSE year

In general, low fall accidents occur in a large number of manufacturing sectors with over 250 different categories featuring over the five-year period. Figure 59 shows that the bread and pastry industry and the manufacture of other plastic products ('other plastic') have accounted for 4% the largest proportion of accidents ascribable to a sector over the last five years. Other industries which have a relatively high number are shipbuilding/repair, motor vehicles, aircraft manufacturing and a selection of the steel-working industries ('oth fab metal', 'basic iron/steel' and 'metal structures')

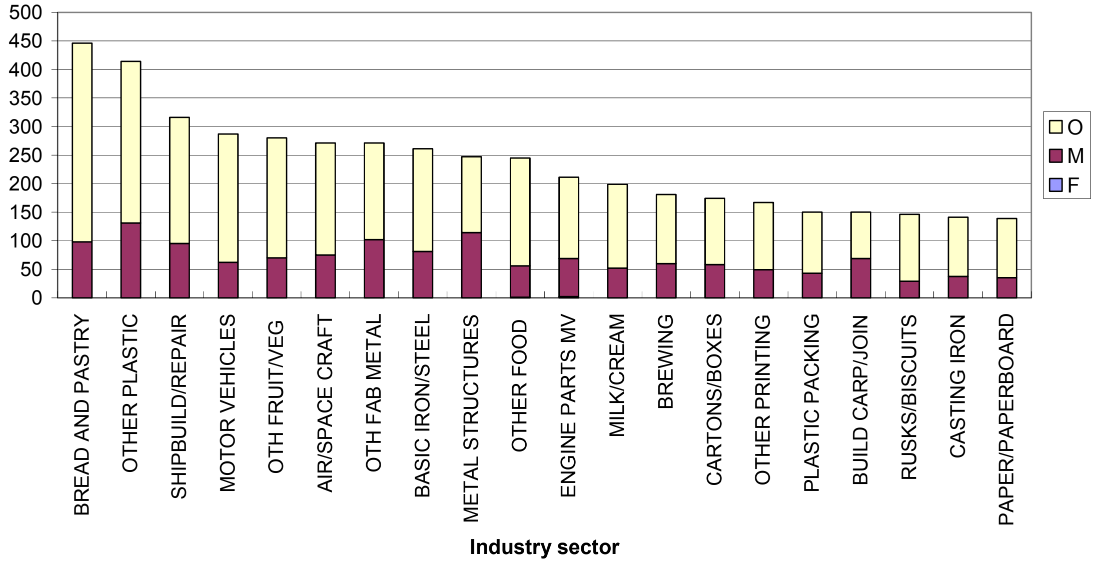

Figure 59 Low level falls in the manufacturing industries between 1996/97 and 2000/01 by industry sector

As well as there being a large number of manufacturing industries in which there are falls from height, there are also many occupations within these which are affected. Those with most low fall accidents are shown in Figure 60. This shows that a general category (other routine operatives) is the occupation with the highest number of low fall accidents, whilst goods drivers and maintenance fitters are the largest of the specific named occupations. Food and drink workers have a high number of over 3-day injury accidents which gives them the fifth highest number of accidents overall.

Figure 60 Low level falls in the manufacturing industries between 1996/97 and 2000/01 by occupation

Figure 61 shows the low fall accidents in manufacturing industries by work process. This reveals that on-site transfer is being undertaken during the majority of these accidents (just under half), with over 3-day injury accidents making up around three-quarters of the total. Loading/unloading and general maintenance have the next highest number of low falls (around a quarter of those incurred whilst carrying out on-site transfer). General handling and travel/delivery also feature highly, together with loading/unloading which highlights the number of accidents associated with goods delivery.

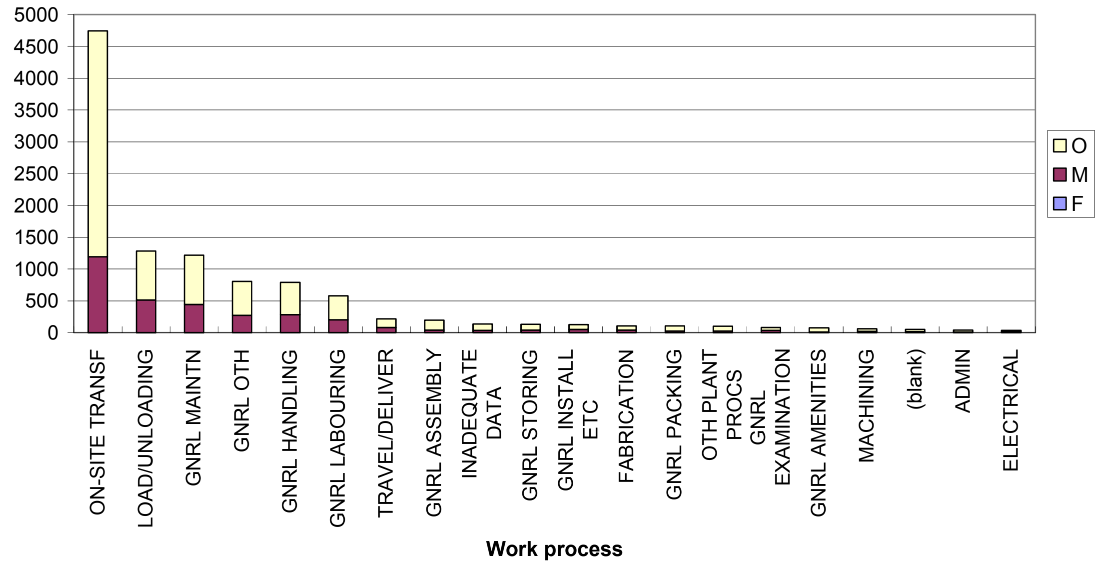

Figure 61 Low level falls in the manufacturing industries between 1996/97 and 2000/01 by work process

Figure 62 shows the agent involved in the low fall accidents. This shows that stairs and ladders have been involved in the majority of the low fall accidents. Stairs were involved in the highest number of low fall accidents overall, however, ladders were involved in the highest number of major injury accidents. This gives an indication that the severity of injury resulting from low falls from ladders is likely to be greater than that resulting from a low fall from stairs. Vehicles, access and work platforms constituted the next three most significant agents.

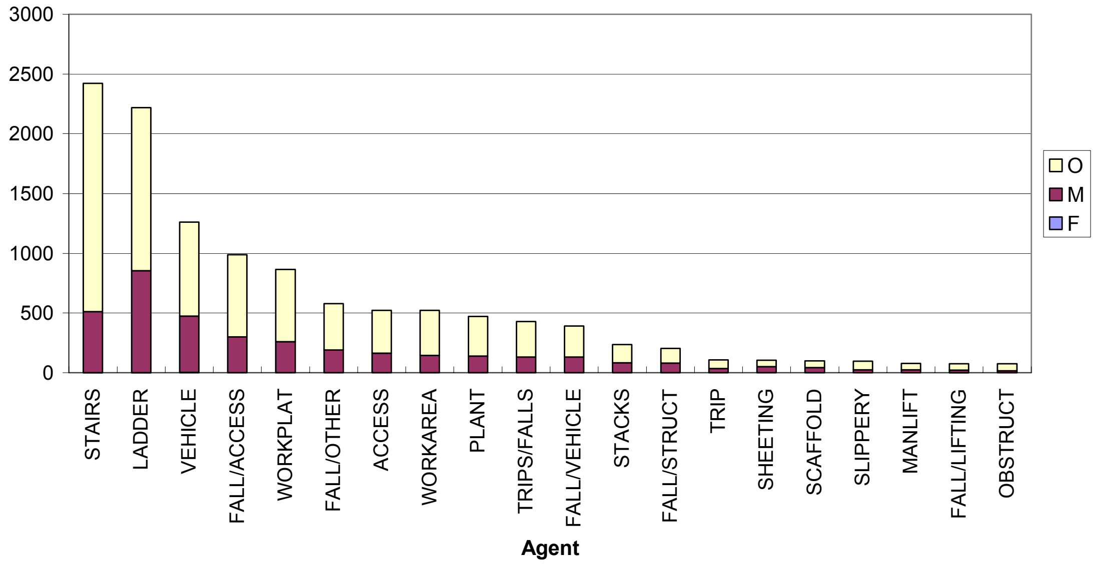

Figure 62 Low level falls in the manufacturing industries between 1996/97 and 2000/01 by agent

The ages of those involved in major injury low falls over the period are shown in Figure 63. This shows that there is an approximate plateau between the ages of 30 and 55, with similar numbers of workers suffering both major and over 3-day injuries.

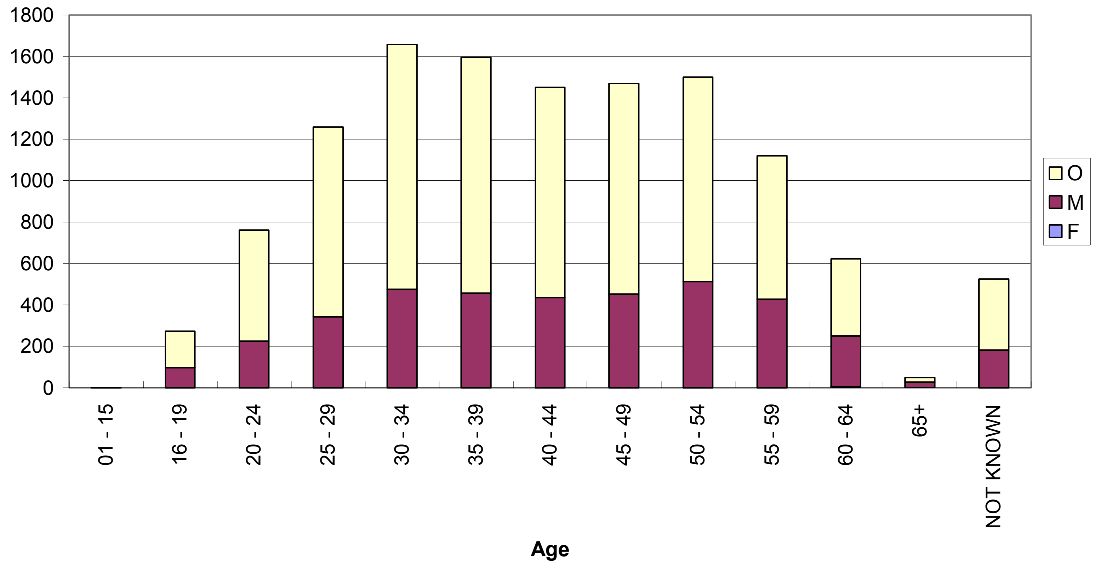

Figure 63 Low level falls in the manufacturing industries between 1996/97 and 2000/01 by age

Figure 64 shows the number of low falls in manufacturing according to employment status. This shows that these accidents are almost exclusively confined to employees with only 2 or 3% among self employed, presumably reflecting the employment patterns in the sector.

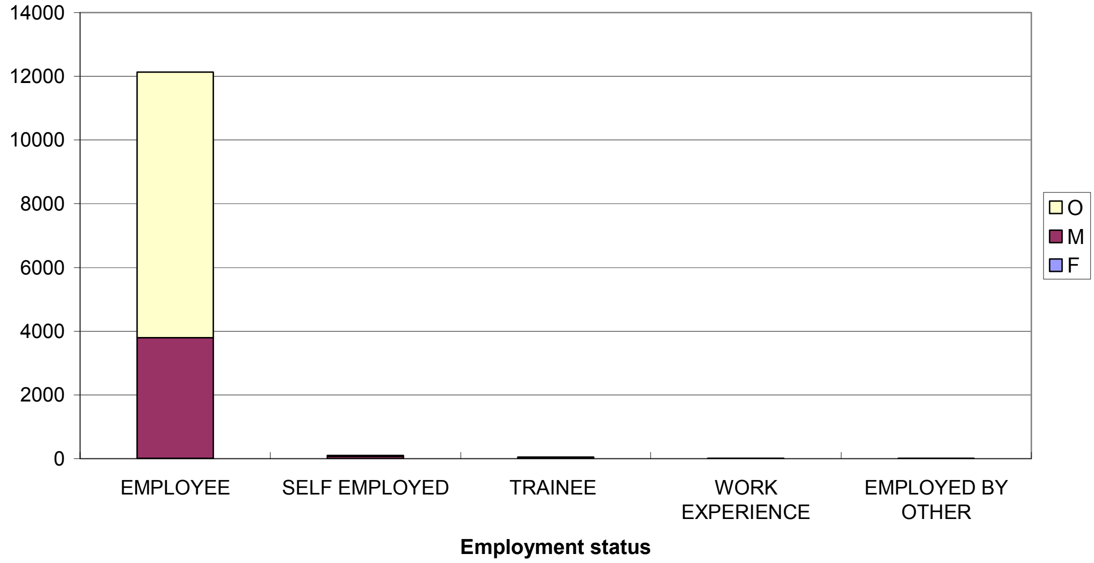

Figure 64 Low level falls in the manufacturing industries between 1996/97 and 2000/01 by employment status

5.6.2 High level falls

It can be seen from Figure 65, that there are considerably less high falls in the manufacturing industries than there are low falls (around a fifth of the number) perhaps reflecting that the majority of work is carried out at low level. Whilst the number of high fall accidents peaked in 1998/99, there appears to have been a noticeable reduction in the two years since.

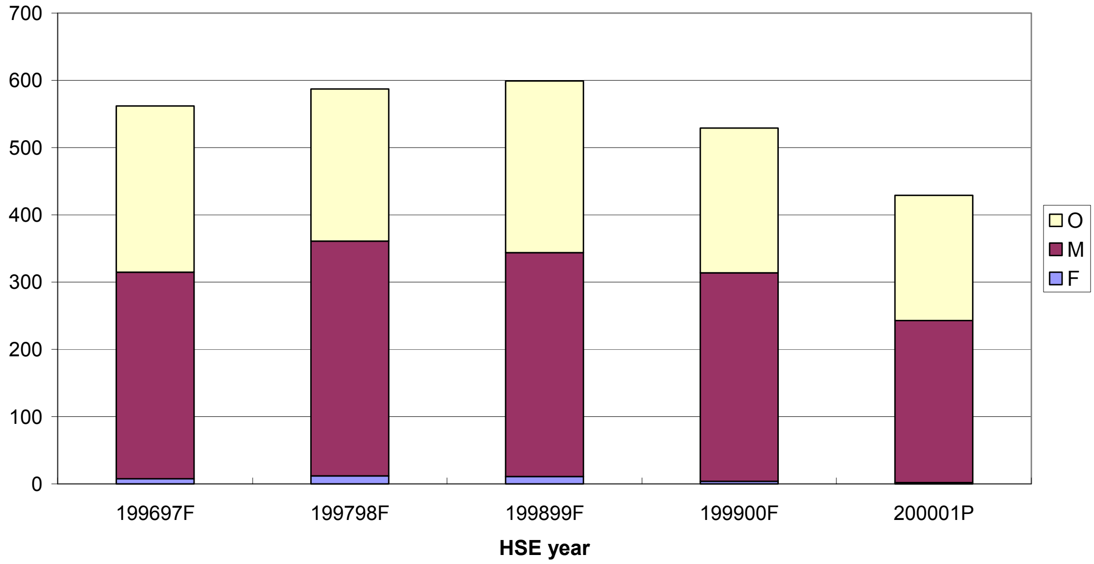

Figure 65 High level falls in the manufacturing industries between 1996/97 and 2000/01 by HSE year

As has been observed in other sectors, there are many similarities between low and high fall accidents in manufacturing in terms of which industrial sectors have the most accidents. Figure 66 shows that the combined steelwork industries ('oth fab metal', 'metal structures', 'basic iron/steel' and 'treat/coat meta') have the highest number of high fall accidents followed by the shipbuilding/repair and plastics industries. There are different accident profiles for the various sectors reflecting the type of work typically carried out. Most of the fatalities occurred in shipbuilding/repair, whilst in the steelwork and general mechanical engineering industries, the majority of the accidents resulted in major injuries.

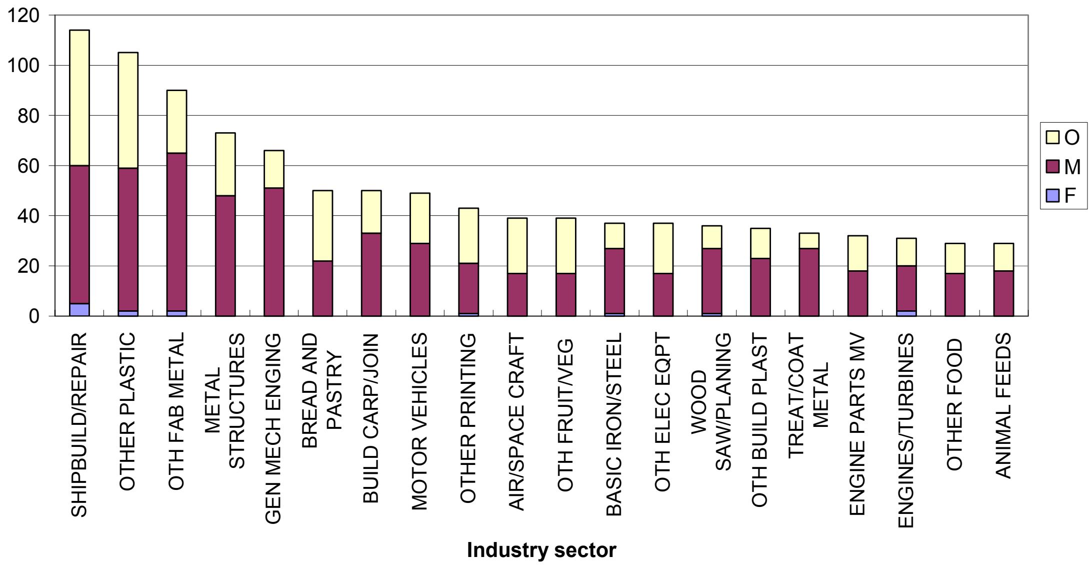

Figure 66 High level falls in the manufacturing industries between 1996/97 and 2000/01 by industry sector

The manufacturing industry occupations involved in the highest number of accidents are shown in Figure 67. This indicates that of the specifically named occupations, maintenance fitters, electrical fitters and goods drivers have been involved in the largest number of high fall accidents. Whilst the other routine operatives and other miscellaneous occupations also had large numbers of high fall accidents, it is difficult to ascertain exactly what occupations these categories refer to.

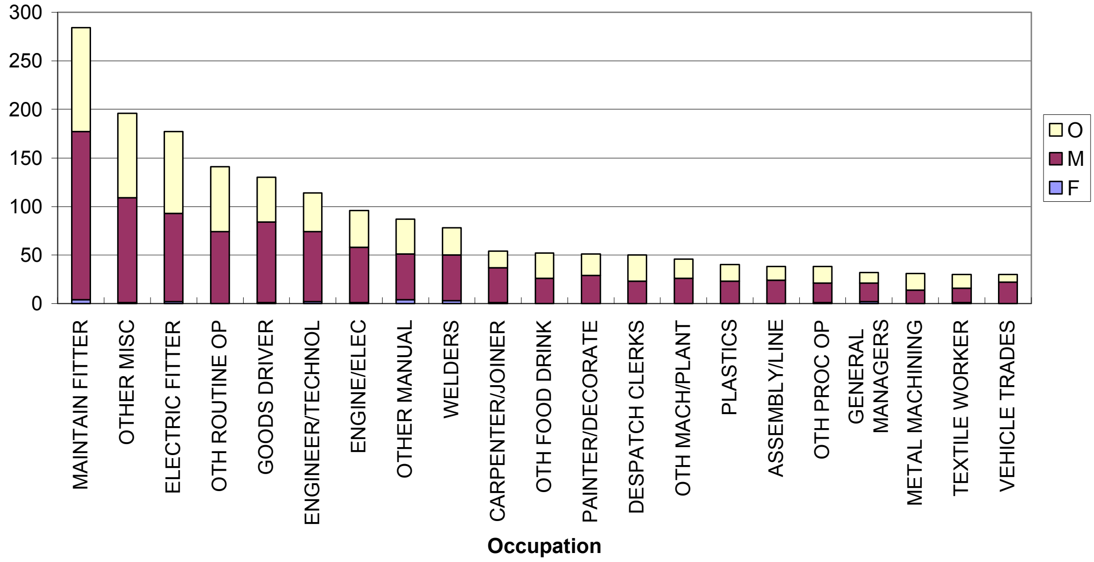

Figure 67 High level falls in the manufacturing industries between 1996/97 and 2000/01 by occupation

Figure 68 shows that the most common work processes involved with high falls are on site transfer and general maintenance. These work processes were also observed to be prominent for low fall accidents (along with loading/unloading). The other work processes with significant numbers of high falls are all general work processes.

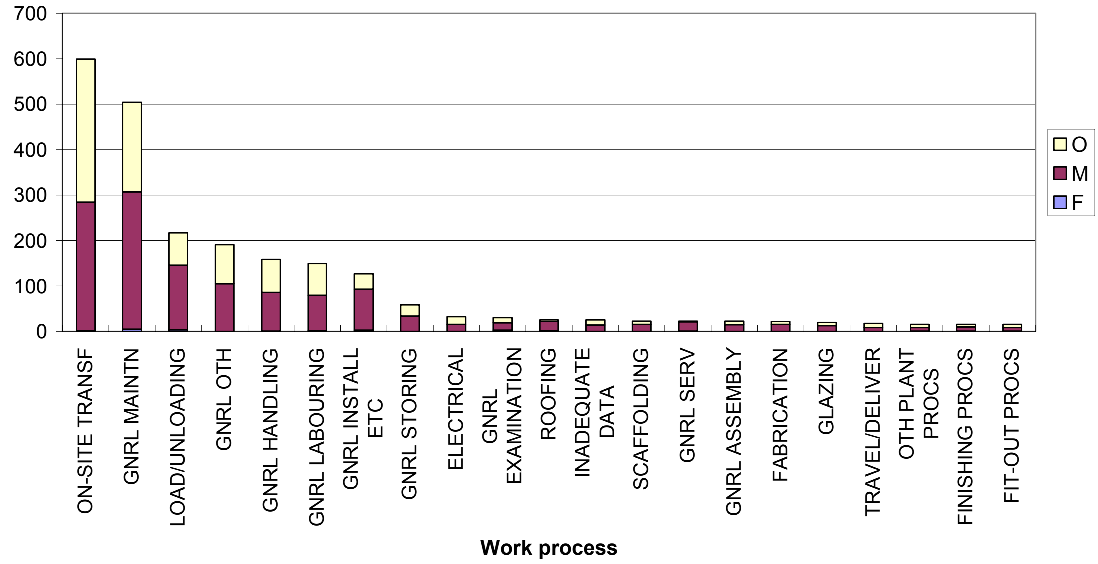

Figure 68 High level falls in the manufacturing industries between 1996/97 and 2000/01 by work process

From Figure 69 ladders can be seen to be, far and away, the agent involved in the most high falls, with over 200 accidents each year. Stairs are the next most significant agent, but were involved in less than a fifth of the number of accidents involving ladders. As with low falls, access, work platforms and vehicles were also reasonably significant.

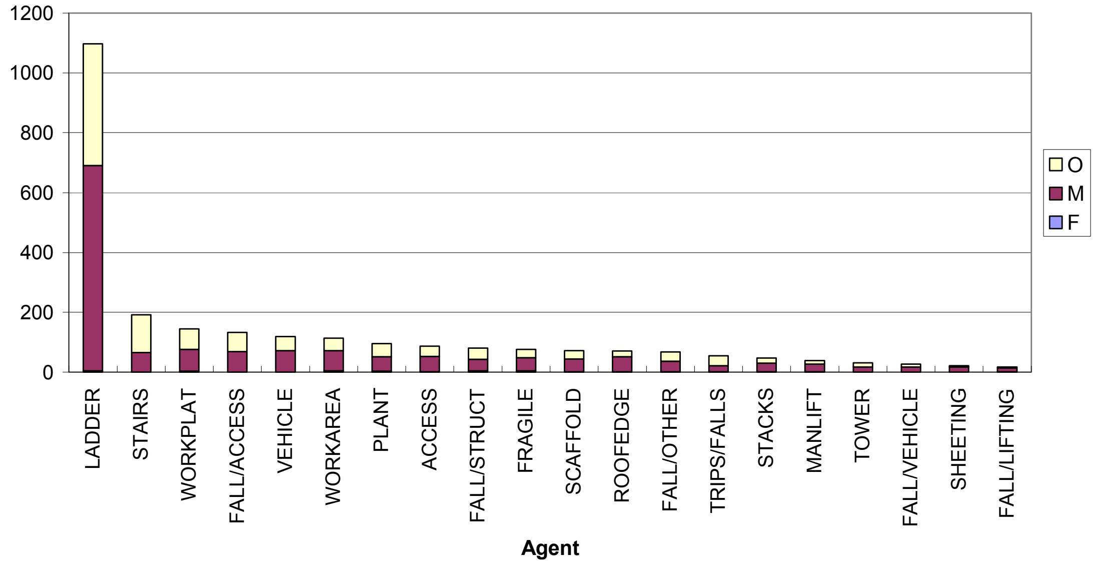

Figure 69 High level falls in the manufacturing industries between 1996/97 and 2000/01 by agent

The age distribution of those workers in the manufacturing industries injured due to high falls is shown in Figure 70. As with low falls, there seems to be a plateau between 30 and 55. However, higher numbers of fatalities appear to be occurring to older workers, with most occurring to workers aged between 50 and 60.

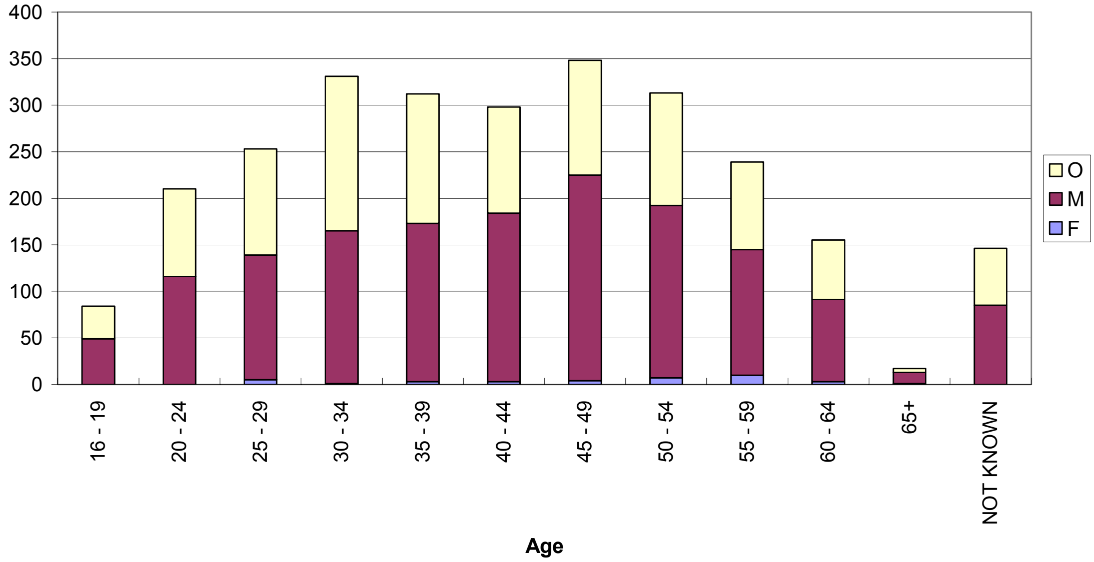

Figure 70 High level falls in the manufacturing industries between 1996/97 and 2000/01 by age

Figure 71 shows the effect of employment status on high falls and, as with low falls, shows that it is employees who are primarily involved the accidents.

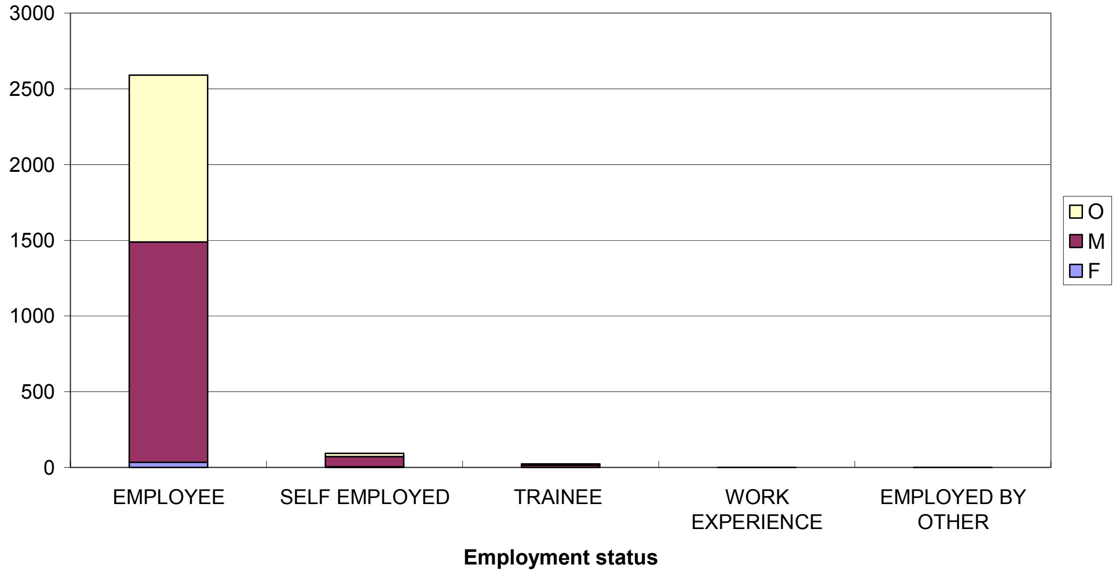

Figure 71 High level falls in the manufacturing industries between 1996/97 and 2000/01 by employment status

5.6.3 Summary

The ship building/repair, steelwork and plastic industries have the largest incidence of both low and high level falls.

For low level falls, goods drivers, routine operatives and maintenance fitters have the highest number of falls, with on-site transfer, loading / unloading and general maintenance being the work processes with the highest number of falls. Ladders and stairs are the agents involved in most low falls, with falls from ladders giving rise to more major injury accidents than stairs.

For high level falls, maintenance and electrical fitters have the most accidents followed by goods drivers. On-site transfer and general maintenance are the most common work processes involved in high falls, accounting for more than half of the number of falls that occurred due to the next most significant work processes, loading/unloading and general handling. The number of high fall accidents involving ladders is ten times that of the next agent, stairs.

5.7 SERVICES INDUSTRIES

Services industries account for the second largest number of both fatal and major injury falls. However, due to the large number of people in services (around 17 million), the industry has a relatively low rate of falls, which from 1996 to 2001 is always the lowest rate of any of the industrial sectors.

5.7.1 Low level falls

Figure 72 shows the variation in the number of fall accidents in the services industries over the last five years. There appear to be two distinct groupings: 1996/97 and 1997/98, and 1998/99 to 2000/01, with a distinct increase of around 1500 accidents per year between 1997/98 and 1998/99. It is difficult to see why there should be such a sustained increase in the number of low fall accidents without a change in the accident reporting/coding system. If all of the falls (low, high and unspecified) are considered, the total number of falls remains relatively constant each year. It would appear that a change in the coding system for accident kind occurred in 1998/99, with many of the unspecified falls being coded subsequently as either low or high falls. There is a decrease in the number of unspecified falls from 1998/99 onwards corresponding to the increase in the combined number of low and high falls.

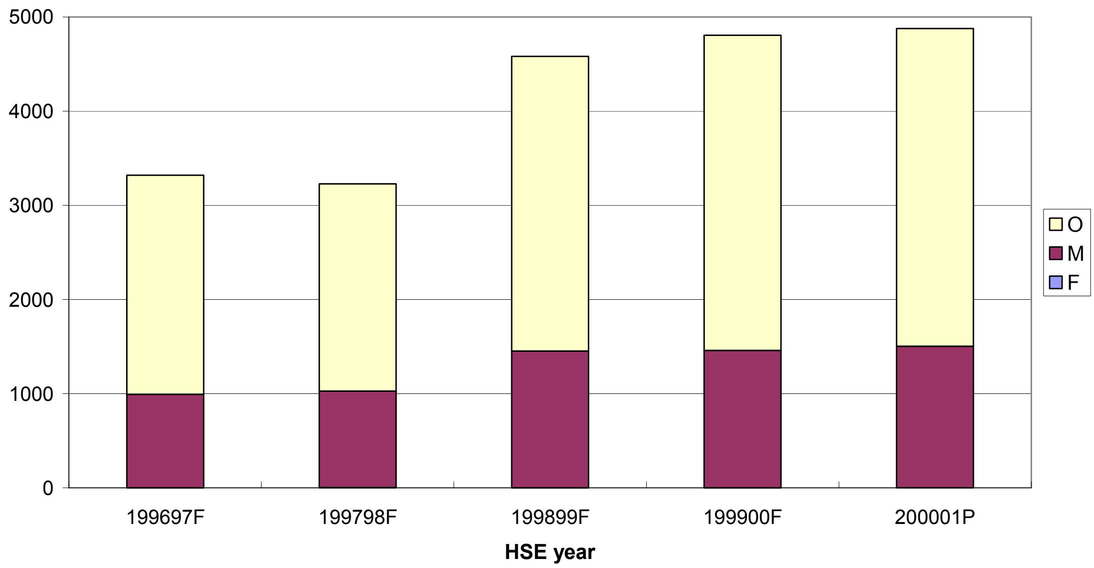

Figure 72 Low level falls in the services industries between 1996/97 and 2000/01 by HSE year

There have been low fall accidents in around 200 services industry sectors over the last five years. Those with the greatest number of accidents are shown in Figure 73. This shows that general public services, freight by road and national post are the three most significant industry sectors. However, the accident profile appears to be quite different, with freight by road suffering the most major injury accidents, whilst national post is dominated by over 3-day injury accidents perhaps reflecting the different types of work (and the associated hazards). Primary and secondary education both appear in Figure 73. This is a little surprising given that it is difficult to imagine such an environment containing many fall hazards.

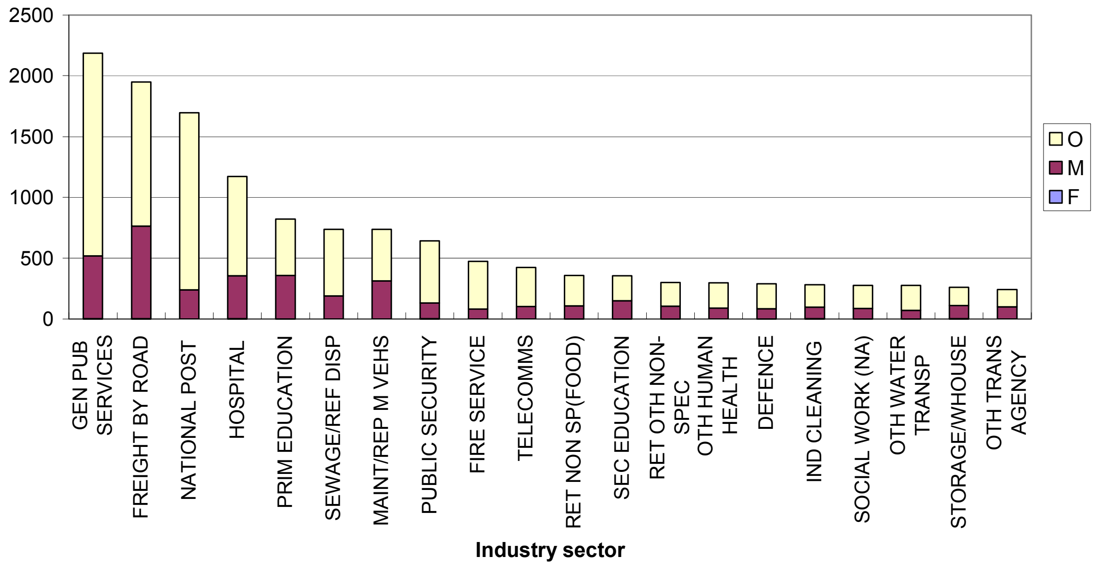

Figure 73 Low level falls in the services industries between 1996/97 and 2000/01 by industry sector

Figure 74 shows that the most prominent services industry occupations for overall numbers of low falls are goods drivers and postal workers (post/message). If only the major injury accidents are considered then teaching is second to goods drivers. The blank category relates to the accidents reported through local authorities (where the coding system is different), and may possibly exhibit similar trends. There a number of occupations that seem to have around 100 low fall accidents each year, including: cleaners, police, care assistants, fire services personnel, admin/government workers and maintenance and electrical fitters.

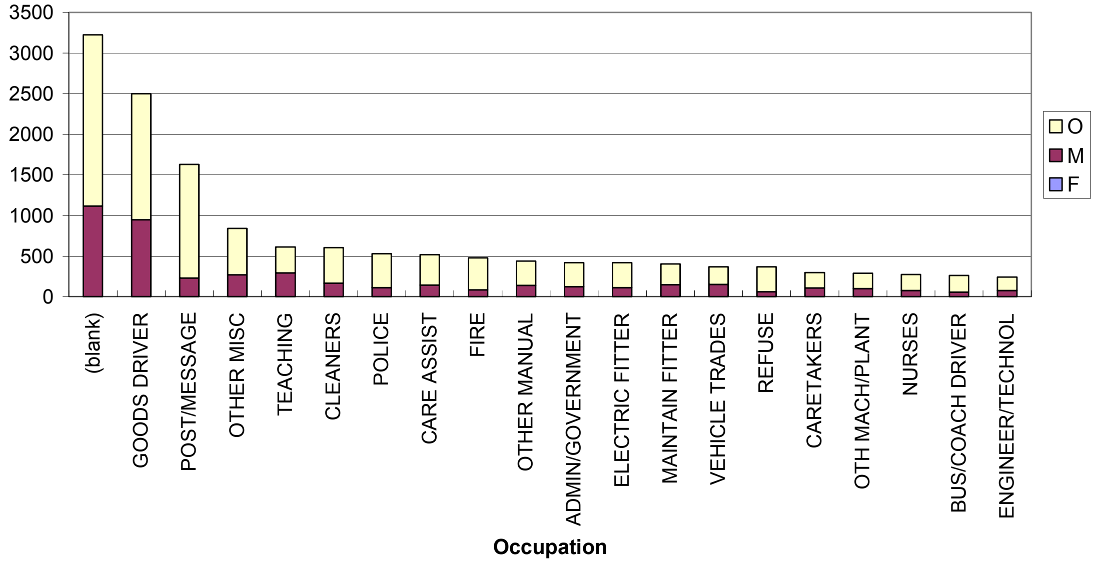

Figure 74 Low level falls in the services industries between 1996/97 and 2000/01 by occupation

Figure 75 shows the low falls in services according to work process. On-site transfer was being undertaken in around 5500 accidents with loading/unloading taking place at the time of around a third of this value. Travel/delivery and loading/unloading are both associated with transport/goods delivery, and can perhaps be considered together. The other significant work process is distribution networks (associated with telecommunications), although the majority of accidents appeared to lead to over 3-day injuries.

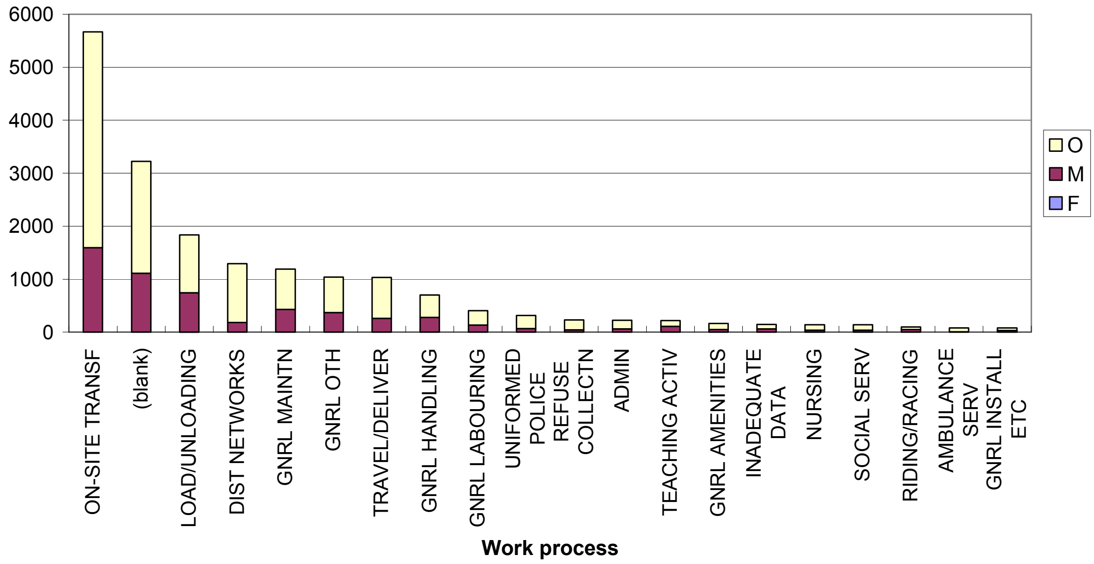

Figure 75 Low level falls in the services industries between 1996/97 and 2000/01 by work process

The agents involved in major injury low falls in services are shown in Figure 76. The most common agent has been stairs resulting in nearly one thousand accidents each year. Vehicle-related agents ('vehicle', 'fall/vehicle' and 'sheeting') are close behind, with over 800 accidents a year on average. Ladders and access areas are each involved in around 400 accidents a year.

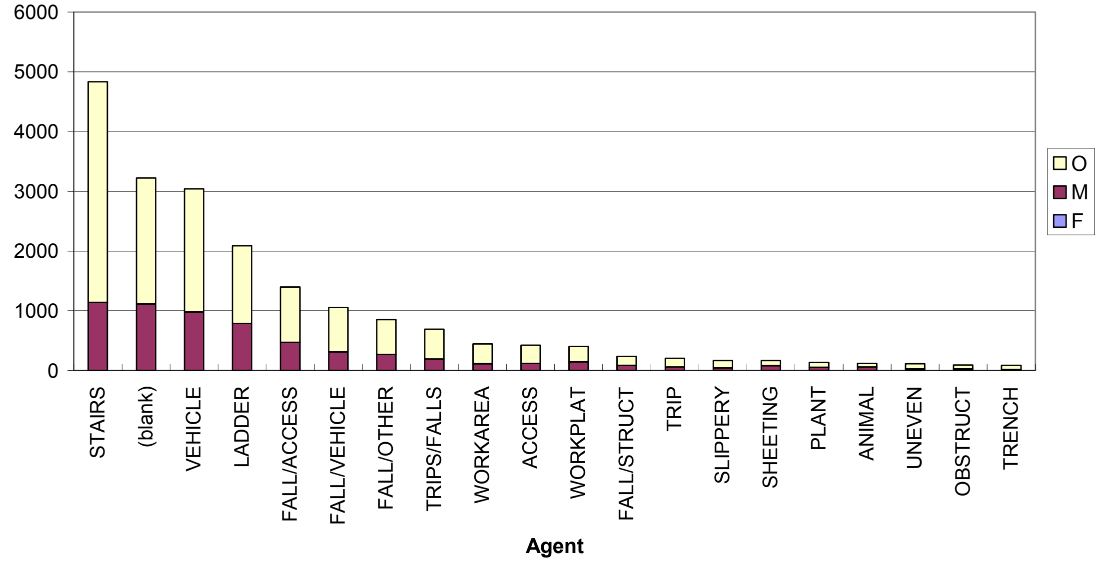

Figure 76 Low level falls in the services industries between 1996/97 and 2000/01 by agent

Figure 77 shows major injury low falls in services by age group. As with manufacturing, there appears to be a plateau in the number of accidents between the ages of 30 and 55. One of the noticeable features is that for the over 65s, the majority of the injuries tend to be major rather than over 3-day. This could be due to elderly workers being more susceptible to serious injuries if they have an accident.

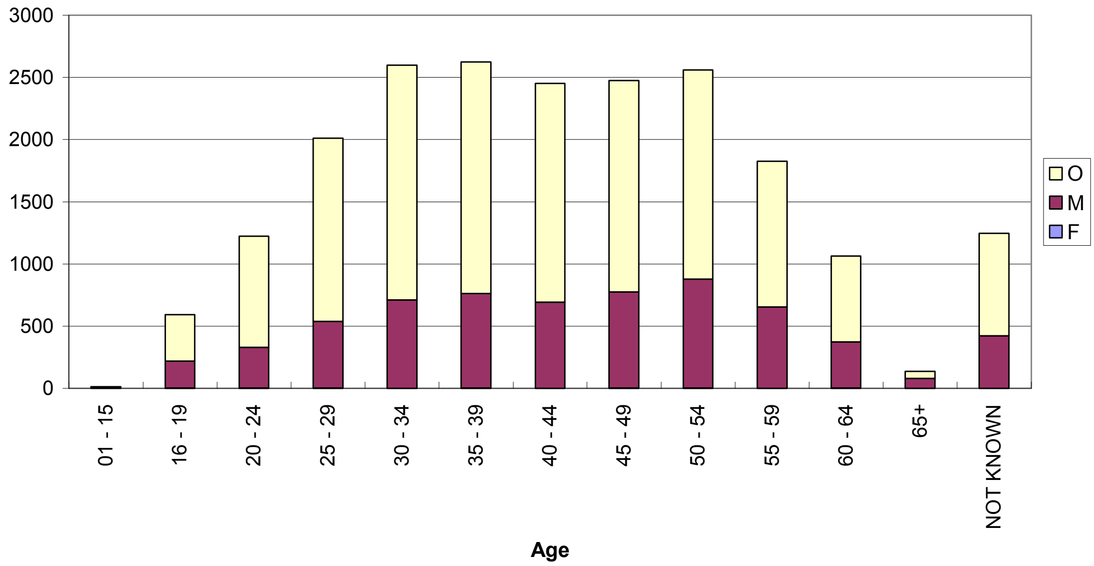

Figure 77 Low level falls in the services industries between 1996/97 and 2000/01 by age

Figure 78 shows the number of low fall accidents by employment status and, as with extractive/utilities and manufacturing, employees are involved in the majority of the accidents. Presumably this is representative of a low number of self-employed in the **services** industries.

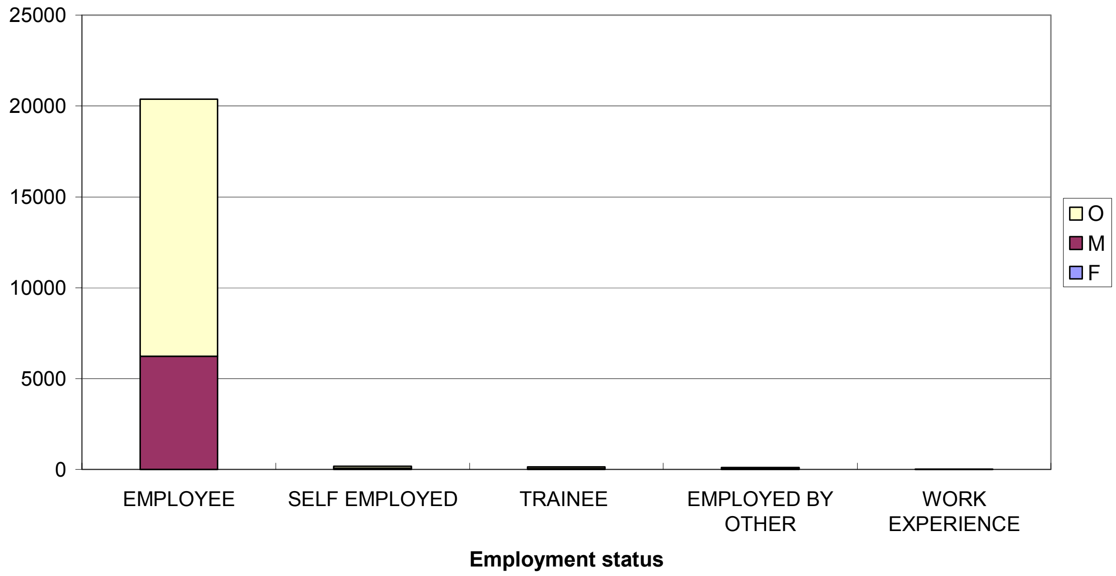

Figure 78 Low level falls in the services industries between 1996/97 and 2000/01 by employment status

5.7.2 High level falls

Figure 79 shows the number of high level fall accidents in the services industries over the last five years. There are significantly less high level falls in services than low level, perhaps reflecting the fact that the majority of work is carried out at low level. The high falls show the same trend as the low falls, with a substantial step-change between 1997/98 and 1998/99 due to the change in the coding system (see Section 5.7.1). However, there does appear to have been signs of reductions since 1998/99.

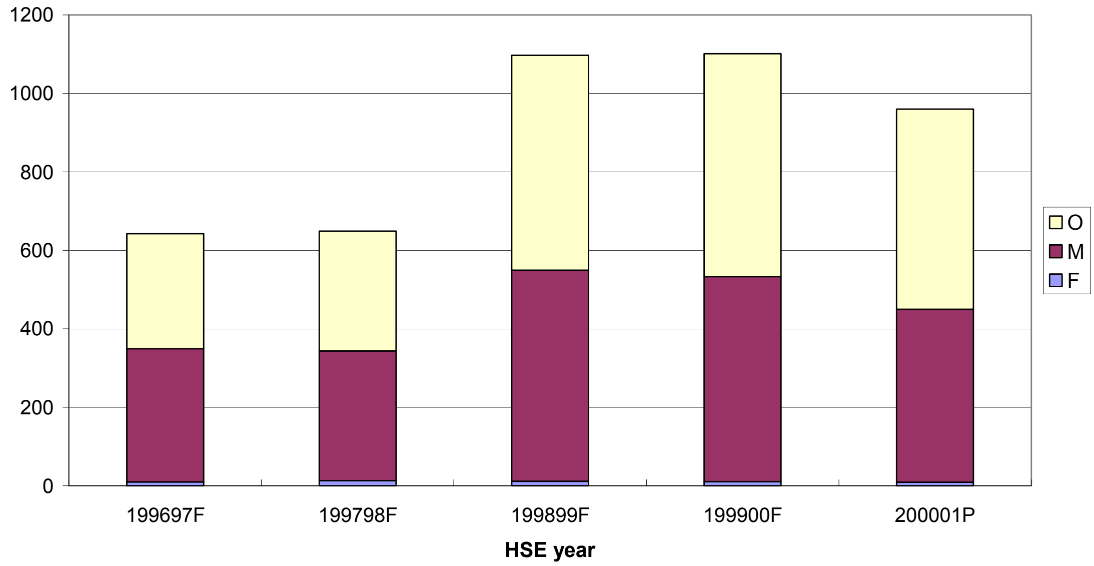

Figure 79 High level falls in the services industries between 1996/97 and 2000/01 by HSE year

Figure 80 shows that freight by road and general public services are the two **services** industry sectors where the most high falls have occurred over the last five years. However, the majority of the fatalities have occurred in industrial cleaning. Telecommunications and vehicle maintenance and repair are on a par with industrial cleaning in terms of overall number of accidents. As with low falls, primary and secondary education also appear.

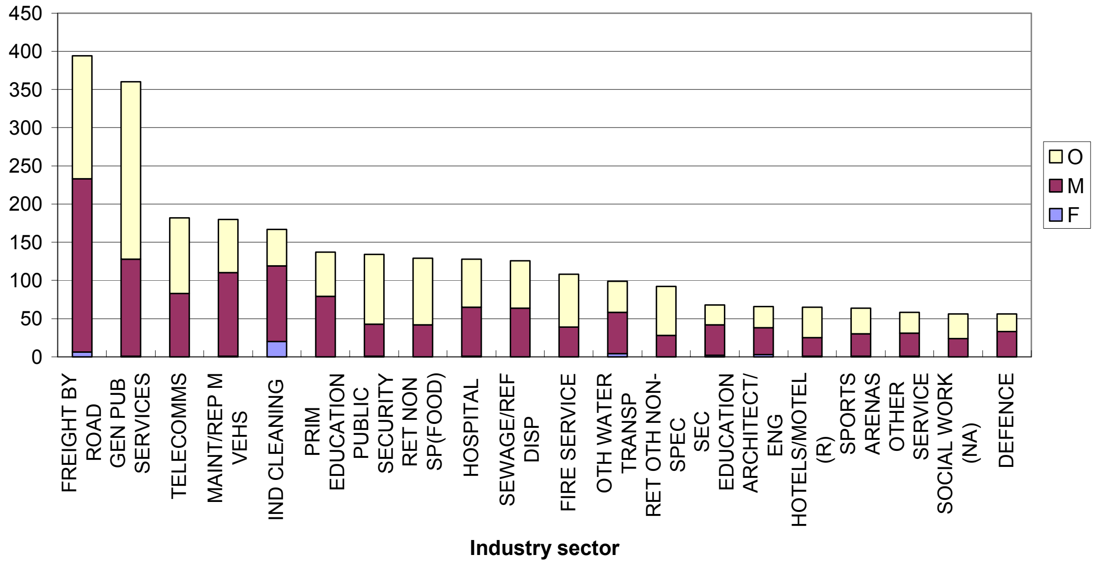

Figure 80 High level falls in the services industries between 1996/97 and 2000/01 by industry sector

Figure 81 is distorted to some extent by the local authority (blank) accident data. Once the categorised data are considered, goods drivers appear to be the occupation suffering the most high fall accidents. As with low falls, electrical and maintenance fitters, and the police and fire services also have a number of high falls. However, window cleaning is the occupation where accidents lead to the most fatalities, accounting for around a third of the total number of the falls-related fatalities in the services industries.

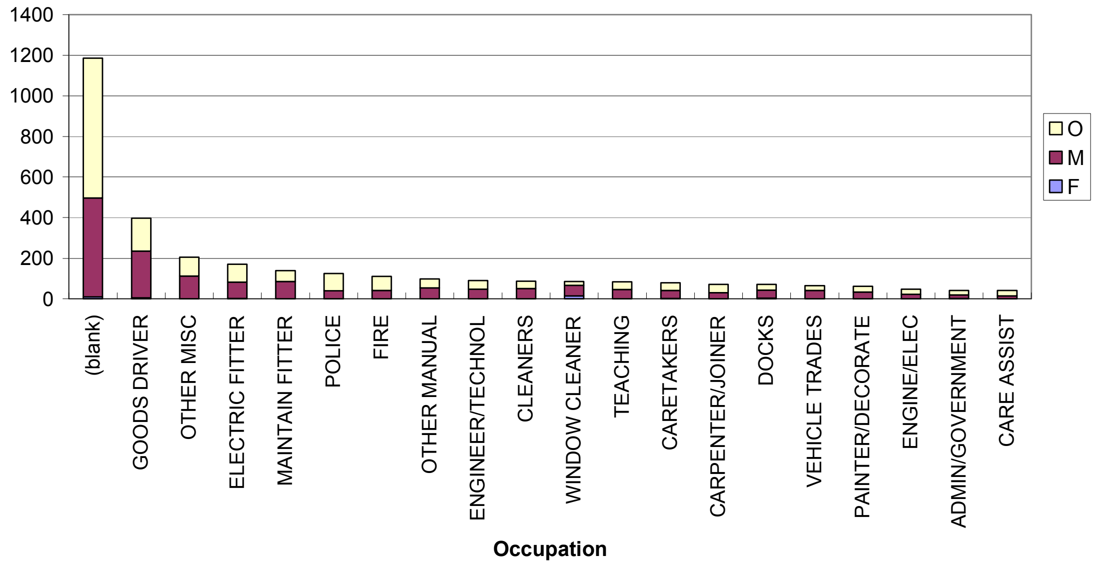

Figure 81 High level falls in the services industries between 1996/97 and 2000/01 by occupation

Figure 82 shows that, in common with low falls, on-site transfer, general maintenance and loading/unloading are the most common activities being undertaken when a high fall occurs. General maintenance and window cleaning have the highest number of fatalities, although several of those workers killed whilst undertaking general maintenance were classed as window cleaners.

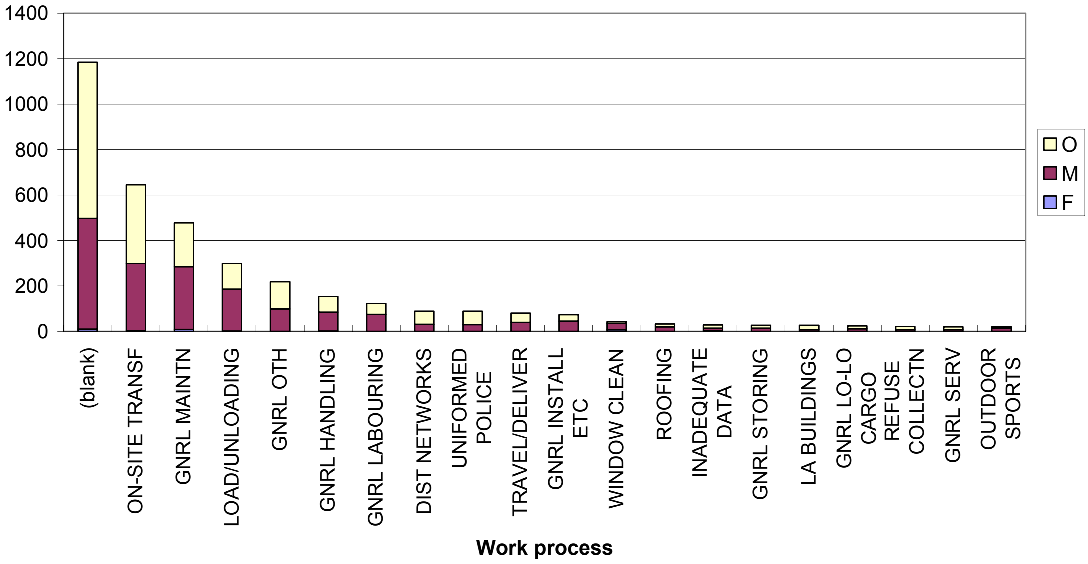

Figure 82 High level falls in the services industries between 1996/97 and 2000/01 by work process

Figure 83 shows that not only are ladders the largest category of agent involved in the overall number of high fall accidents, but they are also the primary source of fatalities. If the local authority reported data were also taken into account, the figures for ladders would probably be much higher. Stairs still feature highly, even though the average flight of stairs is little more than 2m high. The vehicle-related agents ('vehicle', 'fall/vehicle', 'sheeting' and 'tanker') are on a par with stairs in terms of total numbers over the five-year period.

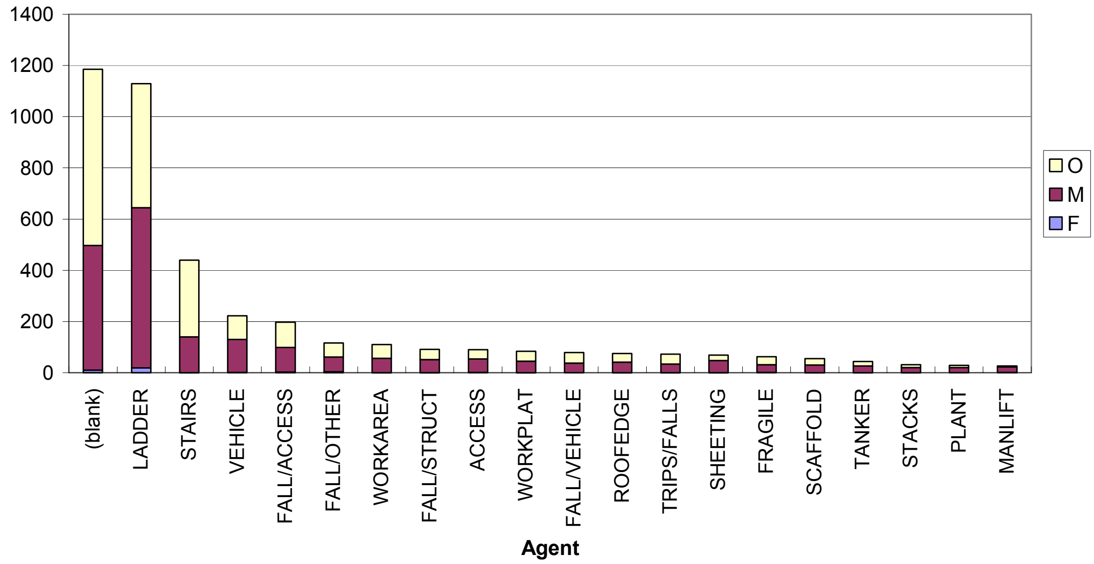

Figure 83 High level falls in the services industries between 1996/97 and 2000/01 by agent

The only real difference in the age profile between low and high falls, is that the plateau starts five years earlier, and stretches from 25 to 55. However, the fatalities appear to be concentrated among the older workers (45 to 65+), with 55 to 59 showing a peak.

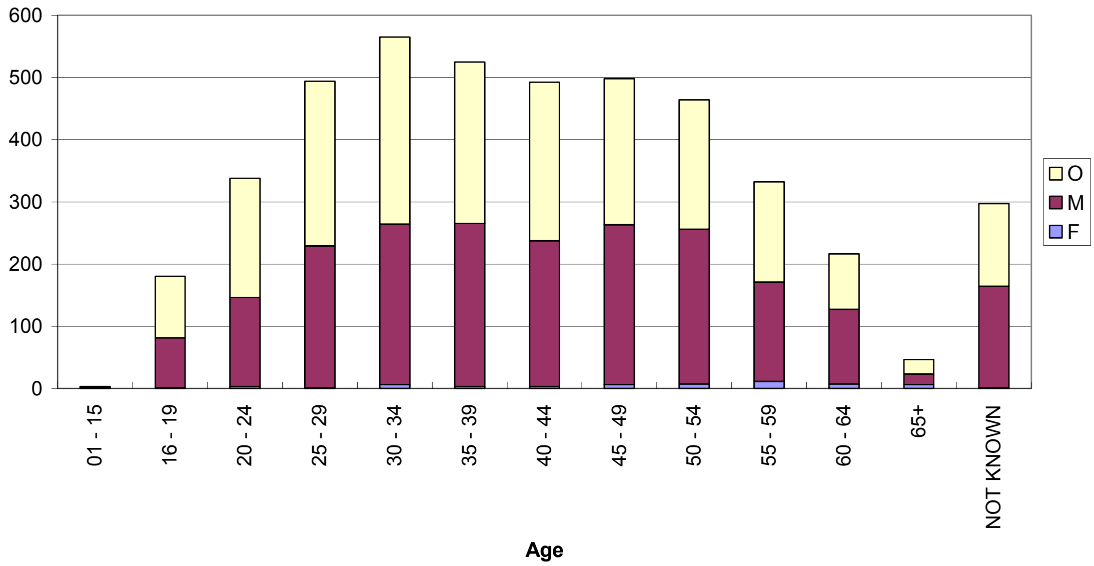

Figure 84 High level falls in the services industries between 1996/97 and 2000/01 by age

Figure 85 shows the number of high falls in the services industries categorised by employment status. As with low falls, employees account for around 90% of the overall number of accidents. However, employees only account for around 60% of the fatalities, with the self-employed accounting for nearly 40%. This possibly suggests that the self-employed are involved in proportionally more of the hazardous work at height, but may also reflect the accident reporting levels.

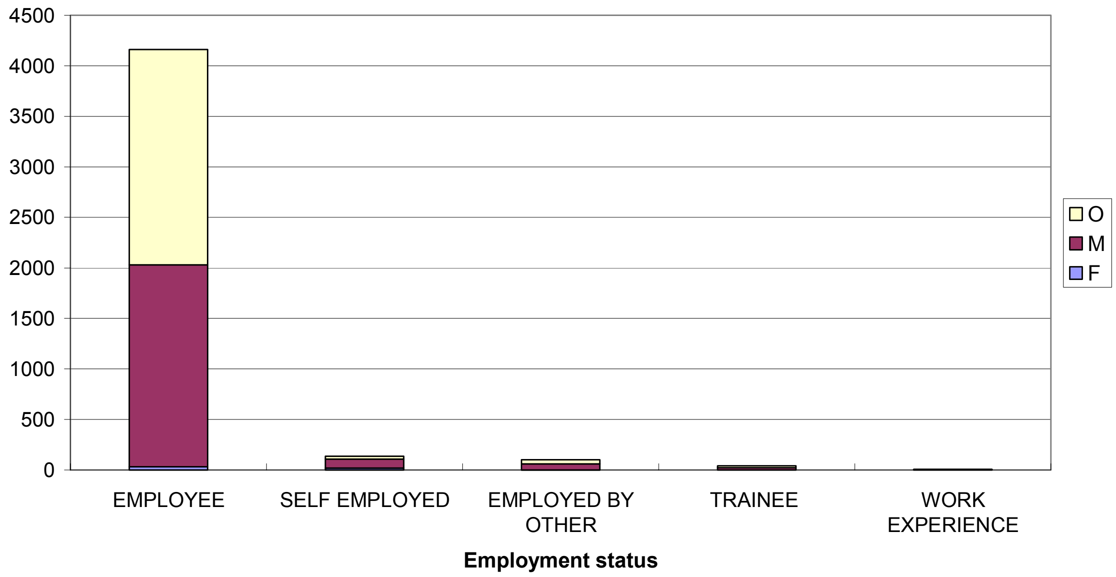

Figure 85 High level falls in the services industries between 1996/97 and 2000/01 by employment status

5.7.3 Summary

When all falls are analysed across services industries there are many risk areas which frequently arise. Window cleaners are particularly associated with fatalities and also a considerable proportion of major injury high falls, although not low falls. Fatal accidents typically involve older age groups (45+) who are self employed. For the non-fatal injury accidents, goods drivers delivering freight by road are associated with both low and high falls with onsite transfer and loading/unloading being the related activities. Maintenance work also features significantly for both low and high level falls. Ladders are involved in the vast majority of high fall major injury accidents and many low falls, although stairs and vehicles are more common for the latter group. Education, particularly primary education has had a surprisingly high number of falls-related accidents over the last five years.

5.8 DISCUSSION OF ALL SECTORS

At this point it is perhaps worthwhile drawing some conclusions on what can be said about all falls across industry sectors. The occupational group which appears across sectors is vehicle drivers. This relates to goods drivers in extraction/utilities, manufacturing and services, agricultural machinery drivers and a number of drivers in construction, although the highest number of falls occur in services followed by manufacturing. A seemingly related finding is that on-site transfer, which relates to the movement (on site) of materials between processes by manual or mechanical means, and loading/unloading are work processes which are commonly associated with falls across all sectors. Maintenance also frequently appears as an activity related to falls, and this ties in with the finding that electric and maintenance fitters are groups involved in a considerable number of falls in all sectors except agriculture.

The agent which dominates in falls across all industries is ladders. Ladders are the most common agent in all major injury falls across industry and are implicated in a considerable proportion of fatal falls. However, in construction and agriculture, falling through fragile roofs appears to be the most prevalent agent in fatalities. Vehicles often emerge as the accident agent especially in services industries, which follows from the finding that drivers are frequently involved in falls across all sectors. In terms of low falls and over 3-day injuries, stairs are also dominant, particularly in the manufacturing and services sectors which are largely indoor-based industries.

Assuming that the age profile of the workforce in each sector is normally distributed with the mean age somewhere in the 40 to 44 bracket, it appears that workers who are older than this may be at more risk in some cases. This is true of fatal falls in agriculture, construction and services where workers in their 50s and 60s appear to account for a disproportionate number of accidents. Also, those in the 50-54 age group are seen to have the most major injury low falls in manufacturing and services. Population data for age and industrial sector would be required in order to confirm these results.

High falls are dominated by construction in terms of overall numbers, but agriculture and construction have similar accident rates per 100,000 of population. On-site transfer is the most frequent activity leading to a fall, but the reported accidents imply that roofing is most likely to kill if a fall occurs. Ladders are the most common agent.

There are few fatalities involving low falls. The dominant industry sector is construction building, but the goods driver is the dominant occupation as this occupation is applicable to several sectors.

On the whole, employees outnumber the self-employed by a considerable margin with reported accidents especially in the extractive/utilities, manufacturing and services industries. Agriculture and construction are the exceptions where there are relatively large numbers of accidents among the self-employed, although this could be due to reporting or the nature of the industries.

6. ACCIDENT CAUSATION INFLUENCE NETWORK WORKSHOPS

6.1 INTRODUCTION

Based on the analysis of the accident data, and consideration of specific risk profiles and industry issues, it was decided to hold Influence Network workshops for: Agriculture, Construction (including separate workshops for 'new build' and 'existing structures'), Specialist/Utilities, Roofing and Transport. It was felt that these represented the two sectors with the worst falls problems (Agriculture and Construction), the work process leading to most fatalities (Roofing), a significant cross-sector low fall problem (Transport/Goods delivery) and cross-sector areas of good practice (specialist rope access and utilities). The results from each of these workshops are described in the following chapters of this report.

In this section, the Influence Network technique is introduced and then customised for falls from height. The workshop methodology is outlined first, followed by the methodology for analysing the networks.

6.2 OVERVIEW

The accident causation workshops were held at the BOMEL offices near Maidenhead, UK, on the following dates:

- Agriculture (23 April 2002)
- Transport (11 June 2002)
- Roofing (30 May 2002)
- Construction – New Build (23 May 2002)
- Specialists and Utilities (28 May 2002)
- Construction – Existing structures (8 August 2002)

The workshops lasted all day and concentrated on the following objectives:

- Identification of the factors that influence falls from height in the particular area of concern 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.

Prior to the workshops each of the participants was provided with a briefing document which contained an Influence Network customised for the area to be covered in the workshop (see Appendix A). The briefing document also summarises the approach and defines the influences to be considered at the workshop.

The process followed in the workshops is described in Section 6.3.2 of this report.

6.3 INFLUENCE NETWORK MODEL

6.3.1 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 86.

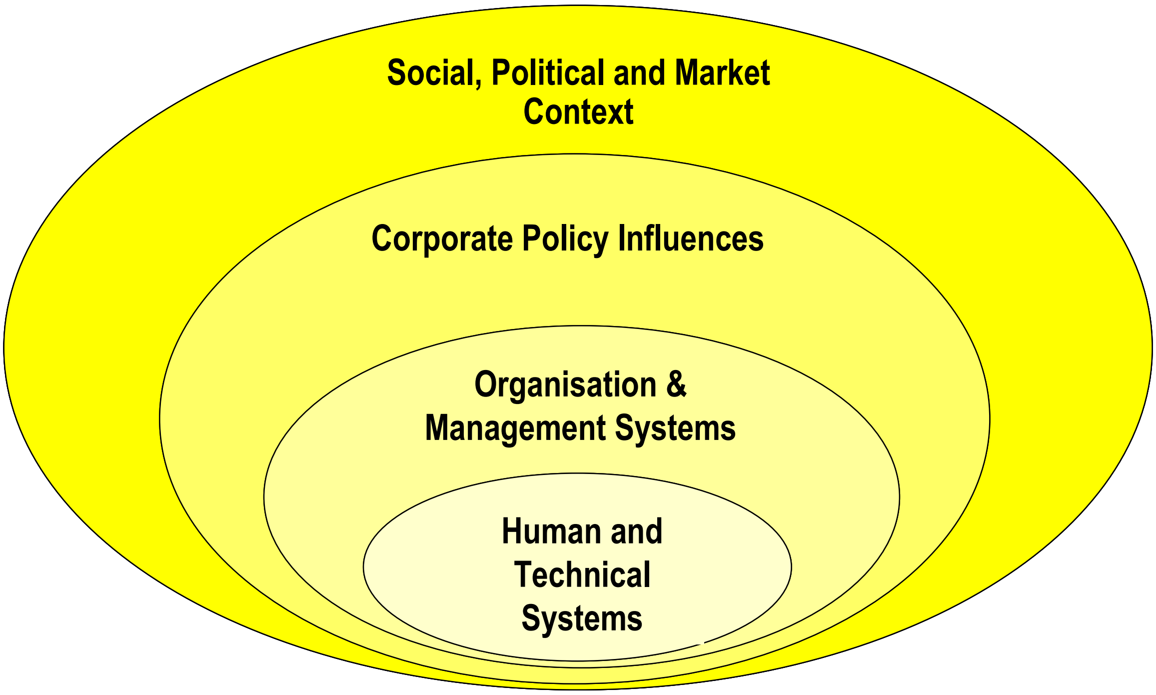

Figure 86 Nested hierarchy of influences

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.

6.3.2 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 86. The Generic Influence Network is shown in Figure 87, and described in the following sections.

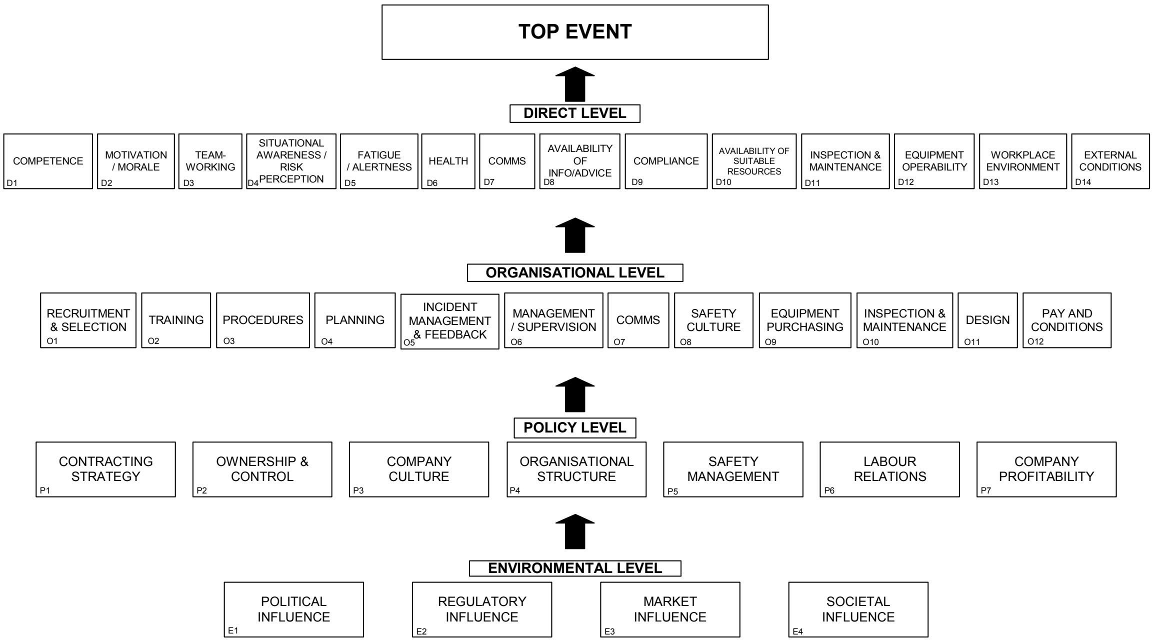

Figure 87 Generic Influence Network

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. accidents in construction) to a specific kind of accident or health issue in specified circumstances (e.g. falls from height or 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, for example, the relevant stakeholders were felt to fit into the model as shown in Table 23. This will differ for each of the workshops, and is discussed in the relevant section for each workshop.

Table 23 Construction stakeholders applied to Influence Network levels

Influence level	*Definition*
Direct level	Applies to site operatives and technicians, i.e. the people actually carrying out the construction work.
Organisational Level	Applies to the site organisation and local management.
Policy Level	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.
Environmental Level	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.

At each level of influence, influencing factors have been identified as shown in the network in Figure 87. 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 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) or low (L) with two intermediate classifications: HM and ML.

9. Repeat Step 8 for the influences above the *Policy* level.

10. Repeat Step 8 for the influences above the *Organisational* level.

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 can be achieved in a one-day workshop. The ideal number of participants is around four to eight experts plus facilitator and recorders.

6.4 ADAPTING THE INFLUENCE NETWORK FOR FALLS FROM HEIGHT

Prior to using the Influence Network to explore the factors influencing falls from height, a review of the data and literature was carried out to identify issues that are likely to shape the risk profile to be modelled by the network. From this, the Influence Network was customised to reflect which of the influences were felt to be relevant to falls from height and which were not. This was used as a basis for discussion in the workshops. During the workshops the Influence Network was customised further in response to the participants views about each factor. The fully customised Influence Network is shown in Figure 88.

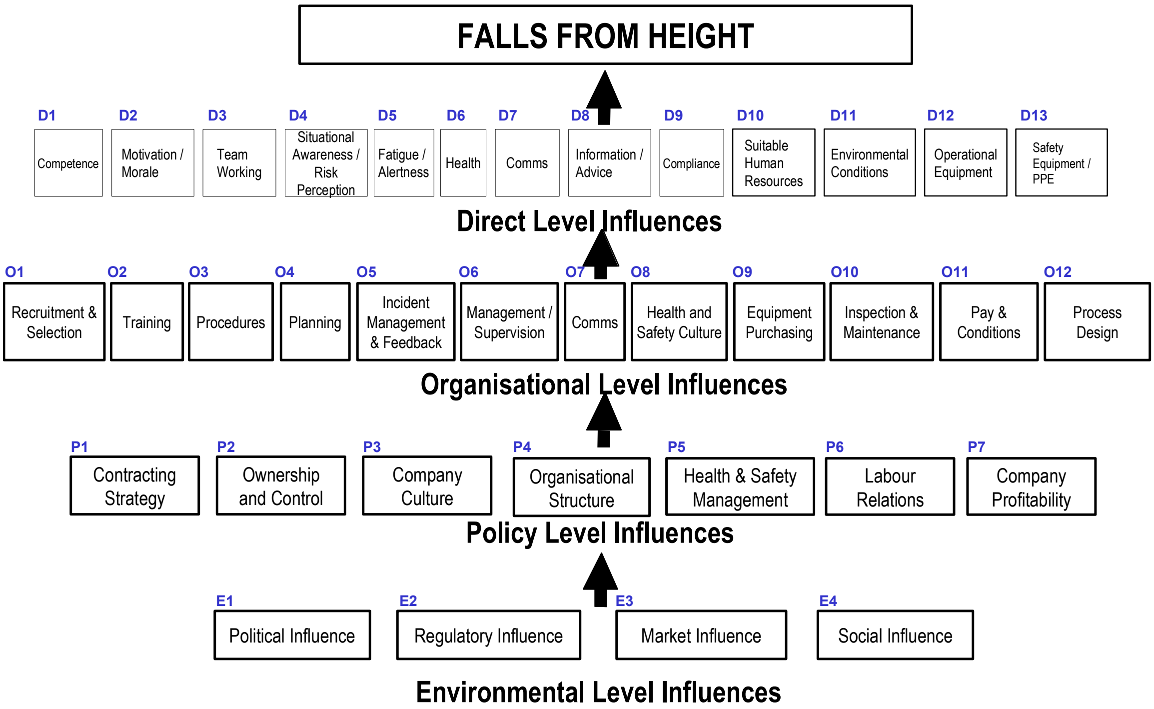

Figure 88 Customised Influence Network for falls from height

6.5 ANALYSIS OF INFLUENCE NETWORK - OVERVIEW

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

- Calculation of a risk index for falls from height 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 6.6).

- Increasing the ratings of factors in a systematic way (i.e. making hypotheses regarding improvements to a factor) in order to assess 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 6.7). Risk control measures are then concentrated on these factors in the sections relating to each of the workshops.

6.6 CALCULATION OF THE RISK INDEX

As described in Section 6.3.2, 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 directly related to risk. A spreadsheet program is used to carry out these calculations.

Risk indices were calculated for each of the workshops, and are summarised in Table 24. 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 each 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. The highest ratings actually serve to provide an indication of where better practices are currently being achieved and thus highlight the potential for others to achieve those rating levels.

The set of risk indices is shown in Table 24.

Table 24 Range of risk indices obtained from the Influence Network workshops

Workshop	*Risk index (Low ratings)*	*Risk index (High ratings)*
Agriculture – Farmers	0.23	-
Agriculture - Contractors	0.36	0.56
Agriculture – Arborists	0.48	-
Construction - New build	0.34	0.68
Construction – Existing structures	0.29	0.51
Specialist occupations/utilities	0.58	0.78
Roofing	0.37	0.57
Transport	0.20	0.61

6.7 APPROACH TO IDENTIFYING CRITICAL FACTORS INFLUENCING FALLS FROM HEIGHT

The Influence Network results from each workshop have been interrogated to identify critical influences on falls from height accidents and paths of influence through the network. This is done in terms of the potential of a factor to reduce the overall risk of falls from height. 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 sensitivity analysis described has been carried out for each workshop to identify critical factors and paths of influence through the network where risk controls likely to be most effective in reducing falls from height can be identified. When the critical path analysis is carried out, (i.e. one factor rating improved by one at each level) a ranking can be produced based on how many times a particular factor appears within a particular range or series of ranges. This ranking can then be used as a guide to the relative significance of that factor.

The critical factor/path analysis for each workshop was carried out using the five different weighting models shown in Table 25. Similar results were obtained, and Model B has been used for the analyses described in the current report

.

Table 25 Weighting models considered in the analysis of the Influence Network

Model	***Weighting for***				
	L	***ML***	***M***	***HM***	***H***
A	1	1.5	2	2.5	3
B	1	2	3	4	5
C	1	2	3	4.5	6
D	1	2	3	6	9
E	1	3	5	7	9

The approach described is adopted to investigate areas where improvements may be targeted to reduce falls from height. 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 work, whereas the benefits of improved *inspection and maintenance* of equipment would be much more limited.

6.8 RISK AS RELATED TO THE RISK INDEX

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:

$$\frac{R_{rco}}{R_o} = 10^{-3(Irco-Io)} \qquad (1)$$

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. An estimate of the residual risk remaining in moving from the lowest to highest ratings is shown in Table 24 for each of the individual workshops

To explain the association with risk in more detail, Figure 89 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 Re*vital*ising targets of 5% and 10% reductions are shown in Figure 89. However, it should be noted that the Re*vital*ising targets change the index such a small amount, that attention needs to be paid to the level of uncertainty involved.

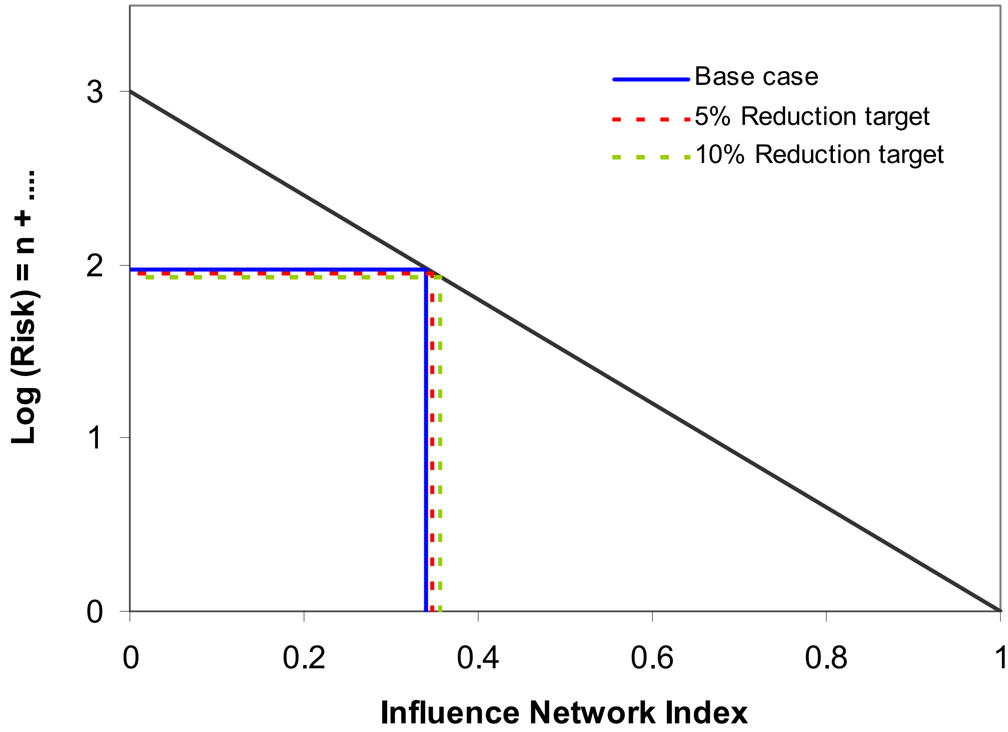

Figure 89 Translation of Influence Network index to a measure of risk

By using Figure 89 and Equation 1, estimates can be made of the number of falls accidents for each value of the risk index. Inspection of Figure 89, suggests that improving the risk index from the current value of 0.34 (for New build construction) to the its highest possible value (1.0) would imply a reduction of around two orders of magnitude in the number of falls 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 falls 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.

6.9 TRANSLATION OF RISK REDUCTION TARGETS TO INFLUENCE NETWORK INDEX

UK industry has been set and is setting itself targets for reducing work-related accidents (reductions of 5% by 2004/5 and 10% by 2009/10 for industry as whole, and 40% by 2004/5 and 66% by 2009/10 for construction). The following assumptions have been made in considering potential risk reductions:

- Any improvements can be expressed in terms of a relative reduction in risk in relation to the baseline.
- That the 5% and 10% (or 40% and 66%) reduction targets apply to falls from height.
- That the industry workloads (and thus workforces) remain reasonably constant and hence any change in incidences of falls from height are not attributable to variations in workload.

On that basis, referring to Figure 89 and Equation 1 as before, estimates of potential relative risk reduction can be made as a means for evaluating proposed risk control measures. This procedure is used in the following chapters for each of the workshops.

7. AGRICULTURE WORKSHOP

7.1 ATTENDEES

The attendees at the workshop are shown in Table 26.

Table 26 Attendees at the workshop relating to work at height in agriculture

Name	*Company/organisation*	*Comments*
David Gould	HSE	12 years as HSE inspector in agriculture and construction.
Stuart Harvey	NWF Agriculture	Head of operations for agriculture distribution company.
Peter Holloway	Tree Surgeon	Technical manager for tree surgery company.
Tony Hutchinson	Rural Design and Build Association	National Secretary of RDBA – majority of agricultural building involves their members.
Derek Potter	Hindhay	Farm, land and quarry manager
David Smith	Self-employed	Farmer, chartered civil and structural engineer, member of NFU technical services committee
Colin Billington	BOMEL	Director. Chartered civil and structural engineer with over 30 years experience across industry combining research, consultancy and contracting, with a special interest in health and safety risk management.
David Jamieson	BOMEL	Psychologist with specific experience in ergonomics and human and organisational factors.
Mike Webster	BOMEL	Chartered civil and structural engineer with experience in building, industrial, bridge and offshore structures.

7.2 CUSTOMISING THE APPROACH FOR AGRICULTURE

In advance of the workshop it was necessary to define exactly which parts of agriculture were to be considered given the diversity of the industry including farming, horticulture, arboriculture, fish farms and veterinary medicine. HSE classify 'mainstream agriculture' into the following categories:

- Agriculture, hunting and related services
- Forestry, logging and related services
- Fishing, fish farming and related services.

From a health and safety point of view, HSE have also identified the following key areas:

- Arable and livestock farming

- Horticulture
- Veterinary medicine
- The rest (forestry, arboriculture, fish farming, game keeping, deer farming, land drainage).

When the RIDDOR accident statistics are analysed for the agriculture sector it can be seen that 93% of fatal falls from 1996 to 2001 were in arable / livestock farming and forestry / arboriculture and that 88% of all falls were in these areas. This suggests that the important areas in terms of the risk of falling from height are arable / livestock farming and forestry / arboriculture. Therefore, in the workshop, agriculture was considered to be:

- Arable and Livestock Farming - including growing vegetables, cereals and other crops, farming of cattle, sheep, pigs, poultry, horses and other animals, animal husbandry services and agricultural services activities
- Forestry and Arboriculture.

The workshop did not specifically cover horticulture, fishing, hunting, game keeping or veterinary medicine.

The Influence Network and factor definitions were customised prior to the workshop based on knowledge of the agriculture sector. This was to ensure that the participants could relate the factors to the agriculture industry, which would in turn encourage discussion. At the *Direct* level, workplace environment and external conditions were merged together to become environmental conditions since it was decided that the two related to the same thing in agriculture. For falls from height accidents, it was felt appropriate to split equipment operability into *operational equipment* and *safety equipment/PPE* to reflect the differences between scaffolding, ladders etc. and harnesses/barriers etc.

At the *Organisational* level, the only change was to make the design factor specifically *process design*. In terms of falls from height, this relates to designing to minimise the need for work at height. It was envisaged that equipment design would be covered in the equipment factors at the direct level if appropriate.

In general terms, the factor definitions were changed to remove many of the references to companies, organisations, senior management, directors etc. since these terms are not applicable to much of the agricultural industry where with the majority of farms the farmer is manager or owner or both.

7.3 INFLUENCE FACTOR DISCUSSIONS

Details of the workshop discussions are presented in Appendix C. The key issues are summarised in the workshop conclusions (Section 7.5) whilst the ratings are summarised in Figure 90 and Figure 91.

7.4 INFLUENCE FACTOR WEIGHTINGS

Direct level influences on falls from height in agriculture

Competence and *situational awareness* were the first to be singled out as having a high influence on falls from height in the industry. The *equipment* factors were also weighted high which was more to do with availability and use rather than quality. *Health* was thought to have a potentially strong influence due to the age of the workforce in farming and *environmental conditions* were thought important since a lot of roof repairs are done in bad weather.

Organisational level influences on significant Direct level factors

Competence was thought to be strongly underpinned by *training, culture* and *planning.* It was felt that *management / supervision* would also have a strong influence but not so much in farming due to the large number of self-employed. For *situational awareness, training, safety culture* and *planning* were thought to have the strongest influence, but it was also commented that good *design* could improve an individual's awareness of risk. To improve the use and availability of the appropriate *equipment* for working at height, it was thought that the main driver needs to be *management / supervision. Management and supervision* were also thought to potentially have the strongest impact on *health,* presumably ensuring people look after themselves properly, and on *environmental conditions* by ensuring the right *planning/procedures* are in place for work in bad weather.

Policy level influences on significant Organisational level factors

The *Policy* level was deemed to be irrelevant for much of farming. However, one trend which did emerge was *profitability* being associated with many of the *Organisational* factors which were judged to be important such as *culture, planning,* and *management/supervision.* The implication is that farmers may not adequately address safety because they feel they cannot afford it.

Environmental influences on significant Policy level factors

The *market* influence was thought to be strongest on agriculture at this level. This currently has a negative effect due to poor market conditions for many farmers.

See Section 12 for a comparison of the weightings across the workshops.

7.5 WORKSHOP CONCLUSIONS

Based on the comments made in the workshop, the main factors relating to falls from height in farming are presented. References are made to agricultural contracting and arboriculture where differences were found. References are also contained to the factor number(s) from which the conclusions were drawn.

The *competence* (D1) of farmers in relation to work at height raised several important questions including:

- What is meant by competence for working at height?
- How can farmers judge either their own or someone else's competence in this respect?
- Is it reasonable to expect farmers to be skilled in working at height when it is such an infrequent task?

These questions and the surrounding discussion (D1, O2) tend to indicate that formal training is not the answer to reducing the risk of falls from height. There are a number of reasons for this:

- There are few training courses which cover work at height.
- Trained people still adopt bad practice, and are involved in falls accidents (noted in arboriculture).
- Training would not be financially viable for farmers due to the infrequency of work at height in farming. Farmers would be reluctant to spend money in this way.
- Many farmers are probably already aware of the right way to carry out work at height (what they would be told in training) but tend to take alternative courses of action due to other factors.
- The effectiveness of training for work at height would be limited due to the fact that this type of work relies so much on experience.

Competence for working at height in farming should be thought of in terms of being aware of the risks (D4) and being familiar with the right information (D8) which allows adequate planning (O4) of a job so it can be done safely. This relies on the right *information / advice* being *communicated* in the right way to farmers with a view to improving their *risk perception* and *planning* as opposed to formal training.

The issue of *motivation and morale* (D2) is pertinent in the agriculture industry at present due to recent incidents such as foot and mouth and BSE contributing particularly to the industry falling onto hard times. The average age of farmers was thought to be around 59. *Morale* was thought to be low largely due to low *profitability* but many cannot afford to stop farming even though they would like to. This leads to a situation whereby farmers will tackle problems in any way they can to save money, which may well increase the risk of falls from height.

There was a clear feeling (D4) that people in agriculture are aware of the hazards associated with working at height but their *risk perception* is such that they underestimate the risks. They generally do not think enough about the potential consequences of a fall. Part of the problem is that farmers do not feel they have the *information* (D8) they require in order to categorise risks. In tree work (D4) it was reported that bonus systems tied into safety have made people more aware of risks and hazards but it is unclear whether such systems could work in farming.

In terms of *compliance* **(**D9**)** with best practice and Regulations, farmers generally know they should comply but often do not. The group discussion indicates that one of the reasons for this is perceived *equipment availability* (D12, D13). Unlike in other industries, farmers have equipment which can gain them access to height even if this is not the intended purpose of the equipment.

An important part of improving *competence*, *motivation*, *risk perception* and *compliance* is to develop a positive *safety culture* in agriculture (O8). It was noted that the largest agriculture companies have this but there are only a few of them. Farmers need to be encouraged to think more about safety and its implications and be willing to take responsibility instead of leaving this to contractors or expecting HSE to always take the lead.

At the *Environmental* level there is perceived to be a negative attitude towards farming within Government (P1). This is not helped by the fact that there is little awareness of the difficulties faced by the industry among the general public and so the Government is under no pressure to change their attitude (E4). The insurance industry drivers (E3) are such that farmers will be tempted to repair a roof themselves rather than claim off their insurance and pay the excess.

7.6 IDENTIFICATION OF CRITICAL FACTORS INFLUENCING FALLS FROM HEIGHT IN AGRICULTURE

The critical factors in agriculture were identified using the methodology described in Section 6.7. Different sections of the agriculture sector were represented at the workshop including farming, agricultural contracting and arboriculture and different ratings and weightings were obtained for each. Due to differences between these sections of the industry, the analysis was divided into farming on one side and contractors/arborists on the other. The only difference between contractors and arborists was that *process design* is not relevant in arboriculture since it has limited application to tree work. Therefore, any reference to *process design* in the results for this group applies to contractors but not arborists.

It became clear that the standard structure of the Influence Network (adopted to provide comparability with the other sectors being considered within this study) does not provide an accurate model for farming. The main difficulty stems from the usual distinction between the *Policy* and *Organisational* levels on the network. This is not appropriate for farming since many farmers are self-employed owners and, as such, there is no separate *Policy* level above them. Instead, there is effectively only one layer of organisation / management / culture in farming which may encompass factors normally found at the *Policy* level such as *safety management*, *company culture*, *contracting* and *labour relations*. The network was, therefore, further customised after the workshop to better represent the structure of farming. Some of the *Policy* level factors were moved to the *Organisational* level and some factors were removed where they were deemed irrelevant in the workshop. The factors which have been taken out are:

- *Teamwork* – It was decided that farmers do not work in teams as defined by this factor.

- *Recruitment and selection* – As stated, many farmers are self employed and recruitment and/or criteria are not on their agenda.

- *Organisational communications* – Farmers seldom have communications at this level.

- *Pay and conditions* – This was thought to be better covered by *profitability* in farming.

- *Company culture* – Covered by *safety culture.*

- *Organisational structure* – As defined, this factor does not exist in farming.

- *Safety management* – Covered by *management / supervision.*

The revised Influence Network for falls from height in farming is shown in Figure 90 with factors colour coded according to their potential influence on the top event (based on the weighting discussions), with the ratings (current standard) of each influence indicated below its box. It can be seen that *competence, situational awareness/risk perception, suitable human resources* and *operational/safety equipment / PPE* emerge as the key factors at the *Direct* level. At the *Organisational* level, *training, planning, management/supervision* and *ownership and control* are most significant followed by *safety culture* and *contracting. Market* and *Regulatory* influence stand out at the *Environmental* level.

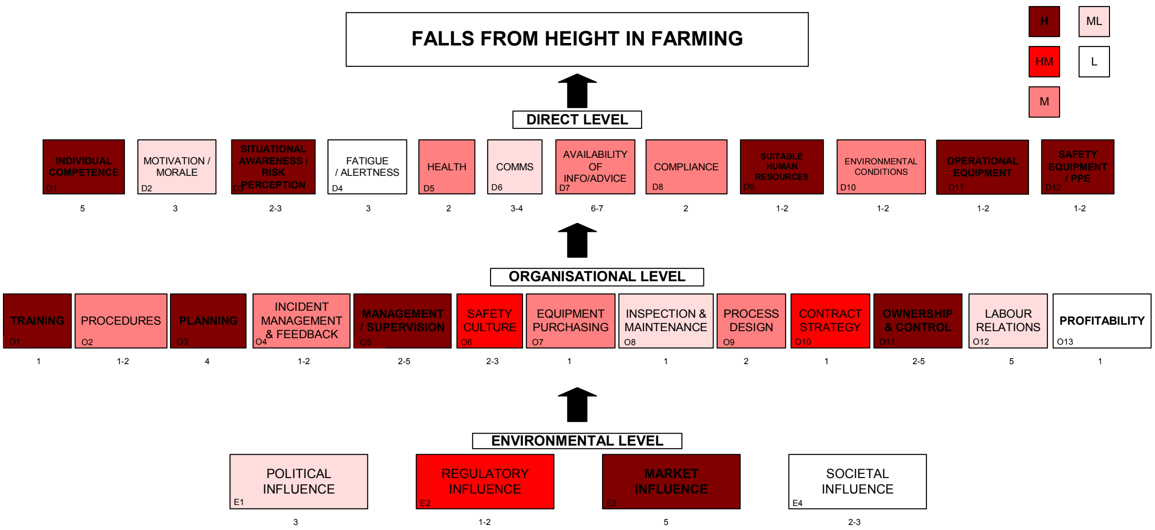

Figure 90 Factors graded according to potential influence on falls from height in farming (weightings – colour-coded, ratings indicated by numbers)

For agricultural contractors and for arborists the factors at the *Organisational* and *Policy* levels of the Influence Network were considered to be relevant. The factors with most potential influence in these parts of the industry are shown in Figure 91. It can be seen that the factors which are most important at the *Direct* and *Organisational* levels match those which were identified for farming. At the *Policy* level (not applicable to farming), *company culture* and *safety management* were highlighted as significant influences. As with farming, the *market* and the *Regulator* were deemed to have most influence at the *Environmental* level.

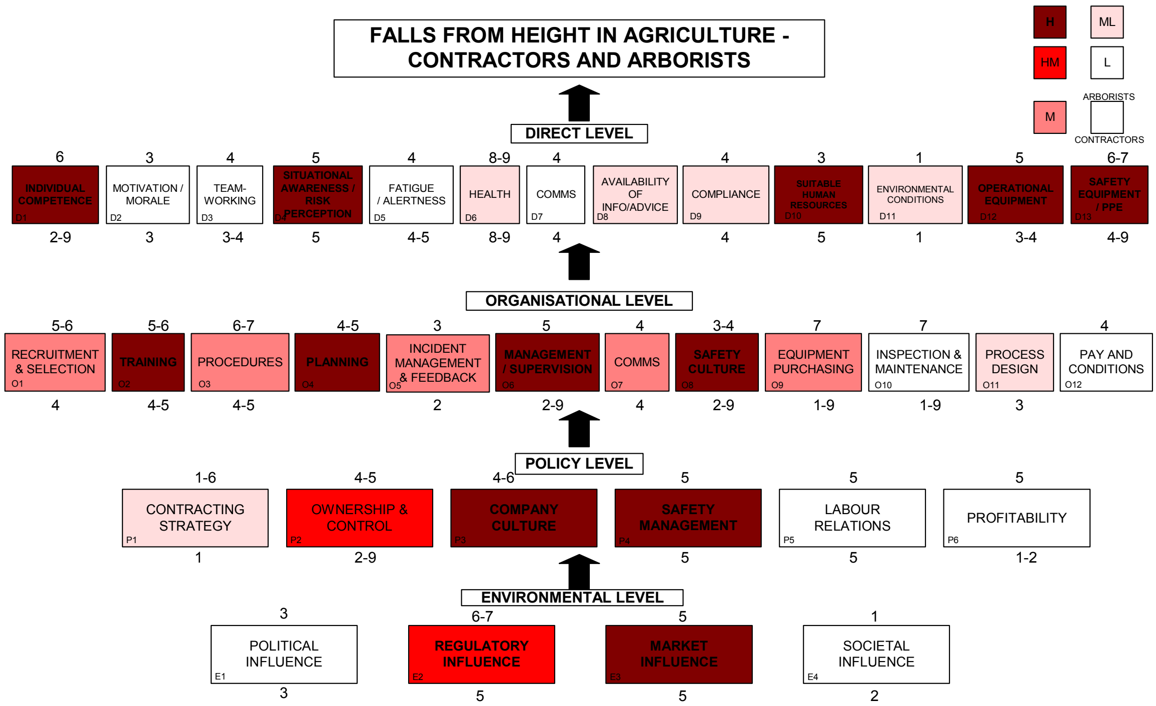

Figure 91 Factors graded according to potential influence on falls from height for agricultural contractors and arborists

Table 27 shows the factors classed as having a high or high-medium influence on falls from height in agriculture, as illustrated in Figure 90 and Figure 91, against which the ratings assigned to them in the workshop are given. This highlights which factors are critical in terms of having the greatest potential for reducing the risk of falls from height.

Table 27 Critical factors for different groups in agriculture

Most potential influence	*Ratings*	
	Farmers	*Contractors/arborists*
Direct		
Competence	5	5-6
Situational awareness/risk perception	2	5
Suitable human resources	1	3-5
Operational equipment	1	3
Safety equipment/PPE	1	6
Organisational		
Training	1	5
Planning	4	4
Management/supervision	3	5
Safety culture	2	4-5
Policy		
Contracting strategy	1	-
Ownership & control	3	4
Company culture	-	5
Safety management	-	2
Environmental		
Regulator	1	6
Market	5	5

Table 27 shows that there is considerable common ground between farming and agricultural contractors/arborists in terms of the factors which need to be addressed to reduce the risk of falls from height despite differences in other areas. For all groups it was thought that people are aware of hazards while working at height but *risk perception* is lacking in that the risks are underestimated. *Equipment operability* is also a common problem area in that people tend to use equipment which may not be appropriate for working at height. Farmers are particularly poor when it comes to *safety equipment/PPE* which, in many cases, will be absent.

At the *Organisational* level there are general shortcomings related to *management/supervision, planning* and *safety culture*. Farmers/managers are poor at undertaking job specific risk assessments as part of work planning and supervision may be completely absent. In terms of culture, cost is still the over-riding factor and safety is often left to contractors. No one thinks about the risks associated with working at height unless they are forced to for whatever reason.

The lack of consideration of safety at the front line management level is also reflected in more remote factors such as *company culture*, *safety management systems* and *contracting* where safety is often not on the agenda. There is a lack of *ownership* and safety responsibilities are not fulfilled. Finally, the *Regulator* is thought to have an important role to play especially in farming in terms of more discussion of problems instead of further Regulation and enforcement.

Based on the workshop findings, it is possible to identify a set of factors which offer the greatest opportunity for reducing the risk of falls from height in agriculture. These are shown in Figure 92. Lower level factors have been identified as always having the strongest influences on factors at the level above. As such, critical paths of influence can be traced between the factors highlighted on the network for each of the potential risk control options outlined below. However, it should be borne in mind that not all of the factors applicable to contractors/arborists are applicable to farmers (see previous discussions).

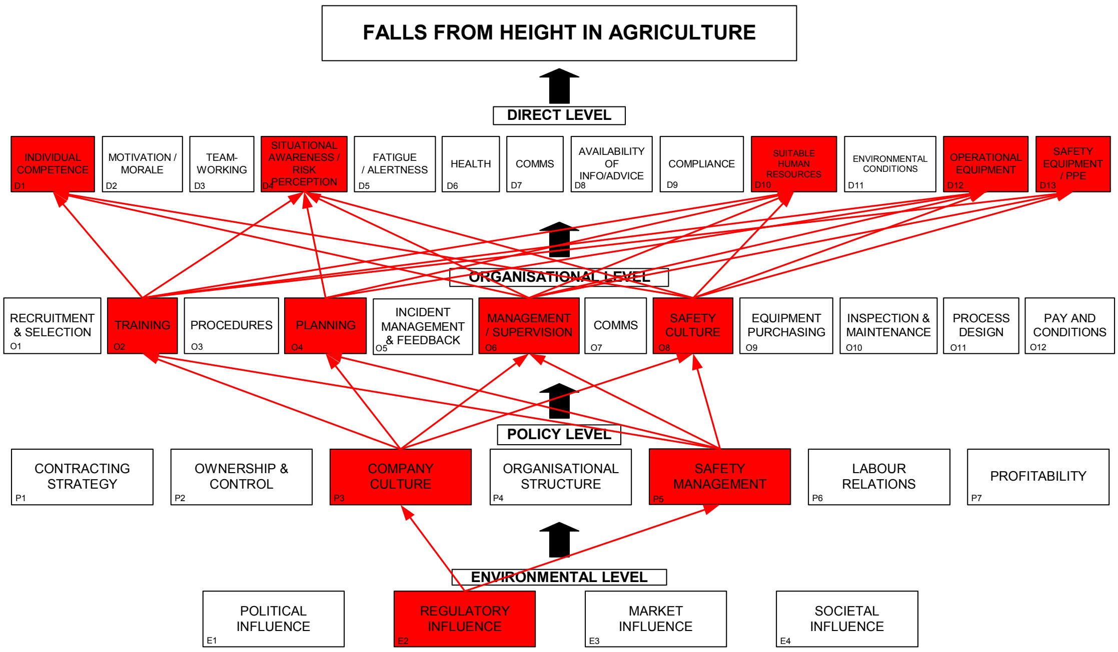

Figure 92 Critical paths identified for falls from height in agriculture

Figure 92 indicates that the primary critical factors that the *Regulator* should influence at the *Direct* level to achieve greatest impact are *competence*, *risk perception, suitable human resources*, *operational equipment* and *safety equipment*. To influence these, the *Regulator* would need to influence *company culture* and *safety management* (where applicable, or their equivalent at the *Organisational* level for farmers) in order to mobilise improvements in *training*, *planning*, *management and supervision* and *safety culture* at the *Organisational* level.

7.7 INDUSTRY SPECIFIC RISK CONTROLS

The four key risk control measures (themes) that could potentially improve the safety in relation to falls from height utilising the factors highlighted in Figure 92 are outlined below.

1 – Improvements in Situational awareness / risk perception

Situational awareness/*risk perception* has been identified as an important factor in that people may be aware of the hazards but tend to underestimate the risks when working at height. It was therefore felt that farmers in particular need more *information*/*advice* on the risks associated with work at height and the potential consequences. They need to have the information necessary which allows them to better assess risks. It is of vital importance that information is communicated through to the front line whether the target is a self-employed farmer or a company employee. Slightly different approaches may be required for each (such as targeting farmer's families), but the important factor is that the information is in a usable form, perhaps using simple diagrams and illustrations.

2 – Developing a safety culture

In terms of the overall *management/supervision* and *culture* associated with working at height, it was felt that more supervision of the work could act as a risk control in itself. The management of such work needs to include more responsibility for safety taken by the client (the farmer) instead of shifting responsibility to contractors. Formal contracts which cover safety might help in this respect.

3 – Developing a 'company' culture

In companies working in the agriculture sector there needs to be more *ownership* taken over safety by senior managers and *safety management systems* need to become the norm. There was also a feeling that if the NFU took more interest in safety at a regional level then this might be beneficial to the overall culture in the industry.

4 – Improve the availability of operational and safety equipment

It was stated that some *equipment/PPE*, such as nets, is relatively cheap and will last for years while other equipment is available for hire, but farmers do not always necessarily know what is available or want to pay for it. Relatively expensive plant such as mobile elevated work platforms (MEWPS) could be shared by many farmers in a machinery ring. It appears that farmers require more *information*/*advice* on the alternatives for getting the right equipment for working at height and the cost benefits. The provision of such information may improve *compliance*.

5 – Greater involvement of the Regulator

The Regulator could be used as a means of improving the safety culture within the agricultural sector. Stakeholder mapping would be required in order to identify the most effective communication and influence routes to get the message over, particularly to self-employed farmers. Possible routes of influence could be through retailers, suppliers, the National Farmers Union and the farmers' families.

6 – Insurance as a driver for health and safety

Insurance companies could discourage farmers from working on roofs via the conditions of their policies. A combination of 'carrot and stick' could be used whereby the excess is removed for farmers who indicate that they will not work on roofs, but the premium increases substantially for those farmers who are unwilling to sign up to such a clause. The insurers would also need to develop a preferred list of contractors who will undertake roofwork promptly, safely and at reasonable prices in order to remove the temptation of the farmer undertaking the repair themselves.

8. CONSTRUCTION WORKSHOPS – NEW BUILD & EXISTING STRUCTURES

8.1 ATTENDEES

Due to the differing nature of construction work it was felt necessary to hold two workshops to assess the risk of falls from height across the industry. The first workshop focused on new build construction whilst the second addressed work on existing structures. This had the advantage of covering the different activities and associated risks involved with such work. The attendees at the two workshops are shown in Table 22.

Table 28 Attendees in new build and existing structures workshops

New Build Construction Workshop		
Bill Batchelor	Self-employed	30 years' experience of structural work with Cement and Concrete Association. Now producing computer aided learning packages (including modules on health and safety) for undergraduate and CPD use.
Gwyneth Deakins	HSE	Coordinator of HSE Falls from Height Priority Programme.
Stuart Price	William Hare Ltd	Structural engineer and member of IOSH. Chief designer steelwork and building – has worked on projects covering all types of buildings. Chair of BCSA health and safety committee. Helped to re-write GS-28 and has worked closely with HSE.
Martin Winstone	Slough Estates	Civil engineer with 30 years of site and office experience. Formerly design/build coordinator until inception of CDM then became responsible for compliance with CDM for Slough Estates. Currently health and safety manager in construction department.
Helen Bolt	BOMEL	Director. Chartered civil engineer leading BOMEL's R&D and H&S studies Group.
David Jamieson	BOMEL	Psychologist with specific experience in ergonomics and human and organisational factors.
Mike Webster	BOMEL	Chartered civil and structural engineer with experience in building, industrial, bridge and offshore structures.
Existing Structures Workshop		
Brian Cook	Mouchel	Structural engineer by background, now planning supervisor. Has worked on a variety of construction projects.
Gil Spurrier	HSE	FOD inspector for 14 years with construction experience. Now falls from height topic leader in policy division. Member of falls from height board.
Kenny Shaw	Technip Coflexip	Level 3 IRATA qualified. Experience of a variety of work on existing structures both onshore and offshore from a management/supervisor perspective as well as hands on.
Martin Winstone	Slough Estates	See above
Helen Bolt	BOMEL	See above.
David Jamieson	BOMEL	See above.
Mike Webster	BOMEL	See above.

8.2 CUSTOMISING THE APPROACH FOR CONSTRUCTION

A generic Influence Network diagram was originally customised to investigate fatal falls from height in construction as part of a previous project[(1)]. Although the area of coverage changed slightly for these two workshops, the industry and accident kind remained the same. However, based on experience gained with undertaking workshops addressing work at height in other sectors, the *Operational* and *Safety equipment* were separated out into two factors. These factors addressed availability, *Equipment operability* and *Inspection and maintenance* for the two equipment factors. For these workshops, the *Internal working environment* and *Operating conditions* have been combined together into one factor *Environmental conditions*. The Influence Network used for the 'New build' and 'Existing structures' workshops is shown in Figure 93.

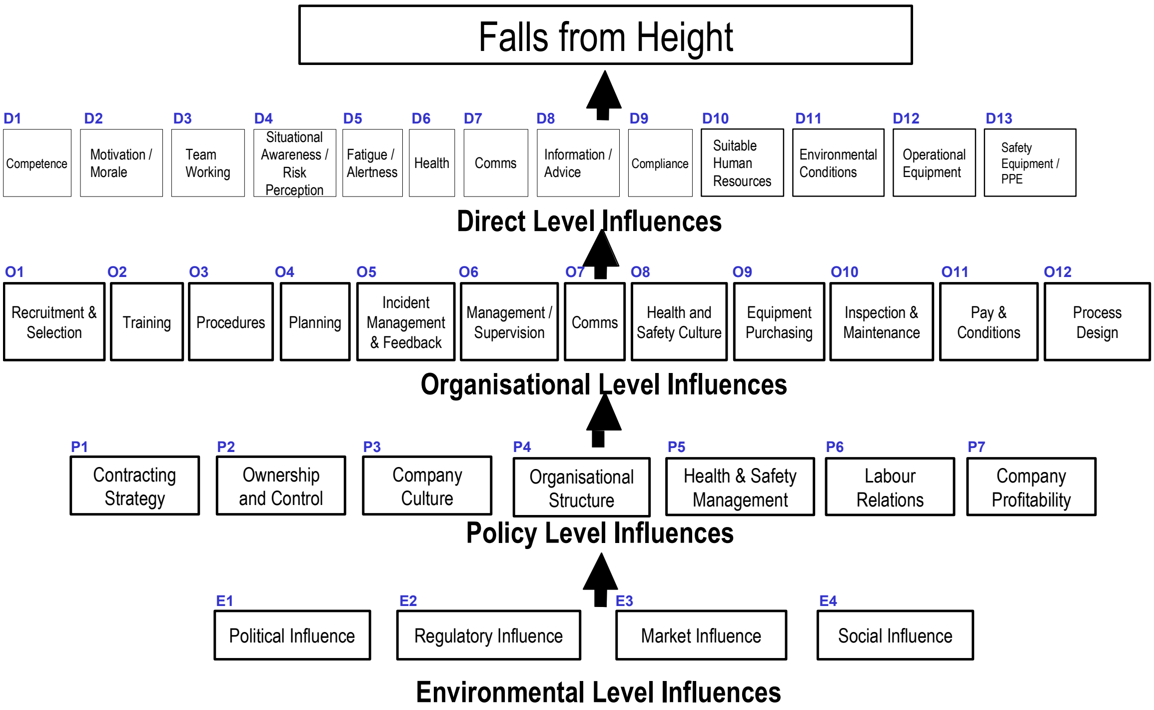

Figure 93 Influence Network used for the New build and Existing structures workshops

The new build workshop was on the construction of single and multi -storey buildings, bridges and industrial structures in structural steel, concrete, masonry and timber. The existing structures workshop covered inspection, repair, maintenance, refurbishment and demolition.

8.3 INFLUENCE FACTOR DISCUSSIONS

Details of the workshop discussions are presented in Appendix D. The key issues are summarised in the workshop conclusions (Section 8.5) whilst the ratings are summarised in Figure 95 and Figure 96.

8.4 INFLUENCE FACTOR WEIGHTINGS

8.4.1 New build construction

Direct level influences on Falls from height

Competence, *situational awareness / risk perception*, *environmental conditions*, *operational equipment* and *safety equipment / PPE* were considered to have the highest influence on falls from height, followed by *fatigue* and *compliance*. The equipment factors were felt to be significant by virtue of the fact that the right equipment is a prerequisite for safety at height, whereas *Health* was taken as a default influence that little could be done about.

Organisational level influences on the significant Direct level factors

Recruitment and selection and *training* were felt to be the key influences on ***competence***, i.e. get in the right person and improve their *competence* through *training*. *Management and supervision* and *safety culture* were felt to be at the next level of influence as they were required to underpin *competence* on site.

Situational awareness / risk perception (considered to be one of the key influences on falls from height) was considered to be influenced primarily by *training* and *procedures*. Essentially, get the right procedures and train people to implement them. *Incident management and feedback*, *communications* and *management and supervision* were all felt to underpin *situational awareness / risk perception* at the next level of significance.

Management and supervision was felt to be the only highly significant influence on ***fatigue / alertness*** reflecting the need for workers to be told to limit their working times. *Procedures*, *planning* and *safety culture* followed at the high-medium level.

Compliance was the first of the *Direct* level factors to be influenced by the *equipment* and *design* factors at the *Organisational* level. It was felt that all of the factors exerted at least a high-medium influence on *compliance*, with *procedures*, *planning* and *management and supervision* being differentiated by being judged to be highly significant influences.

Only *Planning* was considered to have a high influence on ***environmental conditions***, with *training*, *procedures*, *incident management and feedback*, *management and supervision*, *safety culture* and *process design* all considered to have a high-medium influence.

Both ***operational equipment*** and ***safety equipment / PPE*** were considered to be highly influenced by *equipment purchasing* and *inspection and maintenance*. At the next level, *training*, *procedures* and *process design* influenced *operational equipment* and *safety equipment / PPE*. However, *planning*, *management and supervision* and *safety culture* also represented high-medium influences on *safety equipment / PPE*, reflecting the need for proper selection, use and maintenance of the equipment.

Overall, *training* and *management and supervision* appeared to be the most significant influences at the Organisational level with virtually all of their influences being high or high-medium. *Procedures, planning* and *safety culture* also featured highly, with many of their influences being high or high-medium.

Policy level influences on the significant Organisational level factors

Company culture and *safety management* are considered to have the highest influence on ***training***, with *company profitability* at the next level. In the case of *training*, *ownership and control* was also considered to have a high-medium influence.

The influences on ***procedures*** were felt to be fairly clear-cut, with *ownership and control*, *company culture*, *organisational structure*, and *safety management* all being considered to have a high influence and *contracting strategy* considered to have a high-medium influence.

Safety management was judged to have a high influence on ***planning***, with *contracting strategy*, *company culture* and *company profitability* all being considered to have a high-medium influence.

Five of the seven *Policy* level influences were considered to have a high or high-medium influence on ***management / supervision***. *Company culture*, *organisational structure* and *safety management* were all consider to have a high influence, with *ownership and control* and *company profitability* considered to have a high-medium influence. Surprisingly, *contracting strategy* was only considered to have a medium-low influence, despite the potential to dictate supervisory requirements in the contract.

Safety culture was felt to be highly influenced by *ownership and control*, *company culture* and *safety management*, with *contracting strategy* setting the tone (and thus being considered to have a high-medium influence)

Overall, *safety management* appeared to be the most significant influence with nine of its twelve influences being high and two being high-medium. *Company culture* was probably the other significant factor, close behind with seven high and three high-medium influences.

Environmental level influences on the significant Policy level factors

Company culture was felt to be a relatively self-contained factor, with none of the Environmental level factors having any great influence (medium for *regulator*, *market* and *societal* influences, and low for the *political* influence).

The *regulator* was considered to be the key influence on ***safety management*** with the other factors considered to have medium, low or zero influence.

Overall, the *regulatory* influence was considered to be the most significant factor at the *Environmental* level, followed by the *market* influence.

8.4.2 Existing structures

Direct level influences on Falls from height

Competence, *situational awareness / risk perception*, *environmental conditions*, *compliance* and *suitable human resources* were considered to have the highest influence on falls from height, followed by *operational equipment* and *safety equipment / PPE*. The equipment factors were felt to be essential as was the availability of competent workers, with competent workers being considered to be more important than good equipment as good workers can adapt to poor equipment, but good equipment will not compensate for poor workers.

Organisational level influences on the significant Direct level factors

Recruitment and selection, *training* and *safety culture* were felt to be the key influences on ***competence***, i.e. get in the right person and improve their *competence* through *training*. *Management and supervision* was felt to be at the next level of influence.

Situational awareness / risk perception was considered to be influenced primarily by *training*, *communications* and *safety culture*. Essentially, train people and communicate with them. *Recruitment and selection*, *planning*, *incident management & feedback*, *management / supervision* and *inspection / maintenance* were all felt to underpin *situational awareness / risk perception* at the next level of significance.

Compliance was felt to be highly influenced by *procedures*, *safety culture* and *management and supervision*. *Training*, *communications* and *pay and conditions* were felt to exert a high-medium influence. It was felt that ensuring *compliance* is an issue that needs to be addressed after a worker has been employed, i.e. by having *procedures* in place and providing the means and environment for *compliance*. The key issue was that *procedures* had to be easy to comply with otherwise workers will try to defeat the system.

Suitable human resources are highly influenced by *recruitment and selection*, *training management and supervision* and *pay and conditions* in the first instance in order to get suitable workers and then improve them. *Communications* and *safety culture* followed at the high-medium level of influence.

Planning, *management and supervision* and *process design* was considered to have a high influence on ***environmental conditions***, with *training*, *safety culture* and *equipment purchasing* all considered to have a high-medium influence. Whilst the influences of *planning* and *process design* influenced the overall conditions, *management and supervision* was felt to be important in order to indicate whether it was acceptable to work in certain conditions or not.

Both ***operational equipment*** and ***safety equipment / PPE*** were considered to be highly influenced by *management and supervision*, *equipment purchasing* and *inspection and maintenance*. In addition, *process design* was also felt to have a high influence on *safety equipment / PPE*. At the next level, there were differences, with *planning*, *communications* and *process design* influencing *operational equipment*, whilst *training*, *procedures*, *communications* and *safety culture* influencing *safety equipment / PPE*.

Overall, *management and supervision* appeared to be the most significant influence at the Organisational level with all bar one influence being high or high-medium. *Training, planning*, *communications* and *safety culture* also featured highly, with many of their influences being high or high-medium where relevant.

Policy level influences on the significant Organisational level factors

Company culture and *safety management* are considered to have the highest influence on ***training***, with *ownership and control* and *company profitability* at the next (high-medium) level.

Safety management and *company culture* were judged to have a high influence on ***planning***, with *contracting strategy* and *ownership and control*, *company profitability* all being considered to have a high influence. If the right *company culture* was in place, then *planning* would be done.

Five of the seven *Policy* level influences were considered to have a high or high-medium influence on ***management / supervision***. *Ownership and control*, *company culture*, *organisational structure* and *safety management* were all considered to have a high influence, with *labour relations* considered to have a high-medium influence. Surprisingly, *contracting strategy* and *company profitability* were only considered to have a medium influence, despite the potential to dictate supervisory requirements in the contract and the fact that *management / Supervision* have been reduced in recent times in order to improve *company profitability*.

Only *company culture*, *safety management* and *labour relations* were considered to have a high influence on ***communications***, with *ownership and control* having high-medium influence. It was felt that 'open door' policies within companies would affect *communications*.

Safety culture was felt to be highly influenced by *company culture* and *safety management*, with *organisational structure* having high-medium influence.

Overall, *company culture* appeared to be the most significant influence with eleven of its twelve influences being high. *Safety management* followed closely behind with nine of its twelve influences being high.

Environmental level influences on the significant Policy level factors

Company culture was felt to be highly influenced by the *Regulator*, with the *political* influence having a high-medium influence. The main reasons for this were that HSE sets policy through regulations that companies have to comply with including those regulations that influence *organisational structure*.

The *Regulator* was considered the key influence on ***safety management*** with the *market* considered to have a high-medium influence on some organisations where they would not get work without a *safety management* system.

Overall, the *market* influence was considered to be the most significant factor at the *Environmental* level, closely followed by the *political* and *regulatory* influence. Although the *political* factor had no high influences, it was fairly consistent in being a medium or high-medium influence.

8.4.3 Consolidated weightings

Overall there is considerable agreement between the workshops in terms of the factors which have most influence on falls from height. For both new build and existing structures, *competence, situational awareness/risk perception, compliance, environmental conditions* and both *equipment* factors were thought to have a strong influence at the Direct level. The only significant factors which appeared to be sector specific were *fatigue* in the new build workshop and *suitable human resources* in the existing structures workshop.

In terms of the influence of the *Organisational* factors, there was agreement that, in both new build and existing structures, *training, management/supervision, safety culture* and *planning* are the factors with most overall influence on the *Direct* level. *Procedures* in new build and *communications* in relation to existing structures were thought to be sector specific issues.

There was agreement in both workshops that *safety culture* and *safety management* were most important at the Policy level and *Regulator* and *Market* influence were most important at the *Environmental* level.

See Section 12 for a comparison of the weightings across the workshops.

8.5 WORKSHOP CONCLUSIONS

8.5.1 New build conclusions

From the workshop discussions, the factors regarded as important in falls from height in new build construction are now discussed.

The *risk perception* (D4) of construction workers was thought to increase the risk of falls from height in that people are aware of the hazards but underestimate the risks. Risks are taken at work which would normally be unacceptable. This is at least in part due to familiarity with the hazards and complacency towards the risk e.g. 'it won't happen to me'.

The issue of *compliance* (D9) was discussed with a feeling that people generally do not comply with guidance etc. which would reduce the risk of a fall because they know they can get away with it. This may in fact be related to *risk perception* in that if people do not appreciate the risks then they are less likely to feel the need to comply (D4).

The results of the workshop suggested that the *safety equipment and PPE* (D13) used during work at height are important in determining the risk of a fall. The general consensus was that there is a big gap between the standard of equipment used by principal compared with sub contractors. Much of this was thought to come down to individual attitudes towards the importance of such equipment. For instance, *inspection and maintenance* is an area which is often overlooked and could be tightened up with significant health and safety benefit(O10).

As well as in relation to the use of *PPE* (D13), *training* (O2) was also discussed more generally at the organisational level of the Influence Network. It was recognised that there is training for use of MEWPS and for the erection of scaffolding etc. but nothing formal for specifically working at height, even in steel erection. Training tends to be on the job with work at height as a side issue.

When *safety culture* (O8) was discussed there was a feeling that this is an area with much room for improvement in the industry especially among smaller companies and the self-employed. The dominant attitude which prevails in work at height as well as other areas is that people know what they are doing and so safety is not a major concern. This needs to change in order for the culture to improve.

An important part of developing a good *safety culture* (O8) is to improve *incident management and feedback* (O5) and in particular to encourage reporting of near misses. The point was made that falls may only become known about if they are reportable while near misses rarely get communicated. One barrier which needs to be overcome is that certain incidents are seen as part of the job and so people would not think to report them e.g. someone nearly falling.

Process design (O12) was regarded as an area with considerable potential for reducing the risks associated with falls from height. One of the fundamental problems appears to be that designers do not consider how structures will be built. The design may require people to work with an unnecessary risk of falling from height. In the current climate it was felt that designers would find it difficult to cost in safety. In addition, foundations are put in often before detailed design is complete, which can limit the designers' scope.

The *contracting strategy* (P1) of clients was thought to be important as well as their *company culture* (P3) and the *ownership and control* (P2) they take over safety responsibility. These factors are all linked in that if clients have a good safety culture then they will be more motivated to ensure that contracts take into account safety concerns and responsibilities for safety are clearly set out. It was felt that many contractors may be aware of safety issues but may get the job too late in the contractual chain to allow them to make a difference. They can have greatest influence if the client takes them on at the beginning of a 'design and build' project, but this is rare.

In terms of the role of the *Regulator* (E2) it was felt that they are under resourced and sometimes unwilling to take action. Tougher enforcement was thought to be needed especially in relation to individuals. Also, more work on changing attitudes, eliminating hazards and more prescription were called for. It was also acknowledged that the *market* (E3) has a strong influence on safety in construction in that *company profitability* may be so low that many firms are struggling to break even never mind being able to invest to put in place safety measures.

8.5.2 Existing structures conclusions

The main conclusions drawn from the falls from height in existing structures workshop are considered to be as follows.

It is important that systems are in place to avoid having to rely on *competence* (D1) since even competent people are likely to cut corners due to human nature or work pressures.

Inadequate *risk perception* (D4) was thought to contribute to accidents in that people recognise the hazard but do not modify their behaviour accordingly. There is a greater perception of risk for work at high levels but an underestimation of risk at low levels.

Provision of *information / advice* (D8) was generally thought to be poor but is dependent on trade. Evidence from safety inductions indicates that some people do not even recognise basic hazard signs. This situation is compounded by the fact that even safety managers may not know all they should know about working at height. The information that is available on how to do a job probably does not adequately cover safety. Information on older buildings may not even be available because records either do not exist or have not been updated. Even if good information exists it may not be used due to other job pressures.

Compliance (D9) was thought to be an issue in that violations were said to be common in the industry even if method statements are fully disseminated. People will typically have a reason for not following the rules which is related to getting the job done.

The availability of *suitable human resources* (D10) depends on the type of work but is generally poor in terms of people who are good at working at height. The difficulty lies with striking a balance between getting someone who is good at the trade and good at heights. In terms of *recruitment and selection* (O1), people tend to be selected on the basis of their trade skills at the expense of their ability to work at height.

Heat stress for those working at height is an issue that needs further investigation (D6).

The important issue in relation to *operational* and *safety equipment* (D12, D13) for working at height is the appropriate selection of such equipment. The equipment may be of a good standard but is being used wrongly. Another problem is that in *equipment purchasing* (O9) people do not realise the value of having the right equipment.

Contrary to some opinions, the group felt that *training* (O2) was probably not a practical means of improving safety in work on existing structures. It was thought that awareness was the key factor as opposed to training. Also, it was felt that training for work at height would not be cost effective for many in the industry as they do not carry out such work often enough. A checklist at the start of a job may be one way to improve awareness.

Planning (O4) among building managers was thought to amount to getting someone to do the job. They do not think about how this might affect other activities. Another planning difficulty is that the person who did the risk assessment is often not the person carrying out the work. *Management*, in general, and *supervision* were seen as areas needing improvement since many do not have the competence required to manage or supervise work at height (O5).

Safety culture was thought to have improved in construction in general but this has not filtered through to maintenance organisations, as they do not see themselves as being a construction activity (O8).

The *inspection and maintenance regime* was said to be better from those in refurbishment compared with those in purely maintenance activity (O10).

Contracting strategy (P1) was thought to offer potential for improvement but for smaller maintenance jobs there will probably not even be a written contract. It was pointed out that in many countries on the continent the bidder nearest the average tender price will be awarded the job which means companies are more inclined to address safety in tenders as opposed to trying to get their price down as low as possible.

In general, large maintenance/refurbishment companies are thought to be improving in terms of taking *ownership* and responsibility for safety and developing management systems to reflect this. Smaller companies on the other hand may not deal with these issues at all (P2).

In terms of how the *Regulator* can help, it was thought more effort should be made towards getting out to sites and being proactive with stakeholders, for example, design teams (E1).

8.5.3 Consolidated conclusions

There is considerable agreement between the new build and existing structures workshops regarding which are the important factors influencing falls from height.

- Both workshops flagged *situational awareness/risk perception* as being significant in that people recognise the hazards but underestimate the risks.

- There was consensus that people may not *comply* because they do not appreciate the risks.

- Both workshops suggested that the importance of *safety equipment / PPE* is not fully appreciated in the industry. Equipment may be used wrongly or not looked after properly.

- *Safety culture* was raised in both workshops as an area where considerable improvement is needed. Safety is not high enough on the agenda especially among smaller companies and the self-employed particularly those involved in maintenance activity.

- In both workshops, *contracting strategy* was seen as offering great potential for improving safety. There needs to be a move away from cost being the only consideration with more safety responsibilities built into contract. Clients should try to involve the contractor at the earliest stage possible.

- Both workshops agreed that the *Regulator* needs to be more proactive with stakeholders in terms of changing attitudes.

The major difference between the workshops was with the significance attached to *process design.* In the new build workshop this factor was regarded as very important in terms of designing out the need to work at height during construction of new structures. In the existing structures workshop, although it was recognised that *process design* is important, it was acknowledged that design has limited application to buildings already in place.

8.6 FURTHER DEVELOPMENT OF THE INFLUENCE NETWORK MODEL

A slight modification to the Influence Network was required before analysis of the construction data. It has been found that *Process design* at the *Organisational* level has a limited number of factors on which it can have a strong influence at the *Direct* level. This is because the majority of factors at the *Direct* level involve predominantly human influences with fewer that are more hardware oriented. As such, there is less scope for *Process design* 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).

This issue has been identified and discussed in a recent BOMEL report[41] on Hand Arm Vibration Syndrome (HAVS) in construction. The solution identified for HAVS was to create a virtual factor *process design* at the *Direct* level. This was the preferred option as *process design* effectively becomes an extra factor at the *Direct* level as well as a factor at the Organisational level. *Process design* at the *Direct* level was only judged to be influenced by one factor at the Organisational level (*Process design*). 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 and weighting for the virtual factor are taken to be the same as those assigned at the workshop for *Process design* at the *Organisational* level and the weightings from *Organisational* to *Direct* and from *Direct* to the top level were both, by default, high. This approach allows *Process design* to have a significant direct influence. It was also adopted in the roofing workshop.

The model used for the analysis of the Influence Network is shown in Figure 94 for the 'New build' and 'Existing structures' (and Roofing) workshops. The *Process design* factor is shown at the *Direct* level 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.

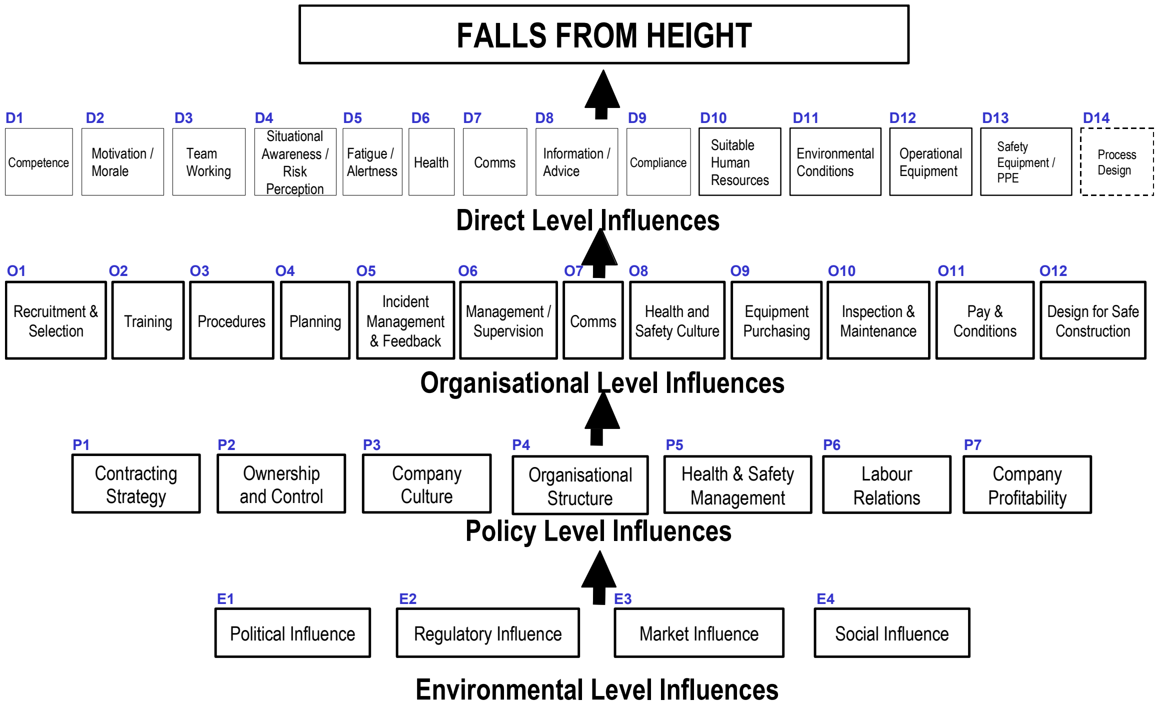

Figure 94 Revised Influence Network model used for analysis of the New build, Existing structures and Roofing workshops

8.7 CRITICAL FACTORS INFLUENCING FALLS FROM HEIGHT IN CONSTRUCTION

The relative rankings for each factor for the new build workshop are shown in Figure 95. Five factors were considered to be highly significant at the Direct level: *competence*, *situational awareness / risk perception*, *environmental conditions, operational equipment* and *safety equipment / PPE*. The significant factors at the Direct level appear to be well-defined in that these five are highly significant, whereas the rest are from medium to 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, *training*, *management and supervision* and *process design* are the most significant followed by *procedures*, *planning* and *safety culture*. The three main factors at the Organisational level are found to underpin the key factors at the Direct level. At the Policy level, *company culture* and *safety management* have been identified as the key factors followed by *company profitability*. At the Environmental level, the *Regulatory* influence is considered to be the most significant followed by the *market* influence.

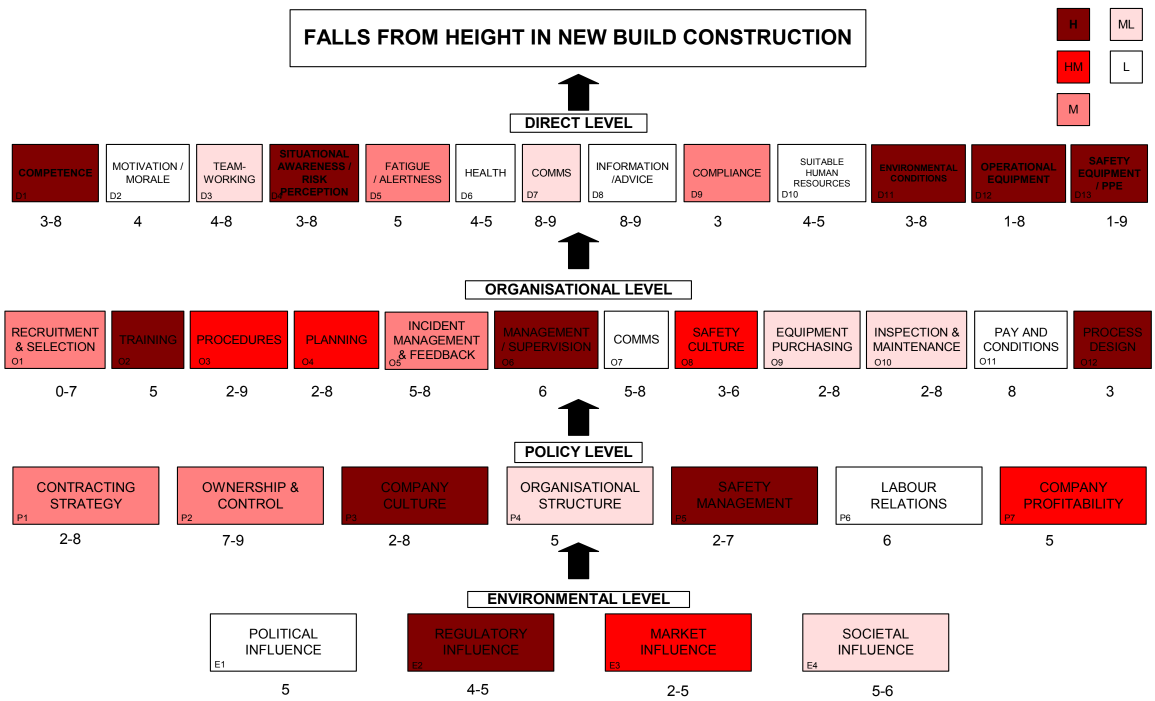

Figure 95 Factors graded according to potential influence on falls from height in new build construction (weightings – colour-coded, ratings indicated by numbers)

The relative rankings for each factor for the existing structures workshop are shown in Figure 96. At the *Direct* level, *competence*, *situational awareness / risk perception*, *compliance* and *suitable human resources* have been identified as the most significant factors, followed by *operational equipment* and *safety equipment / PPE*. This is not quite as clear-cut as the new build workshop, with the analysis indicating that there are six key factors influencing falls from height. At the *Organisational* level, *training*, *management and supervision* and *safety culture* are the most significant followed by *planning* and *communications*. At the *Policy* level, *Company culture* and *safety management* have been identified as the key factors followed by *ownership and control*. At the *Environmental* level, the *market* influence is considered the most significant followed by the *regulatory* influence. Again, *process design* was included at the Direct level for analysis purposes only.

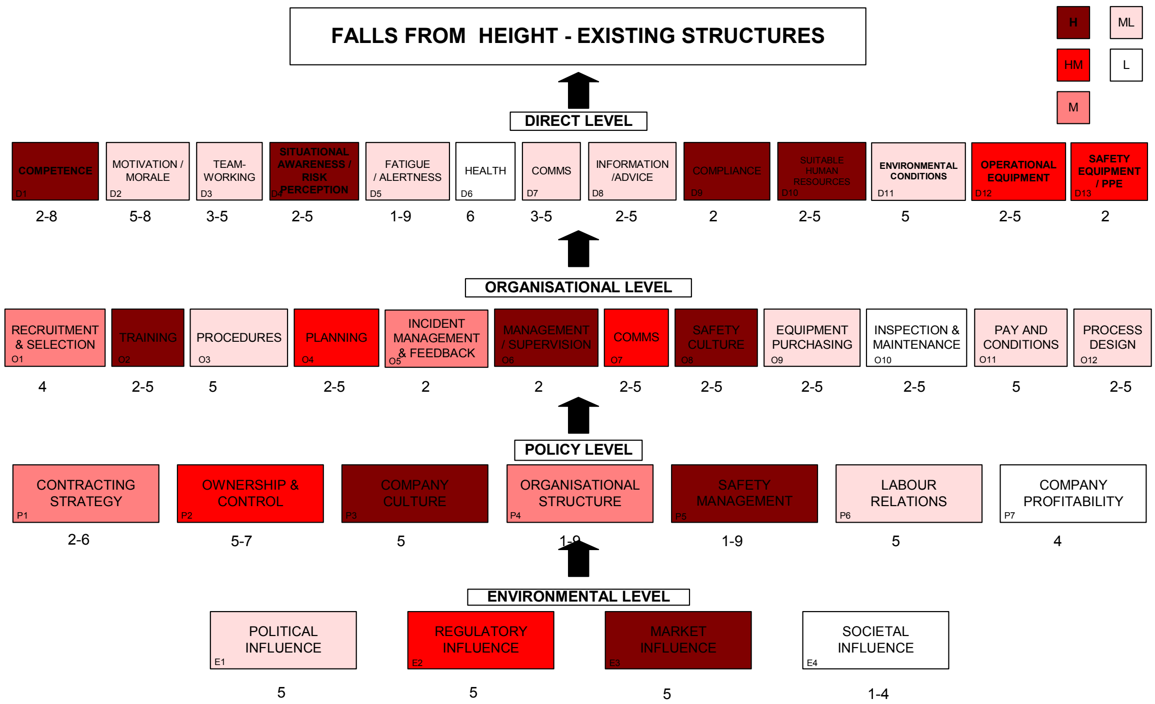

Figure 96 Factors graded according to potential influence on falls from height in work on existing structures (weightings – colour-coded, ratings indicated by numbers)

The ratings given to those factor considered to be of high or high medium influence are shown in Table 29. Analysis of these ratings in conjunction with the workshop comments makes it possible to identify the factors with the greatest potential to reduce the risk of falls from height in construction. These tend to be the factors which have a high weighting, are currently of poor quality in the industry and have associated measures which could bring about change.

Table 29 Critical factors in falls from height in construction

Most potential influence	***Ratings***	
	New build	***Existing structures***
Direct		
Competence	3	2
Situational awareness/risk perception	3	2
Compliance	3	2
Suitable human resources	-	2
Environmental conditions	3	-
Operational equipment	1	2
Safety equipment/PPE	1	2
Organisational		
Training	5	2
Procedures	2	-
Planning	2	2
Management/supervision	6	2
Communications	-	2
Safety culture	3	2
Process design	3	-
Policy		
Ownership & control	-	5
Company culture	2	5
Safety management	2	1
Company profitability	5	-
Environmental		
Regulator	4	5
Market	2	5

It should be noted that a rating of 2 is recorded against many of the factors under the 'existing structures' heading due to the fact that this group felt more comfortable using a qualitative rating scale from poor to excellent. A rating of 2 has been used where the group judged a factor to be 'poor' which was commonly the case.

Based on the findings presented in the previous section and the workshop discussion, the critical factors influencing falls from height in construction (both new build and existing structures) have been evaluated. These critical paths through the network provide an indication of the optimum means of improving the overall risk index.

The critical paths identified for the New build workshop are shown in Figure 97. These essentially fall into three categories:

- *Competence* and *risk perception / situational awareness* on site (shown in red).
- *Environmental conditions*, *operational equipment* and *safety equipment / PPE* on site (also shown in red).
- *Process design* (shown in blue).

The routes of influence for these three categories are shown as being via the *regulator* influencing *company culture* and *health and safety management* in order to influence *training* and *management / supervision* for both of the site categories. For the *process design* category, the *regulator* would need to influence *contracting strategy* as well as *company culture* and *health and safety management* in order to influence *process design*.

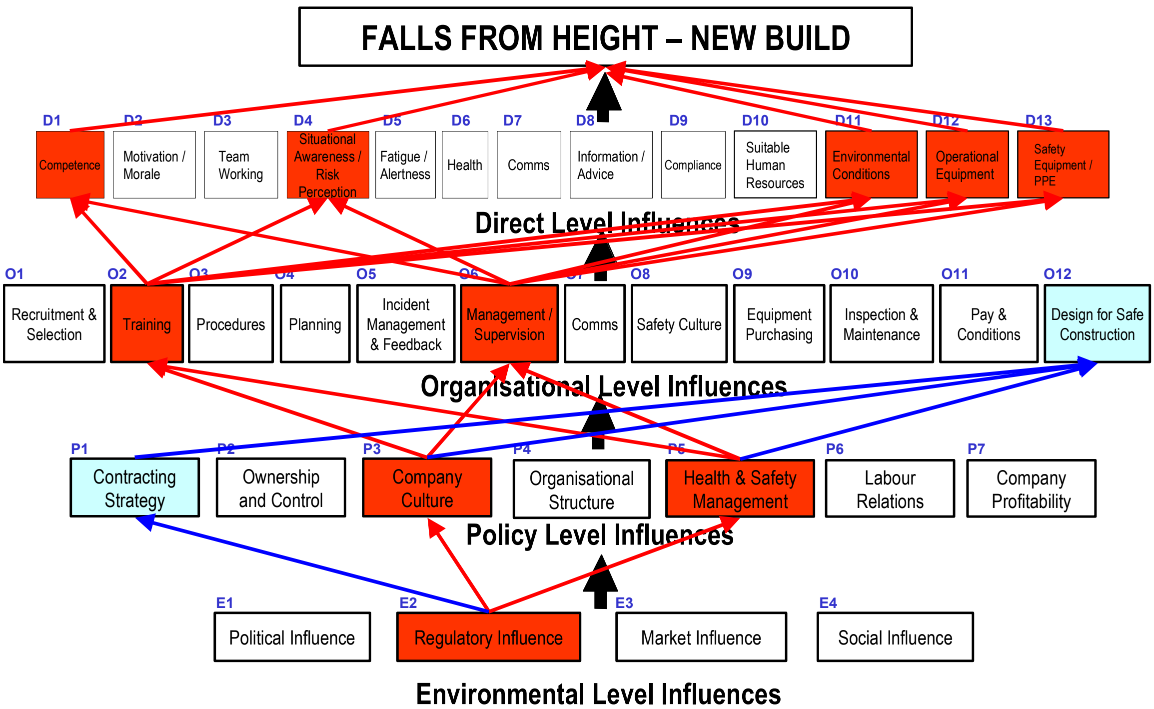

Figure 97 Critical paths identified for work at height in New build construction

The critical paths identified for the Existing structures workshop are shown in Figure 98. These essentially fall into two categories:

- *Competence*, *risk perception / situational awareness*, *compliance* and *suitable human resources* on site (shown in red).

- *Process design* (shown in blue).

The routes of influence for these two categories are shown as being via the *regulator* influencing *company culture* and *health and safety management* in order to influence *training* and *management / supervision* for both the site and *process design* categories.

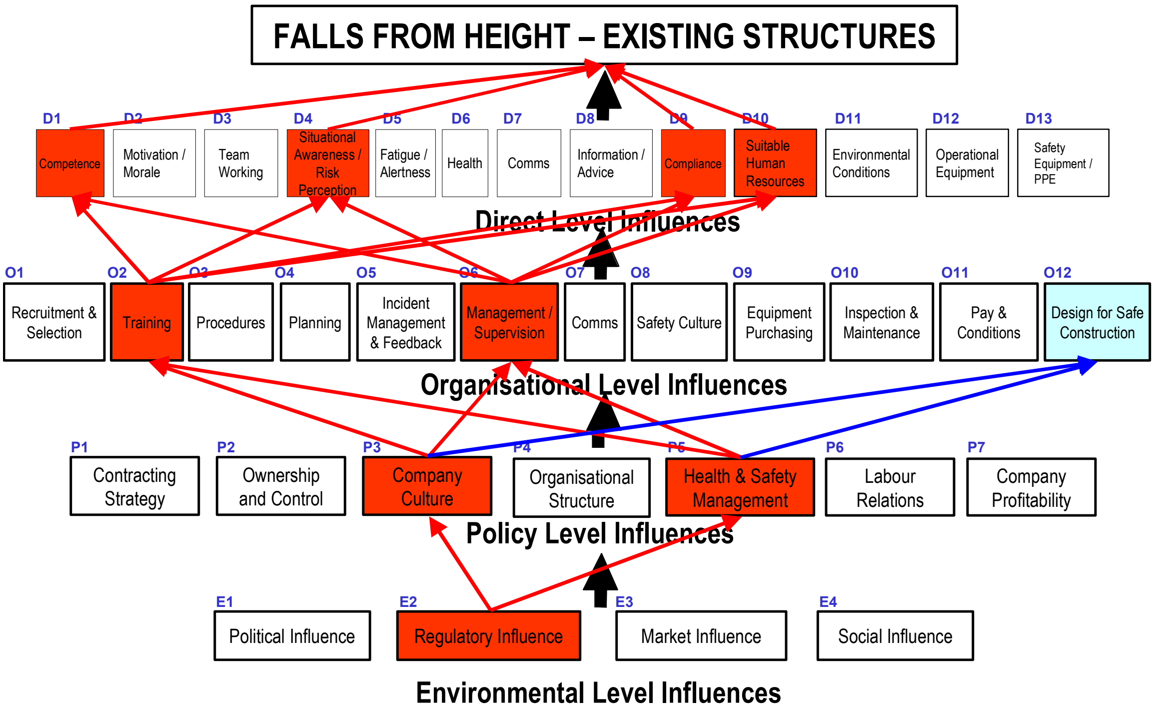

Figure 98 Critical paths identified for work at height in Existing structures

The critical paths identified for the consolidated critical paths based on both workshops are shown in Figure 97. These essentially fall into three categories:

- *Competence*, *risk perception / situational awareness* and *compliance* on site (shown in red).
- *Operational equipment* and *safety equipment / PPE* on site (also shown in red).
- *Process design* (shown in blue).

The routes of influence for these three categories are shown as being via the *regulator* influencing *company culture* and *health and safety management* in order to influence *training* and *management / supervision* for both of the site categories. For the *process design* category, the *regulator* would need to influence *contracting strategy* as well as *company culture* and *health and safety management* in order to influence *process design*.

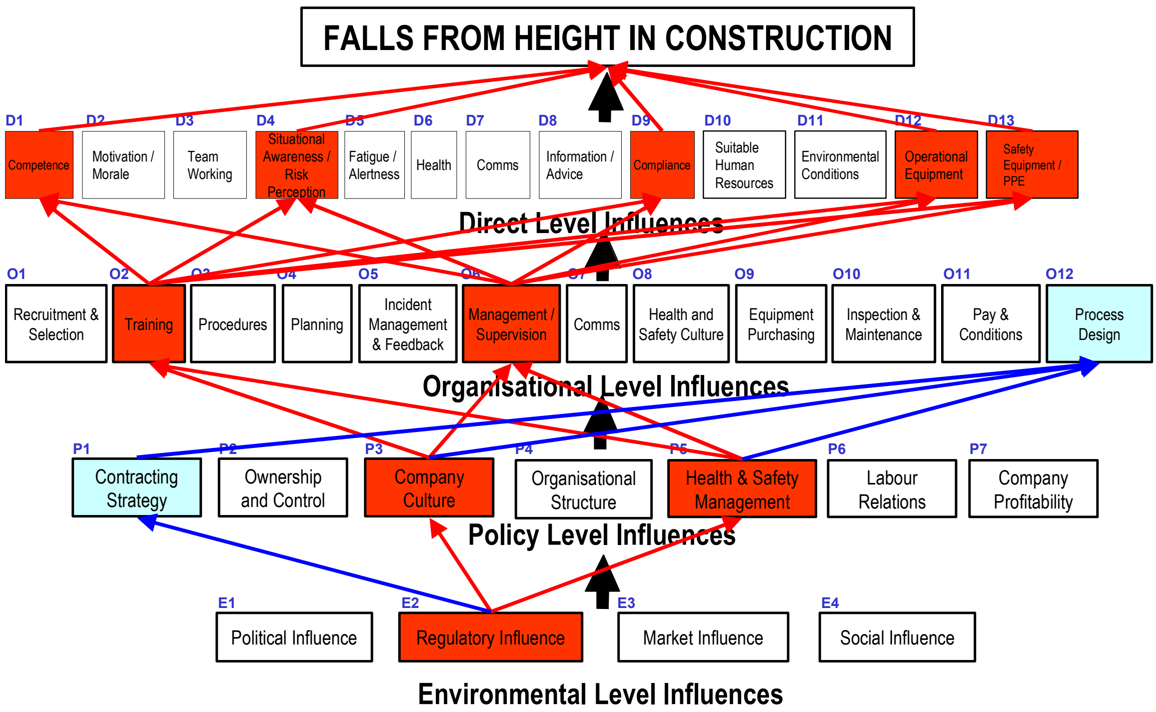

Figure 99 Consolidated critical paths identified for work at height in construction

8.8 INDUSTRY SPECIFIC RISK CONTROLS

On the basis of the discussions and analyses in the previous sections, the following potential risk control measures are proposed:

1 – Action to raise situational awareness and improve risk perception

In terms of improving *situational awareness / risk perception,* a number of possibilities were put forward in the workshops including:

- Presenting the risks, hazards and consequences of falls from height in a way which attracts workers' attention.
- Supervisors leading by example i.e. not taking unnecessary risks at height.
- Introducing risk taking and the consequences into the education system to encourage an overall societal change.

This suggest that a multi-prong approach is required, addressing risk perception among both current and future workers.

2 – Achieving compliance

To get people to *comply* with the rules, regulations and procedures for working safely at height it was thought that, in some cases, the only way to change attitudes was through prosecution. Alternatively, people need to accept more responsibility both for themselves and others. However, this requires an attitude change. The DuPont STOP system was mentioned whereby workers are encouraged to stop others to discuss safety issues. Increased *supervision* was thought to be at least of partial help towards improving compliance.

3 – Recruiting suitable workers into the industry

Under the *suitable human resources* factor there were a number of suggestions to help prepare people for work at height. New staff should be made aware of the hazards associated with work at height through induction training. Managers should attempt to recruit people who at least have some experience of working at height, for example ex-window cleaners. An important part of selecting people to work at height is consideration of the balance between experience of high work against skills in the trade. Ideally, one should not vastly outweigh the other. Finally, the re-introduction of apprenticeships was felt to have potential for improving the skill base of people for working at height.

4 – Better selection, use and maintenance of safety equipment

Stricter requirements in terms of *safety equipment / PPE* and its upkeep and appropriate disciplinary measures for failures in this respect were put forward as options to increase standards. *Training* on the appropriate use of PPE was thought to be important as well as the provision of *information / advice* to contractors on the different PPE options which are available. Other measures put forward included greater use of nets and a rule that equipment should be renewed after a specified time period.

5 – Better trained workforce

Training for work at height, at least in certain areas of new build, was thought to be important. Options suggested for making training more effective were:

- Including work at height skills as part of trade training.
- The provision of man-management courses for supervisors.
- State funding for health and safety training.
- Induction training covering work at height.

6 –More planning and appropriate method statements

Several points should be borne in mind when plans are drawn up for work at height. A *planning* meeting should be held which should include consideration of how work at height may affect other activities or be affected by external events. Method statements or risk assessments should be checked for validity before any work is started. Ideally, the person carrying out the work will have been involved in the risk assessment. Contingency plans should be thought about in case the work is subject to change. To aid planning, it was felt that *managers* require greater knowledge of the risks involved in work at height. They should be encouraged to train small teams who can carry out a range of work at height jobs.

7 – Improving the culture

Safety culture on site and the wider issue of *company culture* were acknowledged as important and difficult issues to deal with. The sharing of information was thought to be an important aspect and the encouragement of a reporting culture similar to the one in the chemical industry was recommended. Two other areas which could make a difference were identified as getting the client on site to talk to the site manager about safety issues and raising the profile of corporate manslaughter to catch the attention of senior managers and directors.

8 – Using better design to eliminate hazards and reduce risks

The *design* of new structures was generally felt to be a key part of reducing the risks from working at height. Specific measures for improvement covered:

- Designing out fragile roofs.
- Educating designers in designing with safety, buildability and maintenance in mind.
- Designing in attachments for safety nets / lines.
- Producing design safety cases demonstrating that safety had been considered in design.
- Encouraging the client to influence the architect.
- Stressing the benefits of using CDM.

9 – Increasing the impact of the Regulator

The *Regulator* was thought to have an important role in reducing the risks from work at height. The most beneficial lines of actions which the Regulator could pursue were thought to be:

- More follow-ups to HSE visits.
- Dissemination of information through trade associations.
- Providing examples of good practice.
- Tougher enforcement.
- More prescription than goal-setting.
- More involvement with design teams.
- Impartial advice.

9. ROOFING WORKSHOP

9.1 ATTENDEES

The original list of participants for the roofing workshop included representation from manufacturers, training providers and roofing contractors. Unfortunately only two people were able to attend on the day although they did provide broad experience of the industry.

Table 30 Attendees at the roofing workshop

Name	*Company/organisation*	*Comments*
Mike Long	National Federation of Roofing Contractors (NFRC)	Chair of various health and safety committees representing the industry. Involved with training, NVQ assessment and BSI.
Russell Calderwood	HSE	Interest/experience in construction, training, CDM and domestic v industrial risks.
Helen Bolt	BOMEL	Director. Chartered civil engineer leading BOMEL's R&D and H&S studies Group.
David Jamieson	BOMEL	Psychologist with specific experience in ergonomics and human and organisational factors.
Mike Webster	BOMEL	Chartered civil and structural engineer with experience in building, industrial, bridge and offshore structures.

9.2 CUSTOMISING THE APPROACH FOR ROOFING

The Influence Network used in the roofing workshop was the same as the network used in the new build construction workshop (and therefore the same as the generic falls from height network). Roofing is generally considered as construction activity and so the factors affecting roofing and how these can be structured are largely similar to those for the construction industry as a whole.

Domestic as well as industrial roofing, and new construction as well as repair/maintenance were covered in the workshop including the following activities:

- SLATING AND TILING; including clay, concrete, natural and man made slate, steel, bitumin and wooden shingles and shakes.

- SHEETING AND CLADDING; including profiled self supporting fibre cement, steel, aluminium and fully supported metals with fillers, sealants, fixings and fastners and roof lights.

- FLAT ROOFING; including built up felt roofing, single ply, mastic asphalt, liquid applied waterproofing and dry seal.

At the start of the session there was a general discussion which helped to further refine the definition of roofers as a group. Roofers as a trade are those who have been trained to undertake specialist roof work. This is distinct from people who happen to work on roofs, for example, joiners. It was suspected that many of the latter cases will be classed as roofers in accident statistics even though technically they are not. Even within the roofing trade there are different levels of qualification. It is estimated that roof work undertaken by contractors belonging to the National Federation of Roofing Contractors (NFRC) accounts for about 40% of the roofing market and yet only 10% of roofing accidents. Clearly these contractors represent the better side of the industry and it is likely they were being used as a reference point in much of the workshop since many of the ratings are from moderate to good. This should be borne in mind when reviewing the rating discussions in the next section.

9.3 INFLUENCE FACTOR DISCUSSIONS

Details of the workshop discussions are presented in Appendix E. The key issues are summarised in the workshop conclusions (Section 9.5) whilst the ratings are summarised in Figure 100.

9.4 INFLUENCE FACTOR WEIGHTINGS

Direct level influences on falls from height in roofing

The factors rated as having the strongest direct influence on falls from height in roofing were *competence, situational awareness/risk perception, compliance, suitable human resources, conditions* and *safety equipment/PPE.* Although conditions were weighted as high, the point was made that this is only a potential influence. In reality, if the weather is very bad then people will not work on roofs which probably serves to lessen its significance.

Organisational influences on significant Direct factors

The *Organisational* factors considered to have the strongest influence on the ***competence*** of roofers were *training* and *safety culture* with training felt to be the key factor. These factors were also thought to be the primary influences on ***situational awareness/risk perception.*** For ***compliance****, safety culture* was said to be of high influence but with *management / supervision* perhaps having the strongest influence. For ***suitable human resources***, *recruiting* the right people, ensuring appropriate *training* and *paying* suitable wages were the key organisational factors. Finally, the quality of ***safety equipment/PPE*** used in roofing is most heavily influenced by *equipment purchasing* and *inspection and maintenance* and the appropriate *training* is required in its use.

Policy influences on significant Organisational factors

Training clearly emerged at the *Organisational* level as the most important factor in terms of weightings to the *Direct* level. *Company culture* was highlighted as having the greatest potential impact on ***training*** although other factors such as contracting strategy and safety management were also thought to play a part. ***Safety culture*** also emerged as a significant factor at the *Organisational* level with *company culture, safety management* and good *labour relations* emerging as the key drivers for this at the *Policy* level.

Environmental influences on significant Policy factors

A key point that was made here was that companies need to be seen to be taking safety seriously both in the market place and in society. For this reason, *market* and *societal* influence were judged to have the strongest influence on *company culture*.

See Section 12 for a comparison of the weightings across the workshops.

9.5 WORKSHOP CONCLUSIONS

The main conclusions drawn from the workshop regarding the influences on falls from height in roofing are as follows:

- The younger and older workers are at most risk of falls from height due to lack of awareness in the former case and complacency in the latter (D4).
- *Fatigue* among roofers, for example through alcohol or having more than one job, may be a significant factor which in some cases warrants more attention (D5).
- The provision of *information / advice* (D8) to roofers is an area where improvements are needed. The main issue appears to be that information is not pitched at the level that workers need, either being too complicated or too generic.
- The eyesight of the workforce is a *health* area that has been overlooked and needs further investigation (D6).
- *Compliance* in the industry was thought to be poor with even skilled people taking unnecessary risks (D9). This seems to be ingrained in the culture, and people are allowed to get away with safety violations too often.
- Many accidents have been seen which are due to the weather and perhaps more control is needed in this area (D11).
- In terms of the *equipment and PPE* (D12, D13) used in roofing, smaller companies involved in maintenance and domestic work are often lacking when it comes to having the right equipment. They may have no safety equipment at all or equipment is used in the wrong way. The quality of any equipment they do have is likely to be degraded through poor maintenance. The use of ladders was a particular area of concern.
- *Training* was seen as indispensable for any roofing work (D1). A major problem area is that the self-employed are unlikely to have any formal training (O2).
- *Incident management and feedback* (O5) is an area that has the potential to raise awareness of the hazards involved in work at height. Companies are doing nothing in this respect, and it is being left to the NFRC to drive this area.
- *Supervision* (O6) was identified as a key area for improving safety in work at height. Supervision at the moment does not carry enough safety responsibility but is more

focused on operations and getting results. One of the main problems is establishing good links between the office and the site.

- It was thought that the risks associated with roof work could be minimised at the *design* stage by giving consideration to both the design of the structure and providing attachments for safety nets and lines (O12).

- Generally, the *safety culture* (O8) in the industry is lacking. Not enough companies have the standards in place that are necessary to promote safety, although there have been improvements in recent years.

- Building safety into *contracts* (P1) could be an effective means of improving safety but is only used by large companies at the moment. Clients appointing smaller contractors and facilities managers may not appreciate their safety responsibilities.

- HSE have an important role to play in improving safety in the industry (E2). The key activities were thought to be more site visits and warnings along with dissemination of information in order to raise awareness. It was recognised that HSE are under resourced at present, and this limits how much they can do in these areas.

9.6 CRITICAL FACTORS INFLUENCING FALLS FROM HEIGHT IN ROOFING

Often it was possible for participants to give one rating score for the industry perhaps reflecting the fact that the workshop covered a particular trade. Many of the ratings which were given tended towards the higher end of the scale, which, as described in Section 9.2, reflects the fact that one of the delegates was from the NFRC who represent the more professional end of roofing. However, differences were picked up in certain areas such as between new build and domestic repair/maintenance and between larger and smaller companies. In general, smaller companies involved in domestic roof work and repair/maintenance tended to pull the ratings down. The lower set of ratings has been used in the analysis in order to focus on the areas of the industry where improvements are most needed.

The factors ranked as having the most potential influence on falls from height in roofing are shown in Figure 100. At the *Direct* level, there is a clear distinction between factors with a high influence and those with very little. *Competence, risk perception, compliance, suitable human resources, conditions* and *safety equipment/PPE* clearly stand out as the most important factors with none of the others weighted above medium. At the *Organisational* level, the factors ranked as most important are *training, safety culture* and *design* followed by *recruitment and selection, procedures* and *management/supervision. Company culture* and *safety management* emerge as most significant at the *Policy* level followed by *contracting strategy* and *organisational structure.* The *Regulator* and the *market* are the dominant influences at the *Environmental* level. *Process design* was included at the *Direct* level for analysis purposes only (see Section 8.6).

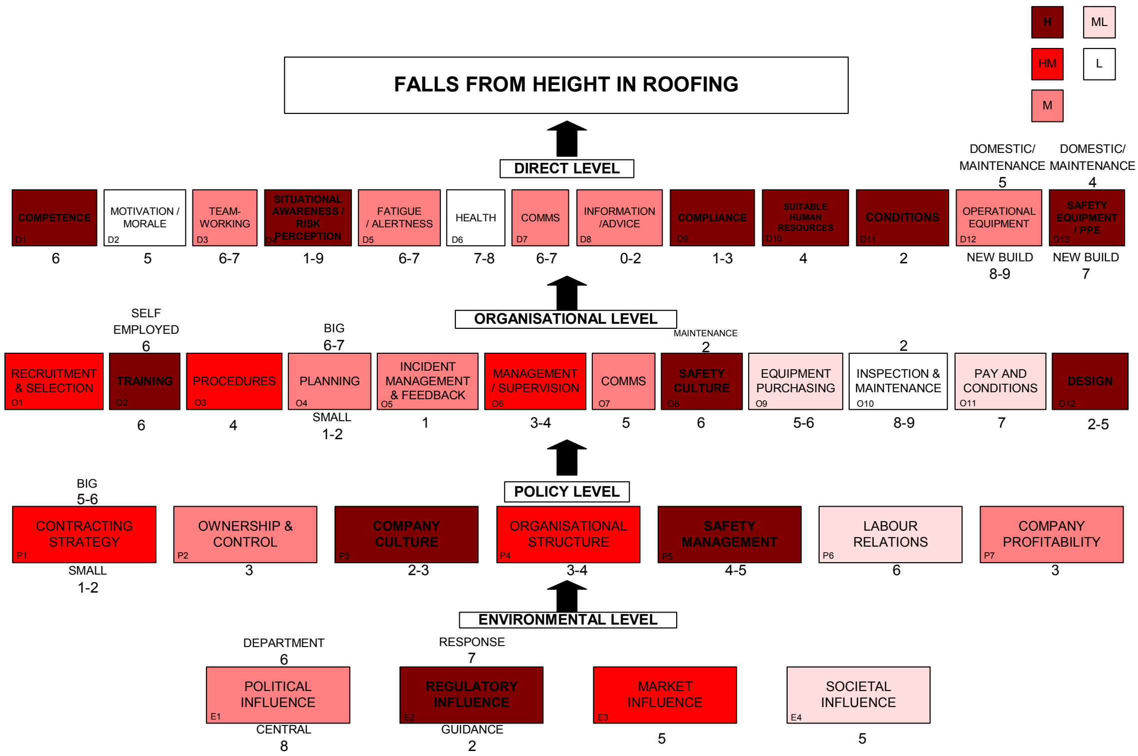

Figure 100 Factors graded according to potential influence on falls from height in roofing (weightings – colour-coded, ratings indicated by numbers)

The factors ranked as having high or high medium influence on falls from height in roofing are shown in Table 31 against the ratings which they were assigned in the workshop. This helps to show which factors have the greatest potential influence and where improvement is currently needed.

Table 31 Critical factors in falls from height in roofing

Most potential influence	***Ratings***
Direct	
Competence	6
Situational awareness/risk perception	1
Compliance	1
Suitable human resources	4
Conditions	2
Safety equipment/PPE	4
Organisational	
Recruitment & selection	2
Training	1
Procedures	4
Management/supervision	3
Safety culture	2
Design	2
Policy	
Contracting strategy	5
Company culture	4
Organisational structure	3
Safety management	4
Environmental	
Regulator	2
Market	5

The most significant routes of influence through the factors influencing falls from height in roofing are shown in Figure 101. Combinations of these factors provide critical paths through the network that constitute the most effective risk control measures. This figure suggests that the *Regulator* should influence *company culture* and *safety management* at the *Policy* level in order to mobilise improvements in *training* at the *Organisational* level. These improvements in *training* should then be targeted at improving *competence*, *risk perception*, *compliance*, *suitable human resources*, *conditions* and *safety equipment* (in particular, its selection, use and maintenance).

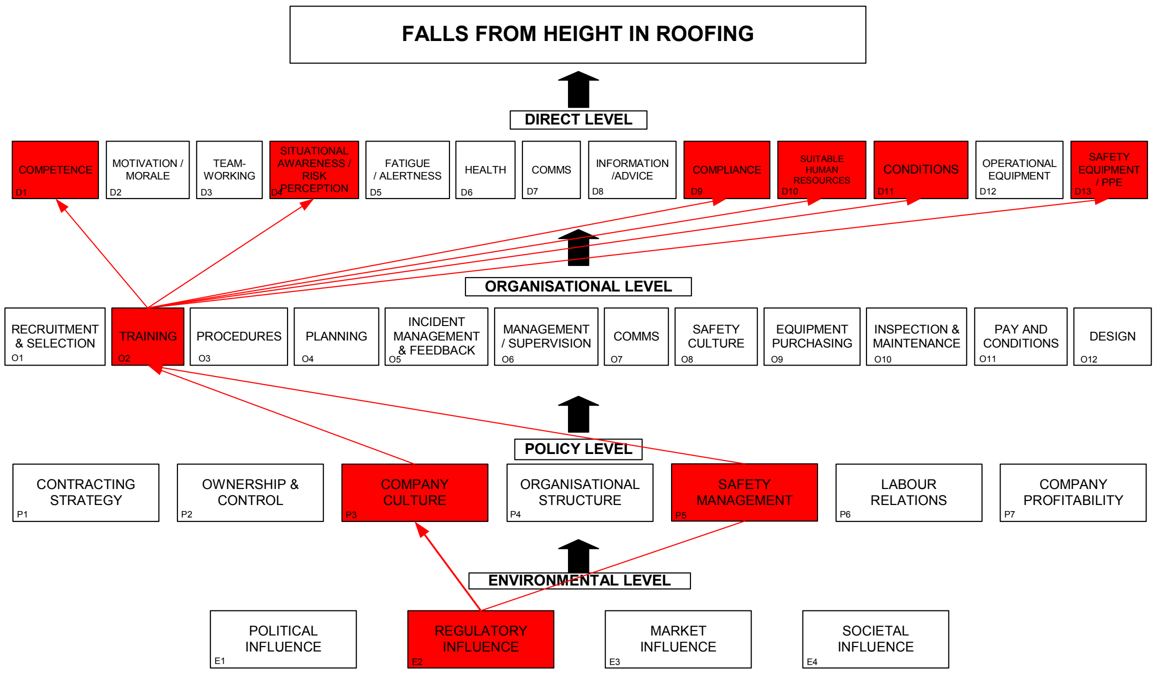

Figure 101 Critical paths identified for falls from height in roofing

9.7 INDUSTRY SPECIFIC RISK CONTROLS

Based on the discussions and analyses in the previous sections, the risk controls identified as having potential for improving the falls from height situation in roofing are considered to be:

1 – Improvements in situational awareness / risk perception

The *situational awareness/risk perception* of roof workers was thought to vary but was felt to be of particular concern at the poor end of the scale. Younger and older (35 to 40) age groups should be targeted to raise their awareness of the hazards and risks associated with working at height. This could be achieved through *training* (skills cards) schemes for new entrants to the industry, also by toolbox talks.

2 – Improvements in compliance

Compliance in the industry was reported to be very poor and the workshop participants found it difficult to see how this could be improved. The key points seem to be changing attitudes through tougher enforcement and easing the time pressure on a job through proper planning and budgeting.

3 – Improve standards in the selection, use and maintenance of safety equipment

There are certain basic standards for *safety equipment/PPE*, which it was felt are often not in place. In the first instance, the appropriateness of equipment should be considered, for example, whether or not there is enough clearance for harnesses or if nets would be a better option. Edge protection, crawling boards, inflatable fall arrest and general access must also be considered. The standard of inspection and maintenance is an area where considerable improvement is needed.

4 – Encourage the use of more relevant procedures

There were several ways in which it was thought *procedures* could be improved for roofwork. They must be kept to a level of detail which is easy to follow and should not be too bulky in order that they are usable. Procedures must also be continually reviewed and updated according to risk assessments.

It was stated that many accidents have been caused when roof sheets have been blown out of control. Such cases are examples of when the job *conditions* have not been taken into account adequately. Guidance and *procedures* are required for roof work in bad weather.

5 – Improve supervision as a means of improving compliance and safety culture

Supervision was put forward as an important means for improving safety in work at height. Supervisors must create a good link between the office and the site. Supervisors for work at height should be appointed on the basis of having experience of such work and should be primed to look at safety as well as the operational side. Senior managers must be committed to putting the right people in place. Supervisors and managers have a responsibility to foster a positive *safety culture*, which should involve setting high standards for safety which everyone is aware of.

6 – Improvements in Process design

Design was flagged as an area where more consideration of safety could help to reduce the risk of falls from height. Ideally, contractors should be involved in the process early on to advise on things such as choice of roofing material. Designers need to think more about maintenance which requires access to the roof e.g. if plant should be on the roof or if it could be somewhere else.

7 – Encouragement of client ownership

Clients should be encouraged to require roofing contractors to cover safety in their tenders. In order to help with this, roofing contractors should strive to develop safety management systems that are ‘live’ in that they help to effectively manage safety from job to job. They should be continually monitored and maintained.

Training was identified as a key area for improving safety in roofwork. There is a system for training in place but the take up is lower than desired. Efforts should be made, therefore, to raise awareness of training courses and highlight the benefits. This is essentially a crosscutting measure that underpins many of the proposed risk controls.

The HSE has an underpinning role to most of these potential risk controls, with suggestions at the workshop that the industry feels that the *Regulator* needs to undertake more site visits that are followed up and issue more warnings. In addition, it was thought that the dissemination of relevant safety information to trade associations would help to raise awareness among smaller companies.

10. SPECIALIST OCCUPATIONS WORKSHOP

10.1 ATTENDEES

The attendees at the specialist / utilities workshop are shown in Table 32.

Table 32 Attendees at the specialist / utilities workshop

Name	*Company/organisation*	*Comments*
Jonathan Capper	Lyon Equipment / Industrial Rope Access Trades Association (IRATA)	Chair of IRATA health and safety committee and also sits on BSI committees. 27 years with Lyon, suppliers of safety equipment including equipment for work at height.
Rupert Douglas Jones	International Powered Access Federation (IPAF)	Training manager responsible for over 300 instructors on the use of access plant (MEWPS).
Graham Gilbert	National Grid	Responsible for safety on towers from 100 to 700 feet high, sometimes live and sometimes not.
Derek Holt	Bacou Dalloz	Head of training for suppliers of safety products including those applicable to work at height.
David Myles	BT	Has 20 years experience of work on transmission poles and radio masts. Recently introduced 23,000 new harnesses for the access work.
Mark Wright	Access Training	Trainer on rope access. Member of the board of FASET (Fall arrest equipment e.g. harnesses and nets)
Helen Bolt	BOMEL	Director. Chartered civil engineer leading BOMEL's R&D and H&S studies Group.
David Jamieson	BOMEL	Psychologist with specific experience in ergonomics and human and organisational factors.
Mike Webster	BOMEL	Chartered civil and structural engineer with experience in building, industrial, bridge and offshore structures.

10.2 CUSTOMISING THE APPROACH FOR SPECIALIST OCCUPATIONS

The purpose of the specialist occupations workshop was to look at occupations where working at height is an integral part of the job, and workers need to be trained to do so. The key objective was to gain an understanding of how these industries have developed good practices and how these might be applied to other industries. Specialist occupations were taken to include rope or powered access work, e.g. for maintenance and repairs, painting, arboriculture etc, as well as work on telegraph poles and electricity pylons. This is distinct from jobs where work at height is infrequent e.g. in transport and agriculture. It was noted that work at height is an integral part of many construction activities, but this was covered in other workshops.

The generic falls from height Influence Network needed very little alteration for the specialist occupations workshop. The only slight modifications were to reduce some of the corporate feel to reflect the fact that many rope access workers may be self-employed or work in small groups.

10.3 INFLUENCE FACTOR DISCUSSIONS

Details of the workshop discussions are presented in Appendix F. The key issues are summarised in the workshop conclusions (Section 10.5) whilst the ratings are summarised in Figure 102.

10.4 INFLUENCE FACTOR WEIGHTINGS

Direct level influences on falls from height in specialist occupations

The factors thought to exert most influence on falls from height from the *Direct* level were *competence, situational awareness/risk perception, information/advice,* and both *equipment* factors. *Equipment* gained special mention since it is integral to working at height. The importance of competence was supported by the claim that this is the main reason for the low accident rate among specialists. *Compliance* was said to be closely linked to competence i.e. if you are competent you will appreciate the importance of the rules.

Organisational influences on significant Direct factors

The prime influences on ***competence*** at the *Organisational* level were thought to be *training, procedures, planning, management/supervision* and *safety culture*. Sensible procedures and robust planning were thought to be a necessity otherwise people may not be able to carry out work in a competent manner.

There were a number of *Organisational* factors thought to have a strong influence on ***situational awareness/risk perception*** which were *training, planning, incident management and feedback, management/supervision, communications, safety culture* and *process design*. *Design* was weighted highly since it was felt that it could be used to make people more aware of their surroundings.

The *Organisational* mechanisms which were judged most important for good ***information/advice*** were *training, procedures, planning, management/supervision, communications* and *safety culture*. These factors were also thought to have a high influence on ***operational equipment*** and ***safety equipment/PPE*** in terms of getting people to use the right equipment. Also considered to have a high influence on the *equipment* factors were *equipment purchasing* and *inspection and maintenance* in terms of ensuring good quality equipment.

Policy influences on significant Organisational factors

Many of the *Organisational* factors were considered to be important in terms of influencing falls from height, from *training*, *management* and *culture* to *equipment purchasing*, *inspection*/*maintenance* and *process design*. Looking below at the *Policy* level, it is possible to identify several factors which were judged to make the most difference to these *Organisational* factors. To bring about organisational change, *safety management* was an important underlying factor in almost all cases. *Contracting strategy* and *company culture* also received several high weightings and *profitability* was also significant in terms of the willingness of companies to spend money on safety at the *Organisational* level.

Environmental influences on significant Policy factors

At the *Environmental* level, the *Regulator* was judged to have the strongest influence on ***safety management*** (which was the key factor at the *Policy* level). The *market* received significant weightings particularly on ***contracting strategy*** (the extent to which safety costs can be built into contracts) and on ***profitability***. Interestingly, *societal* influence was also weighted as high on ***profitability*** due to the importance of brand names.

See Section 12 for a comparison of the weightings across the workshops.

10.5 WORKSHOP CONCLUSIONS

The findings from the specialist occupations workshop have been broken down into two different categories:

- Factors where improvements could be made to further reduce the risk of falls from height in the industry

- Factors that appear to account for the low number of accidents in specialist occupations which can be used as examples of best practice for other industries in terms of improving safety in work at height.

In terms of areas for further safety improvements in specialist occupations, the following conclusions have been drawn:

- Good *information / advice* (D8) on safety exists but there is difficulty with dissemination and possibly use of the information. Part of the problem is that many people in rope access are self-employed and are non-IRATA members which makes it difficult to reach them with information.

- The workforce tends to be dispersed which makes *communication* from organisations downwards more difficult especially when subcontractors are involved (O7).

- In terms of *incident management and feedback,* it was felt that often there are systems in place to collect accident and near miss data but the dissemination of the lessons from this information is not so good and it is not fully utilised to improve safety (O5).

- *Risk perception* while working at low levels could be improved (O4). Workers were felt to not have enough of an appreciation of the risks of low falls.

- Although *training* in specialist occupations is generally very good, there are still areas where improvements could be made (O2). There are cases where someone may get a ticket to work but they are not suitable for a particular job because they have not chosen the appropriate training course. In addition, they may only renew the ticket every 3 years with little refresher training in between. There is also the issue of supervisors being trained to a high level technically but not in terms of man management.

- In terms of equipment for working at height, there is insufficient information available to inform *equipment purchasing* (O9) and the *inspection and maintenance* (O10) of such equipment can be lacking. Companies often buy the wrong equipment, and there is a lack of people competent enough to ensure thorough maintenance.

- *Regulation* (E2) of specialist occupations presents problems because the HSE do not have the expertise necessary to make a difference. Guidance is weak, and it was felt that more inspectors should try to work with companies to make improvements.

The factors which appear to have the most positive influence on the very good safety record in specialist occupations are considered to be:

- The strict system of *training* (O2) people for rope access ensures high levels of both *competence* (D1) and *supervision* (O6) throughout the industry.

- The nature of rope access work means that often people have no option but to *comply* with procedures i.e. unless they follow the method statement they cannot reach the place of work. This makes it easier to build safety into the work process as ropes are required to reach the place of work.

- Rope access work seems to give people a better appreciation of the hazards involved with working at height (D4). People have a strong interest both in what they do and their personal safety, and this has helped to build a good *safety culture* (O8, P3).

- Rope access workers have a firm understanding of which equipment should be used for particular jobs and how this equipment should be looked after (ratings associated with D12, D13, O9 and O10).

- Rope access companies take strong *ownership* of safety and often demand higher standards than their clients (P2, P3). Safety is used as a marketing tool and is part of the *contractual arrangements* to ensure roles and responsibilities are clearly defined (P1, P2, P4).

10.6 CRITICAL FACTORS INFLUENCING FALLS FROM HEIGHT IN SPECIALIST OCCUPATIONS / UTILITIES

At the outset of the workshop it became clear that there are distinctions between the specialised rope access companies and the utility companies who were represented. As such, ratings were recorded for each, with variations for other parts of the industry such as powered access noted where appropriate. The ratings tended to fall into two groups with professional rope access companies towards the high end of the scale and certain parts of utilities and smaller operators at the other end of the scale. The results which are presented are based on the low set of ratings which reflect the smaller operators and areas where utilities and rope access companies do not perform so well.

Based on the analyses described in Section 6.7, the factors assessed to have the strongest potential influence on falls from height in specialist occupations are shown in Figure 102.

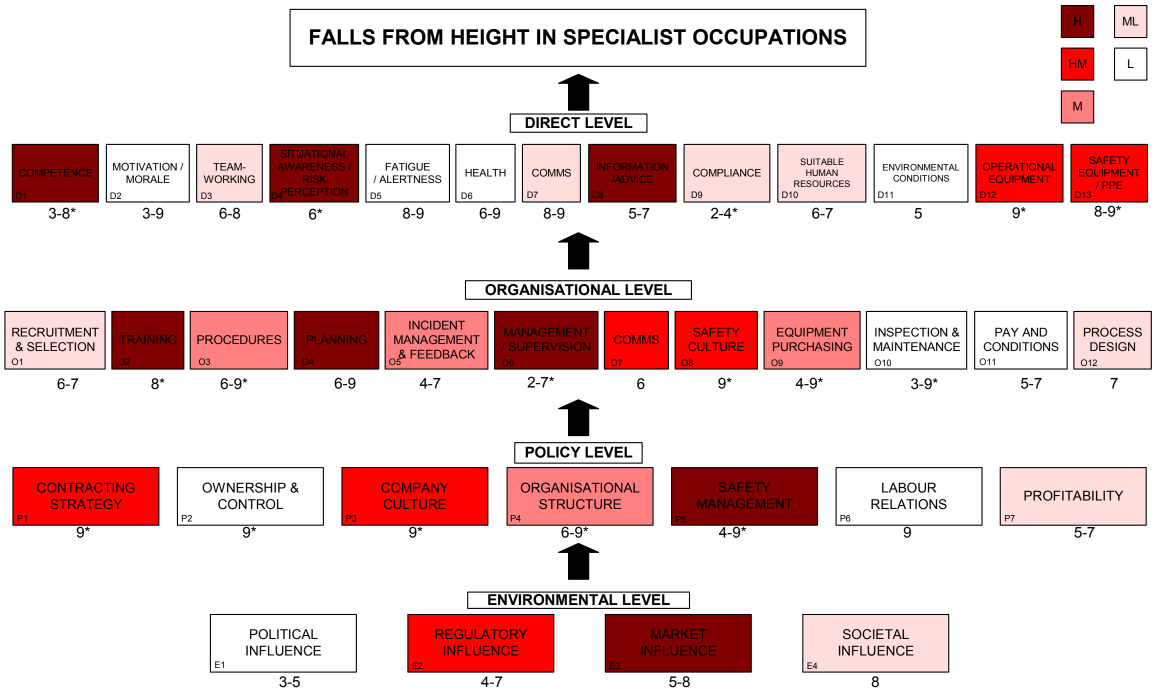

Figure 102 Factors graded according to potential influence on falls from height in specialist occupations (weightings – colour-coded, ratings indicated by numbers)

Figure 102 shows that the workshop delegates were clear on the most significant factors at the *Direct* level of the network. *Competence, situational awareness* and *information/advice* were thought to have a high potential influence followed by *operational equipment* and *safety equipment/PPE*. None of the other *Direct* factors were regarded as having such significant influence since they received relatively low weightings.

At the *Organisational* level, *training, planning* and *management / supervision* emerge as the most important factors with *communications* and *safety culture* also considered significant.

These factors are underpinned by *contracting strategy, company culture* and *safety management* at the *Policy* level. The *market* and *Regulatory* influence were ranked as having most influence at the *Environmental* level.

Those factors identified at the workshop as being the key positive factors associated with the good safety performance of the specialist occupations are shown in Figure 102 by an asterisk nest to the ratings. This shows that, on the whole, these factors coincide with the high or high-medium factors.

The ratings given to those factors considered to be of high or high medium influence are shown in Table 33. Analysis of these ratings in conjunction with the workshop comments helps to identify the factors with the greatest potential to reduce the risk of falls from height in specialist occupations / utilities (generally those factors with high weightings and low ratings). Although, in the case of this workshop, many of the key factors already had high ratings thus reflecting the decisions taken in the past to address these factors.

Table 33 Critical factors in specialist occupations

Most potential influence	***Ratings***
Direct	
Competence	3
Situational awareness/risk perception	6
Information/advice	5
Operational equipment	9
Safety equipment/PPE	8
Organisational	
Training	8
Planning	6
Management/supervision	2
Communications	6
Safety culture	9
Policy	
Contracting strategy	9
Company culture	9
Safety management	4
Environmental	
Regulator	4
Market	5

From the findings presented in the previous section, the critical factors influencing falls from height in specialist occupations / utilities are shown in Figure 103. Critical paths of influence can be traced between the factors since it has been identified that the lower level factors which are highlighted are the strongest influences on the critical factors at the level above. For the main conclusions from the workshops regarding these factors see Section 10.5.

The key difference between the findings from this workshop and the others is that the critical paths and risk controls identified for the specialists are essentially those that have worked for the specialists, and may thus be applicable elsewhere. For instance some the factors highlighted in Figure 103 already have high ratings, and thus there is little scope for improvement, but the important point is that this indicates these factors are key levers in improvement that could be used elsewhere for other industries / activities involving work at height. Figure 103 shows that the primary influence routes are through safety management in order to influence *training*, *planning* and *management and supervision* at the *Organisational* level. These *Organisational* level factors then influence *competence*, *risk perception*, *information and advice*, *operational* and *safety equipment* at the *Direct* level.

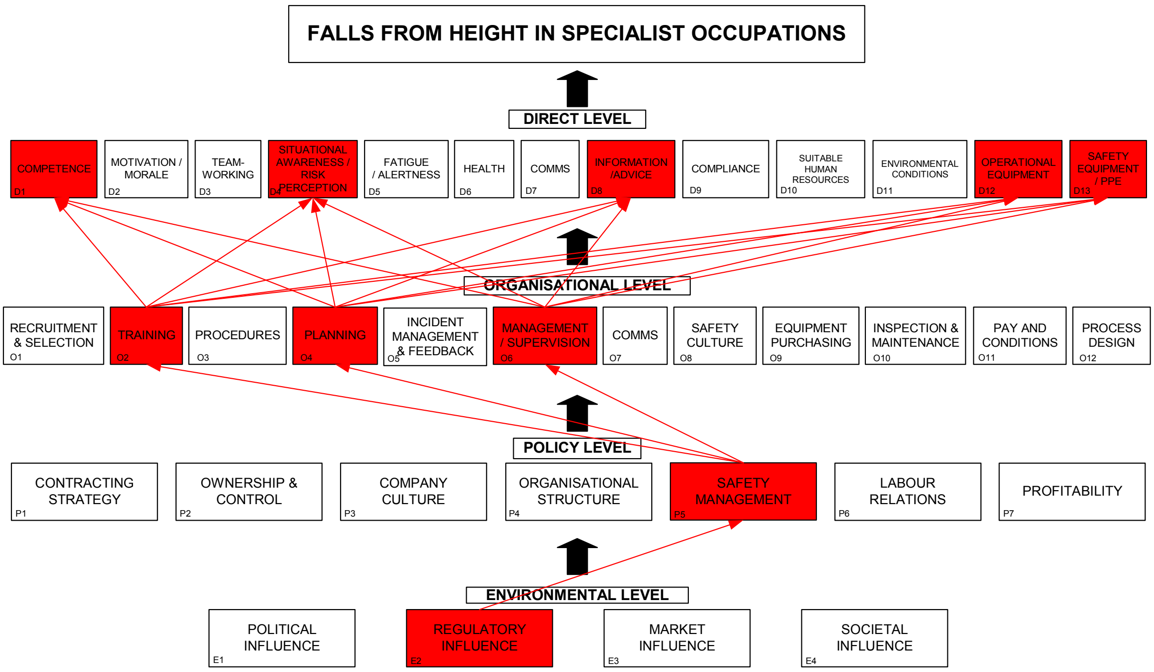

Figure 103 Critical paths identified for falls from height in specialist occupations

10.7 INDUSTRY SPECIFIC RISK CONTROLS

Based on the discussions and analyses presented in the previous sections, potential risk control measures are considered to be as follows:

1 – Raise the levels of competence

In terms of the *competence* of people working at height, IRATA members are highly competent since they must progress through a rigorous training programme which is independently assessed. The problem arises with smaller companies who perhaps cannot afford this level of training and this is when competence can be lacking, especially in activities such as rigging nets. In terms of improving this situation, either there needs to be some kind of subsidy for training to allow more smaller companies to take it up or the larger companies need to try to filter down training skills / requirements to sub-contractors.

2 – Raise the levels of situational awareness / risk perception

Situational awareness/risk perception was thought to be lacking when people are working at low levels where they are less likely to appreciate the risks. Raised awareness is needed in this area with perhaps risks and hazards being presented to the workforce in a different light. People using scissor lifts or portable ladders are examples of those who should be targeted.

3 – Improve the standard of information and advice

The standard of *information and advice* was thought to be lacking in the industry. In terms of improvement, it was thought to be important that information is made more accessible and usable. The information needs to be pitched at a ready to use level for operatives. Particular emphasis should be put on reaching non IRATA members and smaller contractors.

4 – Improve the quantity and quality of management

The role of *management and supervision* was thought to be a key area where improvement is required. Safety is generally not high enough on the management agenda. A proportion of management time should be set aside for safety and they should be given the essential information they need on the issues which need to be addressed for work at height since many may not have this experience. *Safety management systems* should be developed which include monitoring and formal auditing. Supervisors for the work are technically adept but might benefit from man-management training.

5 – Improve incident reporting and information flow

The *communication* of information for safe work at height is difficult due to the dispersed workforce and the amount of sub contracting in the industry. IRATA acknowledged that they need to work on improving their dissemination of information. Part of improved communication should include formal *incident reporting and feedback* systems which will require, among other things, commitment from management and more training in incident investigation for key personnel.

As with other sectors, the role of the *Regulator* was seen as being an initiator in many of the potential risk controls.

11. TRANSPORT WORKSHOP

11.1 ATTENDEES

The workshop attendees are shown in Table 34.

Table 34 Attendees at the Transport workshop

Name	*Company/organisation*	*Comments*
Chris Macrae	Freight Transport Association	Dangerous goods manager responsible for policy and training.
Jerry Mawhood	HSE	Works for Field Operations Division and advises on work transport risks, vehicle movement and crushing accidents.
Trevor Piggot	UK Lift / Association of Lifting and Elevating Equipment Manufacturers	Specialist on lift devices for loading and unloading.
Mike Wood	British Chemical Distributors and Traders Association	Safety information adviser. Has 30 years experience of bulk liquid distribution and storage – chemical and petroleum about 50/50. BCDTA has around 130 members.
Brian Woolley	TDG Euro Logistics	Health and Safety and Operations manager. 1500 vehicles, 500 tractors with the rest tankers and a few curtain sided.
Rodger Wrapson	Road Haulage Association	Hazardous goods manager and secretary of tanker group.
Helen Bolt	BOMEL	Director. Chartered civil engineer leading BOMEL's R&D and H&S studies Group.
David Jamieson	BOMEL	Psychologist with specific experience in ergonomics and human and organisational factors.
Mike Webster	BOMEL	Chartered civil and structural engineer with experience in building, industrial, bridge and offshore structures.

11.2 CUSTOMISING THE APPROACH FOR TRANSPORT

Examination of accident data reveals that transport related accidents are prominent across all industry sectors including agriculture, manufacturing, energy extraction and utilities, services and construction. Closer inspection reveals that the majority of these accidents are low falls (<2m) involving goods drivers while loading and unloading vehicles including tankers. Furthermore, the majority of goods drivers involved in these accidents are working in the services sector. The workshop was therefore focused on the loading and unloading of goods vehicles and tankers, including consideration of the people and equipment involved, access issues etc, with particular emphasis on the services sector.

The Influence Network factors needed little alteration for the transport workshop. Unlike previous workshops it was felt unnecessary to separate operational and safety equipment/PPE at the direct level since the equipment involved in loading/unloading can mostly be placed in one group (equipment operability) and PPE is not a major issue. At the organisational level, the design factor was used to cover the design of vehicles and the associated equipment, both fixed to and separate from the vehicle.

11.3 INFLUENCE FACTOR DISCUSSIONS

Details of the workshop discussions are presented in Appendix G. The key issues are summarised in the workshop conclusions (Section 11.5) whilst the ratings are summarised in Figure 104.

At the outset of the workshop, a clear distinction was made between dedicated and non-dedicated operations. Dedicated operations are when delivery of the same load is made to the same outlets on a regular basis. Examples are petroleum deliveries to service stations and wholesale delivery to supermarkets. These operations are usually well planned and organised and everyone is familiar with the operations involved. This is in contrast to non-dedicated operations when the load could potentially be anything during a one-off delivery to somewhere the driver has never been before. It was generally agreed that safety is better during dedicated operations because, among other things, sites are well organised and designed for loading/unloading which improves safety. It was felt that this was an important distinction and so ratings were gathered for dedicated and non-dedicated operations where appropriate. There is a further distinction between large companies with a fleet of vehicles and smaller road haulage operators with versatile flat bed vehicles. ‘Flat bed’ was used to characterise the latter group, with the distinction being made because of the type of operation, and not just the type of vehicle.

11.4 INFLUENCE FACTOR WEIGHTINGS

Direct level influences on falls from height in transport

Communications were identified as arguably the key factor influencing safety in transport related accidents. It followed from this that *information and advice* had to be weighted highly also. Other factors which were regarded as key *Direct* influences were *situational awareness / risk perception, conditions* (such as wind) and *operational equipment.*

Organisational influences on significant Direct factors

The strongest *Organisational* level influences on ***communications*** at the *Direct* level were thought to be *training, procedures, organisational communications* and *safety culture.* These were also thought to be important for *information/advice.* A number of organisational factors were judged to have strong influences on ***situational awareness/risk perception*** including *communicating* the right information on risk, fostering a *culture* in which people look out for each other, *planning* to ensure everyone is aware of hazards, having a system of *incident management and feedback* to promote learning and covering safety in *training.* These factors were also important for raising awareness of the risks associated with poor ***environmental conditions*** as well as having adequate procedures for work in such conditions. The most important factors impacting on ***operational equipment*** were said to be *equipment purchasing* and *inspection and maintenance* but *training* in the use of equipment was also raised.

Policy influences on significant Organisational factors

Organisational communication emerged as one of the most significant factors at the *Organisational* level and was judged to be most strongly influenced by *company culture, organisational structure* and *safety management* at the *Policy* level. *Company culture* and *safety management* were also judged to have a strong effect on ***safety culture*** and ***training.***

Environmental influences on significant Policy factors

The *market* was felt to have the strongest impact on ***company culture*** with the *Regulator* having the greatest potential influence on ***safety management.***

See Section 12 for a comparison of the weightings across the workshops.

11.5 WORKSHOP CONCLUSIONS

Communication at the *Direct* (D7) and *Organisational* (O7) levels between the different parties involved in transport operations was thought to be one of the key factors in terms of the potential to improve safety. This should involve contractors, the site and drivers. In this way, responsibilities could be made clear which is something that was thought to be lacking at the moment. The main stumbling block with this was established to be the fact that a job may go through 4 or 5 hands before getting to the driver which tends to deteriorate the quality of communications.

It was thought to be important that drivers communicate feedback when they come across difficulties on their rounds in order that areas for improvement can be identified (O5). Furthermore, *information / advice* is needed in terms of the risks associated with non-dedicated operations (D8).

Driver *fatigue* was discussed as an issue with the potential to compromise safety (D5). Many drivers have to start work around 4am for a number of possible reasons including to avoid traffic congestion, deliver fresh produce and avoid loading/unloading restrictions. Body rhythms are at a natural low during these times and to make matters worse some drivers may have a second job which will make them even more tired.

Several important points in relation to *equipment operability* **(**D12**)** were made including that *design* should be used to reduce risks where possible. The suitability of hardware for getting in/out of cabs or on/off trailers was considered to be a potentially important area which may be overlooked. The final conclusion on equipment was that it is often used for the wrong purpose. As such, the problem is generally not the quality of equipment but how it is used.

The *training* of drivers was regarded as an important part of improving safety. Currently 'dedicated' drivers have a higher *competence* level compared to 'non-dedicated' drivers (D1). This is because major companies will have training for their drivers but small operators will not. It was felt that a central part of training should be to make people aware of when not to do a job i.e. to have the ability to assess a job and decide whether it can be done safely or not.

The group was informed that there is currently a draft EU standard on driver *training* which includes much more than just driving skills including health and safety, paperwork and first aid (O2). This was thought to be a good idea in principle although a lot will depend on how the standard is implemented in the UK. There was also concern that the additional costs may present financial barriers to some people trying to enter the industry.

The *planning* of jobs was seen as an integral part of safety with formal risk assessments important in ensuring that drivers do not adopt the wrong approach to a job (O4). Risk assessments would probably have to be generic but tailored to specific jobs.

Larger dedicated companies will have an established *safety management* system (P5), and safety will be covered in *contracting* arrangements (P1). Small non-dedicated companies will probably not even carry out risk assessments and contracts will amount to no more than verbal orders on trust. However even in bigger companies it was felt there is still a tendency to sub-contract to shift responsibility for safety (P1).

Finally, the role of the *Regulator* was thought to be important (E2). It was stressed that HSE are actively developing their transport priority programme strategy although there is still much work to be done. The feeling from industry was that they would like more prescription and good practice guidance, in particular, information on risks (D7).

11.6 CRITICAL FACTORS INFLUENCING FALLS FROM HEIGHT IN TRANSPORT

The significant influences on falls in transport are shown in Figure 104. At the Direct level it can be seen that the group were able to clearly differentiate the most important factors. *Competence, situational awareness / risk perception, communications, information / advice, conditions* and *equipment operability* were judged to have a high influence with no other factors above medium. At the Organisational level, *training* and *safety culture* are the most significant followed by *procedures, planning, management / supervision* and *organisational communication.* The Policy factors with the highest weighting are *contracting strategy, company culture* and *safety management.* At the Environmental level it is the *Regulatory* and *market* influences which are thought to be strongest.

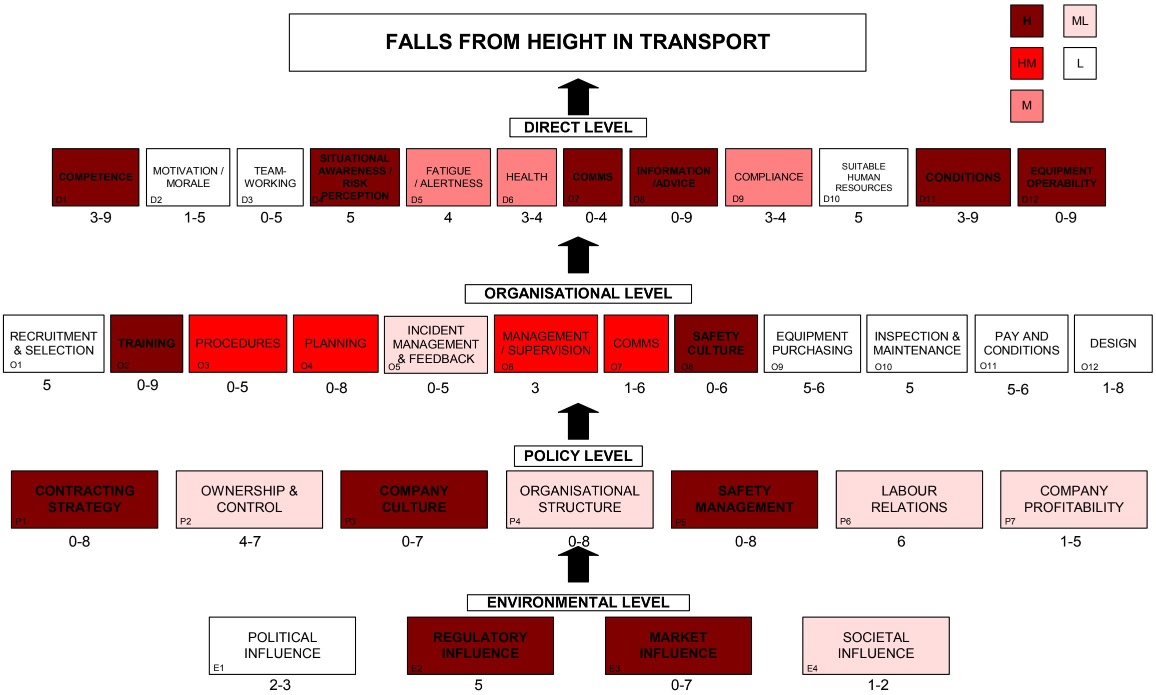

Figure 104 Factors graded according to strength of influence on falls in transport (weightings – colour-coded, ratings – shown as numbers)

The factors ranked as either high or high medium influence are shown in Table 35 against the ratings which they were assigned in the workshop. This helps to illustrate which areas offer the greatest potential to reduce the risk of falls from height in transport and where improvements are most needed.

Table 35 Critical factors in transport by weightings and ratings

Most potential influence	***Ratings***
Direct	
Competence	3
Situational awareness/risk perception	5
Communication	0
Information / advice	0
Conditions	3
Equipment operability	0
Organisational	
Training	0
Procedures	0
Planning	0
Management/supervision	3
Communication	2
Safety culture	0
Policy	
Contracting strategy	0
Company culture	0
Safety management	0
Environmental	
Regulator	5
Market	0

The critical paths that offer the greatest potential to reduce falls in transport are shown in Figure 105. This figure indicates that the *Regulator* could achieve the greatest increase in the index value by influencing *contracting strategy* and *safety management* at the *Policy* level in order to mobilise influence on *training* and *safety culture* at the *Organisational* level. These *Organisational* factors would then need to exert positive influences on *competence*, *risk perception*, *communications*, *information/advice*, *conditions* and *equipment operability* at the *Direct* level.

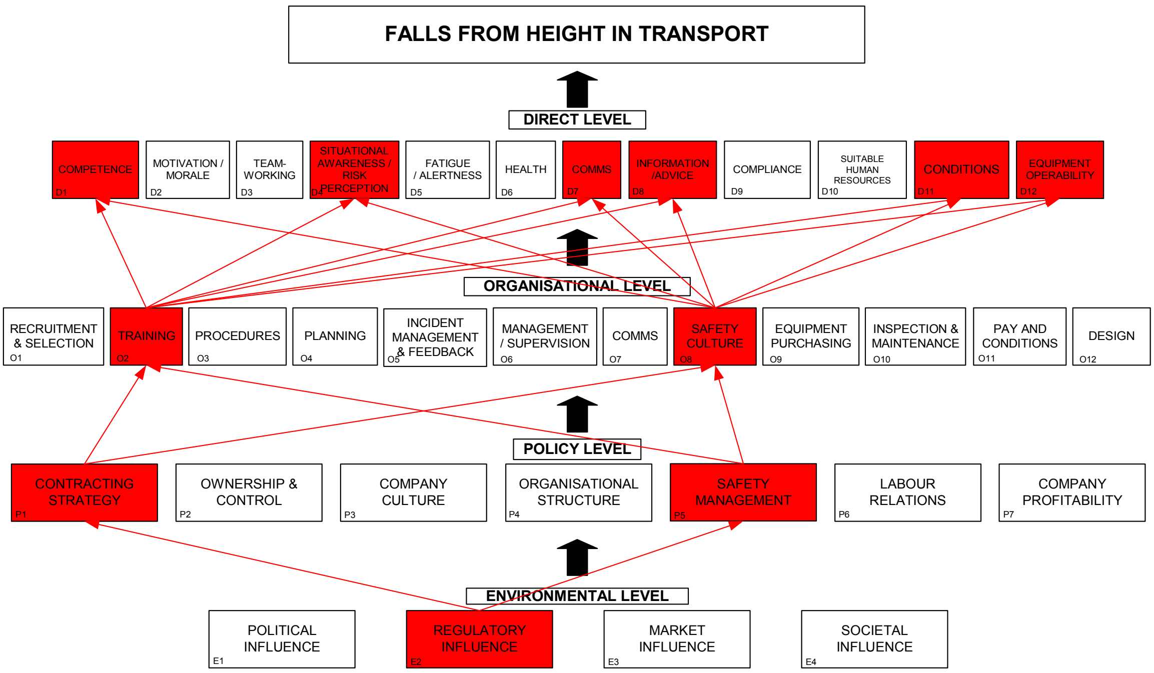

Figure 105 Critical paths identified for falls from height in transport

11.7 INDUSTRY SPECIFIC RISK CONTROLS

Based on the discussions and analyses presented in the previous sections, the potential risk control measures that could bring about improvements in relation to falls from height in transport are considered to be:

1 – Encourage a greater take-up of training

The discussions on *competence* and *training* were closely linked in the workshop. The general feeling was that major companies will train their staff whereas small operators are not likely to have any training resulting in employees of the former being more competent in terms of health and safety. It was felt there needs to be a higher take up of training across the industry especially among smaller operators. It was said to be important that driver training includes a health and safety component (there is currently a draft EU standard which may push this). There is a potential problem with the funding of training and this also needs to be addressed.

2 – Raising the situational awareness of drivers

Improvement to drivers' *situational awareness / risk perception* offers scope for reducing accidents. As in other industries, there is an 'it won't happen to me attitude' especially when the risks are not obvious such as at low levels on a flat bed lorry. There needs to be effort towards raising awareness in this area perhaps as part of training. Also, drivers need to be more aware of when not to do a job due to unacceptable risk. These improvements are likely to require in-house effort on the part of companies.

3 – Improved communications between haulage firm and destination site

Improved *communication* and the passing of the relevant *information / advice* are thought to offer simple but effective means to improve transport safety. The could involve as little as a telephone call or fax between the contractor and site to make sure adequate provisions are in place for delivery. A simple checklist could be used to ensure all the important points are covered. Responsibilities for safety should be clearly defined. In addition, it was felt that more information is needed on the risks associated with non-dedicated operations. Driver feedback needs to be encouraged as part of this process.

4 – Improved design and use of equipment

Several points were made in relation to how either the design or use of *equipment* could help to reduce risk. These included the following:

- Bottom loading for tankers (but, this may not be possible with some products)
- Retro-fitting protection to trailers, scissor lifts etc.
- Vehicle lock-ins at loading bay
- Assessment of suitability of hardware for getting in/out of cabs or on/off trailers
- Training / raised awareness on the correct use of equipment

5 – Improvements in safety culture

Safety culture needs to be encouraged in the industry especially among smaller non-dedicated operators. This should concentrate on the following:

- Incident reporting and feedback
- More long term thinking
- Better clarification of responsibilities
- More ownership of safety at the management level
- Guidance for small operators on the best way to improve safety

It was felt that smaller non-dedicated operators in the industry need to take more account of safety in management practices and in contracting. Currently, many jobs will be verbal orders on trust and elements of planning such as risk assessment will be absent. It was felt that more formal assessment of safety in contracts and in job planning would be of benefit.

In terms of the role of the *Regulator,* the industry would like to see more prescription, good practice guidance and information on risks. The use of the internet and simple pocket cards for drivers were thought to be good ideas.

12. CROSS INDUSTRY ANALYSIS

12.1 INTRODUCTION

One of the main advantages of the current work is that information on the underlying causes of falls from height, as well as associated risk controls, has been gathered across a variety of different industries. This approach has two main benefits. Firstly, it is likely that there are a number of factors common to falls from height irrespective of the industry. Looking at the problem across industry should provide a robust profile of underlying causes and associated risks controls which can be applied to any industry. At the same time, there are likely to be some factors which are more important to some industries compared to others. Identification of these differences should help to pinpoint where an industry specific approach may be required in certain areas. It is therefore appropriate to draw comparisons between how the Influence Network factors were rated and weighted across the workshops.

The ratings which were assigned to the factors often covered a wide range, sometimes from very low to very high. This reflects the fact that in most industries there are examples of good and bad practice. In terms of reducing the risk of falls from height, it is appropriate to look at the ratings at the lower end of the scale to see if there are factors which consistently receive low ratings across several industries or if a factor has been rated poorly in a particular industry. The importance of these factors (the weightings assigned across the workshops) then needs to be examined in order to determine their potential to reduce the risk of falls from height. This approach is taken over the next two sections.

12.2 COMPARISON OF RATINGS

Figure 106 shows the ratings assigned to the *Direct* level factors in each of the workshops.

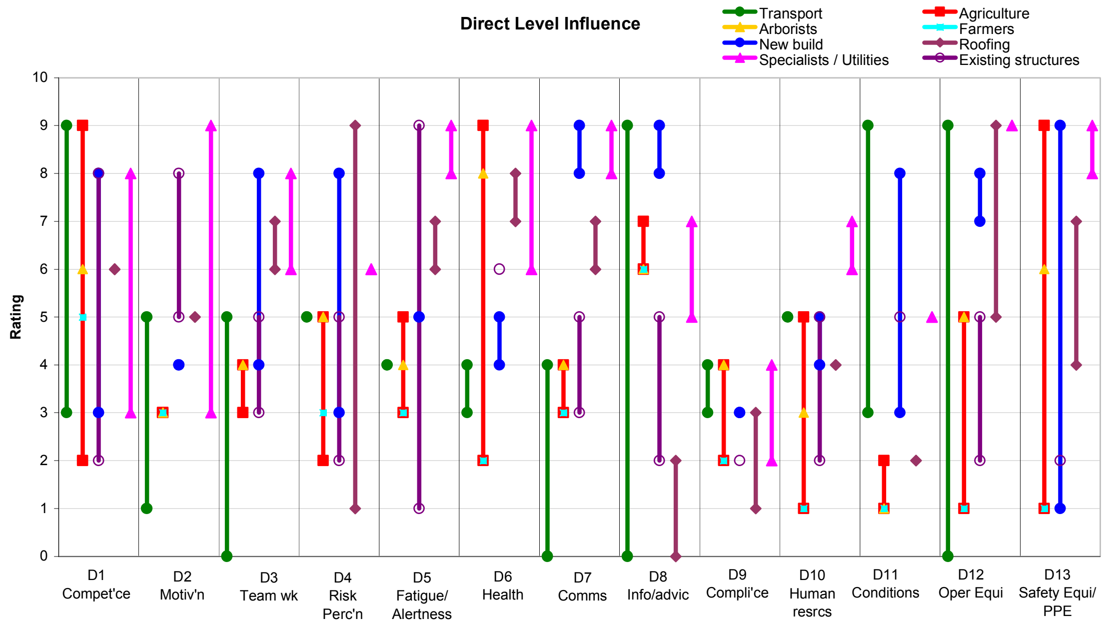

Figure 106 Ratings for Direct level factors across the workshops

It can be seen from Figure 106 that *competence* (D1) received a low rating across several industries with the exceptions being farming and arboriculture (although certain parts of agriculture were rated as low) and roofing. *Competence* was always closely linked with *training* (O2) at the *Organisational* level. The general finding from the workshops was that issues of competence/training are more relevant in some industries compared to others. In construction related industry and utilities there was felt to be a need for a higher level of competence for people working at height. In agriculture and transport this was thought to be less of an issue. It may be difficult to reduce the risk of falls from height through competence/training because it was felt to be difficult to judge whether or not someone is competent for work at height and also that training does not ensure competence without the appropriate experience. The issue is complicated by the fact that even workers considered to be competent are liable to cut corners to get a job done.

Situational awareness / risk perception (D4), tended to receive moderate to low ratings across all industry. Only the better areas of construction, roofing and specialist work were thought to have workers with above average *risk perception* while working at height. Common threads from all workshops included suggestions that people are aware of hazards but underestimate risks, there may be good awareness of risk of high level falls but not low level falls and there are particular risks for younger (limited experience) and older (complacency) workers.

Fatigue/alertness (D5) was not strongly associated with falls from height in any workshops but did receive a particularly low rating at one end of the scale in the existing structures workshop. Issues regarded as pertinent here included workers having long journeys before climbing, maintenance being required at night and teams being away from home without regular sleep patterns.

The ratings of *communications* (D7) and *information / advice* (D8) were significantly lower in the transport workshop compared to the others. This related to the interaction between contractors, drivers and the site in goods delivery which was felt to be often lacking in a way which is detrimental to safety. *Information/advice* (D8) was also thought to be poor in some parts of roofing and existing structures work. This seems to come from the fact some of this work is not viewed as carrying significant risk and so no information is provided.

Of all the *Direct* factors, *compliance* (D9) shows the closest agreement between ratings across the workshops. This factor was consistently rated at the low end of the scale from 1 to 4. The consensus views were that people know that they should comply, but do not, particularly when risk is not appreciated (e.g. at low level), *compliance* is worst when a job is running behind, people only take the precautions that they consider are necessary and workers will continually violate if they 'get away' with it.

Conditions (D11) were generally not regarded as a problem area across the workshops since it was felt that if the weather is too extreme then work at height will not go ahead. The exceptions to this appeared to be in agriculture and roofing when it is considered repairs to roofs may have to be undertaken in bad weather when conditions are a significant risk factor.

The quality of the equipment related factors, *operational equipment* (D12) and *safety equipment/PPE* (D13), generally had a wide range with most industries having areas of excellent practice as well as examples of poor practice. Perhaps one difference of note is that the ratings in new build construction were mostly higher than those in the existing structures workshop. It seems that equipment is generally of a poorer standard in repair/maintenance work. It should be remembered, however, that the main finding from the workshops in relation to equipment was that it is the improper use of equipment which presents the greatest risk of falls as opposed to the quality of the equipment itself.

Figure 107 shows the ratings assigned to the *Organisational* level factors across the workshops. It can be seen that, for *training* (O2), many of the ratings were low to medium, which suggests room for improvement, but, as stated in the discussion on *competence* (D1), training appears to be more relevant in some industries compared to others and ensuring *competence* for work at height through training is problematic.

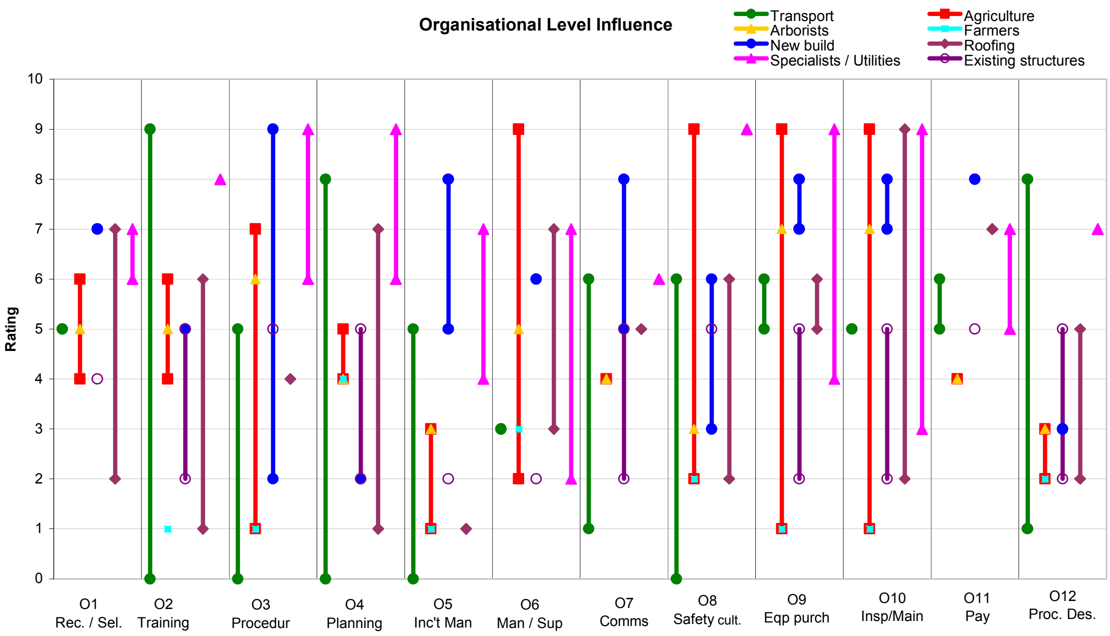

Figure 107 Ratings for Organisational level factors across the workshops

Planning (O4) for work at height, other than in specialist occupations and some parts of roofing, was generally rated across the workshops as an area with considerable room for improvement. A common theme was that basic planning is done, but primarily to get the job done, not to get the job done safely. This is especially true in smaller rather than larger companies. Similarly, *incident management* (O5) and *management / supervision* (O6) were only rated above moderate for the larger construction companies and specialist occupations. As regards *incident management,* the lack of people trained in investigation and transient nature of the workforce in many industries makes feedback difficult. Certain incidents occurring at height are just seen as part of the job and so near misses are thus rarely brought to attention. The focus of *management* time tends to be on time and cost and work at height is often not deemed to be of a high enough risk to warrant the level of *supervision* that is needed. With these points in mind, it is not surprising that *safety culture* (O8) was rated poorly across industry with even the best companies only scoring a rating of around 6.

In terms of *equipment purchasing* (O9) and *inspection and maintenance* (O10), there was a wide range of ratings again indicating examples of best and worst practice in each industry. The ratings for these factors in new build construction were judged to be relatively high but it is likely that these relate to the standard in larger companies. Low ratings were recorded for farming, roofing and repair/maintenance on existing structures on one or both of these factors.

The quality of *equipment purchasing* and *inspection and maintenance* was rated as higher in transport, arboriculture and the better ends of roofing and specialist occupations.

Finally at the *Organisational* level, there was fairly close agreement between the workshops on the rating of *process design* (O12) with almost all the judgements falling between a rating of 2 and 4. It was generally felt that designers do not consider how a structure will be built. Designs tend to be driven by aesthetics rather than safety and CDM was not felt to be working in this respect. There was concern over the number of fragile roofs that exist and many buildings were said to be difficult to maintain due to a lack of consideration at the design stage.

Figure 108 shows the ratings assigned to the *Policy* and *Environmental* factors across the workshops. As with many of the factors at the *Organisational* level, several factors were assigned a wide range of ratings indicating areas of good and bad practice within different industries. *Contracting strategy* was generally regarded as an area where much improvement could be made. The ratings are split in ranges from poor to very good in most industries, which reflects comments that where clients build safety into contracts this is done well but often there may be no mention of safety or no formal contracts.

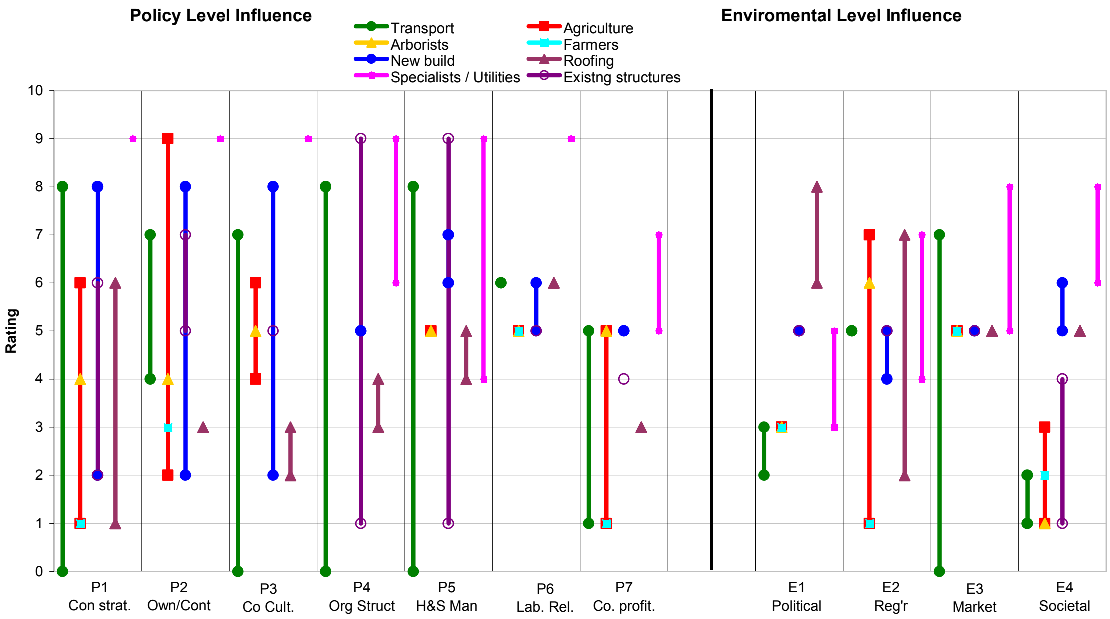

Figure 108 Ratings for Policy and Environmental factors across the workshops

As with contracting strategy, *company culture* (P3) was flagged as offering the potential for improvement in most industries. The ratings tend to be around the mid point suggesting that although some efforts are being made there is still more that could be done. Common points included the need to filter culture down from the top of a company to front line workers and to make clear safety responsibilities. Although a lot depends on senior management 'buy in' it was also clear that front line managers have a pivotal role to play. *Health and safety management* (P5) was rated similarly to *company culture* (P3) with several ratings falling around moderate suggesting efforts in some areas but improvements required in others.

Generally it was felt that too many organisations only do the bare minimum to comply with the law although the standard is better in larger companies. Generic method statements and procedures are often inadequate and the overall SMS tends to lack cohesion. The monitoring component of a SMS is typically missing.

At the *Environmental* level, there was agreement across the workshops that *political* (E1) influence rates low to moderate, *societal* (E4) influence is low and *market* (E3) influence is generally neutral, with the latter almost exclusively given a rating of 5. Most variation at the *Environmental* level was observed in the ratings given to the *regulator* (E2), from poor to good. A rating range within an industry was attributed to regional variations within HSE. Between industry variations are thought to reflect different industry perceptions of the effectiveness of the *regulator*. Irrespective of ratings, common wishes from industry were more follow-ups to HSE visits, dissemination of information through trade associations, examples of good practice, tougher enforcement, more prescription in some cases, more involvement with design teams and more advice on how to deal with problems.

The assigned ratings have been banded, and are presented in tabular format to complement Figure 106 to Figure 108. The notation for Table 37 to Table 40 is given in Table 36. The notations relate to the factor definitions contained in the briefing notes for each workshop, and represent the numerical rating values shown in. Table 36

Table 36 Rating notations for Table 37 to Table 40

Notation	*Ratings*	*Definition*
P	0 – 2	Poor
PM	2 – 4	Poor-Moderate
M	4 – 6	Moderate
ME	6 – 8	Moderate-Excellent
E	8 - 10	Excellent
	-	Not specifically distinguished

Table 37 Direct level factor ratings

Sector		*Direct level influences*												
		D1 *Individual Competence*	***D2*** *Motivation / Morale*	***D3*** *Team working*	***D4*** *Situational Awareness / Risk Perception*	***D5*** *Fatigue / Alertness*	***D6*** *Health*	***D7*** *Communication*	***D8*** *Information / Advice*	***D9*** *Compliance*	***D10*** *Suitable Resources*	***D11*** *Conditions*	***D12*** *Operational Equipment*	***D13*** *Safety Equipment / PPE*
Arboriculture		M	PM	PM	M	M	E	M	ME	M	PM	P	-	ME
Farmers		P to E	PM	-	PM	PM	P	PM	ME	P	P	P	P	P
Agricultural contractors		P to E	PM	PM	M	M	E	M	ME	M	M	P	PM	M to E
New build Construction	Small	PM	M	M	PM		M			PM		PM	P	P
	Large	E	M	ME	E	M	M	E	E	PM	M	ME	ME	E
Existing structures	Small	P	M	PM	P	P to E	M		P	P	PM	M	P	P
	Large		ME	M	M	P to E	M	M	M	P	PM	M	M	P
Roofing		M	M	ME	P to E	ME	ME	ME	P	P	M	P	M to E	M
Rope access		E	E	ME	M	E	E	E	M	E		M	E	E
Utilities		ME	ME	M	M	E	M	E	M	PM	ME	M	E	E
Transport	General	PM	PM	P	M	PM	PM	PM	P	PM	M	PM	P	
	Dedicated	E	PM	M	M	M	PM		E	PM	M	E	E	

Table 38 Organisational level factor ratings

		Active organisational level influences											
		O1 Recruitment & Selection	***O2 Training***	***O3 Procedures***	***O4 Planning***	***O5 Incident Management & Feedback***	***O6 Management / Supervision***	***O7 Communications***	***O8 Safety Culture***	***O9 Equipment Purchasing***	***O10 Inspection & Maintenance***	***O11 Pay & Conditions***	***O12 Design for Safe Construction***
Arboriculture		M	M	ME	M	PM	M		PM	ME		-	M
Farmers			P	P	M	P	PM		PM	P		PM	-
Agricultural contractors		M	M	M		P	P to E		P to E	P to E		PM	PM
New build Construction	Small	P	M	P	P	M		M	PM	P	P	E	PM
	Large	ME	M	E	E	E	M	E	M	ME	ME	E	PM
Existing structures	Small	M	P	M	PM	P	P	P	P	P	P	M	PM
	Large	M	M	M	PM	P	P	M	M	E	M	M	PM
Roofing		P to M	P to M	M	P to M	P	PM	M	PM	PM	P to E	ME	PM
Rope access		ME	E	E	E	M	ME	ME	E	E	E	M	ME
Utilities		ME	E	ME	M	M	M	ME	E	E	E	M	ME
Transport	General	M	P	P	P	P	PM	P	P	M	M	M	P to E
	Dedicated	M	E	M	ME	M	PM	M	M	M	M	M	E

Table 39 Policy level factor ratings

Sector		*Active policy level influences*						
		P1 Contracting Strategy	***P2 Ownership + Control***	***P3 Company Culture***	***P4 Organisational Structure***	***P5 Health + Safety Management***	***P6 Labour Relations***	***P7 Company Profitability***
Arboriculture		PM	M	M		P to E	M	M
Farmers		P	PM	-		-	M	P
Agricultural contractors		P	P to E	M		P to E	M	P
New build Construction	Small	P		P		P		P
	Large	E	E	E	M	ME	M	M
Existing structures	Small	P		M	P	P	M	M
	Large	ME	M	M	E	E	M	M
Roofing		P to M	PM	P	PM	M	M	PM
Rope access		E	E	E	E	E	E	ME
Utilities		E	E	E	E	E	E	ME
Transport	General	P	M	P to ME	P to E	P	M	PM
	Dedicated	E	M	ME	E	E	M	PM

Table 40 Environmental level factor ratings

Sector		E1 Political	E2 Regulatory	E3 Market	E4 Societal
Arboriculture		PM	ME	M	P
Farmers		PM	P	M	PM
Agricultural contractors		PM	M	M	PM
New build Construction	Small	M	M	P	M
	Large	M	M	M	M
Existing structures	Small	M	M	M	PM
	Large	M	M	M	PM
Roofing		ME	P to ME	M	M
Rope access		M	M	E	E
Utilities		PM	M	M	E
Transport	General	PM	M	P to ME	P
	Dedicated	PM	M	P to ME	P

12.3 COMPARISON OF WEIGHTINGS

The weightings of the *Direct* level factors on falls from height are shown in Figure 109 for all workshops. It can be seen that *competence* (D1) and *situational awareness / risk perception* (D4) were given a high weighting in all workshops and *operational equipment* (D12) was weighted as having a high influence in all but the roofing workshop where it was weighted high medium. *Compliance* (D9) was another factor with strong agreement with a high medium weighting in all workshops except for roofing where it was weighted high. With reference to the previous section, it can be observed that where the workshop participants agreed on the factors with the strongest weightings there is also similarity in how these factors were rated, with low to medium ratings for these factors in many sections of industry. Taken together, the results suggest these factors are highly significant in terms of the risk of falls from height across industry.

The weightings of influence from the *Organisational* level to each *Direct* factor are shown in Figure 110. Of particular note are the organisational weightings on the factors identified as most important at the *Direct* level i.e. *competence* (D1), *situational awareness / risk perception* (D4), *compliance* (D9) and *operational equipment* (D12) (shown in rows 1, 4, 9 and 12).

The closest agreement between the workshops regarding the strongest organisational influences on *competence* (D1) can be pinpointed to *training* (O2), *management and supervision* (O6) and *safety culture* (O8) with training emerging as the strongest. For *situational awareness / risk perception* (D4) there were a number of common underlying organisational factors identified across the workshops which were *training* (O2), *planning* (O4), *incident management/feedback* (O5), *management and supervision* (O6), *communications* (O7) and *safety culture* (O8) with *training* and *safety culture* judged to have most influence. Several of these factors were also identified as strong influences on *compliance* (D9) including *training* (O2)*, management and supervision* (O6) and *safety culture* (O8) as well as *procedures* (O3). In this case, *management and supervision* (O6) was unanimously weighted as having a high influence. Finally, there was agreement across the workshops that *equipment purchasing* (O9) and *inspection and maintenance* (O10) are the most important organisational factors in terms of *operational equipment* (D12) with *process design* (O12) also appearing significant. *Training* (O2), *planning* (O4), and *management* (O6) also have a significant influence which relates to the use of equipment as opposed to its quality. Overall, *equipment purchasing* (O9) appears to have most influence.

From analysis of the *Organisational* influences, it is possible to see that there was agreement across the workshops that *training* (O2), *management and supervision* (O6) and *safety culture* (O8) underpin these *Direct* level factors which have the strongest influence on falls from height. Figure 111 allows analysis of which *Policy* level factors were most often judged to underpin these *Organisational* factors (rows 2, 6 and 8). It is very clear that *company culture* (P3) and *safety management* (P5) were judged to have the strongest influence on *training* (O2), *management and supervision* (O6) and *safety culture* (O8) since they were given a high weighting on all these factors in every workshop.

Figure 112 shows the cross industry weightings from the *Environmental* level to the *Policy* factors. Of particular interest are the *Environmental* influences on the factors identified as most significant at the *Policy* level i.e. *company culture* (P3) and *safety management* (P5) (shown in rows 3 and 5). Across the workshops, *market influence* (E3) was judged to have the strongest influence on *company culture* (P3). This is supported by the repeated finding from the workshops that larger, more profitable companies tend to address safety more in how they run their business compared to smaller less profitable outfits. *Societal influence* (E4) has relatively high weightings on company culture probably because of how the public perceptions of brand names can affect profitability. The weightings also suggest that the *regulator* (E2) also has a role to play in shaping *company culture* (P3). In terms of *safety management* (P5), there was clear agreement between the workshops that the *regulator* (E2) has the strongest potential influence.

As discussed in Section 7, the standard structure of the Influence Network does not provide an accurate model for farming. The main difficulty stems from the usual distinction between the *Policy* and *Organisational* levels on the network. This is not appropriate for farming since many farmers are self-employed owners and, as such, there is no separate *Policy* level above them. Instead, there is effectively only one layer of organisation / management / culture in farming which may encompass factors normally found at the *Policy* level such as *safety management*, *company culture*, *contracting* and *labour relations*. The network was, therefore, further customised after the workshop to better represent the structure of farming. Some of the *Policy* level factors were moved to the *Organisational* level and some factors were removed where they were deemed irrelevant in the workshop. The factors which have been taken out are:

- *Teamwork* – It was decided that farmers do not work in teams as defined by this factor.
- *Recruitment and selection* – As stated, many farmers are self employed and recruitment and/or criteria are not on their agenda.
- *Organisational communications* – Farmers seldom have communications at this level.
- *Pay and conditions* – This was thought to be better covered by *profitability* in farming.
- *Company culture* – Covered by *safety culture.*
- *Organisational structure* – As defined, this factor does not exist in farming.
- *Safety management* – Covered by *management / supervision.*

The result of these modifications is that where factors have been combined or not considered relevant for agriculture these factors will be seen to have zero weighting in the following figures.

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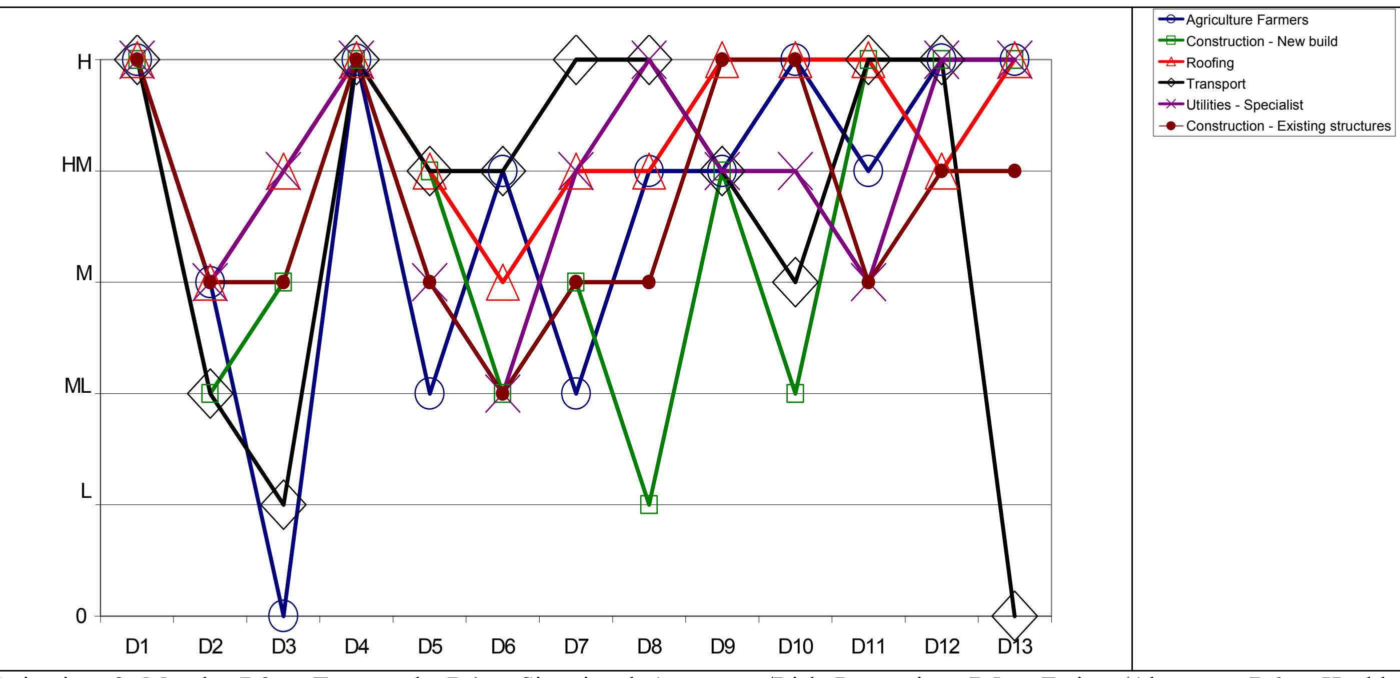
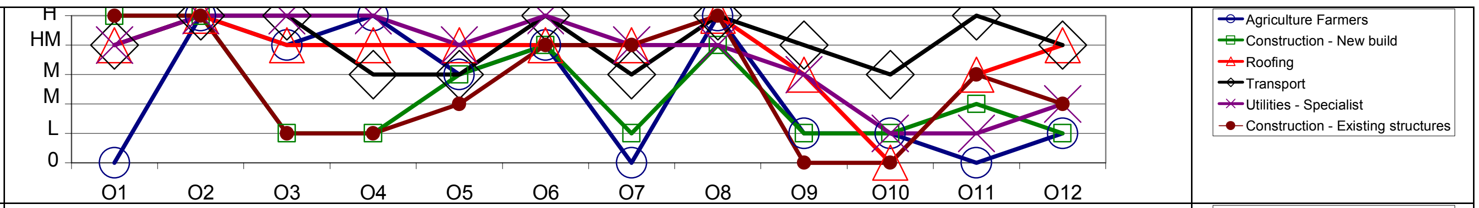
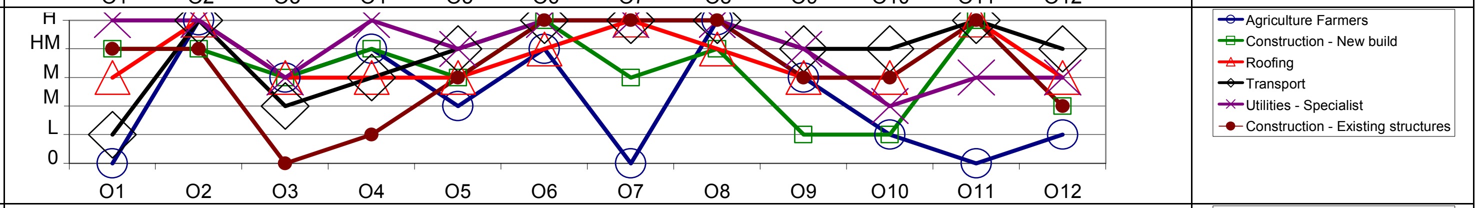
<tr><td>Direct Influences on Falls from Height</td><td colspan="2">
</td></tr>
<tr><td colspan="3">D1 – Competence, D2 – Motivation & Morale, D3 – Teamwork, D4 – Situational Awareness/Risk Perception, D5 – Fatigue/Alertness, D6 – Health, D7 – Communications, D8 – Information / advice, D9 – Compliance, D10 – Suitable Human Resources, D11 – Conditions, D12 – Operational Equipment, D13 – Safety Equipment/PPE</td></tr>
</table>

Figure 109 Cross industry weightings from the Direct level on falls from height

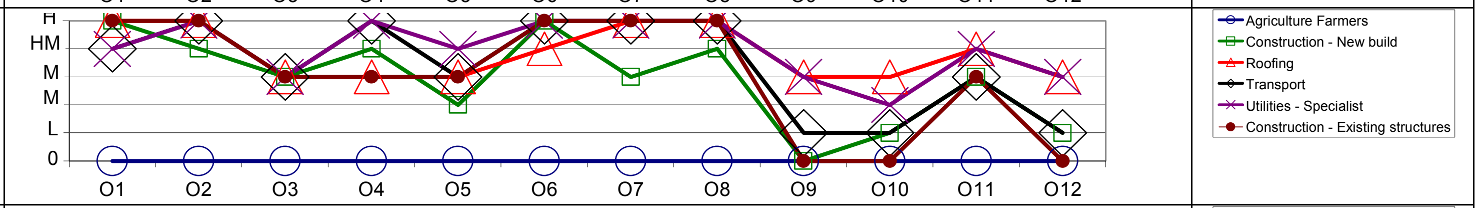
Organisational Influence on D1 (Individual Competence)



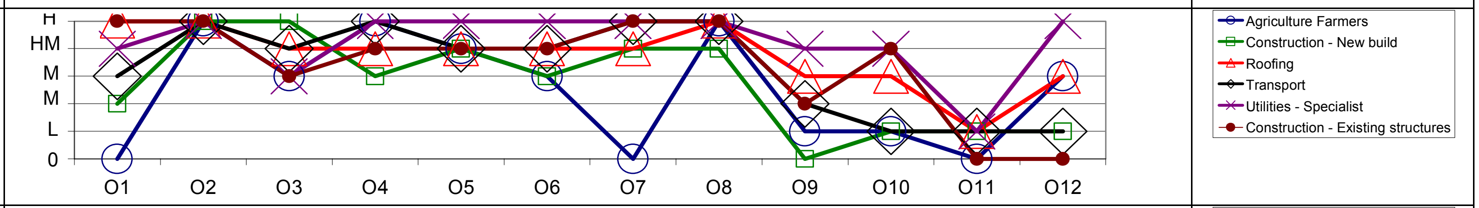
Organisational Influence on D2 (Motivation)



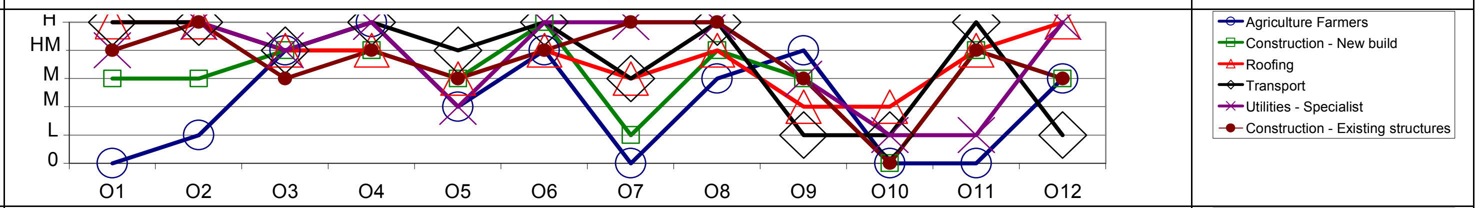
Organisational Influence on D3 (Teamworking)



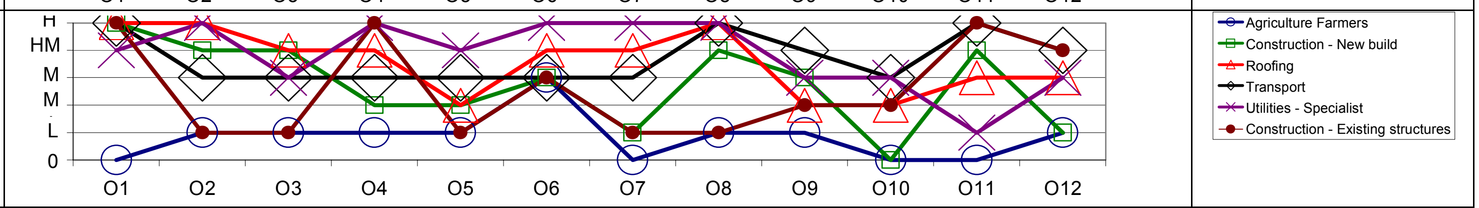
Organisational Influence on D4 (Situational Awareness / Risk Perception)



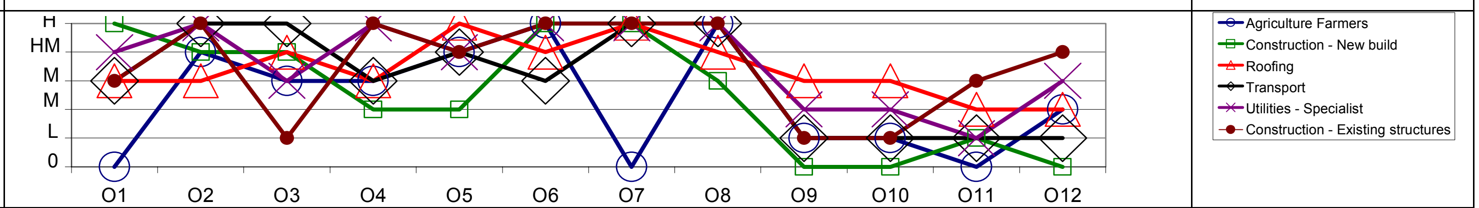
Organisational Influence on D5 (Fatigue / Alertness)



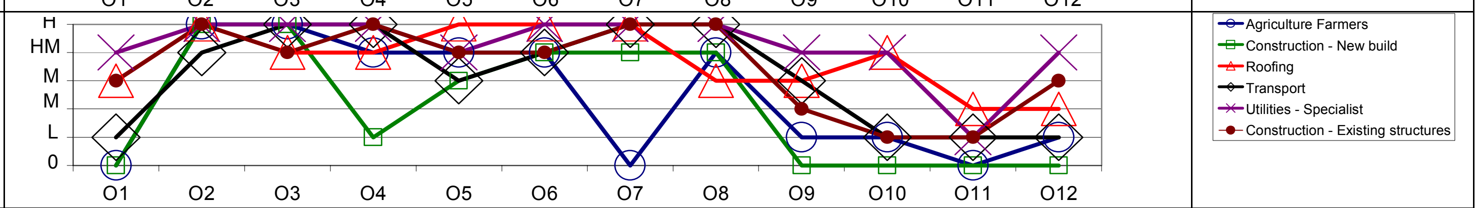
Organisational Influence on D6 (Health)



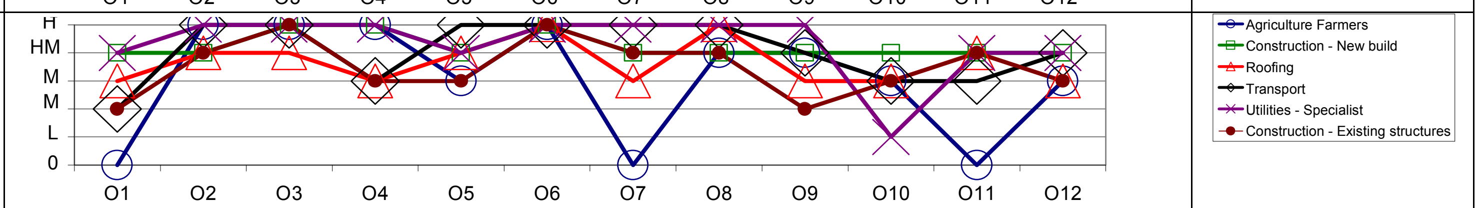
Organisational Influence on D7 (Communications)



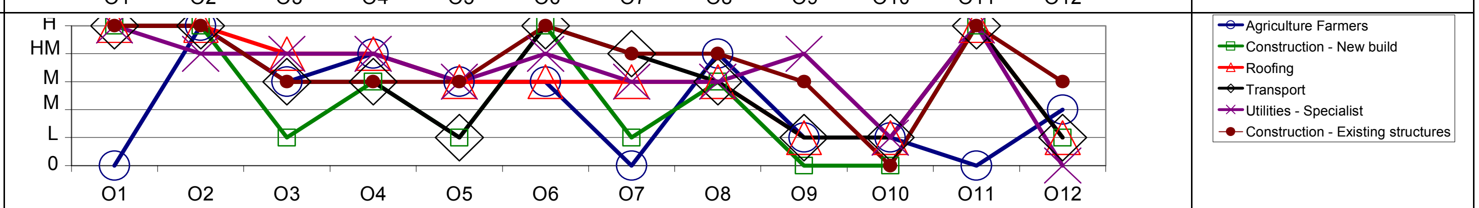
Organisational Influence on D8 (Information / Advice)



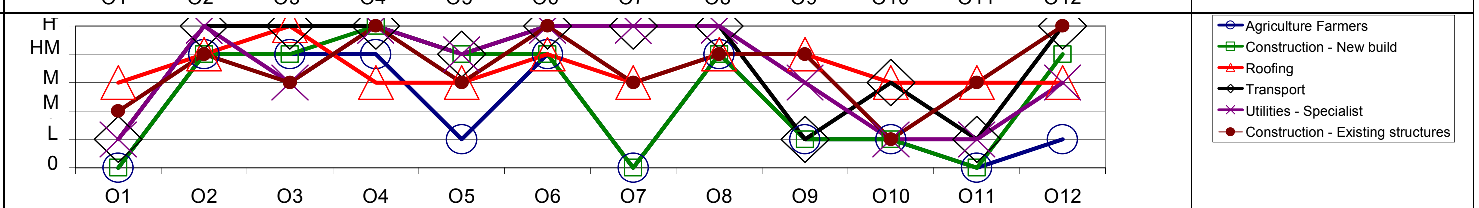
Organisational Influence on D9 (Compliance)



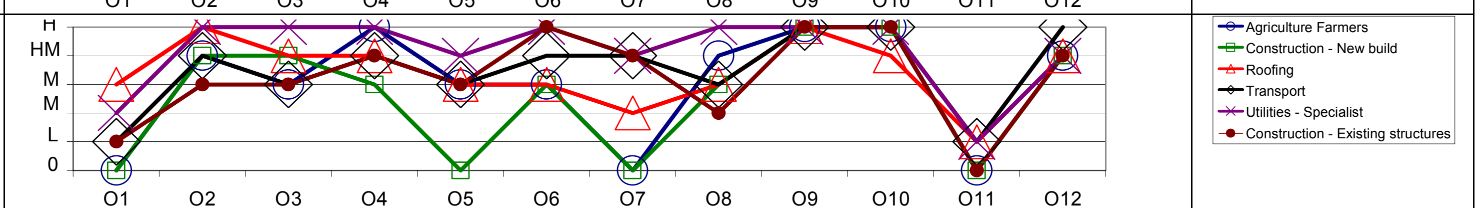
Organisational Influence on D10 (Suitable Human Resources)



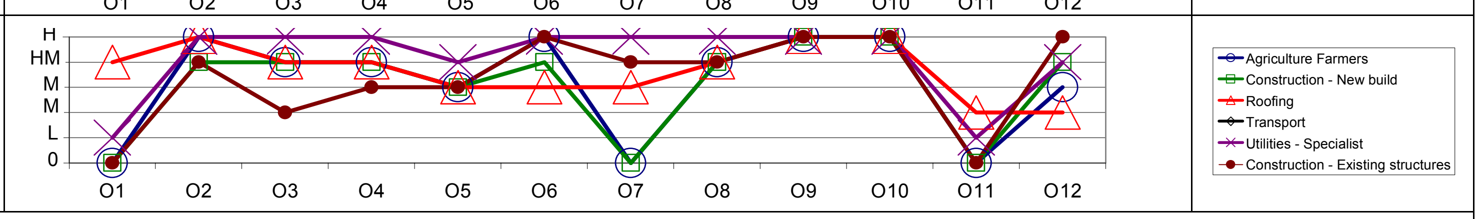
Organisational Influence on D11 (Conditions)



Organisational Influence on D12 (Operational Equipment)



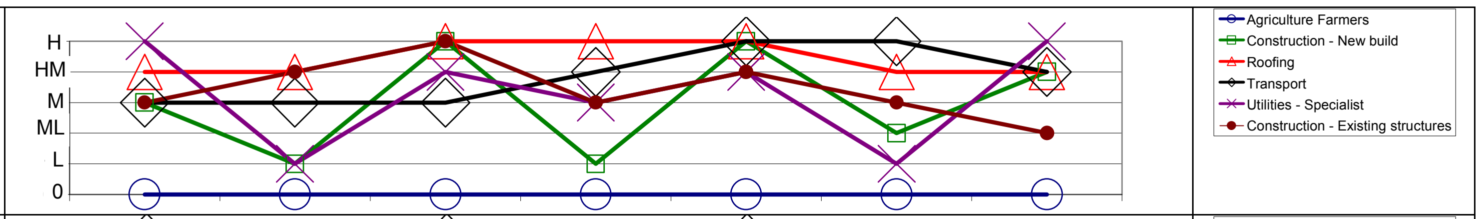
Organisational Influence on D13 (Safety Equipment / PPE)



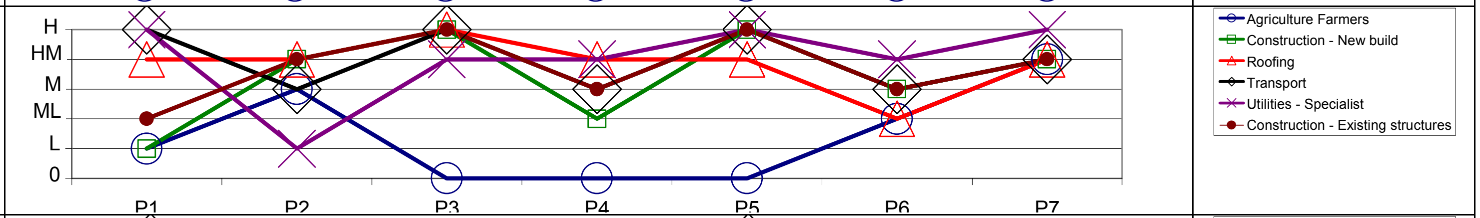
O1 – Recruitment & Selection, O2 – Training, O3 – Procedures, O4 – Planning, O5 – Incident Management & Feedback, O6 – Management / Supervision, O7 – Communications, O8 – Safety Culture, O9 – Equipment Purchasing, O10 – Inspection & Maintenance, O11 – Pay and Conditions, O12 – Process Design

Figure 110 Cross industry weightings from the Organisational level to Direct factors

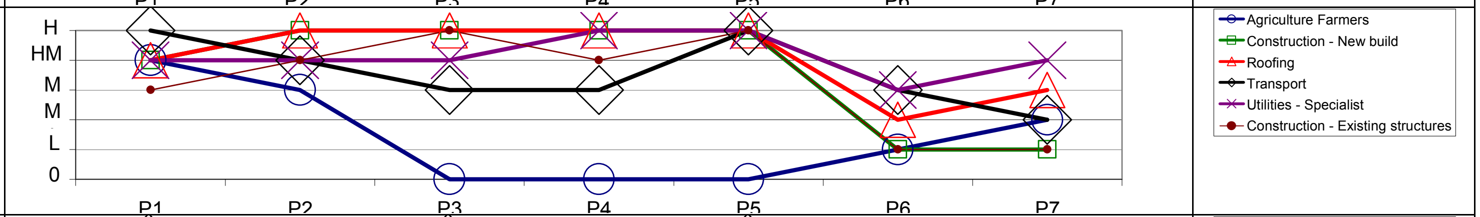
Policy Influence on O1 (Recruitment & Selection)



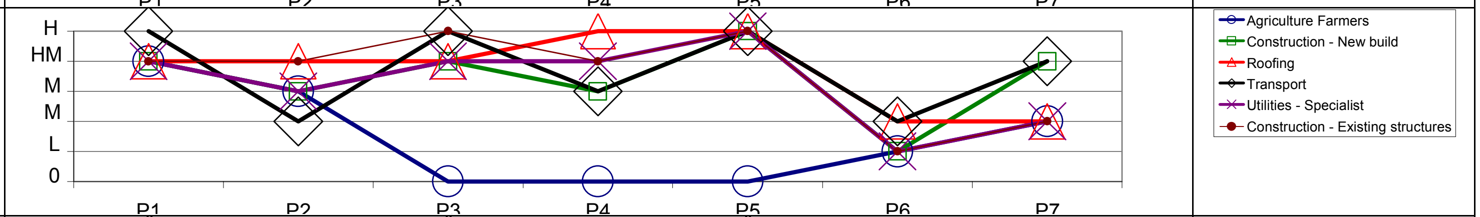
Policy Influence on O2 (Training)



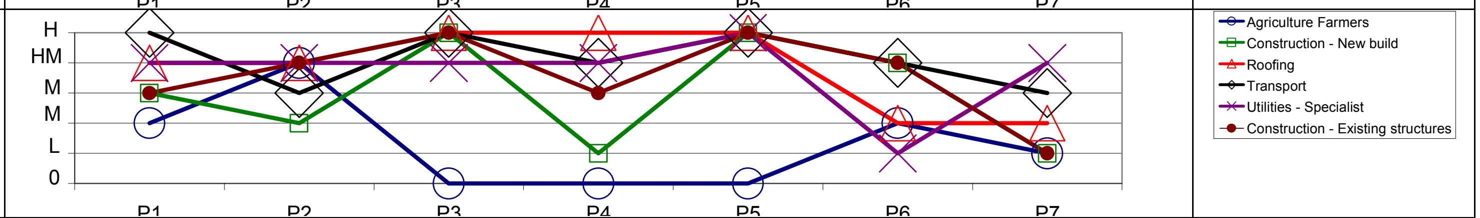
Policy Influence on O3 (Procedures)



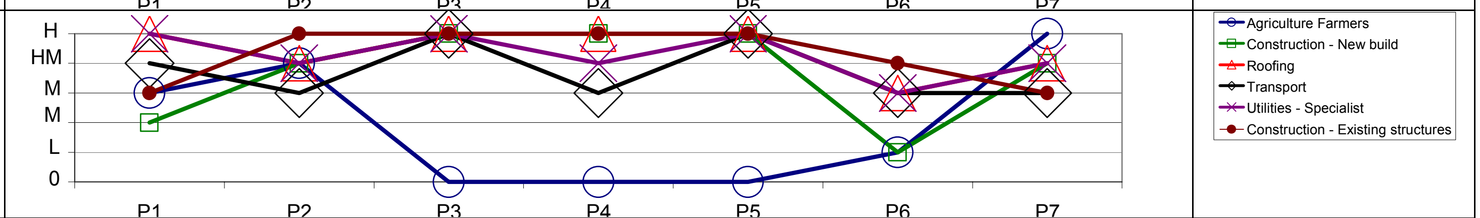
Policy Influence on O4 (Planning)



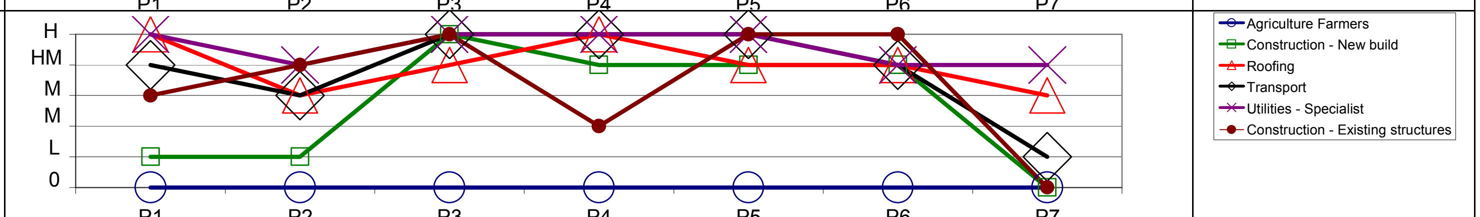
Policy Influence on O5 (Incident Management & Feedback)



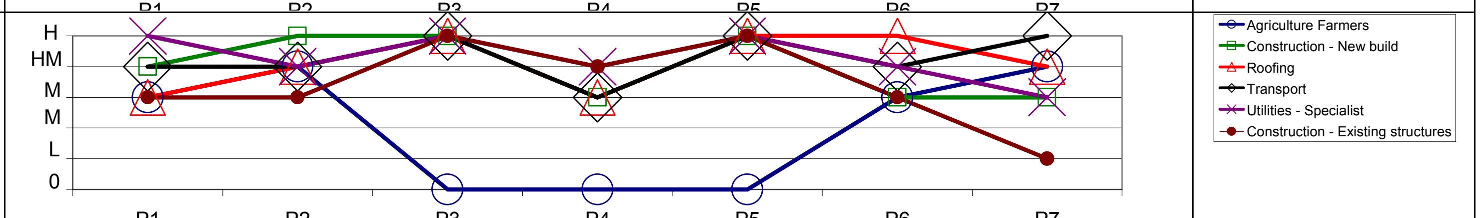
Policy Influence on O6 (Management / Supervision)



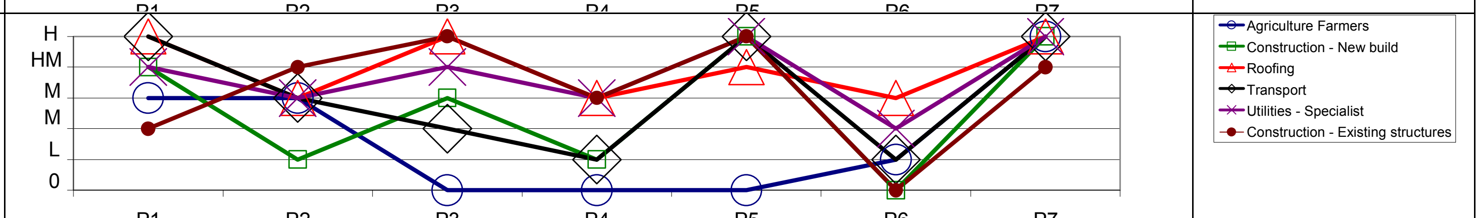
Policy Influence on O7 (Communications)



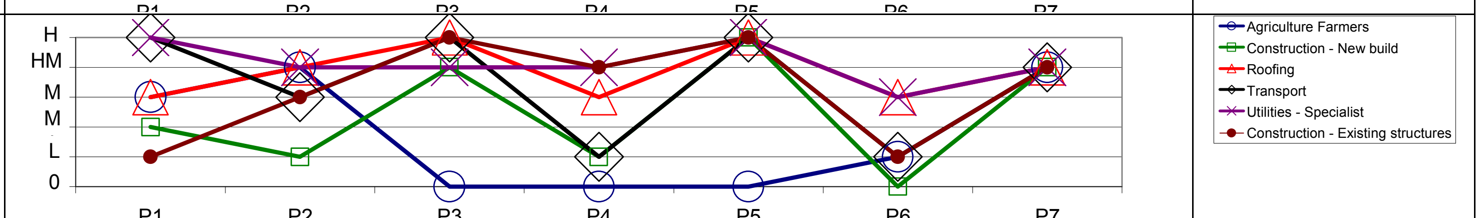
Policy Influence on O8 (Safety Culture)



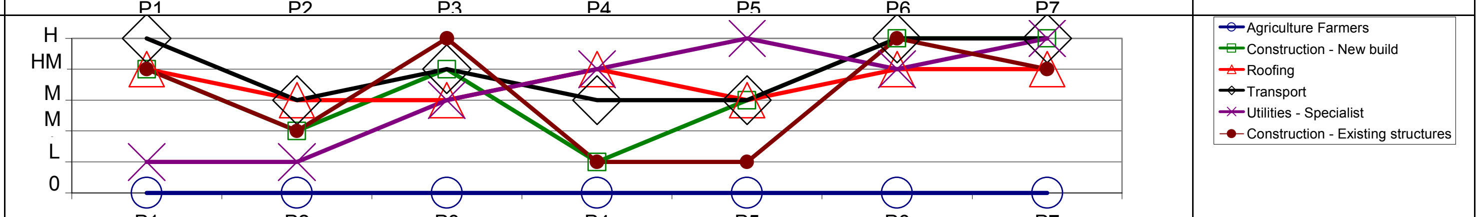
Policy Influence on O9 (Equipment Purchasing)



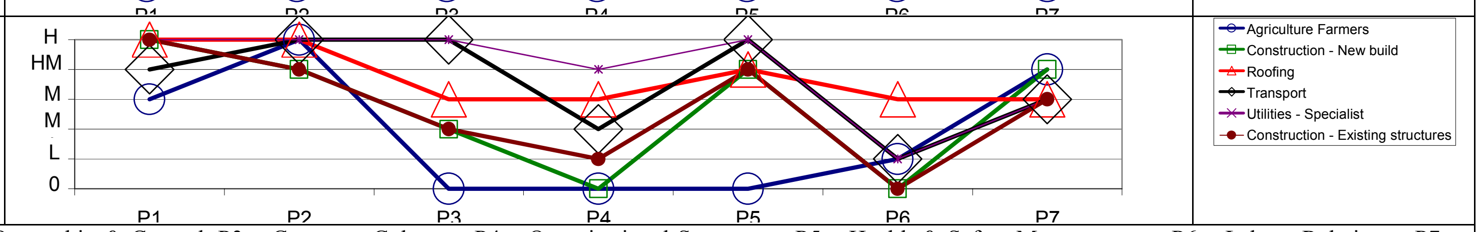
Policy Influence on O10 (Inspection & Maintenance)



Policy Influence on O11 (Pay and Conditions)



Policy Influence on O12 (Process Design)



P1 – Contracting Strategy, P2 – Ownership & Control, P3 – Company Culture, P4 – Organisational Structure, P5 – Health & Safety Management, P6 – Labour Relations, P7 – Company Profitability

Figure 111 Cross industry weightings from the Policy level to Organisational factors

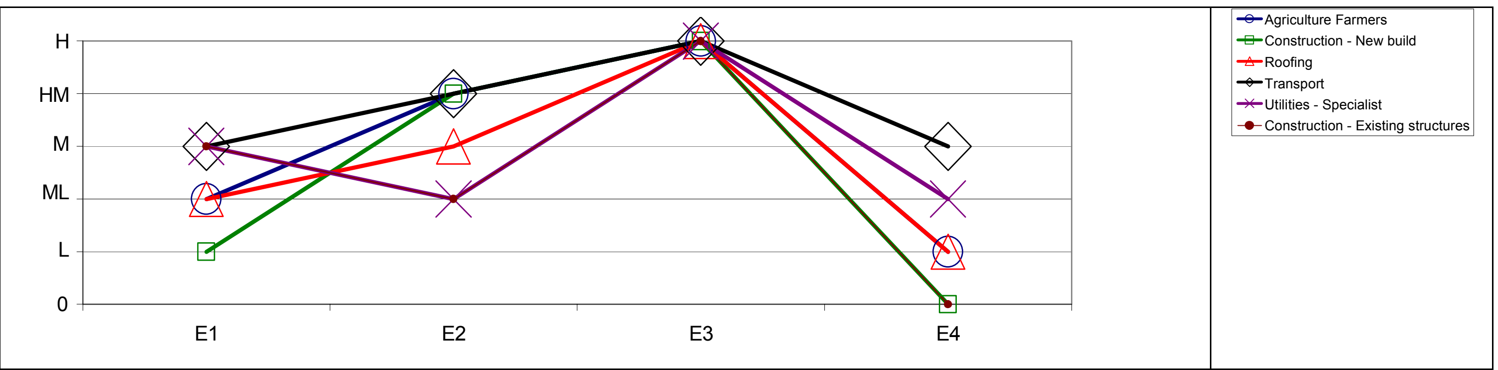
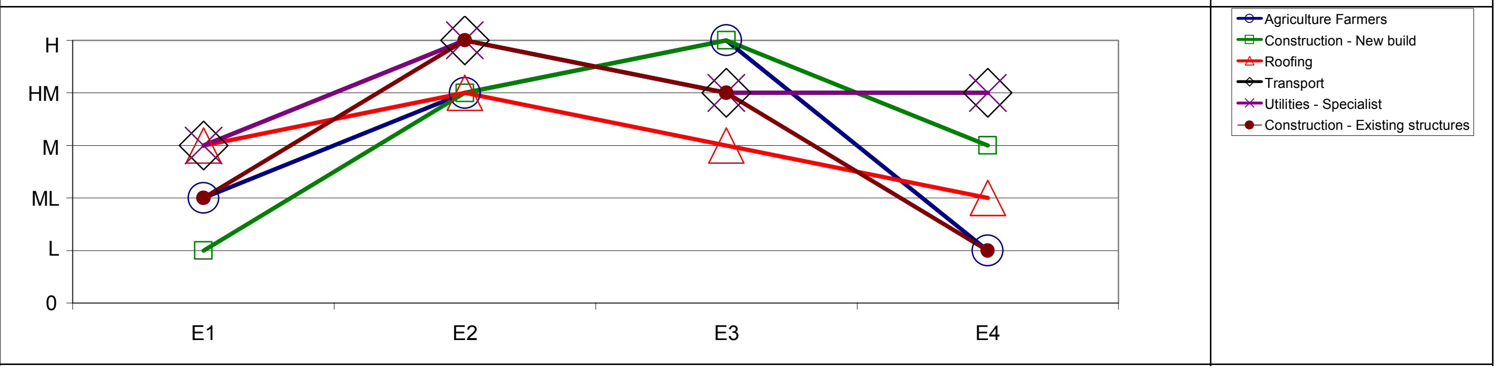
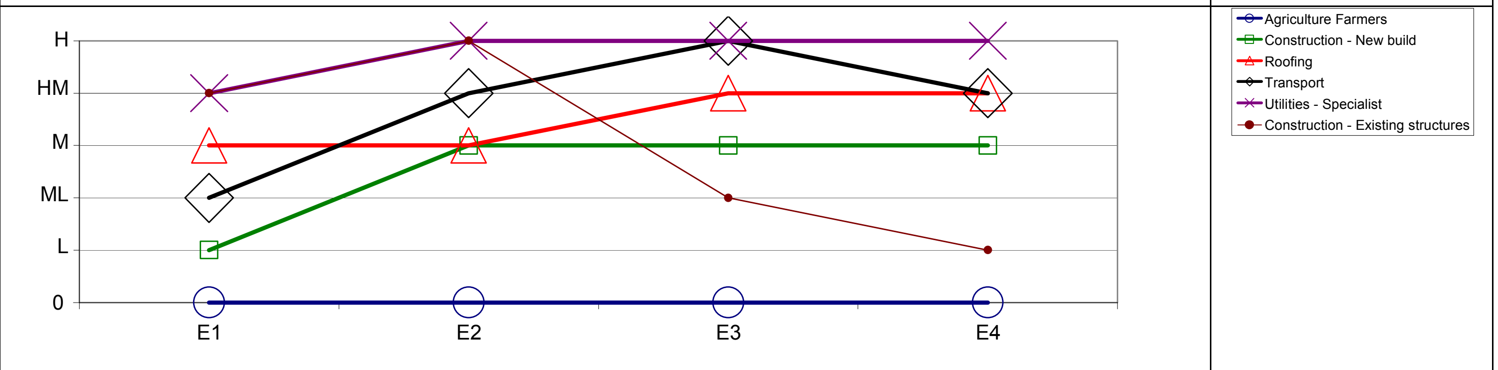
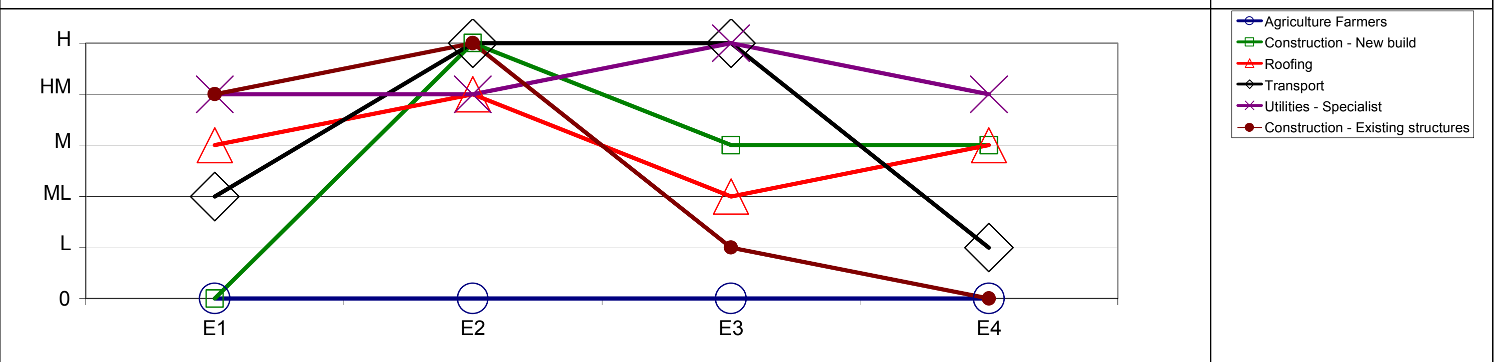
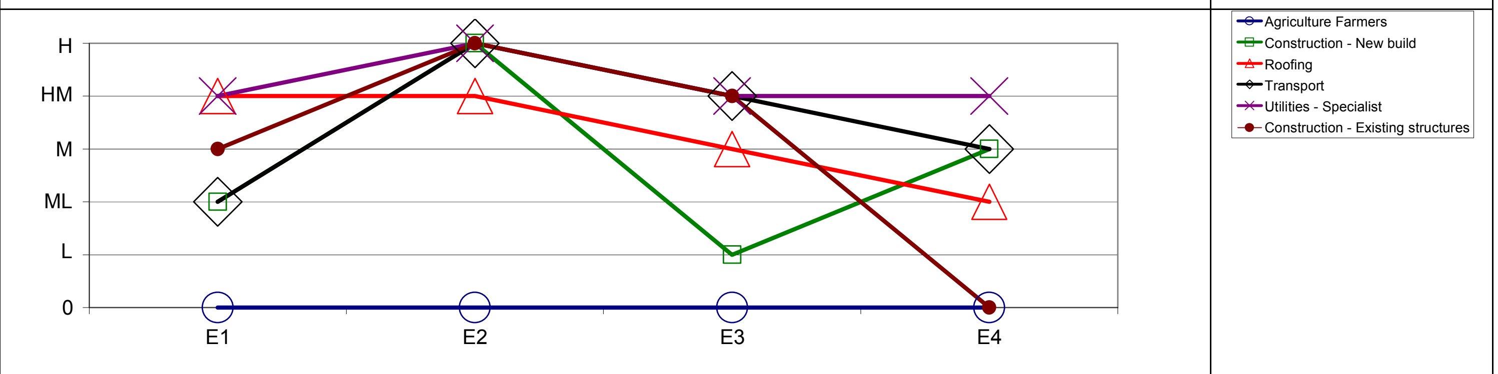
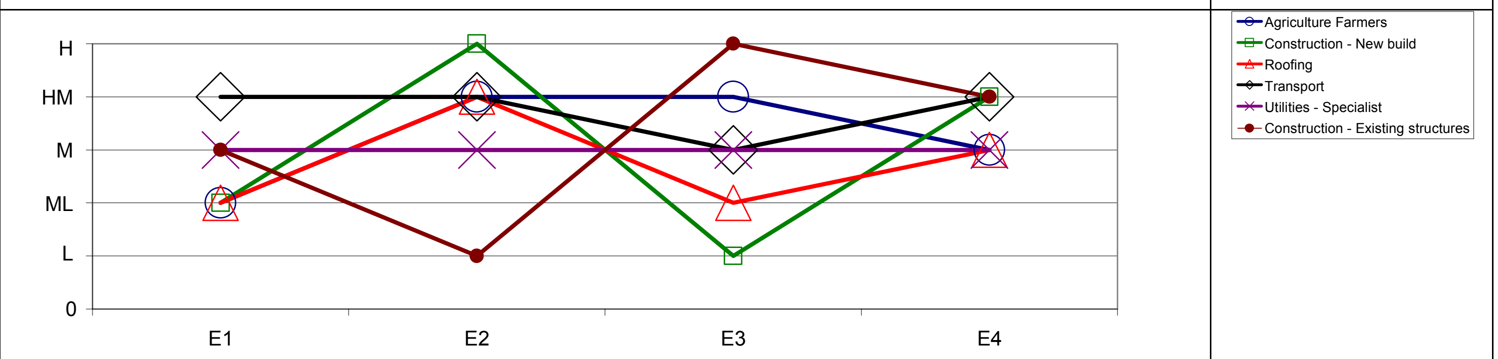
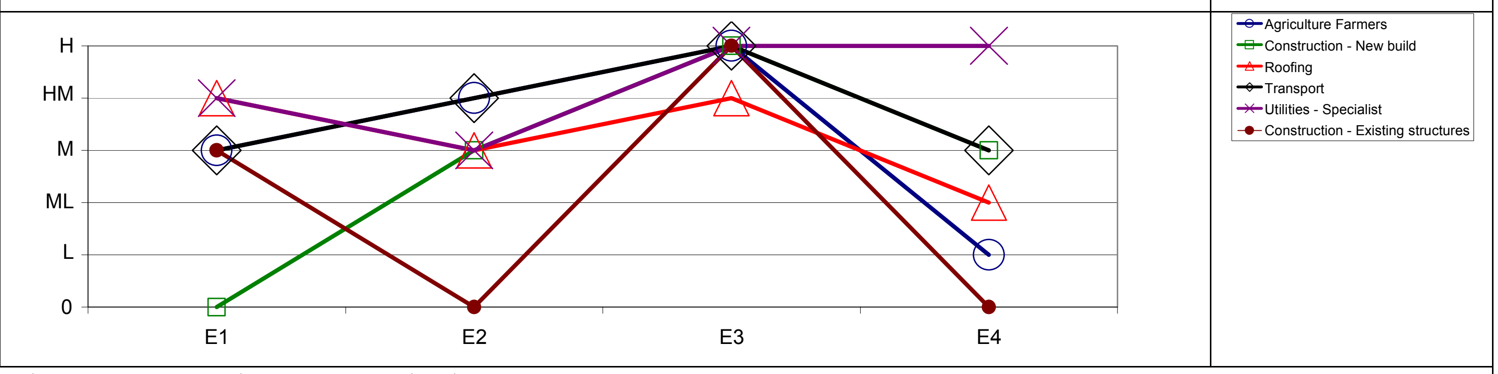
Environmental Influence on P1 (Contracting Strategy)		
Environmental Influence on P2 (Ownership & Control)		
Environmental Influence on P3 (Company Culture)		
Environmental Influence on P4 (Organisational Structure)		
Environmental Influence on P5 (Health & Safety Management)		
Environmental Influence on P6 (Labour Relations)		
Environmental Influence on P7 (Company Profitability)		
E1 – Political, E2 – Regulatory, E3 – Market, E4 – Societal		

Figure 112 Cross industry weightings from the Environmental level to Policy factors

12.4 CROSS-SECTOR CONCLUSIONS

From analysis of the cross workshop ratings and weightings it has been possible to identify the factors contributing most to the incidence of falls from height across industry. These are factors which were consistently weighted highly (indicating strong potential influence) and rated low to medium (indicating room for improvement). Improvements to these factors can be considered as having the greatest potential to reduce the risk of falls from height across industry (see Figure 113).

It should be remembered that the lower level factors in Figure 113 represent the strongest underlying influences on the factors above. As such, paths of influence can be traced through the network. For example, the most effective way to improve *compliance* at the *Direct* level is likely to be through *training, management/supervision* and *safety culture.* Change in these *Organisational* factors needs to be underpinned by a positive *company culture* and good *safety management.* The *regulator* has a strong potential impact on *safety management* and *company culture.*

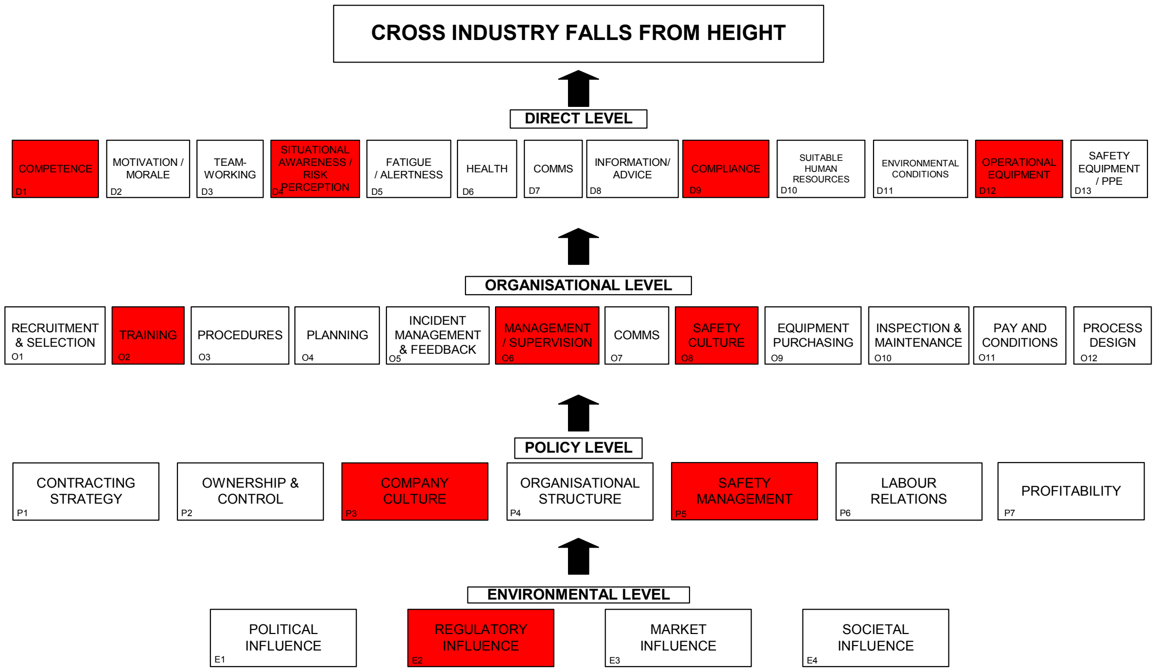


Figure 113 Critical factors in falls from height across industry

Although the factors in Figure 113 can be considered as common contributors to falls from height across industry, it is still the case that some factors are more applicable than others. The critical cross industry factors are shown in Table 41 against the specific industry in which they have been identified as important. This helps to show the areas of industry where each critical factor is most significant. It can be seen that *situational awareness/risk perception, management/supervision, safety management* and the *Regulator* are the critical factors which apply to all the industries. It should also be remembered that other factors have emerged as important in particular industries. Reference should be made to Sections 7 to 11 for the industry specific critical factors.

Table 41 Cross industry factors in falls from height applied to specific industry

Cross Industry Critical Factors	***Critical Factors from Workshops***				
	Agriculture	***Construction***	***Specialist***	***Roofing***	***Transport***
Competence			•		•
Risk perception	•	•	•	•	•
Compliance		•		•	
Equipment operability	•	•			•
Training		•		•	•
Management/supervision	•	•	•	•	•
Safety culture	•	•		•	•
Company culture	•	•			•
Safety management	•	•	•	•	•
Regulator	•	•	•	•	•

13. RISK CONTROL AND PREVENTION MEASURES WORKSHOP

13.1 INTRODUCTION

Workshops to identify risk controls are an important part of the Influence Network process in order to address the critical factors and paths that emerge from causation workshops. Causation workshops inevitably touch on risk controls but the main focus is to establish which are the most influential factors in terms of the top event. It is then important to focus on these factors in a risk control workshop to identify how improvements can be brought about.

The causation workshops on falls from height suggested some measures which were specific to the particular industries under discussion. These workshops also put forward a number of underlying causes in falls from height which appeared to be common across industry. It follows that if these underlying causes could be matched with risk control measures then reductions in the risk of falls from height could be made across industry. This, therefore, was the focus of the risk control workshop. The main objectives of the workshop were as follows:

- To provide validation of the risk control options already extracted from the causation workshops.
- To generate further discussion on which factors have the greatest potential for reducing the risk of falls from height.
- To identify new risk control measures in relation to the factors identified as having most influence across the previous workshops.
- To trace paths of influence through the network where improvements could be made.

13.2 ATTENDEES

The risk control influence network workshop was held on 3 October 2002 at the HSE offices in Bootle, Merseyside. The attendees are shown in Table 42.

Table 42 Participants in risk control workshop

Name	*Company/organisation*	*Comments*
Vince Butler	Scottish Southern Energy	Works on contracting side with 3000 electricians working on towers, overhead lines and building work, new and existing
Sandy Edwards	A & M Inspection and Testing	Inspection and testing on and offshore. Regular work at height on new and existing structures. Fall restraint rather than arrest. Sometimes involved with design side.
Alan Gonczar	Custom	Experience of short-term jobs at height such as for maintenance. Concerned with access systems and fall restraint rather than arrest. Research and testing of equipment.
Hash Maitra	HSE	Head of HSE section dealing with technical issues in relation to falls from height and CDM
Robert Riley	Scottish Power	Works in section of company dealing with wires and cables, overhead lines etc., and building work. Chair of company group for work at height and involved with industry wide committees looking at the issues.
Helen Bolt	BOMEL	Director. Chartered civil engineer leading BOMEL's R&D and H&S studies Group.
David Jamieson	BOMEL	Psychologist with specific experience in ergonomics and human and organisational factors.
Mike Webster	BOMEL	Chartered civil and structural engineer with experience in building, industrial, bridge and offshore structures.

13.3 APPROACH

The cross industry critical factors in falls from height were taken as the basis for the risk control workshop (Section 12.4). When the individual workshop findings were also considered, it was decided to focus on the following areas in the workshop:

- Competence and Training
- Risk Perception
- Compliance
- Management and Supervision
- Process Design
- Safety Culture

It will have been noted that the areas chosen to be the focus of the risk control workshop do not match exactly with the cross industry critical factors in Section 12.4. *Equipment* issues were not addressed as discrete topics because it had been identified in the workshops that the misuse of equipment was more of an issue than its quality. It was expected that such issues would be picked up by the discussion of other factors such as *training* and *compliance*. *Process design* was discussed due to the fact that in all the workshops it was acknowledged to be one of the most effective potential levers for reducing the risk of falls from height. None of the *Policy* or *Environmental* factors were topics for the workshop because it was felt that it would be easier to address them during the discussion of higher-level factors.

The cross-industry factors chosen for discussion were presented to the participants of the risk control workshop along with the previous findings on each factor and any associated risk controls. The group was then asked to think about additional risk controls in order to bring about improvement in these factors. Finally, potential paths of influence through the network were suggested to the group for comment.

13.4 RESULTS OF THE DISCUSSIONS

Much of the discussion on the cross-industry factors tended to overlap. However, it is possible to identify sections of distinct discussion on these factors which are now presented.

Process Design

It was felt that designers need to consider much more than they do at the moment including access, maintenance requirements, contingencies etc. It was stated that the main areas that designers need to look at are building, using, maintaining and demolition. Currently designers are not trained to think in this way. They lack basic knowledge of temporary work equipment for example.

In terms of how to bring about change, there was a feeling that contractors need to have more direct communication with designers. Currently issues related to work at height go through the planning supervisor. It may be necessary to break tradition i.e. get designers to do things differently from how they have always been done. Part of this should be to make designers aware of the cost benefits of building safety into design. Also, they should realise that even though a design complies with British Standards it may not comply with health and safety law. Designers are generally happy to make do with old standards instead of looking for something else. A general problem with the standards which designers use is that they are technical with no mention of health and safety.

Clients have a vital role to play in terms of requiring more from designers on health and safety. If hazards cannot be designed out then the client needs to be made aware of the residual risk. Design should also include impact assessment and life cycle assessment as well as cost assessment. Designers need to be made more aware of their legal responsibilities and obligations.

There were a number of comments on how to reduce the risk of falls from height through improved design. This should start with Chartered Institutions and Universities who should make health and safety knowledge more of a requirement for professional qualifications and degrees. Some kind of website for designers where they could obtain information on health and safety issues in design was thought to be a good idea. This might include basic risk assessment for designers and hazard identification. The BSI standards used by civil and structural engineers should include information on CDM and health and safety. One of the most important points was that people need to be convinced of the benefits of good CDM. There was a feeling that perhaps an HSE crackdown on designers may help to get the message across, especially if they concentrated on a few key organisations. Finally, it was generally believed that contracting strategy is an important lever to improving design and that clients need to be educated in this respect as well as designers. In particular, including health and safety items explicitly in the Bill of Quantities may present an ideal opportunity to ensure that health and safety issues are addressed, and that contractors can compete on a 'level playing field'.

The benefits of improving design to reduce the risk of falls from height were thought to be clear. It was felt that less people would be at risk for a small cost. However, it was acknowledged that bringing about change in this area would be difficult because much of the problem comes down to attitudes and culture. It may take decades in order to see significant development in this area.

Competence and Training

The discussion on the issue of competence and training was brief but decisive. The opinions were similar to those which had been encountered in several of the causation workshops. It was felt to be very difficult to define competence for work at height and therefore difficult to train people appropriately. For example, it is not necessarily easy to identify someone who is not competent for working at height. Experienced people who might be thought of as competent may still make mistakes or not behave as expected while working at height. Training may be appropriate in some cases such as for specialist workers and designers. However, the key issue was thought to be that workers may be relatively competent but have inadequate risk perception.

Situational Awareness / Risk Perception

This factor was thought to be very important in terms of reducing the risk of falls from height. One of the issues is that people working at height are usually part of a macho culture which might encourage them to take unnecessary risks. It was thought that people can generally appreciate the hazards but are not good at quantifying the risks. This is especially true for work at low levels. Managers and supervisors tend to have the perception that it will never happen to their best workers and that it must be bad luck if it does. In reality they were probably behaving in an unsafe manner if they are involved in an incident.

The difficulty with risk perception was brought into sharp contrast when it was reported that a particular group of workers had been willing to put themselves at more risk in order to wear a more comfortable harness even though it was less safe. The workers were prepared to sign a declaration that they would not bring claims against the company if they had an accident. This appears to relate to the attitude that 'it won't happen to me'. The feeling emerged that workers may be competent, know the hazards and the rules and have the right equipment but still take unnecessary risks while working at height due to poor risk perception.

In terms of improving risk perception, it was acknowledged that this is a difficult area but there were a number of suggestions. Of great importance is that managers and supervisors lead by example and do not take risks which they do not want their men to take. This was thought to be the first step in developing a culture where people take less risks. The difficulty here comes when clients are not willing to pay for safety and so it is not possible to have the level of supervision which is required. Another approach which it was thought would make a difference is for HSE to crack down more on individual workers who are irresponsible. The point was made that unless people see negative consequences for unsafe behaviour then they will continue to break the rules because they feel they can 'get away' with it. The difficulty here is that due to employment law it is not easy for companies to sack people for such offences. Finally it was proposed that the nature of working at height means the hazards and risks are not appreciated as much as other similar hazards. This being the case it is perhaps necessary to present the hazards and risks in a different light.

Compliance

There was little discussion on compliance in isolation since it tended to come up in relation to competence and situational awareness/risk perception. The workshop delegates concurred with previous suggestions for improving compliance which included design to mitigate against people's tendency to improvise, more supervision, stricter prosecution, clearer definition of responsibility and behavioural observation systems such as the Du Pont STOP system.

Management and Supervision

Managers and supervisors were seen as pivotal for controlling the risks associated with work at height. A major obstacle was thought to stem from the fact that those who progress up the management chain tend to be people who have taken most risks in order to get the job done quicker. These people are more inclined to turn a blind eye when they see unsafe practice as managers. This leads people to believe that taking short cuts is accepted practice. Productivity is allowed to dominate at the expense of safety. Management were thought to take calculated risks based on cost, i.e. 'what can we get away with?'.

In order to combat the aforementioned problems associated with management and supervision it was thought necessary firstly to ensure that people with experience of work at height fill these positions. A management culture should be developed in which workers know that short cuts are not tolerated and production does not dominate at the expense of safety. Managers and supervisors should lead by example in terms of safe behaviour. Managers should also be made aware of the cost benefits of good safety. Finally, managers can use incentive schemes in order to encourage the reporting of incidents and sharing of information about hazards to look out for. However, care must be taken to ensure that the rewards are not overly positive, which breeds cynicism, or too negative, which may lead to under reporting.

Safety Culture

Safety culture only received brief discussion as a factor in itself but was frequently mentioned throughout the workshop as an important influence. The development of a positive safety culture was thought to rely heavily on senior managers and directors of companies. More effort needs to be put into influencing the mindset of managing directors. Key messages should include that improving performance through safety could help to improve the share price and insulate from takeover and could lead to higher profits. There also needs to be a clear organisational structure with everyone having a responsibility for safety to steer away from a blame culture. If supervisors make a safety related decision they need to be fully supported from further up in the organisation.

13.5 FOCUSING ON RISK CONTROL

Although the risk control workshop indicated that a number of factors need to be taken into account to address falls from height, much of the discussion related to an underlying attitude associated with these accidents which appears to be *'it wont happen to me'*. This is supported from all the workshops where it has emerged that there are many workers who may be competent at their job, aware of the hazards, have at least some comprehension of the risk, know the rules and have access to the right equipment and yet they still put themselves in a position with unnecessary risk of a fall. Several hypotheses for this attitude have been put forward including:

- Complacency – 'I've been doing the job for 20 years and have never had an accident so why should it happen now?'.

- Inexperience.

- Production culture - work pressures forcing people to cut corners.

- A lack of appreciation of the scale of the risk.

- Basic human nature to get things done quickly and easily.

- Macho culture.

In reality, it is likely to be a combination of these factors which encourages people to take unnecessary risks while working at height. The discussions in the risk control workshop provide insight as to how the *'it wont happen to me'* attitude can be overcome. At the basic level the two underlying factors which need to be addressed are:

- Eliminate hazards through improved ***process design***. This offers the most effective solution since the *'it wont happen to me'* attitude becomes largely redundant.

- Encourage safe behaviour while working at height, thereby improving ***compliance***. This approaches looks to alter the *'it wont happen to me attitude'* by making people realise that it could happen to them. Improving *compliance* is strongly linked to *risk perception.*

13.6 RISK CONTROL INFLUENCE NETWORKS

From the rationale in the previous section, improving *process design* and *compliance* have been taken as offering the greatest potential to reduce the risk of falls from height. The next step in the process is to map the influences on these factors (identified in the risk control workshop) and provide a breakdown of the associated risk control measures which were put forward. A generic falls from height influence network to cover all industry has been used for this purpose. Separate networks have been developed to show the influences on *process design* and *compliance* respectively which are shown in Figure 114 and Figure 115. The following steps have been undertaken to develop each network:

- Map the dominant influence on falls from height (*process design* or *compliance*) – coloured green in the diagrams

- From the risk control workshop comments, identify the main influencing factors on the dominant factor from lower levels of the network – shown by the red boxes and connecting arrows in the diagrams

- Identify the main influencing factors on the dominant factor at the same level of the network (horizontal influence) or from a level higher up (reverse influence) – shown by the blue boxes and connecting arrows in the diagrams

13.6.1 Process design

It can be seen from Figure 114 that the main influences on *process design* from below were identified as *contracting strategy* and *political* and *regulatory* influence. At the organisational level, *training* and *communication* were regarded as key and provision of *information and advice* from the direct level to designers was also thought to be significant. The relationships between the factors and the associated risk controls are now broken down into three distinct packages.

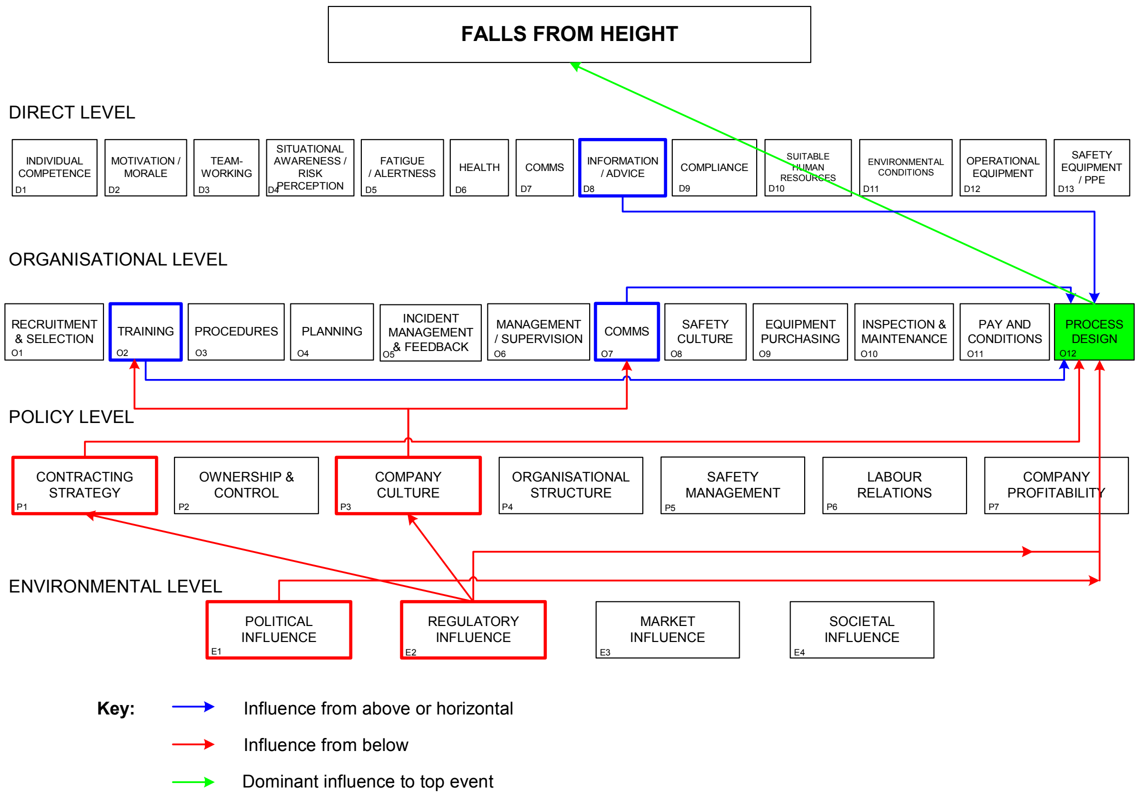


Figure 114 Risk control Influence Network for Process Design

1a Political and Regulatory influence on process design

Political* influence on *process design
It was felt that political influence could be exerted on *process design* through:

- Education authorities developing programmes for chartered institutions and universities to include health and safety on courses for designers.

- The appropriate government department influencing BSI standards used by designers for civil and structural work so that they include information on the CDM Regulations and designing for health and safety. It should be made clear that complying with British standards does not mean complying with health and safety law.

Regulatory* influence on *process design* and *contracting* and *company culture
The Regulator could help influence *process design* directly through enforcement and indirectly through contracting strategy and company culture. Much of the indirect influence is related to entering into discussions with clients and design companies and encouraging them to address safety in design and contracting. The key points include:

- Placing more responsibility on the lead designer as opposed to the planning supervisor.

- Continuing with plans to provide on-line information for designers on health and safety issues.

- Crack down on a few organisations to send a clear message through the industry on the need to improve.

- Help provide information and advice to clients and designers as listed under *D8 to O12 - Information and advice to process design.*

1b Client influence

Contracting strategy* influence on *process design
In general it was felt the client is in the strongest position to influence the designer. Although this was clear there was a lack of discussion regarding exactly how the client could be influenced in this way or precisely what they should do except for the following pointers:

- Clients need to lean on designers to encourage them to consider health and safety by making it clear they want this as part of the design package.

- Clients need to budget for health and safety in design.

- Clients need to be educated on the importance of health and safety in design, probably by HSE.

1c Designer training, information and improved communications

Company culture* influence on *process design* through *training

- Provide some kind of formal training for designers on incorporating health and safety into design. Part of the training might be tailored for clients in order to improve their knowledge on the subject.

- Training should cover building, using, maintaining and demolition since designers are currently not trained to think in this way.

- Training could include design risk assessment and how to produce a design safety case to show how safety has been taken into account

- Key people could be put through training to help disseminate the knowledge to colleagues

Company culture* influence on *process design* through *organisational communication

- A system needs to be in place whereby contractors have access to direct communications with designers as opposed to through the planning supervisor. Contractors need to pass on information about problems and potential solutions.

- If designers cannot design out hazards they must inform contractors of residual risk.

- Communication between stakeholders on a project including the client, design team and contractors needs to start as early as possible.

I*nformation / advice* influence on *process design*

Designers were thought to require an array of health and safety information including on:

- Access, maintenance requirements, contingencies that may be needed, how construction and maintenance jobs are done and temporary work equipment.

- The cost benefits of safety in design so they can demonstrate benefits to the client.

- The legal aspects relating to health and safety and their responsibilities.

- Simple hazard identification and risk assessment in design.

13.6.2 Compliance

Figure 115 shows the risk control influence network for *compliance*. It can be seen from this that *situational awareness / risk perception* has a close link with *compliance* and will also have a significant effect on the top event. For this reason it has been highlighted and classed as a secondary direct influence after compliance.

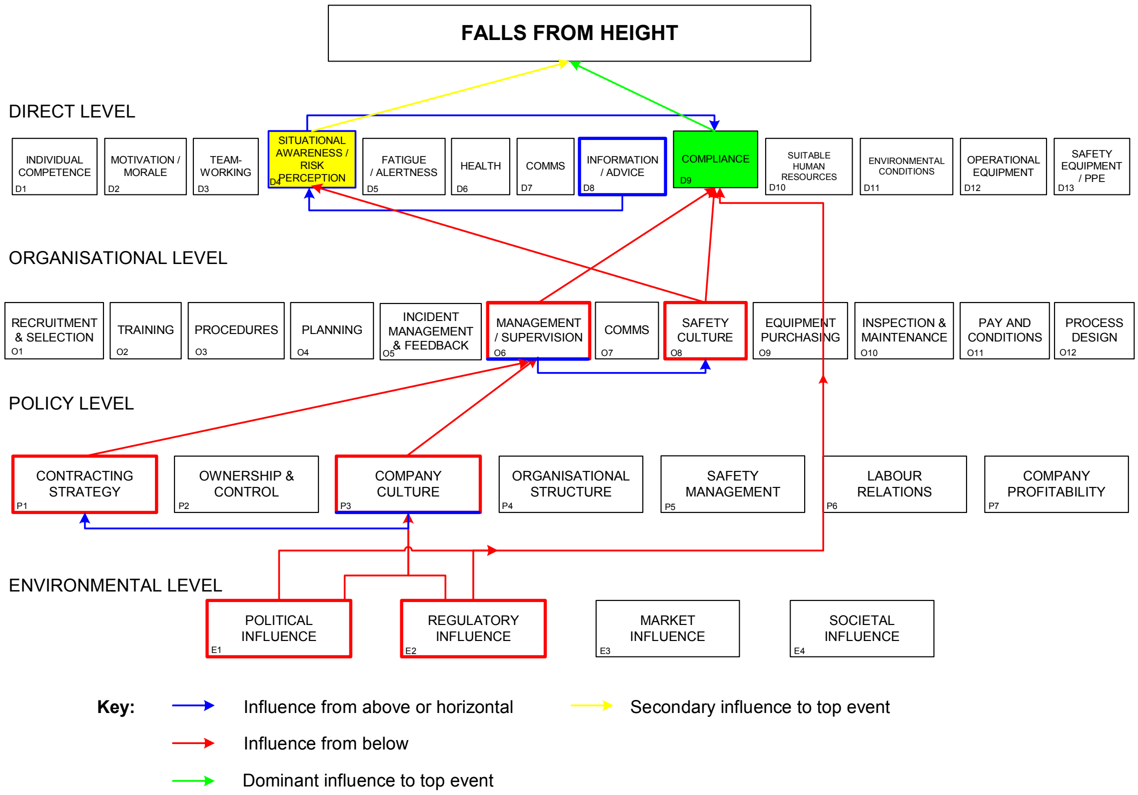


Figure 115 Risk control Influence Network for compliance

The relationships shown in Figure 115 can be broken down as follows:

- *Political* and *regulatory* influence having a direct effect on *compliance* as well as *company culture.*
- *Company culture* having a direct effect on *management and supervision* and an indirect effect on this factor through *contracting strategy.*
- *Management and supervision* having a direct effect on *compliance* and an indirect effect on this factor through *safety culture.*
- *Safety culture* having a direct effect on *situational awareness / risk perception* which is in turn influencing *compliance* as well as falls from height directly.
- *Information / advice* influencing *situational awareness / risk perception* (and *compliance* through this).

The risk control options associated with these influences are again presented as three different packages.

2a Direct *political* and *regulatory* influence on *compliance*

It was indicated that the government / government departments and HSE could have a direct influence on compliance:

- The difficulty in dismissing people who violate undermines discipline and makes compliance less likely. A review of employment law may and contract provisions be required here.

- The HSE can prosecute individuals who are irresponsible under the Health and Safety at Work Act. Prosecutions such as this may be required to get across the message of safe working at height. The value for many based on the repercussions from one prosecution need to be assessed.

2b *Compliance* through *management*

Political* and *regulatory* influence on *company culture
The HSE and government need to put the safety message to managing directors and others at the top of construction contractors and clients.

- The government could use financial incentives to influence MDs to address safety. The government should also include safety as part of public procurement contracts.

- HSE need to stress the cost benefits of safety to those at the top, for example, that improving performance through safety will improve the share price and perhaps insulate a company from take over. As part of this, HSE should highlight the importance of including safety in contracts.

Company culture* influence on *contracting strategy
The government and regulator should be aiming to alter *company culture* in terms of how much they consider safety in the way they run their business. A change in *company culture* in this direction would create an influence in that more clients would build safety into contracts. In particular, inclusion of health and safety items in bills of quantities would ensure that health and safety are at least considered, and that contractors are competing on a relatively equal basis.

Company culture* and *contracting strategy* influences on *management / supervision
A change in company culture would be likely to directly improve management and supervision of safety in terms of:

- More expected of managers/supervisors in terms of safety.

- More support given to managers in terms of safety related decisions.

- More thought given to employing managers/supervisors suited to the job e.g. with experience of work at height.

- More time given to *incident management and feedback* to help prevent falls from height.

- More investment in *training* teams to perform work at height.

Managers and supervisors would benefit if safety were taken more account of in contracts in that more time and resource could be built in for these people to address safety as part of the job.

Management / supervision* influence on *compliance
Managers and supervisors can have a direct effect on workers compliance while working at height by not turning a blind eye to unsafe acts but instead using appropriate measures of discipline. This requires appropriate negative consequences for unsafe behaviour to ensure it is not reinforced. With either no consequences or positive feedback, e.g. a well done from the boss for getting the job done quickly even though corners were cut, then unsafe behaviour will remain.

2c Improving compliance through culture and risk perception

The underlying influences on *management and supervision* described under 2b 'Compliance through management' are also applicable to how managers and supervisors can influence compliance through culture and risk perception.

Management / supervision* influence on *safety culture
It has been identified that *management and supervision* are key to developing a positive *safety culture* among the workforce on site. The important issue was identified as leading by example. Managers and supervisors must not take unnecessary risks while working at height which would create a bad role model.

Safety culture* influence on *compliance* and *situational awareness / risk perception
If management on site are able to develop a positive safety culture in which they lead by example, pass on the relevant information on safety while working at height and give out appropriate discipline when people behave unsafely at height then:

- Workers will see management do not turn a blind eye.

- People are likely to take more responsibility for their own actions.

- Worker perception of the dangers of working at height will improve.

- People will be less likely to break the rules for work at height.

- People will behave more safely while working at height.

Information and advice* influence on *situational awareness / risk perception
Certain information passed to front line workers presented in the right format was thought to be potentially of benefit:

- Making the point that men should always use their own equipment for working at height since they will be less familiar with equipment they are not used to and it may contain defects.

- Presenting the hazards, risks and consequences of falls from height in a different light. This may include comparing the risk level to a domestic situation which people would never put themselves into, showing graphic illustrations of the severe consequences and making particular mention of low falls.

Situational awareness / risk perception **influence on** ***compliance***
If people are more aware of the hazards and risks then they are more likely to follow the rules for working at height without strict policing.

13.7 RISK CONTROL EFFECTIVENESS

As illustrated in the risk control Influence Networks in the previous section, factors are 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 sessions have allowed identification of the factors where improvement offers the greatest potential to reduce falls risk across industry (Section 12.4) and have shown the paths of influence which can bring about such change. The sessions have also brought together a potential set of risk control measures for work at height. 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 estimate the potential risk reduction that may be obtained from the risk control options in Section 13.6, it has been necessary to assess the impact of each risk control package. This has been done by making estimates of the potential increases to each of the relevant factors if the package were implemented and the resulting change in the risk index. As illustrated in the previous section, the risk control packages are:

1 Process design

1a Political & Regulatory influence on designers.

1b Client influence.

1c Changes to designer training, information and communications.

2 Compliance

2a Direct Political and Regulatory influence.

2b Compliance through management.

2c Improving compliance through culture and risk perception.

The factor rating increases relating to each of the individual components of the risk control packages (1a to 2c) are shown in Table 43 along with estimates of the potential reductions in risk. For illustrative purposes, the base rating has been taken as the lowest rating from the New build workshop. An indicative increase in rating of one has been assumed for each of the factors to be improved. 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.

The estimates shown in Table 43 indicate that potential risk reductions of around 30% can be obtained from improving *process design*. This is a broad figure for industry as a whole, but greater or lesser potential reductions in risk would be expected in specific circumstances.

The estimate of potential risk reduction for improving *compliance* on its own is also around 30%. However, if improvements can be made in *process design* and *compliance* then the potential risk reduction is estimated to be around 50%. This demonstrates the importance of addressing the underlying issues as well as the direct ones.

It should be noted that the potential risk reductions from the individual measures are not directly additive due to overlap and synergies. Furthermore, these relative measures of risk reduction are founded in the collected views of the stakeholder delegates who participated in the Influence Network workshops.

It is important to look back at the definitions and the extent of the improvements that the rating changes imply. In any specific implementation the degree of improvement would need to be assessed for that situation. The numbers presented in Table 43 are merely indicative.

It is important to note that improvement is not confined to the risk controls identified in this study. Other risk controls may have the potential to contribute significantly to the control of work at height. It may be the case that some factors are regarded as important but the ideas to bring about improvement are limited. It is therefore important that the findings of this work are not regarded as exhaustive, but moderated by practice, experience and new developments. However, the critical factors can be seen as priority areas for controlling work at height and the associated risk controls are an effective starting point in the process.

Table 43 Potential effect of risk control measures

Influence network factor		*Base rating*	*Risk control package*					
			1a	*1b*	*1c*	*2a*	*2b*	*2c*
Direct level								
D1	Competence	3						
D2	Motivation / Morale	4						
D3	Team working	4						
D4	Situational Awareness	3						1
D5	Fatigue	5						
D6	Health	4						
D7	Quality of Communications	8						
D8	Information / Advice	8						1
D9	Compliance	3				1	1	1
D10	Suitable Human Resources	4						
D11	Environmental Conditions	3						
D12	Operational Equipment	1						
D13	Safety Equipment / PPE	1						
D14	Process design – virtual factor	3	1	1	1			
Organisational level								
O1	Recruitment and Selection	0						
O2	Training	5			1			
O3	Procedures	2						
O4	Planning	2						
O5	Info Management & Feedback	5						
O6	Management/Supervision	6					1	1
O7	Communications	5			1			
O8	Safety Culture	3						1
O9	Equipment Purchasing	2						
O10	Inspection and Maintenance	2						
O11	Pay and Conditions	8						
O12	Process design	3	1	1	1			
Policy level								
P1	Contracting Strategy	2		1			1	1
P2	Ownership and Control	2						
P3	Company culture	2			1		1	1
P4	Organisational Structure	5						
P5	Safety Management	2						
P6	Labour Relations	6						
P7	Company Profitability	5						
Environmental level								
E1	Political Influence	5	1			1	1	1
E2	Regulatory Influence	4	1	1	1	1	1	1
E3	Market Influence	2						
E4	Social Influence	5						
Potential risk reduction %				29			30	
Combined potential risk reduction %					50			

14. COST-BENEFIT ANALYSIS OF RISK CONTROL AND PREVENTION METHODS

14.1 INTRODUCTION

Accidents and injuries at work can result in costs at three levels:

- The individual level.
- The employer level.
- The national level (society as a whole)

There are also benefits to be gained at each of these levels both in terms of the actions taken, and the accidents and injuries prevented. Obviously some sort of risk balancing is required in order to compare and evaluate different proposals. Cost-benefit analysis (CBA) can be used to inform such decisions, but not necessarily determine those decisions as the issues are never entirely clear-cut.

One of the key issues from the workshops is that it can be difficult to convince employers and other decision-makers of the benefits of safer working, and that the way to get the message over is in financial terms. Whilst there is no national source of information on the costs and benefits of improving health and safety, individual organisations or groups of organisations may be able to carry out cost-benefit analyses relevant to their own operations.

This section of the report outlines the potential sources of both costs and benefits and, where available, presents indicative values. A framework is thus provided for those organisations wishing to undertake cost-benefit analyses.

14.2 OVERVIEW

The European Agency for Safety and Health at Work[42] has identified a set of indicative preventions, consequences and analyses shown in Table 44. The consequences range from those that are readily visible to the individuals involved but are difficult to quantify (e.g. pain and suffering), through to those that affect us all as a result of individual accidents and injuries (e.g. increased insurance costs). In between are those costs and consequences that affect companies and other organisations. These can be quantified and identified on the balance sheet based on the performance of a particular company or group of companies.

In the following sections costs, benefits and means of analysing them will be outlined. The key objective is to raise awareness of both the financial consequences resulting from an accident or injury and the potential benefits of preventing or minimising those costs. The range of consequences (and their associated costs) are likely to be more extensive than many people would initially imagine. By identifying such consequences, the possibility is opened of assigning costs to them for individual circumstances.

Table 44 Examples of health and safety costs and benefits and methods for evaluating costs and benefits

Applicable to	*Examples of prevention activities (preventive costs)*	*Examples of consequences or effects of an accident and diseases*	*Possibilities of analysis or evaluation of costs and benefits*
Individual employees	• using personal safety equipment • effort in adopting safety attitudes and healthy life and workstyles	• pain and suffering • consequence to relatives and friends • losses in second job or household	• evaluation of own safety and health activities
Employers	• developing safety and health management • carrying out workplace safety and health inspection • developing a safety climate • planning production measures to improve working conditions	• production losses • insured and uninsured costs of accidents • quality losses • legal sanctions	• evaluation of effects of preventive measures, efficiency measurement • insurance: compensations and premiums • evaluation of production process costs and benefits in decision-making techniques • profit–loss analyses
Society as a whole	• social attitudes and values • safety and health legislation and inspection • trade union and sector organisation activities • safety and health research, education and information	• medical treatment and rehabilitation • accident investigation and administrative and legal actions • insurance activities • costs to the national economy • social costs	• evaluation of national safety attitudes and safety programmes • cost–benefit analysis of new regulation • evaluation of trade union and sector organisation activities

14.3 THE INDIVIDUAL

Table 45 contains a summary of some of the potential costs to an individual if they have an accident adapted form Reference 42. Some of the effects are quantifiable, particularly those directly related to current expenditure and loss of income. Some of the effects are difficult to quantify, such as potential loss of earnings due to no longer being able to perform a manual job. However, effects such as grief and suffering and a reduction in the quality of life are highly subjective, vary between individuals and are difficult to quantify.

Table 45 Costs of accidents to the individual

Effect on the individual	*Description*	*How to obtain money value*
Health	Hospitalisation (bed-days) Other medical care, such as non-hospital treatment, medicines Permanent disability (numbers, age of patient) Non-medical (e.g. vocational) rehabilitation, house conversions	Expenditures for healthcare that are not compensated by insurance or employer
Quality of life	Life expectancy, healthy life expectancy Quality adjusted life years Disability adjusted life years	Willingness to accept, willingness to pay Height of claims and compensations
Grief and suffering	For victims, but also for relatives and friends	No reliable method available
Present income losses	Loss in income from present and second job	Reduction in present income, loss of wages
Loss of potential future earnings	Also including the second job	Differences between total expected future income and total compensation or pensions
Expenses that are not covered by insurances or compensations	Examples are costs for transportation, visits to hospitals, costs arising from fatalities such as funerals	Sum of all other expenses for a victim and his/her family (that are not compensated)

The HSE undertook a major study[(43)] into the costs to Britain of workplace accidents in 1995/96. Obviously, many assumptions had to be made in order to obtain estimates of the costs of accidents to individuals, and their families. However, estimates were made in terms of 1995/96 costs with future costs discounted to a net present value (NPV) in 1995/96.

Obviously, there would be a huge variability in the direct financial costs to an individual depending on their particular circumstances. The calculations assume that forced retirement leads to 12 working years being lost whilst fatalities result in 21 years of working life being lost. However, Table 46 does at least provide indicative costs, and highlights the cost to individuals of having an accident of such severity that they are forced to give up work.

Table 46 Estimate of the average financial costs to individuals as a result of an accident-induced injury

Cause	*Costs incurred in 1995/96*	*Net present value of future costs in 1995/96 prices*	*Total costs in 1995/96 prices*
Absence from work	£115	-	£115
Forced retirement	£3,335	£60,000	£63,335
Fatality	£1,550	£46,510	£48,060

The human costs are somewhat more difficult to evaluate as they are largely subjective, and result from the loss of quality of life associated with the pain and suffering resulting from the injury. Compensation payments made in courts could give an indication of these human costs. However, there are serious limitations to using court judgements as the compensation for distress will vary from case to case. An alternative approach has been taken by economists who have sought to obtain values for the cost of fatal and non-fatal injury to individuals based on what people are willing to pay to reduce their risk of being killed or injured, or what they are willing to accept for a small increase in such risks.

The Department for Transport has valued road accident fatalities using a willingness to pay approach. This approach reflects the preferences and attitude to risk of those people who are likely to be affected by those risks. As a measure of the subjective costs to workers and their families of work-related fatalities, the HSE(43, 44) has used the willingness to pay element of the Department for Transport value of prevention per road casualty. A value of £766,000 was derived as the human cost of a fatal injury (in 1995/96 prices). It should be noted that this is a value for the prevention of a fatality, i.e. the willing ness to pay to avoid such injuries in the future, and is not an estimate of the human costs as perceived by family members affected by workplace fatalities. This approach has been extended(43) to estimate the subjective costs of non-fatal injuries. A summary of the subjective costs is given in Table 47.

Table 47 Subjective costs of work-related injuries

Severity of injury	*Subjective cost of injury in 1995/96 prices*
Minor injury	£125
Non-serous reportable injury	£1,550
Serious injury	£10,600
Permanent incapacity following injury	£147,100
Fatal injury	£766,000

14.4 EMPLOYERS

The potential costs of accidents to employers have been adapted from References 42 and 45, and are summarised in Table 48. These essentially fall into two categories, those that have direct cost implications, and those where the costs are due to the effects on workers and company culture leading to higher turnover, absence and early retirement. This latter category has a more indirect impact on costs, but can still be evaluated.

The direct costs can be considered to fall into six categories[45]:

- Incident costs
- Investigation of incident
- Getting back to business
- Business costs
- Action to safeguard future business
- Sanctions and penalties.

Each of these categories has a number of cost items within it leading to an estimate for the total cost of an accident to a company or organisation. For an individual employer, it should be possible to derive cost estimates for the individual items. The HSE has created a web site[45] which provides a tool for companies and organisations to calculate the overall costs of accidents. Along with this tool, there is a facility to file cost case studies on the HSE web site in order to establish a cost database. Once this database is reasonably populated, it will be possible for organisations to obtain indicative cost data and undertake full cost-benefit analyses.

Table 48 Costs of accidents to employers

Effect	*Description*	*How to obtain money value*
Effects of accidents that cannot be expressed directly in monetary terms		
Fatalities, deaths	Number of fatalities	Sum of costs of subsequent activities, fines and payments
Absenteeism or sick leave	Amount of work time lost due to absenteeism	Sum of costs of activities to deal with effects of lost work time, such as replacement and lost production; indirect effect is that sick leave reduces flexibility or possibilities to deal with unexpected situations
Personnel turnover due to poor working environment, or early retirement and disability	Percentage or number of persons (unwanted) leaving the company in a period of time	Sum of costs of activities originated by unwanted turnover, such as replacement costs, additional training, productivity loss, advertisements, recruitment procedures
Early retirement and disability	Percentage or number of persons in a period of time	Sum of costs of activities originated by disability or early retirement, fines, payments to the victim
Loss of orders and productivity	Loss of goodwill and reputation among the workforce, customers and local community.	Estimates based on previous business.
Effects of accidents that can readily be expressed in financial terms		
Incident costs		
Dealing with the injured person	First aid, and taking the injured person to home / hospital	Cost of materials, time and travel
Making the area safe		Cost of materials and staff time plus any costs recovered by emergency services.
Staff downtime	People and plant not working whilst the incident is made safe	Payroll costs, plant hire
Investigation of the incident		
Other, non-health-related costs (e.g. investigations, management time, external costs)	Time and money spent for injury investigation, workplace assessments (resulting from occurrence accidents or illnesses) including time spent with inspectors and consultants	Payroll costs and invoices
Getting back to business		
Non-medical rehabilitation	Money spent by the employer to facilitate returning to work (counselling, training, workplace adjustments)	Invoices
Administration of sickness	(Managerial) activities that have	Total payroll costs for time spent

Effect	*Description*	*How to obtain money value*
absence, injuries, etc.	to be performed by the company related to sick leave	
Damaged equipment	Damages or repair costs of machines, premises, materials or products associated with occupational injuries	Replacement costs
Bringing work up to standard	Remedial action to any parts of the works that may have been damaged during the accident or due to the subsequent downtime. Possibly involving overtime.	Payroll, material and plant hire / purchase costs
Business costs		
Opportunity costs	Orders lost or gained, competitiveness in specific markets	Estimated production value, representing lost income for the company
Lack of return on investment	Non-realised profit because of accident costs, i.e. expenditure due to accidents and not invested in a profitable activity (like production, stock market or saving) generating interests	Interests of the expenditure amount, invested during x years, with an interest rate of y %
Salary costs	Injured person, and their replacement.	Payroll costs
Recruitment costs	Costs of finding replacements	Cost of adverts, time spent in recruiting and then once employed, costs associated with training, low initial productivity etc.
Lost production time, services not delivered	Production time lost as a consequence of an event which results in injury (e.g. because it takes time to replace machines, or production has to be stopped during investigation)	Total production value
Contract penalties	Due to late delivery.	Invoices
Action to safeguard future business		
Reassuring customers		Cost of time spent with clients and travel to and from meetings
Providing alternative supplies to customers		Invoices.
Sanctions and penalties		
Effects on variable parts of insurance premiums, high-risk insurance premiums	Changes in premiums due to the incidence of injuries and occupational illnesses	Invoices
Liabilities, legal costs, penalties	Fines and costs due to criminal proceedings, solicitors fees and other legal expenses and compensation claim payments	Invoices, claims, costs of settlements; fines, penalties

Effect	*Description*	*How to obtain money value*
Extra wages, hazardous duty pay (if the company has a choice)	Extra spending on higher wages for dangerous or inconvenient work	Additional wages
Staff time on legal case		Payroll costs

Until the HSE database[45] is populated, use could be made of the costs to employers derived by the HSE[43]. Given the broad nature of the work reported in Reference 43, the costs shown in Table 49 are split down into fewer categories than those suggested in Reference 45 and Table 48. However, they do give a broad indication of the relative contributions to the overall cost. Insurance and compensation are, on average, the most substantial contributors to the employer's cost, although with greater downtime the cost of extra production may well dominate in some industries.

Table 49 Typical cost to employers for each injury resulting from work-related injuries

Source of cost	*All injuries*	*Serious or major injuries*	*Other reportable injuries*	*Other lost time injuries (3 days or less)*
Damage	£23	£23	£23	£23
Extra production	£229	£2,327	£374	£13
Administration	£28	£286	£46	£2
Insurance and compensation	£534	£12,449	-	-
Total	£814	£15,085	£443	£37

In order to carry out a cost-benefit analysis, the costs of risk controls need to be evaluated. Table 50 has been adapted from Reference 42, and contains a summary of the typical preventive actions that an employer may consider. These have been categorised into the direct risk controls and underlying cultural changes. It is likely to be considerably easier to derive costs for the former category than the latter as cultural change is a somewhat more difficult and variable subject to address.

Table 50 Costs of risk controls to employers

Risk control	***Description***	***How to obtain money value***
Direct risk controls		
Investments	Costs of specific safety equipment or additional costs of other investments related to health and safety.	Market prices, quotations, invoices
Additional investments	Changes in operational (non-safety-related) capital goods to facilitate functioning of safety equipment (e.g. reconstruction of buildings)	Market prices, quotations, invoices
Engineering, consultancy and planning costs, related to investments	Expenditures for internal and external activities for design and implementation of new equipment or working procedures	Market prices, quotations, invoices, total wages of time spent
Additional costs of substitution products (recurring costs)	Price difference (e.g. monitoring equipment at ground level or permanent ladders)	Market prices, quotations, invoices
Purchase of personal protective equipment (recurring costs)	Costs of personal protective equipment	Market prices, quotations, invoices
Additional costs for changed working procedures and maintenance (recurring costs)	Price difference between old ways of working and new, directly related to the preventive action; note that new ways may also result in cost savings (e.g. extra costs to work according to safety standards)	Market prices, quotations, invoices
Extra work time of direct personnel (recurring costs)	Time spent on meetings, training, safety inspections, participatory developments	Total wages of time spent
Costs of internal or external OSH services, other preventive services (recurring costs)	Also includes occupational health services	Market prices, quotations, invoices
In-company activities	Human resource management, health promotion, safety policy and management	Total wages of time spent
Other workplace costs	Anything that is not covered in the previous headings	Market prices, quotations, invoices, total wages of time spent
Risk controls via underlying cultural changes		
Improvements in *process design*	Educating designers and clients, training, improved risk perception.	Difficult to price as the quality of the action and its impact are more important than the quantity. The cost of not achieving improvements is probably easier to evaluate i.e. time for remedial work to designs.
Improvements in *compliance*	Management and supervision, modifying *Company* and *Safety culture* and improved *Risk perception*.	Difficult to price as the quality of the action and its impact are more important than the quantity. (Cost of increased information and management/supervision is guide).

A comprehensive cost benefit analysis is not limited to the issues identified in Table 49 and Table 50. There are additional potential benefits that may accrue to employers from adopting risk control measures. Table 51 has been adapted from Reference 42, and contains suggestions of additional potential benefits. Whilst these factors are difficult to quantify financially, they could be the difference between being a successful organisation or not as many of them relate to the underlying culture of an organisation, how it is perceived (internally and externally) and how well it is able to perform and respond.

Table 51 Potential additional benefits to employer resulting from risk controls

Potential benefit	***Description***	***How to obtain money value***
Increased productivity and other operational effects	Reduced costs for facilities, energy, materials, increased productivity; reduced personnel costs.	Total of cost reduction directly related to intervention to be estimated from effects on the company's operation.
Improved quality of products and services	Changes in product or service quality; reliability of deliveries.	Value depends on company strategy. Reduction in repair costs and warranties.
Improved well-being, job satisfaction and working climate		Indirect effects, e.g. on productivity, quality or flexibility. Increased capabilities to deal with unexpected situations.
Compensations and subsidies received from insurance or authorities	Support for prevention only, compensations received for sick leave or disability are to be excluded	Compensations and subsidies received.
Company image effects	Attractiveness to customers, attractiveness on labour market, attractiveness to contractors, ability to recruit personnel	Indirect effects.
Impact on non-economic company values	To be derived from mission statements and the like, typically strategic considerations	Indirect, long-term effects.
Innovative capacity of the firm	Ability to innovate in products and production processes	Indirect, long-term effects.

14.5 NATIONAL LEVEL

The costs of accidents to society as a whole include those cost to the individuals and those to the employer directly affected. However, as noted in Reference 43, the total cost to society is not a simple summation of these costs. This is primarily due to the issues of transfer payments and taxpayer costs. Whilst social security payments represent income to some, they are a cost to the taxpayer and are thus viewed (by Reference 43) as a transfer between groups in society and involve no resource cost to society as a whole. There are also the costs borne by the taxpayer in general for the National Health Service and the administration of disablement and other social security benefits.

The costs of accidents to society as a whole are thus considered in three separate categories: loss of output, other resource costs and human costs. The sources of these costs are summarised in Table 52.

Table 52 Costs of accidents to society as a whole

Variable	*Description*	*How to obtain money value*
Loss of output		
Damaged equipment (by accidents)		Replacement costs, market prices
Present production losses	Lost earnings due to sick leave, absenteeism and disability	Total lost earnings during period of absence
Lost production due to incapacity of personnel and production downtime		Market price of lost production
Other resource costs		
Administration of sickness absence, etc		Total wages spent on the activity
Health	Hospitalisation (bed-days) Other medical care, such as non hospital treatment, medicines Permanent disability (numbers, age of patient) Non-medical (e.g. vocational) rehabilitation, house conversions	Actual expenditures on medical treatment and rehabilitation.
Investigation costs	HSE or Local Authority Inspectors	Expenditure on inspectors and their associated overheads.
Human costs		
Fatalities (numbers, age of patient)		Willingness to pay or willingness to accept.
Quality of life		Willingness to pay or willingness to accept. Total amount of indemnities and compensations
Grief and suffering	Life expectancy, healthy life expectancy Quality adjusted life years Disability adjusted life years For victims, but also for relatives and friends	Willingness to pay or willingness to accept. Total amount of indemnities and compensations
Loss of potential future earnings and production	Lost earnings during the whole period of permanent disability	Sum of lost income during expected disability period, in which both the income and the period are estimated on statistical data

HSE[42] estimates for the costs to society as a whole of work-place accidents are contained in Table 53, where it can be seen that the cost of fatalities dominates. Whereas the human costs are on a par with the loss of output for all of the other injuries, for fatalities the human cost is three times the cost to society of the loss of output.

Table 53 Estimates of the cost to society as a whole of whole of work-place accidents

Source of cost	*Fatalities*	*Serious or major injuries*	*Other reportable injuries*	*Other injuries*	*Average all injuries*
Loss of output	£245,725	£10,330	£1,660	£60	£1,075
Other resource costs	£5,950	£3,700	£315	£30	£280
Human costs	£766,000	£15,930	£1,550	£125	£1,440
Total costs	£1,017,675	£29,960	£3,525	£215	£2,795

Whilst the previous tables address the costs of the accidents, Table 54 summarises the sources of the costs to the nation of various risk controls. This is essentially Table 50 plus the risk controls associated with the regulator (in particular HSE). These costs will need to be considered for society as a whole in carrying out a cost benefit analysis.

As Hallett[46] indicates, even though the idea of placing monetary value on human life may appear morally unacceptable, this is done implicitly whenever resources are allocated to reduce the risk of fatal accidents. Final judgements about expenditure to reduce specific risks are in many cases unavoidably political, with cost-benefit analyses informing but not determining decisions.

In 1998, the UK Government published new guidance on the form of regulatory impact assessment that must be carried out for all regulatory proposals that lead to new legislation. Risk assessment is a fundamental part of this process, identifying the scale of the problem being addressed and the likely benefits of the proposal. It must also be demonstrated that the best of a range of options is being proposed. Costs and benefits should be clearly identified, as should the distribution of the effects of the policy within society. The approaches adopted by the Health and Safety Executive (HSE) for assessing, managing and regulating risks are described in Reference 44.

Regulatory impact assessment thus provide cost-benefit analyses of legislative proposals, as well as the detailed background to them. The format and technical requirements for these cost-benefit analyses are set out in HM Treasury's Green Book[47] which ensures a consistent approach across Government Departments to definitions of costs and benefits, and to the weighting of current and future effects through discounting.

Table 54 Costs to the nation of various risk controls

Risk control	*Description*	*How to obtain money value*
Direct risk controls		
Investments	Costs of specific safety equipment or additional costs of other investments related to health and safety.	Market prices, quotations, invoices
Additional investments	Changes in operational (non-safety-related) capital goods to facilitate functioning of safety equipment (e.g. reconstruction of buildings)	Market prices, quotations, invoices
Engineering, consultancy and planning costs, related to investments	Expenditures for internal and external activities for design and implementation of new equipment or working procedures	Market prices, quotations, invoices, total wages of time spent
Additional costs of substitution products (recurring costs)	Price difference (e.g. monitoring equipment at ground level or permanent ladders)	Market prices, quotations, invoices
Purchase of personal protective equipment (recurring costs)	Costs of personal protective equipment	Market prices, quotations, invoices
Additional costs for changed working procedures and maintenance (recurring costs)	Price difference between old ways of working and new, directly related to the preventive action; note that new ways may also result in cost savings (e.g. extra costs to work according to safety standards)	Market prices, quotations, invoices
Extra work time of direct personnel (recurring costs)	Time spent on meetings, training, safety inspections, participatory developments	Total wages of time spent
Costs of internal or external OSH services, other preventive services (recurring costs)	Also includes occupational health services	Market prices, quotations, invoices
In-company activities	Human resource management, health promotion, safety policy and management	Total wages of time spent
Other workplace costs	Anything that is not covered in the previous headings	Market prices, quotations, invoices, total wages of time spent
Risk controls via underlying cultural changes		
Improvements in *Process design*	Educating designers and clients, training, improved risk perception.	Difficult to price as the quality of the action and its impact are more important than the quantity. The cost of not achieving improvements is probably easier to evaluate i.e. time for remedial work to designs.
Improvements in *Compliance*	Management and supervision, modifying *Company* and *Safety culture* and improved *Risk perception*.	Difficult to price as the quality of the action and its impact are more important than the quantity. (Cost of increased information and management/supervision is guide).
Regulatory costs		
Costs of policy-making, research and enforcement at national or sector level	Including labour inspectorates	Total expenditures and wages of relevant authorities and sector organisations

14.6 SUMMARY

In this section, frameworks have been provided for carrying out cost-benefit analyses for the individual, employers and the nation as a whole. The framework for employers can be used by individual organisations as a checklist in order to assess and compare various risk control options. The framework for the nation as whole would be used by the regulator (HSE) in carrying regulatory impact assessments of forthcoming legislation such as the Temporary Work at Height Directive.

Table 55 is presented as a summary of the average yearly costs to individuals, employers and society of accidents due to falls from height in the five industry sectors. These costs have been calculated from the number of falls accidents (given in Section 4.2) averaged over the five year period 1996/97 to 2000/01 and the costs to individuals, employers and society (given earlier in this section). From Table 55 it can be seen that falls cost a staggering £277m to society as a whole each year, with around £100m resulting from both the construction and service industries.

Table 55 Average costs per year of falls from height across various industry sectors between 1996/97 and 2000/01

Injury type		*Agriculture*	*Construction*	*Extractive utility supply*	*Manufact-uring*	*Service industries*	*Total*
Number of accidents							
Fatal (F)		9	45	1	9	15	79
Major (M)		145	1690	83	1206	2431	5555
Over 3-day (O)		129	1353	172	2205	4762	8621
Total		283	3088	256	3420	7208	14255
Cost to individuals							
F	£766,000	£6,894,000	£34,470,000	£766,000	£6,894,000	£11,490,000	£60,514,000
M	£10,600	£1,537,000	£17,914,000	£879,800	£12,783,600	£25,768,600	£58,883,000
O	£1,550	£199,950	£2,097,150	£266,600	£3,417,750	£7,381,100	£13,362,550
Total		£8,630,950	£54,481,150	£1,912,400	£23,095,350	£44,639,700	£132,759,550
Cost to employers							
F		£0	£0	£0	£0	£0	£0
M	£15,085	£2,187,325	£25,493,650	£1,252,055	£18,192,510	£36,671,635	£83,797,175
O	£443	£57,147	£599,379	£76,196	£976,815	£2,109,566	£3,819,103
Total		£2,244,472	£26,093,029	£1,328,251	£19,169,325	£38,781,201	£87,616,278
Costs to society							
F	£1,017,675	£9,159,075	£45,795,375	£1,017,675	£9,159,075	£15,265,125	£80,396,325
M	£29,960	£4,344,200	£50,632,400	£2,486,680	£36,131,760	£72,832,760	£166,427,800
O	£3,525	£454,725	£4,769,325	£606,300	£7,772,625	£16,786,050	£30,389,025
Total		£13,958,000	£101,197,100	£4,110,655	£53,063,460	£104,883,935	£277,213,150

15. RISK CONTROL TOOLKIT

15.1 INTRODUCTION

In this section, the work undertaken in the previous sections is drawn together in order to provide a toolkit for selecting effective risk control measures, setting performance targets and monitoring improvement. Given its generic nature, the toolkit is applicable both pan-industry and to the Regulator. The Toolkit is suitable for use by individual companies, industry trade associations for their member companies or sectors, or by the Regulator for either industry sectors or industry as a whole. It is suitable for identifying and evaluating a broad range of risk control measures, from choice of equipment through to Regulatory Policy setting.

15.2 TOOLKIT METHODOLOGY

The proposed methodology of the toolkit is set out step-by-step in the following text:

Step 1 – Define the scope

This step determines the direction and extent of the effort to be put into the following steps. Obviously, the scope will vary depending on whether the exercise is being carried out in-house, or whether benchmarking is required against other companies or a sector as a whole. In addition, it is necessary to determine what budget is justifiable (and available).

Step 2 – Establish baseline data

In order to monitor improvements in the future, it is necessary to establish what the current baseline is. The baseline incident and accident data can be collected in a variety of forms ranging from the number of incidents and accidents to the overall costs of such incidents and accidents. Such data can be collected internally, and perhaps pooled (anonymously) with other companies data via a trade association, in the same way as the IRATA and NASC schemes (see Sections 3.3 and 3.4). Cost data can be collected using the methodology outlined in Section 14. At the macro level, the RIDDOR data can be used as a baseline for the Regulator in evaluating national or sector performance (see Sections 4 and 5).

The basis for measurement of both the baseline and future data also needs to be established. For instance, a moving average may be used as this will smooth out any anomalies that may occur from year to year.

Step 3 – Set improvement targets

Improvement targets can be set in a number of ways, such as adopting those set as part of Re*vital*ising health and safety[2], or those set by CONIAC. Targets could also be based on proportions of the industry or sector values, or based on reductions in the net costs associated with incidents and accidents. These targets need to be appropriate, achievable and measurable and could usefully be based on an assessment of prior performance to eliminate the proportion where safety management failings could be identified.

Step 4 – Establish and quantify the baseline Influence Network

Identify relevant participants, convene an Influence Network workshop, and use the methodology described in Section 6.3.2 and use the briefing note provided in Appendix B to quantify the network in terms of ratings and weightings (along with the underlying reasoning). This will give a baseline view on the current state of an organisation, industry or sector based on the expert opinion of the participants. The quantified Influence Network can be correlated broadly with the baseline data using the procedure outlined in Section 6.6.

Step 5 – Identify potential risk controls

This can be done either in the same workshop used for Step 4, or a separate risk control workshop can be convened. Several approaches can be used to identify potential risk controls including getting the participant to identify risk controls for individual factors or potential routes of influence through the Influence Network. An initial step could be to look at the synergies within the reported workshops and implement the relevant measures. Analysis of the Influence Network can also be carried out as described in Section 6.7 in order to identify critical paths.

Step 6 – Evaluate the effectiveness of the identified risk controls

Once an agreed set of potential risk controls have been established and mapped onto the Influence Network, the workshop participants are then required to make an estimate of the amount by which the ratings of individual factors may increase (and over what timescale) if the potential risk controls were implemented successfully, bearing in mind the relative difficulties that may be involved in increasing the ratings of particular factors. The overall risk index is then recalculated for each of the identified risk controls, and an estimate made of the potential reduction in risk using the approach set out in Section 6.6.

Step 7 – Undertake cost-benefit analyses of the potential risk controls

Having made an estimate of the potential risk reduction for each risk control, the costs and benefits can be compared in order to inform the decision on which of the risk controls offer the most beneficial cost-benefit ratios. The methodology outlined in Section 14 can be used to carry out the cost-benefit analyses.

Step 8 – Select and implement the potentially most cost-effective risk controls

The data generated in Steps 7 and 8 can be used to inform the decision on which risk controls to implement. The chosen risk controls then need to be implemented bearing in mind the need to obtain measurements in order to evaluate the success of the risk controls.

Step 9 – Monitor data

Step 9 requires the key data to be monitored and measured in such a way that it can be compared with the baseline data and expectations about the changes the risk controls will bring.

Step 10 – Monitor other indicators

The ultimate measures of success will be the data obtained in Step 9. However, such data may not be available in the short-term, and it may be worth obtaining other (surrogate) indicators in order to evaluate whether the risk controls are having the desired effect or not. Such indicators may include the number of dangerous occurrences in organisations, or the sales of particular equipment or take up of particular training courses for the Regulator. Another option is to reconvene a meeting of the Influence Network participants in order to assess whether, in their experience, there have been any changes in industry that may lead to increases in factor ratings.

Step 11 – Evaluate performance and determine future strategy

The direct and indirect indicators obtained in Steps 9 and 10 provide a means of evaluating whether the strategies are working, if not why not and thus providing the opportunity to implement changes if necessary. This is an important step, as any data that is collected needs to be used in order to inform future strategy.

16. CONCLUSIONS

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

Objective 1 - Provide a definitive baseline for measuring improvements in the incidence rate of falls from height across a variety of sectors.

1. Within the bounds of the under-reporting of accidents, a baseline of accidents resulting from falls from height does exist.

2. Accident rates per 100,000 workers can be estimated. These indicate that the rate for falls from height whether they be high or low falls and whether they lead to fatal, major or over 3-day injuries is almost always highest in construction. The only exception is the rate for low fatal falls which is highest in agriculture but this is less significant given the relatively small number of accidents involved.

For the **agricultural** sector, study of the accident data indicated that:

3. Mixed farming is the dominant sector of agriculture, with most falls categorised as occurring there.

4. Low-level falls are primarily associated with ladders and vehicles.

5. High-level falls are primarily associated with maintenance work on roofs; in particular, falls through fragile roofing materials.

6. Farm workers appear to be involved in more reported accidents overall, but owners/managers are involved in more fatalities.

7. Age appears to be an issue, with significant numbers of fatalities involving those in their 50s and 60s, and well beyond. This significant skew towards older workers is unique to the agriculture sector.

8. The self-employed are involved in a significant number of reported accidents overall but less than employees, except for high falls, where the self-employed are involved in more fatalities.

For the **construction** industry, study of the accident data indicated that:

9. Similar sectors, occupations, work processes and agents are involved in both low and high falls, with roofing (high falls) and vehicles (low falls) being the primary exceptions.

10. Carpenters and joiners appear to have the most fall accidents. The work process with the largest number of falls is on-site transfer, followed by roofing for high falls. Ladders and scaffolds are most common agents for both low and high falls.

11. The highest proportion of falls accidents occurs among occupations that would not necessarily be associated with working at height i.e. painter, plasterer, glazier, plumber. Given that these trades are well represented in the data for both low and high falls whilst doing the same job, it would suggest that perhaps some of the high fall accidents involving fit-out workers/trades are occurring at heights not much greater than 2m.

12. The self-employed are involved in a significant number of accidents overall but less than employees

13. Given that the UK construction workload is split, almost equally, between new build work and work on existing structures with each sector having different risk profiles, mechanisms are required in the accident data recording to separate out new build work from that carried out on existing structures.

For the **extractive/utilities** industries, study of the accident data indicated that:

14. There are relatively few fatal falls in the extraction/utility supply industries.

15. The primary work process involved in low falls is on-site transfer, with the most significant agents being vehicles followed by ladders and stairs.

16. High falls primarily occur in on-site transfer followed by maintenance work and loading/unloading. Ladders are the primary agent involved.

For the **manufacturing** industries, study of the accident data indicated that:

17. The ship building/repair, steelwork and plastics industries have the largest incidence of both low and high level falls.

18. For low level falls, goods drivers, routine operatives and maintenance fitters have the greatest number of falls, with on-site transfer, loading / unloading and general maintenance being the work processes with the highest number of falls. Ladders and stairs are the agents involved in most low falls, with falls from ladders giving rise to more major injury accidents than stairs.

19. For high level falls, maintenance and electrical fitters have the most accidents followed by goods drivers. On-site transfer and general maintenance are the most common work processes involved in high falls, accounting for more than half of the number of falls that occurred due to the next most significant work processes, loading/unloading and general handling. The number of high fall accidents involving ladders is ten times that of the next agent, stairs.

For the **services** industries, study of the accident data indicated that:

20. Window cleaners are particularly associated with fatalities and also a considerable proportion of major injury high falls, although not low falls.

21. Goods drivers delivering freight by road are associated with both low and high falls with onsite transfer and loading/unloading being the related activities.

22. Maintenance work also features significantly for both low and high level falls.

23. Ladders are involved in the vast majority of high fall major accidents and many low falls, although stairs and vehicles are more common for the latter group.

24. Education, particularly primary education, has had a surprisingly high number of falls-related accidents over the last five years.

Overall, for **all** industries, study of the accident data indicated that:

25. There are few fatalities involving low falls. The dominant industry sector is construction building, but the goods driver is the dominant occupation as this occupation is applicable to several sectors.

26. High falls are dominated by construction in terms of overall numbers, but agriculture and construction have similar accident rates per 100,000 of population. On-site transfer is the most frequent activity leading to a fall, but roofing is most likely to kill if a fall occurs. Ladders are the most common agent.

27. The agent which dominates in falls across all industries is ladders. Ladders are the most common agent in all major injury falls across industry and are implicated in a considerable proportion of fatal falls.

28. In construction and agriculture, falling through fragile roofs appears to be the most important agent in fatalities.

29. In terms of low falls and over 3-day injuries, stairs are also dominant, particularly in the manufacturing and services sectors which are largely indoor-based industries.

30. Vehicles often emerge as the accident agent especially in service industries, which follows from the finding that drivers are frequently involved in falls across all sectors. This relates to goods drivers in extraction/utilities, manufacturing and services, agricultural machinery drivers and a number of drivers in construction, although the highest number of falls occur in services where road haulage businesses are assigned, followed by manufacturing.

31. On-site transfer, which relates to the movement (on site) of materials between processes by manual or mechanical means, and loading/unloading are work processes which are commonly associated with falls across all sectors. However, the RIDDOR coding does not differentiate between loading and unloading.

32. Maintenance also frequently appears as an activity related to falls, and this ties in with the finding that electrical and maintenance fitters are groups involved in a considerable number of falls in all sectors except agriculture.

33. Only in Agriculture and Construction are there a significant number of accidents to the self-employed in comparison with the number of accidents involving employees. Particularly in relation to fatalities (where reporting levels are at their highest).

Objective 2 - Provide a quantified model of the influences affecting falls from height covering human, hardware and external factors for a variety of sectors.

34. The generic Influence Network has been customised to reflect the factors considered to influence falls from height. This model has been used in each of the workshops, with further customisation of the factor definitions to reflect any sector-specific issues.

35. Based on the analysis of the accident data, and consideration of specific risk profiles and industry issues, it was decided to develop quantified Influence Network models for: Agriculture, Construction (separate models for new build and existing structures), Specialist/Utilities, Roofing and Transport.

36. Quantified Influence Network models have been developed and analysed for: Agriculture, Construction (separate models for new build and existing structures), Specialist/Utilities, Roofing and Transport. These are presented in the relevant sections.

Objective 3 - Consult with key stakeholders through workshops to obtain a consensus view on the key issues relating to falls from height and the measures available to prevent and control those risks.

37. Six Influence Network models have been held for: Agriculture, Construction (separate workshops for new build and existing structures), Specialist/Utilities, Roofing and Transport. Numerous stakeholders participated, representing the views for each of the sectors.

38. The Influence Network workshops were used to address both the underlying causes of falls from height, and potential risk controls.

For the **agricultural** sector, study of the underlying influences indicated that:

39. Different sectors of agriculture were represented at the workshop including farming, agricultural contractors and arboriculture, and different ratings and weightings were obtained for each.

40. Due to differences between these sectors of the industry, the analysis was divided into farming on one side and contractors/arborists on the other. The only difference between contractors and arborists was that *process design* is not relevant in arboriculture.

41. As many farmers are self employed owners there is no separate *Policy* level above them. Instead, there is effectively only one layer of organisation / management / culture in farming which may encompass factors normally found at the *Policy* level such as *safety management*, *company culture*, *contracting* and *labour relations*. The network was, therefore, further customised after the workshop to better represent the structure of farming

42. For farmers, at the *Direct* level, *competence, situational awareness/risk perception, suitable human resources* and *operational/safety equipment / PPE* emerge as the

important factors. At the *Organisational* level, *training, planning, management/supervision* and *ownership and control* are most significant followed by *safety culture* and *contracting. Market* and *Regulatory* influence stand out at the *Environmental* level.

43. For agricultural contractors and for arborists the factors at the *Organisational* and *Policy* levels of the Influence Network were considered to be relevant. The factors identified to be most important for agricultural contractors and for arborists match those which for farming at the *Direct* and *Organisational* levels. At the *Policy* level (not applicable to farming), *company culture* and *safety management* were highlighted as significant influences. As with farming, the *market* and the *Regulator* were deemed to have most influence at the *Environmental* level.

For the **construction** industry, study of the underlying influences indicated that:

44. Of the factors that have a *Direct* influence on falls from height, *competence*, *situational awareness / risk perception* and *compliance* have been readily identified as being amongst the most significant factors. These are followed by *operational equipment*, *safety equipment / PPE* and *environmental conditions*.

45. Of the *Organisational* level factors, the primary influence on falls from height are *training*, *management and supervision* and *process design* stand out as the most significant factors at the *Organisational* level, followed by *planning*, *communications* and *safety culture*.

46. Of the *Policy* level factors, *company culture* and *health and safety management* stand out as the most significant influences. Given the discussions at all three workshops about the potential (and need) for the client to exert his influence over health and safety, *contracting strategy* can be considered as following at the next level of significance.

47. Of the *Environmental* level factors, the *Regulatory* and *Market* influences are far more significant than the *Political* or *Social* influences overall. However, it was difficult to obtain a consensus view between the workshops as to the specific influence of the *Market*.

For **roofwork**, study of the underlying influences indicated that:

48. At the *Direct* level, *competence, situational awareness / risk perception, communications, information / advice, conditions* and *equipment operability* were judged to have a high influence with no other factors above medium.

49. At the *Organisational* level, *training* and *safety culture* are the most significant followed by *procedures, planning, management / supervision* and *organisational communication.*

50. The *Policy* factors with the greatest significance are *contracting strategy, company culture* and *safety management.*

51. At the *Environmental* level, the *Regulatory* and *market* influences were judged to be most significant.

For the **specialist / utility** industries, study of the underlying influences indicated that:

52. There are distinctions between the specialist rope access organisations and the utility companies. As such, ratings were recorded for each, with variations for other parts of the industry such as powered access noted where appropriate.

53. The ratings tended to fall into two groups with professional rope access companies towards the high end of the scale and certain parts of utilities and smaller operators at the other end of the scale.

54. At the *Direct* level, *competence, situational awareness* and *information/advice* were thought to have a high potential influence followed by *operational equipment* and *safety equipment/PPE*. None of the other *Direct* factors were regarded as having a significant influence since they were judged to have low weightings in the workshop.

55. At the *Organisational* level, *training, planning* and *management / supervision* emerge as the most important factors with *communications* and *safety culture* following behind.

56. These factors are underpinned by *contracting strategy, company culture* and *safety management* at the *Policy* level.

57. The *Market* and *Regulatory* influences were ranked as having most influence at the *Environmental* level.

58. The factors which appear to have the most positive influence on the excellent safety record in specialist occupations are considered to be:

   - The strict system of *training* workers for rope access ensures a high level of *competence* and *supervision* throughout the industry.

   - The nature of rope access work means that often workers have no option but to *comply* with procedures i.e. unless they follow the method statement they cannot reach the place of work. This makes it easier to build safety into the work.

   - Rope access work seems to give workers a better appreciation of the hazards involved with working at height. People have a strong interest in what they do and their personal safety and this has helped to build a good *safety culture*.

   - Rope access workers have a firm understanding of which *equipment* should be used for particular jobs and how this equipment should be looked after.

   - Rope access companies take strong *ownership* of safety and often demand higher standards than the client. Safety is used as a marketing tool and is part of the *contractual arrangements* to ensure roles and responsibilities are clearly defined.

For **transport / goods delivery** industries, study of the underlying influences indicated that:

59. At the *Direct* level, *competence, situational awareness / risk perception, communications, information / advice, conditions* and *equipment operability* were judged to have a high influence with no other factors close.

60. At the *Organisational* level, *training* and *safety culture* are the most significant followed by *procedures, planning, management / supervision* and *organisational communication.*

61. The *Policy* level factors with the greatest significance are *contracting strategy, company culture* and *safety management.*

62. At the *Environmental* level it is the *Regulatory* and *Market* influences which are thought to be strongest.

Considering **all** of the workshops, and taking a **pan-industry** view:

63. Based on a combination of the workshop discussions and analyses, it has been possible to identify the factors, at each level, most commonly being significant in the incidence of falls from height across all industry. Whilst there were obviously sector-specific issues, there was considerable commonality between the sectors.

64. At the *Direct* level, *competence*, *risk perception*, *compliance* and *operational equipment* regularly appear as being the most significant factors.

65. At the *Organisational* level, *training*, *management/supervision*, *safety culture* and *process design* regularly were regularly judged as being significant.

66. At the *Policy* level, *company culture* and *safety management* were considered most significant.

67. At the *Environmental* level, the *Market* was considered to be most significant. However, the *Regulator* was considered to offer the greatest potential for influence.

Objective 4 - Identify and compare the effectiveness of alternative measures to prevent and control the risk of falls from height in order that efforts can be targeted most appropriately.

68. A wide range of potential risk controls have been identified, both at the workshops and from subsequent analysis of the Influence Network.

For the **agricultural** sector, potential risk control measures include:

69. Improving *situational awareness / risk perception* such that farmers (and their families) are aware of the risks that they face.

70. Developing a *safety culture* among farmers such that safety is an inherent primary consideration.

71. Developing a *company culture* among agricultural companies such that safety is on the agenda at all levels.

72. Improving the availability of *operational and safety equipment*, perhaps through machinery rings such that farmers have readily access to suitable equipment rather than improvising with the equipment that they have.

73. Using insurance policies / terms as a driver to discourage farmers from working on roofs.

74. The provision of *suitable information* and the role of HSE as instigator underpin these potential risk control measures.

For the **construction** industry, potential risk control measures include:

75. The need to take action to raise the *situational awareness* and improve the *risk perception* of workers.

76. Achieving *compliance* on site such that if safe methods of working are provided, they are used.

77. Recruiting *suitable workers* into the industry, particularly in London and the South-east where the skills shortage is most chronic.

78. Improving selection, use and maintenance of *safety equipment*. Whilst suitable equipment is available on the market, the key issue is ensuring that companies are aware of the equipment, select the right equipment for the job, actually use that equipment (properly) and maintain it in working order.

79. Providing a better *trained* workforce perhaps through the uptake of schemes such as the CSCS scheme.

80. Better *planning* and appropriate method statements such that the work process is thought through beforehand and the risks managed in the most appropriate way.

81. Improving the *safety culture* of the construction industry (both individuals and organisations). This is obviously a major long-term undertaking that would not be easy. However, the current *culture* was felt to underpin many of the current problems and thus needed modification.

82. Using better design to eliminate hazards and reduce risks. *Designers* are the only stakeholders who have the ability to eliminate the hazards and reduce the risks significantly. They were felt to have a significant role to play, but were not currently doing so.

83. The role of the *Regulator* underpins many of the potential risk controls. In addition, it was felt that HSE had a major role to play in general, including further providing information, advice and best practice along with greater prescription and tougher enforcement.

For **roof work**, potential risk control measures include:

84. The need to take action to raise the *situational awareness* and improve the *risk perception* of workers.

85. Achieving *compliance* on site such that if safe methods of working are provided, they are used.

86. Improving selection, use and maintenance of *safety equipment*. Whilst suitable equipment is available on the market, the key issue is ensuring that companies are aware of the equipment, select the right equipment for the job, actually use that equipment (properly) and actually it in working order.

87. Encouraging the use of more relevant *procedures* with the right level of appropriate detail.

88. Improving *supervision* as a means of improving *compliance* and *safety culture*.

89. Using better *design* to eliminate hazards and reduce risks. *Designers* are the only stakeholders who have the ability to eliminate the hazards and reduce the risks significantly. They were felt to have a significant role to play, but were not currently doing so.

90. Encouraging better client *ownership* such that health and safety are considered in contracts.

91. *Training*, and the role of the *Regulator* were felt to be cross-cutting issues that underpinned the potential risk control measures.

For the **specialist / utility** industries, the potential risk control measures were primarily those measures that were identified as leading to the good safety record of the specialists, and are thus have potential for transfer to others within the sector and other sectors. These include:

92. Raising the levels of *competence*.

93. Raising the levels of *situational awareness* / *risk perception*.

94. Improving the standard of *information and advice*.

95. Improving the quantity and quality of *management and supervision*.

96. Improving *incident reporting* and information flow.

For **transport / goods delivery** industries, potential risk control measures include:

97. Encouraging a greater take-up of *training* particularly among smaller operators.

98. Raising the *situational awareness* of drivers.

99. Improving *communications* between haulage firms and the destination site to ensure that adequate provisions are in place for unloading.

100. Improving *design* and use of *equipment* including vehicle lock-ins at loading bays, unloading tankers from the bottom and access/egress from cabs and trailers.

101. Improving *safety culture* such that health and safety are always on the organisational agenda and at the forefront of people's minds.

Considering a **pan-industry** view, a risk control workshop was held, and the conclusions are that:

102. Six key issues for risk control were identified: *competence* and *training*; *risk perception*; *compliance*; *management and supervision*; *process design*; and *safety culture*.

103. *Equipment* issues were not selected as one of the key issues as it was felt that the quality of *equipment* was good, but it was whether the correct equipment was specified, used (properly) and maintained.

104. The six key issues essentially reduce to two key themes: achieving *Compliance,* and improved *Process design* for work at height.

105. Using the Influence Network, it is possible to plot the routes of influence for these two themes. Improvements leading potentially to risk reductions of around 30% have been indicated.

106. Considering *Compliance*, the following three areas need to be addressed:

- Direct *Political* and *Regulatory* influence
- *Compliance* through *management and supervision*
- Improving *compliance* through *culture* and *risk perception*

107. Considering *Process design*, the following three areas need to be addressed:

- *Political* and *Regulatory* influence on designers
- Client influence on designers
- Improvements in designer *training*, *information* and *communications*

Objective 5 - Provide a toolkit for selecting effective measures, setting performance targets and monitoring improvement.

108. A *Toolkit* has been provided in which the work undertaken in this project is drawn together in order to provide a framework for selecting effective risk control measures, setting performance targets and monitoring improvement.

109. The 11-step *Toolkit* is generic, applicable both pan-industry and to the Regulator. The Toolkit is suitable for use by individual companies, industry trade associations for their member companies or sectors, or by the by the Regulator for either industry sectors or industry as a whole. It is suitable for identifying and evaluating a broad range of risk control measures, ranging from choice of equipment through to Regulatory Policy setting. The sector studies within this project provide a useful starting point.

17. RECOMMENDATIONS

17.1 GENERAL RECOMMENDATIONS

The following recommendations are presented as offering the greatest potential to reduce the hazards and risks associated with falls from height in industry. Detailed industry-specific risk control measures are discussed in Sections 7.7, 8.8, 9.7, 10.7, 11.7 and 13.6 of this report and summarised in the conclusions. The recommendations in this section centre on the following four key pan-industry themes that should be addressed in the manner most appropriate to each sector:

1. Improvements should be made in *Compliance*

Compliance appears to be one of the major issues. There appears to be sufficient guidance and equipment available. The difficulty is ensuring that people are aware of the potential risks, and actually use guidance and equipment that are available.

This appears to be a pan-industry problem, with each industry requiring its own solutions tailored to the particular problems and the cultures, structures and influence paths of those industries. Implementation plans need to be developed along with the HSE inspectors in the relevant sectors in order to see how the sector stakeholders can be mobilised to address the specific risk controls presented in this report.

2. Improvements should be made in *Process design*

Designers appear to be the only stakeholders who are able to eliminate the work at height hazard or significantly reduce the risks associated with these hazards. The feeling in the workshops was that designers are not currently making these contributions and workers are being required to work at height or perform awkward tasks unnecessarily.

Not only does the HSE need to exert its influence on designers, but clients need to be brought on board such that they can demand that designers consider safety in their work. In addition to this influence designers need to be helped by the provision of suitable information and training at all stages of their career such that they are aware of the implications of their decisions and the potential options.

3. Awareness needs to be raised of the risks associated with low-level falls

Low falls have contributed around 60% of the non-fatal accidents and injuries due to falls over the last five years. A large number of these falls occur when working off ladders and platforms, going up and down stairs or working on or around goods vehicles. Whilst work at high level has a high profile, these lower level activities are seen as everyday tasks with little associated risk perceived. A two-prong approach is required. Specific sectors need to be targeted and understood, and awareness of the potential problems needs to be raised such that the relevant industries are encouraged to tackle the problems.

4. The economic benefits of better health and safety need to be demonstrated

There have been numerous mentions in this report of the need to address industry culture such that health and safety are high on the agenda. However, this may take some time.

Cost and cost reduction are an integral part of the current culture in UK industry, 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. A *Toolkit* has been presented in this report for identifying risk controls and carrying out cost-benefit analyses. This should be used in conjunction with a number of pan-industry examples 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 business culture.

17.2 RECOMMENDATIONS FOR FUTURE WORK

1. The issues surrounding low-level falls, particularly in relation to fit-out work, need to be investigated in detail in order to determine the best routes to raise the level of perception of the everyday risks associated with working at (low) height with painters, plasterers, electrical fitters etc.

2. The issues surrounding falls on stairs need to be addressed. As falls from stairs are so numerous, reducing the number of falls could make a significant impact on the Re*vital*ising targets. The interaction between surface conditions (in initiating a 'trip') fall consequences of being at height need to be understood.

3. Further work is required to understand the situation relating to *process design*, in particular, what the key levers are to encourage designers to eliminate the need for work at height at all stages of the process or to ensure work can be conducted as safely as possible. Particular attention should be construction-related activities whether for construction or maintenance of the structure of subsequent use of the facilities.

4. Further work is required to investigate the routes to improving the *safety culture* within UK 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. It must also reflect the traditional culture within the sector.

5. Detailed cost-benefit analyses of real-life case studies are required in order to demonstrate the benefits of good health and safety.

6. Having identified the '*Market* influence' as being of fundamental importance in this work, there is a significant need to explore sub-influences on companies such as economics, finance and insurance and their inter-relation in generating risk and/or providing incentives for risk reduction. This can be done using the Influence

Network, in order that more strategic policy areas for risk management and control can be identified.

18. REFERENCES

1 BOMEL Limited: *Improving Health and Safety in Construction: Phase 1 – Data collection, review and structuring*, HSE Contract Research Report CRR 387/2001 2001 (available for download free of charge from www.hse.gov.uk).

2 Department of the Environment, Transport and the Regions: *Revitalising Health and Safety – strategy statement – June 2000*, DETR, July 2000.

3 Health and Safety Commission: *Strategic Plan2001-2004*, www.hse.gov.uk.

4 *Health and Safety at Work etc Act, 1974*, HMSO, 1974.

5 Health and Safety Executive: *Health and Safety Regulation – A short guide*. http://www.hse.gov.uk/pubns/hsc13.htm.

6 *Management of Health and Safety at Work Regulations*, 1999.

7 *Safe use of work equipment. Provision and Use of Work Equipment Regulations 1998*, Approved Code of Practice and Guidance L22, HSE Books, 1998, ISBN 0 7176 1626 6.

8 *Safe use of lifting equipment. Lifting Operation? and Lifting Equipment Regulations 1988*, Approved Code of Practice and Guidance L113, HSE Books, 1998, ISBN 0 7176 1628 2.

9 *Construction (Health, Safety and Welfare) Regulations*, 1996.

10 *Construction (Design and Management) Regulations*, 1994.

11 European Parliament: *Directive 2001/45/EC of The European Parliament and of The Council of 27 June 2001 amending Council Directive 89/655/EEC concerning the minimum safety and health requirements for the use of work equipment by workers at work (second individual Directive within the meaning of Article 16(1) of Directive 89/391/EEC)* (available for download from www.hse.gov.uk).

12 Health and Safety Executive: *Health and safety in construction*, HSG 150 (rev 1), HSE Books. 2001.

13 Health and Safety Executive: *Health and safety in roof work*. HSG 33. HSE Books, 1998.

14 Health and Safety Executive: *LOLER: How the Regulations apply to Arboriculture*. Agricultural Information Sheet AIS 30.

15 Health and Safety Executive: *Preventing falls from roofs in agriculture*. Agricultural AIS 32.

16 Health and Safety Executive: *Tower scaffolds*, Construction Information Sheet No 10.

17 Health and Safety Executive: *General access scaffolds and ladders*, Construction Information Sheet No 49.

18 Health and Safety Executive: *Preventing Falls From Height in the food and drink industry*, Food Information Sheet No 30.

19 OSHA: *Construction Resource Manual* (available from www.osha-slc.gov/Publications/Const_Res_Man/index.html).

20 OSHA: *Fall protection in construction*, Publication 3146, 1998, 43 pages (available from www.osha-slc.gov/SLTC/fallprotection.html).

21 OSHA: *Fall protection – It's a snap* (available from www.osha-slc.gov/Region7/fallprotection/).

22 OSHA: *Stairways and ladders*, Publication 3124, 1997, 18 pages (available from www.osha-slc.gov/SLTC/fallprotection.html).

23 The Occupational Safety and Health Service of the Department of Labour: *How to Avoid Falls From Heights*, Health and Safety Construction Bulletin No. 1, October 1998, 2 pages.

24 The Occupational Safety and Health Service of the Department of Labour: *Guidelines for the Prevention of Falls To Meet the Requirements of the Health and Safety in Employment Act 1992 and Regulations 1995*. April 2000. 69 pages.

25 Site Safe New Zealand: *Working at Height Safety Guide - Best Practice Guidelines for Working at Height – for Residential, Commercial & Civil Construction, and all associated trades*, June 2000, 44 pages.

26 Department of Minerals and Energy Western Australia: *Mine safety matters – Working at height*, June 2001, 2 pages.

27 Workplace Safety Board of Tasmania and Workplace Standards Tasmania: *Working at height - A guide to reducing the risks of injury while working at height working at height*, GB109, September 2000, 20 pages.

28 Victorian WorkCover Authority: *Code of Practice No. 10 - Safe work on roofs (excluding villa construction)*, 1989, 22 pages.

29 Victorian WorkCover Authority: *Code of Practice No. 22 - Safe Work on Roofs (Excluding Villa Constructions) Amendment*, 26 February 1998, 4 pages.

30 *Draft Occupational Health and Safety (Prevention of Falls) Regulations 2000*. Draft 11, 4 October 2000, 11 pages.

31 Government of Western Australia: *Prevention of Falls at Workplaces*, Code of Practice, September 1997, 73 pages.

32 Health and Safety Executive: *Guide to the Reporting of Injuries, Disease and Dangerous Occurrences Regulations 1995*, HSE Books, 1996.

33 Health and Safety Executive: *The Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995*, RIDDOR, SI No 3163, HMSO, 1995.

34 Health and Safety Executive: *FOCUS Data Handbook*, Version 2.0, undated.

35 BOMEL Limited: 'Improving Health And Safety in Construction Phase 2 - RIDDOR Data Management And Analysis Tool', BOMEL Reference C1021\03\011R, May 2002.

36 National Access and Scaffolding Confederation: *Safety report 1999*, 4 pages.

37 National Access and Scaffolding Confederation: *Safety report 2000*, 8 pages.

38 Industrial Rope Access Trade Association: *Report on accident statistics 1997*, ISBN 0 9523227 3 0, 8 pages, 1999.

39 Industrial Rope Access Trade Association: *Report on accident statistics 1998*, 4 pages, 1999.

40 Industrial Rope Access Trade Association: *Annex A - Summary of accident returns for 1999*, 5 pages, 2001.

41 BOMEL Limited: *Improving Health and Safety in Construction Phase 2 – Volume 4: Hand Arm Vibration Syndrome Underlying causes and risk control in the construction industry*, HSE, September 2002. (To be published).

42 European Agency for Safety and Health at Work: *Inventory of socio-economic costs of work accidents*, Luxembourg, ISBN 92-950007-67-0, 46 pages, 2002.

43 Health and Safety Executive: *The costs to Britain of workplace accidents and work-place ill-health in 1995/96*, Second edition, HSE Books, 1999, ISBN 0 7176 1709 2.

44 Health and Safety Executive: *Reducing risks, protecting people*, HSE Books, 2002.

45 Health and Safety Executive: *Costs of accidents and injuries*, www.hse.gov.uk/costs.

46 Hallett, N: 'The role of cost-benefit analysis in decision-making – The UK experience', *Health and safety at work – A question of costs and benefits?*, Issue 1, 20 December 1999, http://agency.osha.eu.int/publicatons/magazine/.

47 HM Treasury: *Appraisal and Evaluation in Central Government ('The Green Book')*, Second edition, The Stationery Office, 1997.

APPENDIX A

ACCIDENT CAUSATION WORKSHOP

BRIEFING NOTE

FALLS FROM HEIGHT IN ROOFING

INFLUENCE NETWORK WORKSHOP

MAY 2002

BRIEFING DOCUMENT

1. AIMS AND OBJECTIVES OF BRIEFING DOCUMENT

The aim of this briefing document is to provide you with enough background material to prepare you for the Influence Network workshop on Falls from Height in Roofing to be held at the BOMEL offices near Maidenhead on 30 May 2002 at 9.30am.

This short document:

- Defines the overall objectives of the project.
- Defines the objectives of the workshop.
- Describes the background to the approach.
- Describes the falls from height issues to be considered in the workshop.
- Provides a customised diagram for consideration prior to and during the workshop.
- Defines the factors considered to influence falls from height.

2. PROJECT OBJECTIVES

This is a pan-industry project considering falls from height and their risk control and prevention measures across a variety of industries. The primary objectives of this project are:

- To provide a definitive baseline for measuring improvements in the incidence rate of falls from height across a variety of sectors.

- To provide a quantified model of the influences affecting falls from height covering human, hardware and external factors for a variety of sectors.
- Identify and compare the effectiveness of alternative measures to prevent and control the risk of falls from height in order that efforts can be targeted most appropriately.
- To consult with key stakeholders through workshops to obtain a consensus view on the key issues relating to falls from height and the measures available to prevent and control those risks.
- To provide a toolkit for selecting effective measures, setting performance targets and monitoring improvement.

3. WORKSHOP OBJECTIVES

The key objectives of this workshop are based on the second and fourth project objectives as follows:

- Identify the factors that influence falls from height in roofing.
- Rate these factors in terms of current practice and their influences on other factors.
- Identify possible risk control measures.

4. BACKGROUND

Influence Networks have been used, for example, within the Formal Safety Assessment (FSA) methodology developed to inform shipping regulators. The FSA methodology provides a rational and systematic approach for assessing risks associated with a particular activity, and for evaluating the costs and benefits of different ways of reducing those risks. Thus FSA is a tool to assist decision-makers, and aims to achieve a balance between technical and operational issues, and between safety and costs. Additionally, by recognising the roles of different stakeholders, and by taking account of the human element, the use of FSA should facilitate changes equitable to all affected parties.

Within the overall process, it is clearly important not only to assess risk, but to develop an understanding of the factors which influence the level of risk. Attention can then be focused upon strengthening factors which have the greatest influence. Influence Networks fulfil this purpose, since they provide a structured means for identifying and assessing the various factors that bear upon the risk of a particular type of accident. In particular, Influence Networks are structured so as to categorise influences into a hierarchy of factors, some being remote (such as the political and market environment) and some being more direct (such as the suitability of PPE and the competence of operatives). Furthermore, the diagrams allow judgements to be made regarding the relative strength of these different influencing factors, so that significant factors can be identified and addressed, thus improving safety.

5. CONTEXT

Falls from height are a considerable cause for concern and measures to improve safety are being sought. For example, the recent blitz by HSE inspectors on 223 construction sites in London resulted in 110 Prohibition Notices being served, 90 of which were for falls from height. Use of the Influence Network can structure thinking on the problem, ensuring that a wide range of risk control options for falls from height are identified and their potential impact assessed. The Network enables behavioural factors to be captured alongside hardware considerations and external elements which all affect safe working.

The focus for this workshop will be on falls from height in roofing. The risk of falls to roofers is significant since this group account for 28% of all fatal falls in construction from 1996 to 2001 which is the largest proportion of any occupational group. The roofing activities which we are interested in are:

- Slating and Tiling – including clay, concrete, natural and man made slate, steel, bitumin and wooden shingles and shakes.

- Sheeting and Cladding – including profiled self supporting fibre cement, steel, aluminium and fully supported metals with fillers, sealants, fixings and fastners and roof lights.

- Flat Roofing – including built up felt roofing, single ply, mastic asphalt, liquid applied waterproofing and dry seal.

Many of the factors influencing falls from height in these jobs may be common to other work. However, we aim to capture those which are specific to the working locations and the work processes in roofing. The overall purpose of the workshop is to identify the strongest influences on falls from height in roofing and identify possible risk control measures to improve safety.

6. INFLUENCING DOMAINS

Most accidents are caused by a complex combination of events; they do not happen in isolation, but are part of a wider system of causal factors. This is shown in Figure 1 as a set of nested systems or domains that influence the performance of people and hardware in a hazardous situation. The effect of each domain on the others can be characterised by a set of influences, each having a potential effect on any influence within the enclosed domains. All of these influencing domains interact in the causes of accidents, and are also the areas where error prevention and risk control measures can be introduced.

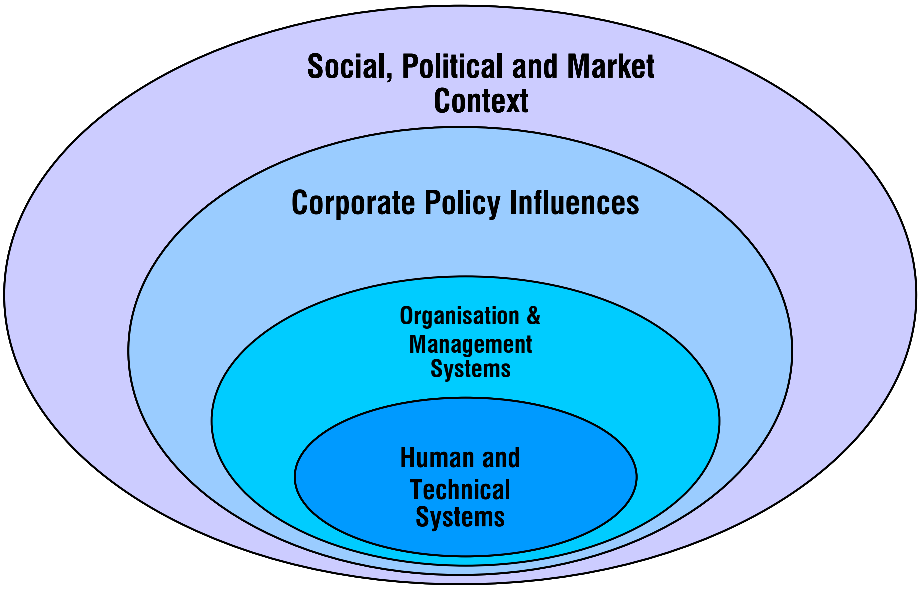


Figure 1 Nested System of Influences

Effective safety management requires a clear understanding of the various technical, human and organisational factors that affect risk, and of the influence that each of these factors exerts. Influence Networks have been developed to deal with the complexity of factors which can influence a particular undesirable event.

7. THE INFLUENCE NETWORK

An Influence Network is a model representing the various factors that influence the occurrence of an undesirable event such as a specific kind of accident. The development of an Influence Network involves the definition of the event under consideration and the identification of the hierarchy of influences upon the event.

Figure 2 illustrates the typical composition of an Influence Network, and the various levels of influence that can be identified. This diagram has been refined in the course of many studies to reflect the potential influences on people's health and safety across a variety of industries. Within the workshop session, the diagram will be customised to reflect your expert judgement about critical influences on falls from height in roofing.

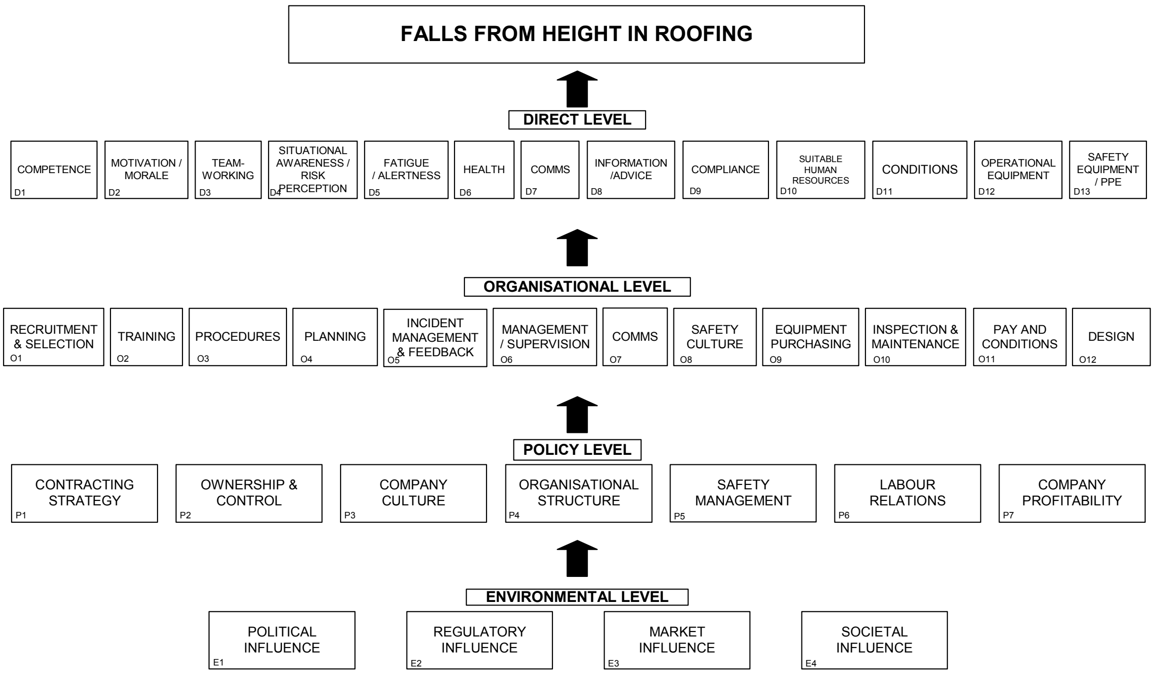


Figure 2 **Influence Network**

Within the diagram, there are four levels of influencing factors, reflecting the domains shown in Figure 1:

- **Direct Level**, which refers to unsafe acts and/or technical failures immediately related to the accident.

- **Organisational Level**, which refers to the underlying organisational factors for each company, contractor, subcontractor etc. at the worksite, and the workplace conditions that have an impact on the occurrence of the accident.

- **Policy Level**, which comprises the policy factors that determine the organisational processes, stemming from the Client, the overall Project Management and the 'head offices' of the individual companies, contractors etc.

- **Environmental Level**, which refers to the regulatory and wider external influences that determine organisational policies and processes.

Within each level, there are several potential influencing factors. The factors have been defined in the context of falls from height in roofing (see Annex A). These definitions and the associated descriptions of best and worst practice will be debated and refined in the workshop. Based on these scales, current practice in each area will be 'rated' on a scale of 0 (poor) to 10 (excellent) in the context of work which could lead to falls from height in roofing.

In the next stage, the relative strength of the influences at one level will be assessed in terms of their impact on the influences at the level above. A quantitative 'weighting' will be assigned.

With these weightings and ratings in place, a risk index can be calculated. The impact of risk control measures to modify the underlying influences can then be assessed in terms of the impact on this risk index.

8. THE WORKSHOP SESSION

Within the workshop session the aim is to customise the Influence Network to reflect the critical influencing factors on falls from height in roofing. The quality of each of these factors will be rated and the importance will be weighted.

Prior to the workshop it would be useful if you could familiarise yourself with the Influence Network and think about the kind of influences that would have a bearing on falls from height in roofing as well as general aspects of safety within construction. If you feel that the influences identified do not completely reflect all relevant factors then this can be explored within the session. No other preparation is required, and the full procedure will be explained on the day.

We look forward to seeing you there.

Further information can be obtained from Helen Bolt, Mike Webster or David Jamieson at BOMEL Tel: 01628 777707 Fax: 01628 777877 Email: davidjamieson@bomelconsult.com.

APPENDIX A
INFLUENCE NETWORK FACTORS

Direct Level Influences

This refers to the immediate workplace factors that have a bearing on the human and technical conditions that can lead to unsafe acts and/or technical failures that are responsible for the accident.

D1 - Competence	
The skills, knowledge and abilities required to perform particular tasks safely.	
Poor	Operatives cannot perform work at height safely without direct instruction and supervision. They have little or no knowledge of either the operational or safety equipment which should be used. They have little or no understanding of their responsibilities when working at height.
Moderate	Operatives can work safely at height in most situations, but need assistance with complicated or novel task situations. They are able to utilise equipment only in normal operations. They have a basic understanding of their responsibilities when working at height.
Excellent	Operatives can perform all tasks safely while working at height even 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 when working at height.

D2 - Motivation / Morale	
Workers incentive to work towards business, personal and common goals.	
Poor	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 safety issues such as falls from height is low.
Moderate	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 safety issues such as work at height if they can be presented as important enough.
Excellent	Workers are positive and optimistic about their jobs and conditions and are proactive in relation to safety. They demonstrate high levels of commitment to high quality work and preventing falls from height.

D3 - Teamworking	
The extent to which individuals work in teams and look out for each other's interests.	
Poor	People work on individual work fronts and rarely interact to talk about safety. There is negative peer pressure (with respect to safety) in that people are expected to get on with working at height irrespective of risks and well intended advice is perceived as interference.
Moderate	People work in teams some of the time. They will sometimes discuss safety and may look out for each other in terms of certain hazards but not always falls from height.
Excellent	There is positive interaction within teams, with people actively looking out for each others safety including falls from height. There is positive peer pressure and advice regarding work at height is welcomed.

D4 - Situational Awareness/Risk Perception	
The extent to which workers are aware of the hazards and risks associated with falls from height.	
Poor	Lack of awareness of fall from height hazards and disregard of the risks.
Moderate	Acknowledgement of fall from height hazards and risks but little effort towards behaviour modification.
Excellent	Clear recognition of fall from height hazards and risks with appropriate behaviour modification to compensate.

D5 - Fatigue/Alertness	
The degree to which performance is degraded, for example, through sleep deprivation, excessive mental or physical activity, or the effects of drugs / alcohol.	
Poor	People are drowsy or tired leading to poor judgements and unnecessary risks while working at height.
Moderate	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 the risk of falls.
Excellent	People are exceptionally alert, vigilant and attentive and always make good decisions about working at height in order to minimise the risks.

D6 - Health	
The well being of body and mind of the workforce.	
Poor	There are relatively high levels of poor physical health, e.g. musculoskeletal, which increases the risk of fall accidents.
Moderate	Any sickness or injury is minor or transient and will only temporarily affect capacity for work, e.g., headache, flu etc.
Excellent	Levels of sickness and injury are low. Capacity for work is at its peak.

D7 - Communications	
The extent to which the frequency and clarity of communications are appropriate for ensuring effective task and team work.	
Poor	In relation to work at height, communication is unclear, unreliable or too infrequent resulting in poor task/team work.
Moderate	In relation to work at height, communication is usually clear, timely, and reliable, but deteriorates occasionally.
Excellent	In relation to work at height, communication is always clear, reliable, timely and appropriate for those who require the information, resulting in effective task/team work.

D8 - Information / Advice	
The extent to which people can access information that is accurate, timely, relevant and usable.	
Poor	Information on work at height is too frequent or infrequent, unobtainable, irrelevant, incomplete or difficult to interpret.
Moderate	Information on work at height is obtainable and relevant, but at times is difficult to interpret or too infrequent.
Excellent	Information on work at height is accessible, understandable, relevant, complete and timely.

D9 - Compliance	
The extent to which people comply with rules, procedures or Regulations.	
Poor	Rules, procedures and Regulations on working at height are frequently violated or not followed at all.
Moderate	Rules, procedures and Regulations on working at height are followed without consideration of their appropriateness to the context.
Excellent	Rules, procedures and Regulations on working at height are complied with and due consideration to the appropriateness of the context is always given.

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.	
Poor	There is a lack of workers with the necessary experience and knowledge for working at height. People will be stressed, and / or experience excessive workload.
Moderate	Workers with knowledge and experience of working at height are available most of the time but occasionally people are overstretched.
Excellent	There is a stable and regular supply of workers that possess the appropriate experience and knowledge for working at height.

D11 - Conditions	
The extent to which internal factors (such as noise, vibration) or external factors (weather etc.) have an affect on the workplace activity.	
Poor	Frequent influence on work at height from poor meteorological / environmental factors, e.g. night time, strong winds, fog, heavy rain, muddy conditions, temperature, noise, motion, vibration.
Moderate	Working at height is affected by adverse weather, distractions etc, either occasionally or with limited severity (e.g. dull conditions, intermittent rain etc.).
Excellent	Working at height is immune from environmental influences due to weather, distraction etc.

D12 - 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.	
Poor	Equipment and materials involved in work at height, such as ladders, scaffold, mobile work platforms etc. are of poor quality/grade and never or rarely inspected, serviced or maintained. This can create difficulties which may increase the risk of a fall.
Moderate	Equipment and materials involved in work at height 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 at height is made more difficult and the risk of falls is increased.
Excellent	Equipment and materials involved in work at height 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.

D13 - 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.	
Poor	Safety equipment / PPE for work at height such as fall arrest equipment (nets, harnesses) and barriers are either absent, of poor quality or impractical and are never or rarely inspected, serviced or maintained.
Moderate	Safety equipment / PPE for work at height 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 tasks at height are not as safe as they could be.
Excellent	Safety equipment / PPE for work at height 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.

Organisational Level Influences

This refers to the underlying organisational factors that influence the human and technical conditions of the working environment and therefore shape the occurrence of human/technical failures.

O1 - Recruitment and Selection	
The system that facilitates the employment of people that are suited to the job demands.	
Poor	There are no clear selection criteria for jobs which involve working at height: recruitment is informal and discriminatory; selection is subjective and casual. There are no defined competencies to inform worker selection.
Moderate	There are selection criteria for working at height 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.
Excellent	Guidelines for selecting people to work at height 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.

O2 - Training	
The system that ensures the skills of the workforce are matched to their job demands.	
Poor	There is no budget or system for identifying personnel training needs or assuring competence for working at height: e.g. no appraisal system. There is no investment in the workforce.
Moderate	There is a system for training personnel for work at height that is based on minimum legal requirements, but does not target individual needs. There is minimum investment in the workforce.
Excellent	There is a system of training for work at height 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.

O3 - Procedures	
The system that ensures that the method of conducting tasks and/or operations is explicit and practical.	
Poor	There are no procedures in place to guide or inform people on working at height. Any such procedures do not represent actual tasks or are so poorly presented / inaccessible as to render them ineffective.
Moderate	There are procedures for working at height but they are of inconsistent quality: e.g. they do not require the level of detail required.
Excellent	Procedures for working at height 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.

O4 - Planning	
The system that designs and structures work activities	
Poor	Planning is reactive and schedule driven with no regard to safe methods for working at height. Risk assessments are not undertaken as part of work planning.
Moderate	Basic planning for work at height exists but with little regard for how different activities may be affected. Risk assessments are only undertaken sporadically.
Excellent	Planning for work at height is proactive and interactive for different work activities. Risk assessments are an integral part of working at height.

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.	
Poor	There are no procedures for recording information on fall from height incidents that can be used to prevent further occurrences.
Moderate	Information on fall from height incidents is recorded but may be poor in quality and not be disseminated. Near miss data is not given high priority.
Excellent	Good quality information on falls from height is recorded in a clear and comprehensible manner and is effectively disseminated. Information on incidents enables steps to rectify and prevent further incidences from occurring. Near miss data is actively used in decision-making and feedback.

O6 - Management / Supervision	
The system that ensures human resources are adequately managed/supervised.	
Poor	There is poor management and supervision of work at height. Human and hardware resources are often used inappropriately which increases the risk.
Moderate	There are management procedures for dealing with work at height and supervision of the problem is helpful and appropriate although seldom proactive.
Excellent	Management and supervisors are proactive in controlling the risks from working at height. To this end, resources (human and hardware) are used appropriately.

O7 - Communications	
The system that ensures that appropriate information is communicated clearly to its intended recipients.	
Poor	Work at height information is not collected or communicated.
Moderate	There are systems in place for gathering and communicating work at height information, but breakdowns occur and little thought is given to information requirements.
Excellent	There is a system in place to ensure the effective collation and dissemination of practical work at height information. This information is received and understood by those who need it when it is required.

O8 - Safety Culture	
Product of individual and group values, attitudes, competencies and patterns of behaviour in relation to safety.	
Poor	Falls from height are given little or no priority. There is apathy towards these accidents which stifles the sharing of relevant information. Control of work at height is generally regarded as someone else's responsibility. People are resistant to new ideas to make work at height safer.
Moderate	Falls from height only have a high priority to the extent it maintains image. The sharing of information on working at height is not encouraged and often ignored. Responsibility for work at height is confined to a few people. People are only proactive now and again and this is not always well received.
Excellent	Falls from height have a high priority and are 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 controlling work at height are welcomed.

O9 - Equipment Purchasing	
The system that ensures that the appropriate range of equipment is available.	
Poor	There is no budget and no thought is given to specifying and acquiring new equipment which would help to reduce the risk of falls from height. Money that is available is used for the purchase of the cheapest available equipment that rarely suits what is required.
Moderate	Equipment for minimising the risks of work at height is obtained but it does not necessarily meet user or task requirements.
Excellent	There is a purchasing policy for work at height 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.

O10 - Inspection + Maintenance	
The system that ensures equipment and materials are maintained in good working order.	
Poor	There is nothing to ensure the inspection and maintenance of equipment and materials essential for safe work at height. The operational life of equipment is frequently exceeded. Any repairs are aimed at maintaining working progress but not at preventing further equipment degradation.
Moderate	Inspection and maintenance conforms to minimum requirements in terms of safe working at height but equipment may be maintained past its operational life to avoid new purchases.
Excellent	Systems of inspection and maintenance for safe work at height surpass minimum requirements. Equipment is replaced or maintained to a high standard as and when required. Procedures cover long-term planning and contingency management.

O11 - Pay + Conditions	
The remuneration package and benefits in the context of working hours and conditions and welfare facilities.	
Poor	Lower than average rates of pay or piece work payment, long working hours.
Moderate	Average pay rates, bonuses linked to productivity, reasonable working hours.
Excellent	Above average pay rates, bonuses linked to safety performance as well as productivity.

O12 - Design	
The process of design of the structures to ensure buildability, operability and safety during construction or maintenance.	
Poor	Designs are difficult to build or maintain and require a considerable amount of time to be spent working at height. There is no coordination between designers, nor explicit recognition of the risk factors involved in working at height in roofing.
Moderate	The design process is carefully managed, but there are still difficulties in building/maintenance associated with work at height. Attempts are made by designers to address safety issues in as far as their knowledge of roof construction/maintenance allows them to deliver.
Excellent	Designs are buildable in a way which requires minimal work at height. Designers take full account of safety matters 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.

Policy Level Influences

This comprises the policy and corporate level factors that determine the organisational processes.

P1 - Contracting Strategy	
The extent to which health and safety is considered in contractual arrangements and the implications.	
Poor	Contracts meet no more than minimum legal requirements on safety. There is no consideration of 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 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 safety. Those carrying out the work, particularly the self-employed or small organisations, are unclear of their responsibilities in relation to work at height. As such, contractors still take little or no measures to minimise the risks from working at height.
Moderate	Contract procurement specifications explicitly address specific safety requirements such as work at height. Safety is included in contractor evaluation criteria, but may be secondary to cost. Whilst no attempt is made to 'offload' responsibility for safety, it is not clear what the safety responsibilities of each party are. As such, contractors do not always fulfil their responsibilities with regard to working at height.
Excellent	There is a strong emphasis on safety through contract procurement, and safety considerations affect contracting strategy. Safety requirements are identified for all stakeholders and include recognition of interface issues and change control. 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 safety of each party is appropriate to their role. The communication of responsibility is clear and obvious. Contractors have clear policies and procedures for work at height.

P2 - Ownership + Control	
The extent to which ownership and control is taken over sustained safety performance.	
Poor	Managers/directors are disinterested in taking responsibility for safety either within their own organisation or in working with contractors. Falls from height are not considered as an issue.
Moderate	Managers/directors delegate responsibility for safety but take little direct interest and do not always provide the resources needed to tackle specific safety issues such as working at height. Regulatory targets are followed but there is little or no proactive activity.
Excellent	Managers/directors have clear roles and responsibilities regarding the control of safety. Safety responsibilities are embraced and industry initiatives are welcomed. Targets and initiatives are set to address falls from height and contractors are expected to adopt these targets and initiatives. Cooperation at all levels is expected and encouraged. A commitment to safety is visible and transparent.

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.	
Poor	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 from work at height.
Moderate	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 such as from work at height.
Excellent	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 safety, with commensurate standards for behaviour and continuing goals for improvement. Safety is a high priority which includes an active program to control risks from work at height.

P4 - Organisational Structure	
The extent to which there is definition of safety responsibility within and between organisations	
Poor	Roles and responsibilities for safety and controlling work at height are not clearly defined, with no regard to communication issues or cooperation. Relationships are confrontational and competitive.
Moderate	There is some definition of roles and responsibilities for safety and controlling work at height but there may be gaps particularly in respect of communication issues.
Excellent	Roles and responsibilities for safety and controlling work at height are clearly defined, with explicit consideration of communication and cooperation issues. Relationships are open and constructive encouraging continuous improvement.

P5 - Safety Management	
The management system which encompasses safety policies, the definition of roles and responsibilities for safety, the implementation of measures to promote safety and the evaluation of safety performance.	
Poor	There are no clearly written roles and responsibilities in relation to safety. Safety management either does not exist or fails to implement measures such as risk assessments etc. There are no management procedures for monitoring/evaluating safety performance. In relation to working at height, policies either do not exist or do not have explicit objectives as to the manner in which operations should be conducted.
Moderate	Safety measures are implemented at a basic level. The main aim of safety management is compliance with the regulations. Safety management is not actively maintained and review is infrequent. In relation to working at height, there are broad policies and procedures regarding the safe conduct of operations but most responsibility is delegated to operatives.
Excellent	There are clearly defined roles and responsibilities for safety. Safety management is evident in all aspects of the operations by workers and management at all levels. 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. In relation to working at height, clear policies exist with explicit objectives regarding the manner in which operations are to be conducted.

P6 - Labour Relations	
This extent to which there is a harmonious relationship between employers and employees. 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.	
Poor	Employers never consult the workforce on safety matters. Union affiliation is not permitted and thus no collective bargaining structures exist. There is exploitation of the workforce by the employer with little or no provision for workforce welfare, health and safety.
Moderate	A system is in place that facilitates negotiation of pay and conditions and allows consultation on safety. However, it receives minimal commitment from the employer, and is regarded sceptically by the employees. Employees are able to associate with a very restricted range of union / professional bodies.
Excellent	There is full consultation of the workforce on all matters including safety. Choice of professional / union association is open, and negotiation on pay and conditions is frequent, productive, and fair.

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.	
Poor	Falling or poor market share in addition to falling demand. The increasing cost of operations is set against the decreasing rates or prices chargeable forcing unnecessary expenditure to be reduced and corners to be cut.
Moderate	Reasonable and stable returns.
Excellent	Good returns with growing market (share) and sustained profits enabling investment.

Environmental Level Influences

The regulatory and wider external influences that determine corporate and organisational policies and processes.

E1 - Political Influence	
The profile of, and practices within, Government related to safety in the industry.	
Poor	Political instability and/or detachment from important issues within the industry. No active measures to influence safety.
Moderate	Stable political environment and/or recognition of the industry under the pretext of 'public interest'.
Excellent	Elevated profile for the industry. High-level political involvement and resulting empowerment of the regulator. Fiscal policies support prosperity of the industry and emphasise safety.

E2 - Regulatory Influence	
The framework of Regulations and guidance governing the industry and the profile and actions of the Regulator.	
Poor	Guidance pertaining to work at height 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 the incidence of falls from height.
Moderate	There is guidance covering work at height 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.
Excellent	Guidance relating to work at height is effective and focuses industry attention with a strong and proactive Inspectorate encouraging improvements and strong enforcement deterring transgressions. Regulatory policy in relation to work at height is pro-active and pre-empts potential problem areas.

E3 - Market Influence	
The commercial and economic context affecting the industry.	
Poor	Conditions such that, due to work overload or so little work, margins are squeezed, and corners are cut with respect to safety. Greater willingness to take on high risk work, and at low cost.
Moderate	Some application of safety measures and risk evaluations but inadequate time or financial margins for substantial investment. High risk work not addressed adequately.
Excellent	A commercial environment with a balance of workload / availability and return to enable investment in 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.

E4 - Societal Influence	
Aspects of the community and society at large, which bear upon organisations and workers.	
Poor	Low public regard for industry and / or low concern for the welfare of workers.
Moderate	Neutral attitude to industry and safety of the workers.
Excellent	Highly valued industry with respect for the skills and societal contribution, and concern for workers' welfare.

APPENDIX B

RISK CONTROL MEASURES WORKSHOP

BRIEFING NOTE

FALLS FROM HEIGHT

INFLUENCE NETWORK RISK CONTROL WORKSHOP

3 OCTOBER 2002

BRIEFING DOCUMENT

1. AIMS AND OBJECTIVES OF BRIEFING DOCUMENT

The aim of this briefing document is to provide you with enough background material to prepare you for the Influence Network Risk Control workshop on Falls from Height to be held in Room 1102 at the HSE Daniel House offices in Bootle on 3 October 2002 at 09.30am.

This short document:

- Defines the overall objectives and scope of the project.
- Describes the progress of the project to date.
- Defines the objectives of the workshop.
- Describes the background to the approach.
- Describes the falls from height issues to be considered in the workshop.
- Provides a customised diagram for consideration prior to and during the workshop.
- Defines the factors considered to influence falls from height.

2. FALLS FROM HEIGHT PROJECT

2.1. Project objectives and scope

This is a pan-industry project considering falls from height and their risk control and prevention measures across a variety of industries. The overall objective of this project is to:

To provide a framework for assessing the effectiveness of alternative measures to prevent and control the risk of falls from height in order that efforts can be targeted most appropriately.

The detailed objectives of this project are:

- To provide a definitive baseline for measuring improvements in the incidence rate of falls from height across a variety of sectors.

- To provide a quantified model of the influences affecting falls from height covering human, hardware and external factors for a variety of sectors.

- Identify and compare the effectiveness of alternative measures to prevent and control the risk of falls from height in order that efforts can be targeted most appropriately.

- To consult with key stakeholders through workshops to obtain a consensus view on the key issues relating to falls from height and the measures available to prevent and control those risks.

- To provide a toolkit for selecting effective measures, setting performance targets and monitoring improvement.

2.2. Progress to date

To date, we have:

- Reviewed the RIDDOR accident data for fatal, major and over 3-day injury accidents resulting from falls from height. This has been undertaken for the five sectors: Agriculture, Construction, Extractive and utilities, Manufacturing and Services.

- Carried out an extensive literature review of UK and international relating to where falls occur (Sector / activity), why falls occur (Human factors) and Regulations and guidance.

- Held Influence Network workshops in order to establish the underlying causes of falls from height in:

  - Agriculture
  - Transport
  - Roofing
  - Construction
  - Specialists – abseilers, steeplejacks etc

3. WORKSHOP OBJECTIVES

The key objectives of this workshop are based on the third and fourth project objectives as follows:

- To consider the issues raised in the previous workshops in relation to each of the factors in the Influence Network.
- To identify potential improvements and risk control measures in relation to each of these factors.
- To rate the ease with which factors could be improved.
- To identify a series of risk control measures based on the experience of the workshop participants and the discussions from previous workshops.
- Based on the experience of the workshop participants and output from the Influence Network, consider the impact of these risk control measures in terms of cost and effectiveness.
- Identify potential issues for the future.

4. BACKGROUND TO INFLUENCE NETWORKS

Influence Networks are a powerful means of understanding the underlying causes of accidents and ill health. They can be used both reactively to understand the deeper-rooted causes of past accidents and proactively to understand and quantify those underlying factors contributing to the future risk of accidents and ill health. The approach has been adopted as part of a comprehensive five step (hazard identification, risk assessment, risk control, cost benefit assessment and decision making) Formal Safety Assessment (FSA) methodology by the Maritime and Coastguard Agency (MCA) (supported by the International Maritime Organisation (IMO)) which utilises the techniques to provide a direct evaluation of the effectiveness of regulatory changes in improving marine safety and as a means of assessing the influences on safety across the maritime industry.

Within the overall process, it is clearly important not only to assess risk, but to develop an understanding of the factors which influence the level of risk. Attention can then be focused upon improving factors that have the greatest influence. Influence Networks fulfil this purpose, since they provide a structured means for identifying and assessing the various factors that bear upon the risk of a particular type of accident. In particular, Influence Networks are structured so as to categorise influences into a hierarchy of factors, some being remote (such as the political and market environment) and some being more direct (such as the suitability of PPE and the competence of operatives). Furthermore, the diagrams allow judgments to be made regarding the relative strength of these different influencing factors, so that significant factors can be identified and addressed, thus improving health and safety.

5. CONTEXT

Falls from height are a considerable cause for concern and measures to improve safety are being sought. For example, the recent blitz by HSE inspectors on 223 construction sites in London resulted in 110 Prohibition Notices being served, 90 of which were for falls from height. In addition to work on new installations, maintenance, inspection, repair and improvement activities constitute a significant workload on existing installations, and present a number of potential fall-related hazards.

The focus for this workshop will be on risk control measures for falls from height in construction and maintenance related activities carried out on both new and existing installations. This covers multi-storey buildings, retail units, houses, bridges, industrial/process plants and towers; and will include construction trades, finishing trades and maintenance-related trades. Many of the factors influencing falls from height in these areas may be common across industries and activities, and hence the potential risk controls will be transferable between industries. However, some will be specific to the working locations and the work processes in construction.

Use of the Influence Network can structure thinking on the problem, ensuring that a wide range of risk control options for falls from height are identified and their potential impact assessed. The Network enables behavioural factors to be captured alongside hardware considerations and external elements which all affect safe working.

6. INFLUENCING DOMAINS

Most accidents are caused by a complex combination of events; they do not happen in isolation, but are part of a wider system of causal factors. This is shown in Figure 6.1 as a set of nested systems or domains that influence the performance of people and hardware in a hazardous situation. The effect of each domain on the others can be characterised by a set of influences, each having a potential effect on any influence within the enclosed domains. All of these influencing domains interact in the causes of accidents, and are also the areas where error prevention and risk control measures can be introduced.

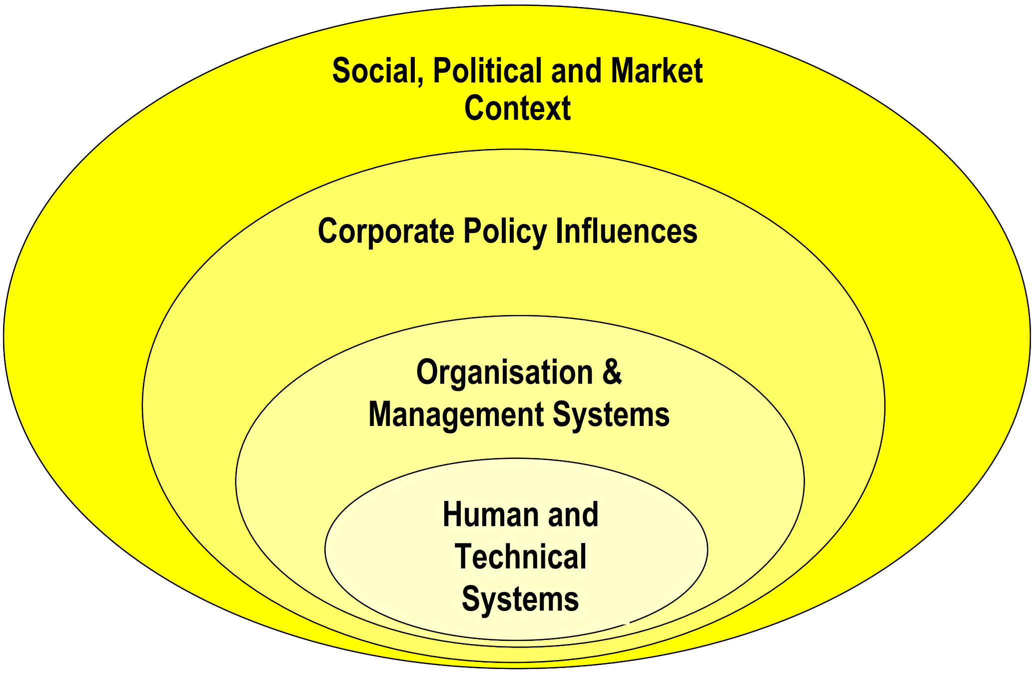


Figure 6.1 Nested System of Influences

Effective safety management requires a clear understanding of the various technical, human and organisational factors that affect risk, and of the influence that each of these factors exerts. It is also essential to reflect the different mechanisms of influence within different industry sectors. Influence Networks have been developed to deal with this complexity of factors influencing an accident or undesirable event.

7. THE INFLUENCE NETWORK

An Influence Network is a model representing the various factors that influence the occurrence of an undesirable event such as a specific kind of accident. The development of an Influence Network involves the definition of the event under consideration and the identification of the hierarchy of influences upon the event.

Figure 7.1 illustrates the typical composition of an Influence Network, and the various levels of influence that can be identified. This diagram has been refined in the course of this project to reflect the potential influences on falls from height across a variety of industries.

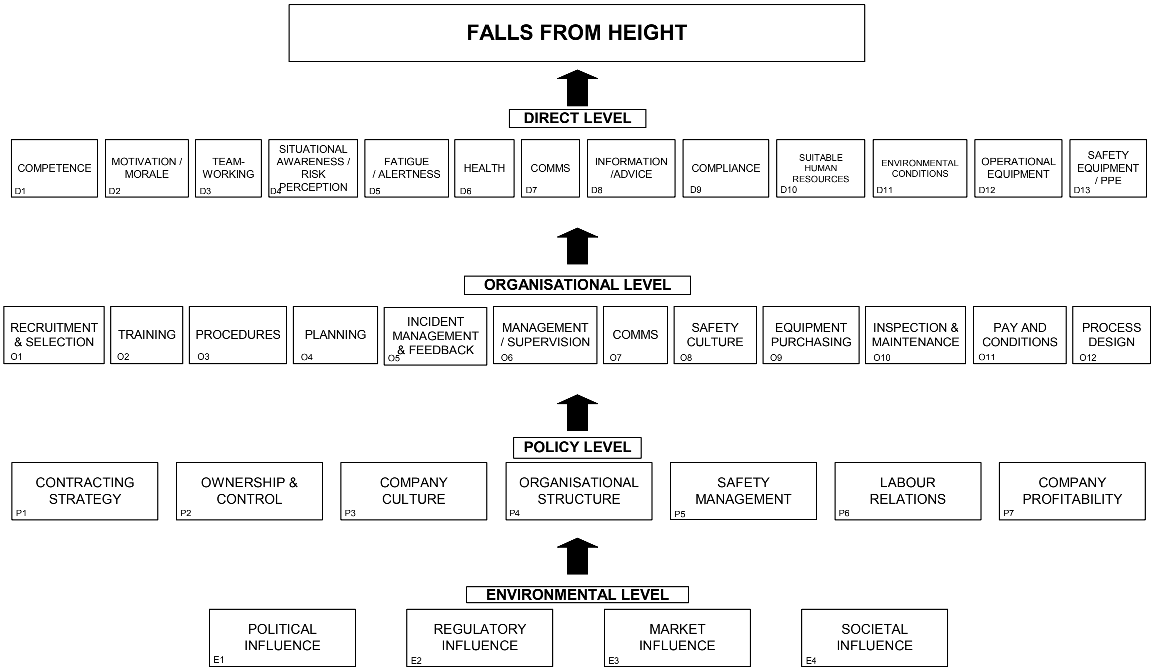


Figure 7.1 Influence Network for falls from height

Within **Figure 7.1** there are four levels of influencing factors, reflecting the domains shown in **Figure 6.1**:

- **Direct Level**, which refers to the immediate workplace factors that have a bearing on the human and technical conditions which can lead to unsafe acts and/or technical failures that are responsible for the accident;

- **Organisational Level**, which refers to the underlying organisational factors that influence the human and technical conditions of the working environment and therefore shape the occurrence of human/technical failures;

- **Policy Level**, which comprises the policy and corporate level factors that determine the organisational processes; and

- **Environmental Level**, which refers to the regulatory and wider external influences that determine corporate and organisational policies and processes.

Within each domain, there are several potential influencing factors. The consolidated set of factors identified in the earlier stages of this project is presented in the attached Appendix for information. These definitions will be used within the workshop as a basis for discussion to identify the potential improvements in practice and risk control options appropriate to those factors

In the previous workshops, the participants have rated the factors in terms of where they currently stand in relation to the descriptions of best and worst practice. In the next stage, they assessed the relative strength of the influences at one level in terms of their impact on the influences at the level above. A quantitative 'weighting' was assigned. Thus a fully quantified model is available for use as a basis for this workshop.

8. THE WORKSHOP SESSION

Within the workshop session the aim is to use your experience and expert judgement in order to estimate:

- What best practice or risk control options are available for each factor?
- What potential increases in rating of the factors are possible?
- What is the ease with which such increases could be achieved?
- What overall risk control measures could be used?
- What factors in the Influence Network do these measures influence?
- What are the potential costs, benefits and overall effectiveness of these measures?

Prior to the workshop it would be useful if you could familiarise yourself with the Influence Network and think about the pertinent issues relating to falls from height, especially the kind of best practice and risk control measures that you judge to have the potential to reduce the risk of a fall significantly. No other preparation is required, and the full procedure will be explained on the day.

We look forward to seeing you there.

Further information can be obtained from Helen Bolt, Mike Webster or David Jamieson at BOMEL tel: 01628 777707 fax: 01628 777877 email: mikewebster@bomelconsult.com.

APPENDIX A

INFLUENCE NETWORK FACTORS

Direct Level Influences

This refers to the immediate workplace factors that have a bearing on the human and technical conditions that can lead to unsafe acts and/or technical failures that are responsible for the accident.

D1 - Competence	
The skills, knowledge and abilities required to perform particular tasks safely.	
Poor	Operatives cannot perform work at height safely without direct instruction and supervision. They have little or no knowledge of either the operational or safety equipment which should be used. They have little or no understanding of their responsibilities when working at height.
Moderate	Operatives can work safely at height in most situations, but need assistance with complicated or novel task situations. They are able to utilise equipment only in normal operations. They have a basic understanding of their responsibilities when working at height.
Excellent	Operatives can perform all tasks safely while working at height even 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 roles and responsibilities when working at height.

D2 - Motivation / Morale	
Workers incentive to work towards business, personal and common goals.	
Poor	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 safety issues such as falls from height is low.
Moderate	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 safety issues such as work at height if they can be presented as important enough.
Excellent	Workers are positive and optimistic about their jobs and conditions and are proactive in relation to safety. They demonstrate high levels of commitment to high quality work and preventing falls from height.

D3 - Teamworking	
The extent to which individuals work in teams and look out for each other's interests.	
Poor	People work on individual work fronts and rarely interact to talk about safety. There is negative peer pressure (with respect to safety) in that people are expected to get on with working at height irrespective of risks and well intended advice is perceived as interference.
Moderate	People work in teams some of the time. They will sometimes discuss safety and may look out for each other in terms of certain hazards but not always falls from height.
Excellent	There is positive interaction within teams, with people actively looking out for each others safety including falls from height. There is positive peer pressure and advice regarding work at height is welcomed.

D4 - Situational Awareness/Risk Perception	
The extent to which workers are aware of the hazards and risks associated with falls from height.	
Poor	Lack of awareness of fall from height hazards and disregard of the risks.
Moderate	Acknowledgement of fall from height hazards and risks but little effort towards behaviour modification.
Excellent	Clear recognition of fall from height hazards and risks with appropriate behaviour modification to compensate.

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.	
Poor	People are inactive, drowsy or tired leading to poor judgements and unnecessary risks while working at height.
Moderate	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 the risk of falls.
Excellent	People are exceptionally alert, vigilant and attentive and always make good decisions about working at height in order to minimise the risks.

D6 - Health	
The well being of body and mind of the workforce.	
Poor	There are relatively high levels of poor physical health, e.g. musculoskeletal disorders, which increases the risk of fall accidents.
Moderate	Any sickness, injury or psychiatric condition is minor or transient and will only temporarily affect capacity for work, e.g., headache, flu etc.
Excellent	Sickness, injury and psychiatric conditions are low. Capacity for work is at its peak.

D7 - Communications	
The extent to which the frequency and clarity of communications are appropriate for ensuring effective task and team work.	
Poor	In relation to work at height, communication is unclear, unreliable or too infrequent resulting in poor task/team work.
Moderate	In relation to work at height, communication is usually clear, timely, and reliable, but deteriorates occasionally.
Excellent	In relation to work at height, communication is always clear, reliable, timely and appropriate for those who require the information, resulting in effective task/team work.

D8 - Information / Advice	
The extent to which people can access information that is accurate, timely, relevant and usable.	
Poor	Information on work at height is too frequent or infrequent, unobtainable, irrelevant, incomplete or difficult to interpret.
Moderate	Information on work at height is obtainable and relevant, but at times is difficult to interpret or too infrequent.
Excellent	Information on work at height is accessible, understandable, relevant, complete and timely.

D9 - Compliance	
The extent to which people comply with rules, procedures or Regulations.	
Poor	Rules, procedures and Regulations on working at height are frequently violated or not followed at all.
Moderate	Rules, procedures and Regulations on working at height are followed without consideration of their appropriateness to the context.
Excellent	Rules, procedures and Regulations on working at height are complied with and due consideration to the appropriateness of the context is always given.

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.	
Poor	There is a lack of workers with the necessary experience and knowledge for working at height. People will be stressed, and / or experience excessive workload.
Moderate	Workers with knowledge and experience of working at height are available most of the time but occasionally people are overstretched.
Excellent	There is a stable and regular supply of workers that possess the appropriate experience and knowledge for working at height.

D11 - Conditions	
The extent to which internal factors (such as noise, vibration) or external factors (weather etc.) have an affect on the workplace activity.	
Poor	Frequent influence on work at height from poor meteorological / environmental factors, e.g. night time, strong winds, fog, heavy rain, muddy conditions, temperature, noise, motion, vibration.
Moderate	Working at height is affected by adverse weather, distractions etc, either occasionally or with limited severity (e.g. dull conditions, intermittent rain etc.).
Excellent	Working at height is immune from environmental influences due to weather, distraction etc.

D12 - 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.	
Poor	Equipment and materials involved in work at height, such as ladders, scaffold, mobile work platforms etc. are of poor quality/grade and never or rarely inspected, serviced or maintained. This can create difficulties which may increase the risk of a fall.
Moderate	Equipment and materials involved in work at height 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 at height is made more difficult and the risk of falls is increased.
Excellent	Equipment and materials involved in work at height 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.

D13 - 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.	
Poor	Safety equipment / PPE for work at height such as fall arrest equipment (nets, harnesses) and barriers are either absent, of poor quality or impractical and are never or rarely inspected, serviced or maintained.
Moderate	Safety equipment / PPE for work at height 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 tasks at height are not as safe as they could be.
Excellent	Safety equipment / PPE for work at height 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.

Organisational Level Influences

This refers to the underlying organisational factors that influence the human and technical conditions of the working environment and therefore shape the occurrence of human/technical failures.

O1 - Recruitment and Selection	
The system that facilitates the employment of people that are suited to the job demands.	
Poor	There are no clear selection criteria for jobs which involve working at height: recruitment is informal and discriminatory; selection is subjective and casual. There are no defined competencies to inform worker selection.
Moderate	There are selection criteria for working at height 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.
Excellent	Guidelines for selecting people to work at height 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.

O2 - Training	
The system that ensures the skills of the workforce are matched to their job demands.	
Poor	There is no budget or system for identifying personnel training needs or assuring competence for working at height: e.g. no appraisal system. There is no investment in the workforce.
Moderate	There is a system for training personnel for work at height that is based on minimum legal requirements, but does not target individual needs. There is minimum investment in the workforce.
Excellent	There is a system of training for work at height 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.

O3 - Procedures	
The system that ensures that the method of conducting tasks and/or operations is explicit and practical.	
Poor	There are no procedures in place to guide or inform people on working at height. Any such procedures do not represent actual tasks or are so poorly presented / inaccessible as to render them ineffective.
Moderate	There are procedures for working at height but they are of inconsistent quality; e.g. they do not require the level of detail required.
Excellent	Procedures for working at height 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.

O4 - Planning	
The system that designs and structures work activities	
Poor	Planning is reactive and schedule driven with no regard to safe methods for working at height. Risk assessments are not undertaken as part of work planning.
Moderate	Basic planning for work at height exists but with little regard for how different activities may be affected. Risk assessments are only undertaken sporadically.
Excellent	Planning for work at height is proactive and interactive for different work activities. Risk assessments are an integral part of working at height.

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.	
Poor	There are no procedures for recording information on fall from height incidents that can be used to prevent further occurrences.
Moderate	Information on fall from height incidents is recorded but may be poor in quality and not be disseminated. Near miss data is not given high priority.
Excellent	Good quality information on falls from height is recorded in a clear and comprehensible manner and is effectively disseminated. Information on incidents enables steps to rectify and prevent further incidences from occurring. Near miss data is actively used in decision-making and feedback.

O6 - Management / Supervision	
The system that ensures human and hardware resources are adequately managed/supervised.	
Poor	There is poor management and supervision of work at height. Human and hardware resources are often used inappropriately which increases the risk.
Moderate	There are management procedures for dealing with work at height and supervision of the problem is helpful and appropriate although seldom proactive.
Excellent	Management and supervisors are proactive in controlling the risks from working at height. To this end, resources (human and hardware) are used appropriately.

O7 - Communications	
The system that ensures that appropriate information is communicated clearly to its intended recipients.	
Poor	Work at height information is not collected or communicated.
Moderate	There are systems in place for gathering and communicating work at height information, but breakdowns occur and little thought is given to information requirements.
Excellent	There is a system in place to ensure the effective collation and dissemination of practical work at height information. This information is received and understood by those who need it when it is required.

O8 - Safety Culture	
Product of individual and group values, attitudes, competencies and patterns of behaviour in relation to safety.	
Poor	Falls from height are given little or no priority. There is apathy towards these accidents which stifles the sharing of relevant information. Control of work at height is generally regarded as someone else's responsibility. People are resistant to new ideas to make work at height safer.
Moderate	Falls from height only have a high priority to the extent it maintains image. The sharing of information on working at height is not encouraged and often ignored. Responsibility for work at height is confined to a few people. People are only proactive now and again and this is not always well received.
Excellent	Falls from height have a high priority and are 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 controlling work at height are welcomed.

O9 - Equipment Purchasing	
The system that ensures that the appropriate range of equipment is available.	
Poor	There is no budget and no thought is given to specifying and acquiring new equipment which would help to reduce the risk of falls from height. Money that is available is used for the purchase of the cheapest available equipment that rarely suits what is required.
Moderate	Equipment for minimising the risks of work at height is obtained but it does not necessarily meet user or task requirements.
Excellent	There is a purchasing policy for work at height 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.

O10 - Inspection + Maintenance	
The system that ensures equipment and materials are maintained in good working order.	
Poor	There is nothing to ensure the inspection and maintenance of equipment and materials essential for safe work at height. The operational life of equipment is frequently exceeded. Any repairs are aimed at maintaining working progress but not at preventing further equipment degradation.
Moderate	Inspection and maintenance conforms to minimum requirements in terms of safe working at height but equipment may be maintained past its operational life to avoid new purchases.
Excellent	Systems of inspection and maintenance for safe work at height surpass minimum requirements. Equipment is replaced or maintained to a high standard as and when required. Procedures cover long-term planning and contingency management.

O11 - Pay + Conditions	
The remuneration package and benefits in the context of working hours and conditions and welfare facilities.	
Poor	Lower than average rates of pay or piece work payment, long working hours.
Moderate	Average pay rates, bonuses linked to productivity, reasonable working hours.
Excellent	Above average pay rates, bonuses linked to safety performance as well as productivity.

O12 - Process Design	
The process of design of installations to ensure operability and safety during repair, maintenance, refurbishment etc. both in relation to existing installations and the design of any repair, maintenance or refurbishment scheme.	
Poor	Designs are difficult to maintain and require a considerable amount of time to be spent working at height. There is no coordination between designers, nor explicit recognition of the risk factors involved in working at height once a structure is built.
Moderate	The design process is carefully managed, but there are still difficulties in maintaining structures once they are built. Attempts are made by designers to address safety issues in as far as their knowledge of maintenance/repair activities allows them to deliver.
Excellent	Designs can be maintained in a way which requires minimal work at height. Designers take full account of how a structure will be 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.

Policy Level Influences

This comprises the policy and corporate level factors that determine the organisational processes.

P1 - Contracting Strategy	
The extent to which health and safety is considered in contractual arrangements and the implications.	
Poor	Contracts meet no more than minimum legal requirements on safety. There is no consideration of 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 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 safety. Those carrying out the work, particularly the self-employed or small organisations, are unclear of their responsibilities in relation to work at height. As such, contracts still take little or no measures to minimise the risks from working at height.
Moderate	Contract procurement specifications explicitly address specific safety requirements such as work at height. Safety is included in contractor evaluation criteria, but may be secondary to cost. Whilst no attempt is made to 'offload' responsibility for safety, it is not clear what the safety responsibilities of each party are. As such, contractors do not always fulfil their responsibilities with regard to working at height.
Excellent	There is a strong emphasis on safety through contract procurement, and safety considerations affect contracting strategy. Safety requirements are identified for all stakeholders and include recognition of interface issues and change control. 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 safety of each party is appropriate to their role. The communication of responsibility is clear and obvious. Contractors have clear policies and procedures for work at height.

P2 - Ownership + Control	
The extent to which ownership and control is taken over sustained safety performance.	
Poor	Managers/directors are disinterested in taking responsibility for safety either within their own organisation or in working with clients or contractors. Falls from height are not considered as an issue.
Moderate	Managers/directors delegate responsibility for safety but take little direct interest and do not always provide the resources needed to tackle specific safety issues such as working at height. Regulatory targets are followed but there is little or no proactive activity.
Excellent	Managers/directors have clear roles and responsibilities regarding the control of safety. Safety responsibilities are embraced and industry initiatives are welcomed. Targets and initiatives are set to address falls from height and contractors/clients are expected to adopt these targets and initiatives. Cooperation at all levels is expected and encouraged. A commitment to safety is visible and transparent.

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.	
Poor	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 from work at height.
Moderate	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 such as from work at height.
Excellent	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 safety, with commensurate standards for behaviour and continuing goals for improvement. Safety is a high priority which includes an active program to control risks from work at height.

P4 - Organisational Structure	
The extent to which there is definition of safety responsibility within and between organisations	
Poor	Roles and responsibilities for safety and controlling work at height are not clearly defined, with no regard to communication issues or cooperation. Relationships are confrontational and competitive.
Moderate	There is some definition of roles and responsibilities for safety and controlling work at height but there may be gaps particularly in respect of communication issues.
Excellent	Roles and responsibilities for safety and controlling work at height are clearly defined, with explicit consideration of communication and cooperation issues. Relationships are open and constructive encouraging continuous improvement.

P5 - Safety Management	
The management system which encompasses safety policies, the definition of roles and responsibilities for safety, the implementation of measures to promote safety and the evaluation of safety performance.	
Poor	There are no clearly written roles and responsibilities in relation to safety. Safety management either does not exist or fails to implement measures such as risk assessments etc. There are no management procedures for monitoring/evaluating safety performance. In relation to working at height, policies either do not exist or do not have explicit objectives as to the manner in which operations should be conducted.
Moderate	Safety measures are implemented at a basic level. The main aim of safety management is compliance with the regulations. Safety management is not actively maintained and review is infrequent. In relation to working at height, there are broad policies and procedures regarding the safe conduct of operations but most responsibility is delegated to operatives.
Excellent	There are clearly defined roles and responsibilities for safety. Safety management is evident in all aspects of the operations by workers and management at all levels. 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. In relation to working at height, clear policies exist with explicit objectives regarding the manner in which operations are to be conducted.

P6 - 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.	
Poor	Management/directors never consult the workforce on safety matters. Union affiliation is not permitted and thus no collective bargaining structures exist. There is exploitation of the workforce by the employer with little or no provision for workforce welfare, health and safety.
Moderate	A system is in place that facilitates negotiation of pay and conditions and allows consultation on safety. However, it receives minimal commitment from the employer, and is regarded sceptically by the employees. Employees are able to associate with a very restricted range of union / professional bodies.
Excellent	There is full consultation of the workforce on all matters including safety. Choice of professional / union association is open, and negotiation on pay and conditions is frequent, productive, and fair.

P7 - Company Profitability	
The extent to which the owner is subject to competition over market share and constrained as to the price that they can charge.	
Poor	Falling or poor market share in addition to falling demand. The increasing cost of operations is set against the decreasing rates or prices chargeable forcing unnecessary expenditure to be reduced and corners to be cut.
Moderate	Reasonable and stable returns.
Excellent	Good returns with growing market (share) and sustained profits enabling investment.

Environmental Level Influences

The regulatory and wider external influences that determine corporate and organisational policies and processes.

E1 - Political Influence	
The profile of, and practices within, Government related to safety in the industry.	
Poor	Political instability and/or detachment from important issues within the industry. No active measures to influence safety.
Moderate	Stable political environment and/or recognition of the industry under the pretext of 'public interest'.
Excellent	Elevated profile for the industry. High-level political involvement and resulting empowerment of the regulator. Fiscal policies support prosperity of the industry and emphasise safety.

E2 - Regulatory Influence	
The framework of Regulations and guidance governing the industry and the profile and actions of the Regulator.	
Poor	Guidance pertaining to work at height 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 the incidence of falls from height.
Moderate	There is guidance covering work at height 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.
Excellent	Guidance relating to work at height is effective and focuses industry attention with a strong and proactive Inspectorate encouraging improvements and strong enforcement deterring transgressions. Regulatory policy in relation to work at height is pro-active and pre-empts potential problem areas.

E3 - Market Influence	
The commercial and economic context affecting the industry.	
Poor	Conditions such that, due to work overload or so little work, margins are squeezed, and corners are cut with respect to safety. Greater willingness to take on high risk work, and at low cost.
Moderate	Some application of safety measures and risk evaluations but inadequate time or financial margins for substantial investment. High risk work not addressed adequately.
Excellent	A commercial environment with a balance of workload / availability and return to enable investment in 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.

E4 - Societal Influence	
Aspects of the community and society at large, which bear upon organisations and workers.	
Poor	Low public regard for industry and / or low concern for the welfare of workers.
Moderate	Neutral attitude to industry and safety of the workers.
Excellent	Highly valued industry with respect for the skills and societal contribution, and concern for workers' welfare.

APPENDIX C

AGRICULTURE WORKSHOP

DETAILED DISCUSSIONS

C. AGRICULTURE WORKSHOP

Summaries of the workshop discussions are presented in the following sections. These summaries have been reported against the individual influence factors. The key issues that feed through to the conclusions are highlighted in bold type face.

C.1 DIRECT LEVEL INFLUENCES

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

Thinking about competence in relation to falls from height in agriculture proved to be difficult. **The question of 'what is competence for roofwork?' was raised and also 'how do you judge whether someone is competent or not?'**. This was thought to be a difficult issue and not something that could be purely taught. It is also necessary to have relevant experience, for example, driving tractors near silage pits.

None of the group was aware of courses on competence for working at height. It was felt that most falls from height in farming happen to non-specialist roofers. **Farmers are rarely required to work on a roof, so is it reasonable to expect them to be trained for such infrequent activity?** In any case, the point was made that there is training in arboriculture but two people who had been trained in the previous year had been killed.

A further hindrance to farmers developing competence was the perceived lack of information available on working at height and the inaccessibility of the relevant standards. This makes it difficult for farmers to judge whether or not a contractor is competent or whether good practice is being adopted or not. **Rating(s): Arboriculture – 6, Other agriculture – 2-9**

D2 Motivation / Morale - Workers incentive to work towards business, personal and common goals

The main motivation factors in the industry were thought to be the fear of job losses and the fear of getting caught not taking precautions. The method of pay is relevant here in that many are on piece work and may cut corners at the expense of taking such precautions. **There is a serious morale problem in the industry due to recent problems such as foot and mouth**, and there is a lack of incentives to help industry pull out of it. Despite this though, there was a feeling that motivation is still quite high. The problem is illustrated by the fact that the average age in the industry is 59 with most being self-employed. Financial returns and therefore morale are low but **these people cannot afford to stop farming because they have nothing to fall back on**. **As such, they will tackle a problem in any way that they can**, which may well increase the risk of a fall in certain work. **Rating(s): Industry as a whole – 3**

D3 Teamworking - The extent to which individuals work in teams and look out for each other's interests

Team working was not deemed to be relevant for farmers and was subsequently removed from the farming Influence Network for analysis. This is primarily because most farmers are sole workers. Team working was only thought to apply to contractors and arborists in the context of this workshop. Suppliers try to work with farmers, but examples were given where these suppliers have had to buy safety equipment to protect their drivers when farmers have been uncooperative. However, suppliers are not able to assess every farm for risk and must rely on farmers to a certain extent. Farmers do get advice in this respect but not all of them act on it. Some are more helpful than others.

Arborists were different from farmers on this factor in that they always work in teams. Teamwork is of variable quality but most people are aware of the safety issues. **Rating(s): Farmers – not relevant, Contractors – 3-4, Arboriculture – 4**

D4 Situational Awareness - The extent to which workers are aware of the hazards and risks associated with falls from height

The feeling here was that **people are familiar with the hazards when working at height but underestimate the risks**. Part of the reason for this was thought to be the fact that people do not think about the potential consequences of unsafe acts. It was also thought that farmers do not have the knowledge necessary to quantify risks. One way to change attitudes was thought to be through the fear of prosecution. **Safety bonus systems in tree work were reported to make a difference** but it was unclear if this approach was transferable to agriculture generally. **Rating(s): Farmers – 2-3, Contractors – 5, Arboriculture – 5**

D5 Fatigue - The degree to which performance is degraded, for example, through sleep deprivation, or excessive / insufficient mental or physical activity, or drugs / alcohol

Fatigue is an issue for individual farmers who maybe continually tired, but not necessarily so for contractors. The physical nature of the work in arboriculture can lead to tiredness. Fatigue is not a major issue in accidents from HSE experience. Drink may be an issue for contractors, some of whom may still go to work under the influence of alcohol. These people tend to have the poorest attitude to safety as well. **Rating(s): Farmers – 3, Contractors – 4-5, Arboriculture – 4**

D6 Health - The well being of body and mind of the workforce

There was little discussion on this factor suggesting that it was not regarded as a major influence in relation to falls from height. The average age of Farmers (late 50s) was thought to be an issue with some being in poor physical condition although there may be regional differences here. Health was though to be good in the tree and agriculture contracting industries due to the nature of the work. People who are unable to carry out the work tend to leave these industries. However, this is not always an option for farmers due to financial constraints. **Rating(s): Farmers – 2, Contractors and arboriculture – 8-9**

D7 Communications - The extent to which the frequency and clarity of communications are appropriate for ensuring effective task and team work

In farming communications at the *Direct* level (i.e. between workers) may not be a central issue, as many farmers work on their own. Where communications do become important is when people come onto the farm for some reason e.g. to deliver goods. There is a UKASTA document to help lorry drivers with this, but it is not widely used. Lorry drivers do not always communicate their arrival times effectively, and are sometimes unable to get in to farms which are locked to ensure that there are no unattended deliveries. In terms of communication, mobile phones were thought to be a necessity for farmers. **Rating(s): Farmers – 3-4, Contractors – 4, Arboriculture – 4**

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

There was considerable discussion of this factor **suggesting that it was of importance for work at height**. The feeling from the farmers' side was that HSE needs to be doing more in terms of providing information especially in helping farmers to define risks so they can better decide what is and is not safe. The HSE do publish free leaflets, priced publications, websites, articles in agriculture magazines etc., and it was difficult to see what more they could do to try and get the messages across. The view was also expressed that farmers cannot hide behind saying that the information is not there. Quite often they have it but it ends up on the shelf and is not read. There was a **feeling that the information still failed to define risks particularly well**. The need for many tasks, such as working on roofs, do not arise very often, and this adds to the problem. Farmers have to deal with a range of tasks and it is difficult for them to be familiar with them all. The communication of information was touched on, and was thought to be a problem in tree work where the lines of communication are not through to the worker. Furthermore, **the information is not in the form that users require** and illiteracy can be a barrier. There was thought to be a need for more literature with simple diagrams and pictures. **Rating(s): All – 6-7 (information available but either not suitable or not used)**

D9 Compliance - The extent to which people comply with rules or regulations

In general, **people know that they should comply but often they do not comply**. Farmers do not always comply with good practice when it comes to work at height. They differ from people in other industries in that **they have access to equipment that they can use to improvise access at height** and, as such, they are tempted to use it instead of getting in the right equipment. There was some discussion of benefits of both design and safety equipment as ways to minimise the effect of people's tendency to improvise. For example, fixing points could be designed into roofs to allow for safety lines. However, a drop of 5m is needed for a safe drop in a harness and most agricultural buildings are not that high. Nets are another option but there is not always the room to install them. **Rating(s): Farmers – 2, Contractors – 4, Arboriculture – 4**

D10 Availability of 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

This factor did not appear to be particularly relevant to falls from height. Workload is not related to roof work as a roof will have to be repaired when the problem arises, and most other repair jobs are undertaken in the 'quiet' season and so human resources was not regarded as an important issue. People with experience of roofwork should be available when needed, although they will probably have different levels of experience. In arboriculture, one key issue was that some tree companies do not have the resources to rescue climbers. **Rating(s): Farmers – 1-2, Contractors – 5, Arboriculture – 3**

D11 Environmental Conditions - The extent to which environmental factors, such as weather, affect workplace activity

Weather was regarded as an important factor in working at height. Roofs often need to be repaired in wet and windy weather, as this is when they tend to get damaged and there is a need to keep further rain out. Arborists are trained to work from the ground where possible, which can mitigate the effects of bad weather. **Rating(s): All – 1-2**

D12 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

In terms of operational equipment, farmers have to use what is available to them. The equipment they have could be adapted but at a price which they may not be willing to pay. As such, **a lot of work is done using the available equipment which may not be appropriate for the job**. **Rating(s): Farmers – 1-2, Contractors – 3-4**

D13 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

The group thought that safety equipment/PPE was typically not there on most farms. Equipment may be available for hire but farmers do not always know where to look for it. There was a feeling that farmers tend to have a misperception that safety equipment is too expensive, when, in reality, some equipment such as safety netting is relatively cheap and will last for a long time. **The perceived barriers to obtaining the right equipment in farming can be overcome by 'machinery rings'** whereby farmers share equipment which may be too expensive for any one farmer to buy. Getting the right equipment is easier in tree work than is the case in farming. **Rating(s): Farmers – 1-2, Contractors – 4-9, Arboriculture – 6-7**

C.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 was not deemed to be relevant to farmers in the context of how it was defined for the workshop. For contractors, it was stated that recruitment and selection are not as formalised as they should be. In arboriculture, everyone applies to work at height but if they are not up to it then they will work from the ground. In arboricultural companies, people are taken on at the bottom, and are then given training to aid their development. Itinerant workers are given tests and are then employed on a trial basis. **Rating(s): Farmers – Not relevant, Contractors – 4, Arboriculture – 5-6**

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

The comments in relation to this factor were inevitably similar to those for *competence* at the *Direct* level, given that the two factors are so closely related. The point was made that training can be formal or informal with the suggestion that training for work at height is mostly informal. Again, the group was **unsure as to whether or not there are training courses for work at height**. It was stated that there are courses but not specific to agriculture given that work at height is relatively infrequent in agriculture. There are not many people seeking training in agriculture because of the expense. There is a certain irony in that the Government provides money for some training courses but not those required by law. This does not help the industry. The fragmentation of training for tree work is a problem in arboriculture as there is no central body to set standards. **Rating(s): Farmers – 1, Contracting – 4-5, Arboriculture – 5-6**

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

The discussion on procedures started with risk assessments which farmers may undertake but will not necessarily write into procedures. HSE provide step by step guidance for working at height in agriculture, but many farmers are not aware of it and so the information is not getting to the many people who need it. There was a supplement on the topic in *Farmers weekly*, which was thought to be useful. **Rating(s): Farmers – 1-2, Contractors – 4-5, Arboriculture – 6-7**

O4 Planning - The system that designs and structures work activities

Again, risk assessments were mentioned in that they may be undertaken so far as farmers are able to but nothing is written down. **Farmers' planning in terms of safety is limited by a lack of information**. In arboriculture, workers have a good grasp of generic risk assessments but are not so good when it comes to certain task specific situations. **Rating(s): Farmers – 4, Arboriculture – 4-5**

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

The point was made that farming operations are too small to produce any meaningful information for themselves. Bigger operators may have procedures for reporting but they are often not used. Contractors are pushing for more information but there is a reluctance to report. NFU Mutual have accident data which is thought to be better than RIDDOR but they are not prepared to share it because of its sensitivity. **Rating(s): Farmers – 1-2, Contractors – 2, Arboriculture – 3**

O6 Management / Supervision - The system that ensures human resources are adequately managed/supervised

It was made clear that in the majority of farms (about 70%) there are no layers of supervision/management. For contractors there is a range in the quality. Sub-contractors are typically used on site and better companies will usually have someone checking. In arboriculture there are generally 2 to 3 man teams with a team leader. The standard of supervision varies a lot. Some will have a contract manager whereas some will report directly to the client. **Rating(s): Farmers – 2-5, Contractors – 2-9, Arboriculture – 5**

O7 Communications - The system that ensures that appropriate information is communicated clearly to its intended recipients

Due to the fact that farming is only really organised at one level it was felt that communications were dealt with adequately at the *Direct* level of the Influence Network (see comments in relation to factor D7).

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

It was thought that **the best enterprises have a *safety culture* from top to bottom** but they are in the minority. Several points were made which are perhaps indicators of the safety culture in agriculture. The NFU are concerned about safety nationally but much less so on a regional basis and, as such, are not really acting as a cultural driver. **Farmers often leave safety to contractors**. In terms of falls from height, **nobody thinks about the issue until the situation exists**. The best that farmers can do is to select contractors who consider health and safety, but price is much more of a concern. Although safety culture is lacking there was an opinion that there is rising awareness of safety and its implications. **Rating(s): Farmers – 2-3, Contractors – 2-9, Arboriculture – 3-4**

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

The initial feeling was that farmers are likely to buy the cheapest equipment available, but it was then stated that this would not necessarily be the case and that they would think about whether it was suited to the job or not. Work at height is unusual in farming and so farmers cannot be expected to have specialist equipment for it. However, there is the option of hiring the right equipment for such jobs. To save money, farmers will not do this if they can use something else instead. To make matters worse, contractors may not have suitable equipment but will borrow or hire what they can to get the job done. **Rating(s): Farmers – 1, Contractors – 1-9, Arboriculture – 7**

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

This factor had very little discussion since it was felt that the points covered in relation to equipment purchasing also applied to inspection and maintenance. Basically, farmers will get by as best they can. **Rating(s): Farmers – 1, Contractors – 1-9, Arboriculture – 7**

O11 Process Design – The process of engineering and ergonomic design (conceptual and detailed) of the structures, plant and equipment to ensure fitness for purpose, operability and safety during either maintenance or operation

Most of the discussion on this factor centred on the design of roofs, with concern that there are so many fragile roofs and that if this issue could be tackled in the design process then it would be of great benefit. However, there was also a feeling that all roofs will become fragile at some stage, and that it is maintenance as opposed to design that is important. Design was not thought to be the answer in terms of fragile roofs since the choice of material is hindered by the problem of condensation. An area where perhaps design improvements could be made is with slurry pits and towers. This factor is not relevant in arboriculture. **Rating(s): Farmers and contractors – 3, Arboriculture – Not relevant**

O12 Pay + Conditions - The remuneration package and benefits in the context of working hours and conditions and welfare facilities

This factor was not thought to be relevant to farmers because it is defined in terms of the method of pay (hourly, piece work etc.), the number of working hours in a standard week and welfare conditions. None of these issues are particularly relevant to farmers since many are self-employed. Clearly money is important, but for farmers this is probably better dealt with as profitability at the next level of the network. For contractors and arborists the factor was relevant with both reporting bonus systems related to productivity. **Rating(s): Farmers – Not relevant, Contractors and arborists – 4**

C.3 POLICY LEVEL INFLUENCES

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

The definition of *contracting strategy* was extended to include the main parts of the *organisational structure* (P4) definition relating to the clarity of roles and responsibilities for safety. The new definition therefore encompassed the extent to which safety is covered in contractual arrangements and in particular how responsibilities for safety are set out. In a lot of farming there is apparently little consideration of such matters, with most contracts being awarded on an informal basis. The situation appears better in arboriculture particularly with work for local authorities which constitutes around 30% of the workload in the industry. **Ratings(s): Farmers and contractors – 1, Arboriculture – 1-6**

P2 Ownership + Control - The extent to which their is ownership and control taken over sustained safety performance

Ownership of safety was generally thought to be poor. It was felt that in farming, attitudes are very much reactive in that if someone has a fall there is concern about safety, but little thought is given to safety otherwise. It was acknowledged, however, that some farms are better in this respect than others. In arboriculture if was felt that managers want little to do with health and safety. **Rating(s): Farmers – 2-5, Contractors – 2-9, Arboriculture – 4-5**

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

On the whole, safety culture does not exist at this level for the majority of farmers. *Culture* only exists at one level for most farmers and since it had already been discussed at the organisational level it was not thought appropriate to discuss it again at the corporate level. However, this factor was relevant for agricultural contractors and arboriculture companies where it was felt to be important that safety is driven from the top of companies otherwise it becomes a side issue. Standards tend to be better in the larger operations then smaller ones. **Rating(s): Farmers – Not relevant, Contractors and arboriculture companies – 4-6**

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

This factor was merged into *contracting strategy* (P1).

P5 Safety Management - The management system which encompasses safety policies, the definition of roles and responsibilities for safety, the implementation of measures to promote safety and the evaluation of safety performance

As with culture, management only really exists at one level for most farmers and had already been discussed at the *Organisational* level which meant it was inappropriate for it to be considered at the corporate level. Some contractors were thought to have management systems but there is a wide range in the standards. It had previously been stated that in arboriculture most managers had little interest in health and safety. **Rating(s): Farmers – Not relevant, Contractors and arborists – 2-9 (majority at lower end)**

P6 Labour Relations - This extent to which there is a harmonious relationship between managers/owners 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

The unions in agriculture were portrayed as being ineffective, and, to a certain extent, irrelevant to safety in farming although union representatives may help to disseminate information. In arboriculture there is no representation for workers unless they work for local authorities. This means that in many cases information only comes down through management (and only when they feel that it is appropriate). **Rating(s): All – 5**

P7 Profitability - The extent to which the owner is subject to competition over market share and constrained as to the price that they can charge

This factor was thought to have little or no influence on falls from height. The only possible influence might be if profit margins are so low that farmers will not employ contractors or specialist equipment for working at height. **Rating(s): General agriculture – 1-2, Arboriculture – 5**

C.4 ENVIRONMENTAL LEVEL INFLUENCES

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

There was thought to be a **poor understanding of the industry (and business in general) within the Government**. It was also thought that there is a negative attitude towards the industry, with the Regulator not being given enough money to address the problems. The Re*vital*ising strategy was seen as a positive attempt to bring people up to a minimum level. **Rating(s): All – 3**

E2 Regulatory Influence - The framework of Regulations and guidance governing the industry and the profile and actions of the Regulator

There is a feeling among farmers that the industry is over regulated and that this will not bring about improvement given the culture of the industry at the moment. Farmers feel that they are being asked to spend more time complying with Regulations than actually producing anything. This may create a situation whereby it is easier for buyers to import. There is now an attitude among farmers that Regulations will not be enforced and so there is no point in complying with them. However, there is a feeling that young inspectors are too keen to prosecute in order to make their mark. The situation has got to the stage where there is a dislike of all government departments without any distinctions made between those departments. A positive step was seen to be more discussion of problems instead of more regulation and enforcement. **Rating(s): Farmers – 1-2, Contractors – 5, Arboriculture – 6-7**

E3 Market Influence - The commercial and economic context affecting the industry

There was little discussion on this factor suggesting it was not seen as particularly relevant to falls from height. One point made was that **insurance policies for storm damage include an excess so the farmer is more likely to try to make the repair rather then claim**. **Rating(s): All – 5**

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

There was little discussion on this factor. The general feeling was that although there is sympathy for the plight of farmers within the agricultural community, this has not filtered through to the general public. In this sense, there is **no public opinion to sway government policy on agriculture**. **Rating(s): Agriculture in general – 2-3, Arboriculture - 1**

APPENDIX D

CONSTRUCTION WORKSHOPS

DETAILED DISCUSSIONS

D. CONSTRUCTION WORKSHOPS

Summaries of the workshop discussions are presented in the following sections. These summaries have been reported against the individual influence factors. The key issues that feed through to the conclusions are highlighted in bold type face.

D.1 DIRECT LEVEL FACTORS

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

Work-shop	Comments	Rating
New build	It was felt that those at more risk of high falls are generally more competent for working at height than those who are at risk of low falls. There is limited competence certification for work at height. One problem is that older workers may not be as agile. There was also a strong feeling that training does not necessarily relate to competence. It is vital to have the right blend of experience and training. It is easy to check for training but less so for competence. There was thought to be a certain amount of informal selection of more competent people by experienced managers that perhaps goes unnoticed. However, generally, there are not enough people coming through with training for work at height. Language problems may be a barrier to this. Steel erection was felt to have a rating of 8, whilst much of the industry was felt to be around 3-4.	3/4 - 8
Existing	It was pointed out that there are differences between major construction companies and smaller organisations with competence generally poorer in the latter. There are also differences between short term maintenance jobs and longer term work. On smaller jobs people may be pulled in at short notice with little or no training. These jobs tend not to be thought through by building managers and so competence requirements are not even identified. Building managers may not have the technical knowledge to know what the competence requirements should be. **Even if someone is competent to do a job they may find an easier way of doing it which they prefer even though this is less safe**. Alternatively they may be under pressure which forces them to cut corners. For these reasons it was felt **important that systems are in place to avoid having to rely on competence**. The client was thought to have an important role to play in ensuring competence by making checks on contractors. However, they need information on what contractors should be doing and how they should be assessed. Finally, it was thought that more enforcement of contractors would raise standards. It was suggested that standards in the industry are split 70% to 20% to 10% ratio of poor to moderate to excellent.	2-8

D2 Motivation / Morale - Workers incentive to work towards business, personal and common goals

Work-shop	Comments	Rating
New build	The main motivator in construction was regarded as being money, and this creates more togetherness than concerns about health and safety. One of the reasons for this is the cyclical nature of the industry. People have to make money during boom times and this is their principal objective as they do not know how long they might be out of work when things are not going so well for the industry. The group found it difficult to imagine how this situation might change or what could be done about it. Incentive schemes were discussed as a possible way of encouraging people to report safety concerns. However, there is a feeling among the workforce that if they report an incident then either they will get into trouble or nothing will be done about their concerns. This leads to a situation where people only report incidents if something cannot be covered up or if it has been seen by management. There was also a feeling that improvements have been made over the past 30 years and the industry is now not sure of how to make further advances.	4
Existing	The group found this factor difficult to rate and were unable to relate it directly to falls from height. It was said that motivation/morale depends on a number of factors including the company and the work site. A lot comes down to how the company is run. If it is run well then morale may be good even though conditions are poor. The poor end of the motivation/morale scale was thought to affect all sites. Motivation was perceived as being an individual thing. Moderate.	5-8

D3 Teamworking - The extent to which individuals work in teams and look out for each other's interests

Work-shop	Comments	Rating
New build	The group felt that if people work together regularly then teamwork is generally good, but if they have been thrown together for a job then it can be poor. There is also less trouble with peer pressure if people know each other, i.e. you do not have to prove things to people who you know, and trust is better among people who know each other. In terms of work at height, confidence in teammates may be particularly important. In construction, teams may change on a daily basis especially in the finishing trades which makes it difficult to foster good teamwork. Larger companies were felt to have ratings of 7-8, whilst the finishing trades only rated 4-5.	4/5-7/8
Existing	The main differentiating factor in terms of teamwork was thought to be whether the work is a major project or a small one-off job. On a major project there may be a learning curve at the beginning leading to workers developing as a team. This would not happen in a small project where there is little opportunity for team working. Another important factor is that specialists work in teams whereas other trades tend to come and go and so have little chance to get to know people. Unless a client tends to use the same contractors then teams will not form. Even when there are good teams on site there may be a problem with the relationships between teams. Perhaps the most critical point was that although there may be good team spirit, safety is unlikely to be on the agenda. Low to moderate.	3-5

D4 Situational Awareness/Risk Perception - The extent to which workers are aware of the hazards and risks associated with falls from height

Work-shop	Comments	Rating
New build	It was generally felt that **people are aware of the hazards when working at height but not the extent of the risks**. The attitude that 'it always happens to somebody else' is common in work at height, and there was also felt to be a sentiment that people would rather be killed outright in a fall than end up paralysed. People will take risks during work that would normally be considered unacceptable. It is almost as if they have a different idea of what constitutes risk when they are working. One reason for this seems to arise from overconfidence and familiarity with the hazards. One consequence of this is that there may be more risk of a low fall because the risks do not register as being significant. It was felt that those working at a significant height had a rating of 8, whilst those working at lower levels only rated 3-4.	3/4 - 8
Existing	The group immediately recognised the moderate description of **people recognising the risk but not modifying their behaviour**. The prevailing attitude appears to be one of complacency and that **'it won't happen to me'**. There was thought to be a **greater perception of risk at high levels but an underestimation of the risk at low levels**. Risk perception is not helped by the fact that supervisors may be seen taking risks that they would not let their men take. Improvement of risk perception was thought to require a cultural change at home as well as at work which should start when people are at school. The wider consequences of safety breaches need to be highlighted. Also, people need to take more responsibility for their actions so there is a move away from blame culture. High level working – Moderate; Low level working – Poor.	2-5

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

Work-shop	Comments	Rating
New build	Fatigue was thought to be an issue in the construction industry due to people being pushed hard on occasions. Other factors thought to contribute to fatigue are hot weather and heavy drinking the night before. Process / petrochemical industry construction was thought to be less affected by fatigue compared to general construction due to limits on working hours.	5
Existing	It was thought to be difficult for managers to know whether or not someone is too tired for a job. Also, they do not have the expertise to judge whether or not drugs might be a problem. There are a number of factors which might increase fatigue including a long journey before work, a call out for repair/maintenance through the night, overtime, or people working away from home and so having irregular sleep patterns. Alcohol was thought to be the worst enemy for people who are working away from home.	1-9

D6 Health - The well being of body and mind of the workforce

Work-shop	Comments	Rating
New build	Health was thought to be an issue because of the ageing workforce in construction. Aches and pains tend to increase with age and agility reduces. This may sometimes encourage people to take more care and look out for others. Often people do not admit tohealth problems. The group found it difficult to see what could be done about this factor due to its interrelation with culture and personal attitudes.	4-5
Existing	There was thought to be an element of self-selection for work at height. People who are not suited are either screened out or weeded out. The standard of health was felt likely to be poorer among the self-employed. Majority just above moderate.	6

D7 Communications - The extent to which the frequency and clarity of communications are appropriate for ensuring effective task and team work

Work-shop	Comments	Rating
New build	Communication in terms of safety was thought to be quite good in teams because it is in people's best interests and sometimes it is a necessity. Communications are mostly aimed at getting the job done. However, it was felt that a potential by-product of this may be better safety.	8-9
Existing	This factor was thought to tie with factor D3 – *Teamwork*.	3-5

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

Work-shop	Comments	Rating
New build	The group were of the opinion that the provision of information was at the top end of the scale. This may apply more to larger companies, however, where people receive booklets, safety awareness courses, toolbox talks etc. as well as a yearly induction, site induction, talks on risk assessments and method statements. The issue seemed to be not so much about whether information is available or not, but how it is used. This may be where smaller companies tend to fall down. Another issue is that it may not always be feasible to get information to everybody when they need it.	8-9
Existing	**Provision and use of information was generally thought to be poor**. There is evidence from safety inductions that **some people do not even recognise basic hazard signs**. **The availability of information was thought to be dependent on trade**. Specialists will have more information on safety but even they tend to focus more on the job in hand. IRATA may put out information to managers but this might not get through to workers. Dissemination will be better on large sites if the safety manager is proactive but workers will not go looking for information themselves. However, even this is limited in that the safety manager may not be aware of certain information (e.g. the fact that 5 minutes spent dangling in a harness can be fatal). Sharing information from incidents is hindered by the claims culture which seems to be on the increase. One way to help the spread of information is to provide it with operating instructions for new equipment. Also, **owners of buildings should be made aware of the safety information that they may need to provide for safe maintenance etc**. As a final judgement the group felt that information is likely to be available on how to do a job but probably not in terms of safety. Generally – Poor; Larger sites – Moderate.	2-5

D9 Compliance - The extent to which people comply with rules or regulations

Work-shop	Comments	Rating
New build	**Compliance in terms of working at height was generally thought to be low because people know they can get away with it** (unsafe working practices). Sometimes disciplinary threats will get through to people, but some will never change. A warning will not be enough and even removing someone from one site may not have much effect as they are likely to get work on another site relatively easily. The only way to get through to some people was thought to be with prosecutions. Compliance when working at height is made difficult by a certain mentality that makes people think they are safer when they are not tied on as they feel that harnesses get in their way. Awareness that they should be tied on is high. When caught without being tied on, these workers tend not to argue that they were unaware of the requirement to be tied on.	3
Existing	**Violations were thought to be common** in the industry even if method statements etc. are fully disseminated. These violations will range in seriousness. Often people will be under pressure and will get on with the job without thinking violations are particularly serious. It was thought that if you ask people, **they might know they should not be doing a job that way, but will be able to give you some reason to do with getting the job done as a justification for doing it their way**. This may be influenced by being paid lump sum or trying to please the manager. With transient workers, there is more chance of people breaking the rules because there is less chance of them getting caught. Even if they do get caught they can always get another job. To improve compliance it was thought necessary to get people to accept more responsibility for themselves and others, but this depends on an attitude change. The DuPont STOP system was mentioned whereby workers are encouraged to stop others to discuss safety issues.	2

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

Work-shop	Comments	Rating
New build	The availability of suitable people for the work depends on the amount of direct labour under a manager's control, and generally there are not enough people available. Sometimes there is a shortage of people, whilst on other occasions there is not enough work but there is rarely a balance. It is difficult to attract new people to the industry as it is not perceived as being a particularly attractive environment to work in. As a result people tend to come in and out of the industry, which makes it harder to strike any kind of balance. Typically, if there are shortages in any part of the country then labour is imported, although this is not generally a solution for those working at high level due to the competence requirements. Again, this perhaps indicates that there is more of a problem with the potential for low level falls.	4-5
Existing	This was thought to depend on the type of work, although it was generally considered to be poor. In construction, there always seems to be skills shortages in some areas. **There are few people who are good at working at height**. Even steel erectors are not necessarily trained for work at height, but pick it up on the job. Ex window cleaners might be the best that is available for high level work. This is better than taking in young people with no experience. The difficulty for the industry is that there are no apprenticeships any more to train these people properly. As a result, people are brought into the industry who are not as competent as they might be. In rope access it is **difficult to get people who can do the trade at height** which means you have to take in a trade person and train them to work at height. The alternative is to sacrifice the ability of the tradesman in order to use someone who is good at height. This may be a difficult balance to strike. **The best approach may be to ensure the right work system and work design to minimise the number of trades people who have to work at height**. Poor to moderate.	2-5

D11 Environmental Conditions - The extent to which environmental factors, such as weather, affect workplace activity

Work-shop	Comments	Rating
New build	Several environmental factors were put forward as affecting the risks associated with working at height including wind, night work, rain, frost, muddy conditions and glare from the sun. It was considered too difficult to produce a policy to cover environmental conditions. However, the BCSA do have a document on safe site handover which deals with these issues. Smaller contractors tend not to want to be tied to site handover rules and as a result the environmental conditions on the site may not be particularly well-controlled. The more control the principal contractor has over the site the easier it is to control the environment. As a final point it was said that if the weather changes very quickly it may be safer to leave somebody tied on at height rather than try to get them back down during the bad weather. The better controlled sites were rated at 7-8, whilst the poorer sites were only rated at 3-4.	3/4-7/8
Existing	The likelihood of working in poor conditions was said to depend on project pressures and constraints, but it is unlikely that roofers will work in bad weather. In building works people will find something else to do if the weather is bad. Procedures should be in place to cover the circumstances when people should not be working. Whilst it may depend on the urgency of the work, the norm is that there will be no work at height in bad weather. Most contractors view the weather as a recognised hazard. **Temperature was thought to be a particular issue, e.g. heat stress**, and this perhaps needs to be looked at. This currently comes down to the discretion of the employer / supervisor but guidance is required on the matter. Moderate.	5

D12 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

Work-shop	Comments	Rating
New build	The group felt that there was a significant range for this factor. Generally, operational equipment was viewed as being better if supplied by the principal contractor than if it is supplied by sub contractors. In the latter case, the equipment was not always erected, operated or maintained that well. Mobile towers are an example of particularly bad practice. They are often erected unsafely. Equipment supplied by principal contractors was rated at 7-8, whilst mobile towers etc. were considered to be poor (say 1-2).	1/2-7/8
Existing	The standard of equipment will be dependent on the facility in question. Newly built facilities will tend to have better equipment and access compared with older facilities and it is not always easy to retrofit equipment. Equipment which is moved from site to site, such as ladders, may not receive the care which is required. Larger equipment (such as MEWPS) are different in that service agreements are provided and the equipment is inspected and maintained in accordance with the manufacturer's recommendations. Other equipment such as scaffolding may sometimes be improvised due to job pressures but is generally good. However, equipment used by maintenance workers is typically of lower quality. They use whatever equipment is available in order to get access, and may even have equipment that their managers do not even know about. **The important issue in terms of equipment seems to be the assessment of what equipment is suitable**. Somebody needs to think about what is needed to do the job safely. Often people will fall off ladders that they should not have been on in the first place. **The equipment may be excellent but is often being used wrongly**. Moderate to poor.	2-5

D13 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

Work-shop	Comments	Rating
New build	**The quality of PPE was thought to vary from site to site with larger sites tending to be better equipped**. On larger sites, workers would not be permitted to work without the right equipment. The inspection and maintenance of PPE was discussed, and it was thought that **inspection regimes need to be tightened up**. It was suggested that there should be a rule for some equipment such as lanyards where the equipment is kept for a fixed number of years and then scrapped. The standard of equipment used by principal contractors is generally better than that used by sub contractors. The group found it difficult to see why there should be such a gap in standards and thought it often comes down to individual attitudes. People are never prosecuted for negligence in this respect and as such can get away with lower standards. It was thought that stricter punishment would help to change this. Training for use in PPE was touched on as being important especially in relation to fixing points for harnesses and lanyards. Finally, it was thought that perhaps smaller companies are not fully aware of the range of equipment that is available to them, and that this could be better publicised. Smaller sub contractors were felt to have a rating of only 1, whilst the larger principal contractors were rated 8-9. The industry average was considered to be around 5-6.	5/6 typ 1- 8/9
Existing	As with operational equipment, **the main issue regarding safety equipment / PPE was thought to be appropriate selection**. People may feel safe in a harness but it may not be right for the job. The feeling was that rope access is at the good end of the scale, with general maintenance work at the other end. With maintenance work, people were not considered to know enough about fitness for purpose. Inspection and maintenance was thought to be a big issue for safety equipment / PPE. Some clients may pass responsibility for safety issues relating to maintenance to the tenant. This then encourages the tenant to take responsibility. Some safety features are very difficult to test such as eyebolts. Some safety systems may affect people’s work such as the rail lock system on telecommunications masts. Nets are a good option for temporary work but are not used often enough.	2

D.2 ORGANISATIONAL LEVEL INFLUENCES

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

Work-shop	Comments	Rating
New build	As with other factors, there was thought to be a range here, depending on industry sector and size of company. In general, checks will be made on what people have done in the past before they are taken on. This is easier to check with steel erectors compared with those working at low levels. For the latter group there is unlikely to be any selection for working at height. Selection criteria are likely to depend on whether or not work at height is seen as a key activity in the project. If it is not, e.g. for electricians, then they will not be asked about working at height even though the job may involve this. Steel erectors were felt to rate at around 7, whilst elsewhere there was felt to be little selection, hence the zero rating.	0-7
Existing	The main factor for the selection of people in construction is their skill in their trade, not their suitability for working at height. There was thought to be a big difference between what was termed a professional client as opposed to an amateur client. Basically, these terms were used to distinguish the likes of large multi-national companies from small companies who perhaps have low profit margins. The larger clients will have better selection procedures compared to the smaller ones. In theory the client should assess the suitability of contractors before taking them on but this only really happens in larger organisations and even then not all the time. 50% to 40% to 10% ratio of poor to moderate to excellent.	4

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

Work-shop	Comments	Rating
New build	The question was raised as to whether or not specific training was available for work at height. **There is training for MEWPS and for the erection of scaffolding etc., but even for steel erection training tends to be provided on the job with work at height as a side issue**. The group were not aware of any courses that only cover work at height. Lack of training is not necessarily a budget issue but a question of opportunities. There are NVQs available but these are difficult for the average steel erector to complete. Many are not interested. They see no benefit, as they do not need the qualification to obtain work. They know they will get work from somewhere. Another problem with training is that because of the ageing workforce in construction, many were trained in the 1970s before health and safety was such a visible issue.	5
Existing	Larger companies were thought to rate about moderate for training whereas small companies were said to be poor, with perhaps no training. Small companies doing one off jobs may be good at what they do even though they have not invested in training. This reinforced the point that **training does not necessarily relate to competence, as skill and experience are needed as well**. For small companies, it may be easier to train one person and get them to pass on what they learn in-house. Several questions were raised regarding training specifically for work at height. There was also doubt as to whether it is even possible to train people to be more aware while working at height. There was also uncertainty over whether there is much training for work at height on offer. Even if there is, companies were thought to be unlikely to identify this as a training need for an individual. **They may be justified in this if people do not work at height often enough to make this kind of training cost effective**. In terms of retention of knowledge, it may be better to send someone on a course for two days a year rather than give them a one-off course for a week. Turning to induction training, the group felt that maintenance/refurbishment workers should go through this the same as other site workers, but it may be missed for small ad hoc jobs. Larger companies will be better at ensuring induction training. The final point suggested that **raising awareness for work at height lies not so much with training but more with the information which is present on the site**. A display on site to make everyone clear on the hazards on a day-to-day basis may be an effective way of promoting safer working. Large companies – Moderate. Small companies (making up the majority) – Poor.	2-5

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

Work-shop	Comments	Rating
New build	Procedures based on risk assessments, including those for work at height, were thought to be in place for major construction work, but this does not necessarily mean that they will be used or followed as intended. The procedures on major construction work were at least thought to be at hand and should be used. On major projects, the rating was considered to be around 8/9, elsewhere the situation would not be as good.	2-8/9
Existing	Procedures were thought to be in place but only at a generic level. In the larger companies there will be permits to work at height but not in smaller maintenance companies. Procedures for work at height may be in place but may be difficult to use and/or not monitored. A relevant checklist at the start of a job was thought to be better than making someone have to read through a list of procedures. Moderate.	5

O4 Planning - The system that designs and structures work activities

Work-shop	Comments	Rating
New build	The group felt that planning was generally good on most sites and that planning meetings would be held every day, or at least every week. As such, this factor was rated highly although it is probable that the group were thinking more of major sites and larger companies in this instance.	2-8
Existing	Basic planning exists in most instances, but not in terms of how it affects other activities. **A building manager may not think about how work at height affects maintenance activities**. **A plan for the building manager may well amount to getting someone to do the work but he will not be concerned about how the job is done**. In addition, the building manager may not have the competence to advise on how the job is done. One stumbling block is that **the person who did the risk assessment will not be the one carrying out the work**. Individuals tend to like to work things out for themselves and so may not seek help if something is not going to plan. They may plan to get a job done as quickly as possible, but perhaps without using the safest method. Poor to moderate.	2-5

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

Work-shop	Comments	Rating
New build	The point was made here that if the accident was a high fall then it could not go unnoticed. If someone falls from steelwork, for example, then there is almost always an investigation. There should be an accident book with forms available if more information is required. However, **an accident may only be known about away from the site if it is a reportable injury**. Near misses are rarely brought to anyone's attention. One problem here is explaining to people what is meant by a 'near miss'. **Certain incidents are viewed as being part of the job and so are not reported**. However, some people will not be shy in coming forward due to the possibilities of being awarded compensation for an injury. This is common with back problems. Although accidents/incidents may be recorded, the group were less certain as to whether this information is actively used to improve safety. This was thought to depend on the company or industry sector. One of the companies represented had tried reporting incentive schemes but these did not always work. Steelwork erection was considered to have a rating of 7-8, whilst the new build construction industry was typically around 5.	5 – 7/8
Existing	Incident management and feedback was thought to be very poor across construction. Reporting is limited, and learning from incidents is even less common. Reporting is poor partly because accident reporting forms and investigations lean towards apportioning blame, and this makes people reluctant to report. Learning is limited due to poor reporting which does not help to understand why accidents happened. This limits what can be found out about how to prevent recurrence. It was felt that only larger companies are in a position to run an effective reporting system. Smaller companies will not have the resources or the number of incidents to make it work. Trade associations may be able to help by putting out information, but this may not get through to workers. Poor.	2

O6 Management / Supervision - The system that ensures human resources are adequately managed/supervised

Work-shop	Comments	Rating
New build	Management systems are reportedly better for work at high levels, but not so good for managing the risks of falls at lower levels. The group found it very difficult to rate this factor saying that there were instances at both extremes. Much is dependent on what is being built. The building of bridges for example has much tighter management control. Managers were thought to be particularly important when there is a variation in the work. Who is doing what and when is also a major issue for managers. It was thought that the management of work at significant height is so different compared to work at lower levels that there could be a case for a separate workshop for each topic.	6
Existing	**Some managers were thought to lack the competence required to manage work at height**. They have no concept of what they are asking people to do and their risk perception in this area is poor. The only way around this is to have people with experience in management positions (e.g. rope access experience when managing these activities). In terms of supervision for work at height, **the work is often not deemed to pose a high enough risk to warrant the level of supervision which is actually needed**, and it is not seen as financially viable to increase the number of supervisors. Unless a company specialises in work at height the management and supervision of the work will be very poor. Management need to realise the benefits of training a small team to do (or supervise) tasks at height.	Poor

O7 Communications - The system that ensures that appropriate information is communicated clearly to its intended recipients

Work-shop	Comments	Rating
New build	Organisational communication is another area where there was perceived to be a difference between working at high levels compared with low levels. Risks for work at high levels are generally better communicated. This is also related to the size of the activity in that large structures are so visible that accidents may bring bad publicity. Thus there is a need to have communication systems in place. Communications from the principal contractor to the main contractors are generally good, but between sub contractors this was not felt to be so good. Again, finishing trades were given as an example where communication could be improved. The contractual relationship may come into play here. Whilst the larger sites were considered to have a rating of 8, 5 was considered to be more typical elsewhere.	5-8
Existing	The main problem with communication from the organisation to workers appeared to be the availability of the required information as opposed to communications per se. This is especially true for older buildings where information on the building may not even be available let alone updated for tenants' modifications. Ideally there should be a maintenance strategy in the health and safety file where such information is held and updated. Architects have a role to play in developing such a maintenance strategy, but this is likely to be way down on their list of priorities. Even if there is good information in the health and safety file, pressures during a project might mean that it is not referred to. Much depends on the relationship between the client and contractor. Large companies – Moderate; Small maintenance – Poor.	2-5

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

Work-shop	Comments	Rating
New build	The overall feeling was that **safety culture is generally not good in the industry, and needs addressing**. Culture is better than it used to be, but is still not all it should be. Major companies are looking for continual improvements but not enough companies are following their lead. **There is still a dominant attitude that people know what they are doing and safety is not a major concern. People need to appreciate that safety is important before the culture will change**. Questions were raised regarding what is the best way to change culture. Larger companies were considered to have a rating of 6, whilst smaller companies and the self-employed were considered to be around 3-4.	3/4 - 6
Existing	Good safety culture and the sharing of information to promote safety was thought to **only really happen on larger construction sites**. There are visible signs such as safety signs, men wearing the right PPE etc., and the CDM Regulations have helped to raise awareness. However, this is **only just starting to affect facilities management**, and has **not really got through to maintenance at all**. Part of the reason for this was thought to be that maintenance is divorced from construction and maintenance organisations do not really see themselves as performing a construction activity. Refurbishment is akin to construction, and improving, Maintenance – Poor.	2-5

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

Work-shop	Comments	Rating
New build	In general it was felt that purchasing is not an issue for the major companies, but it is for smaller organisations. Major companies will look at the most efficient way to do a job when tendering and take into account the equipment which is required to get the job done. There are lots of hire companies which can be used if a company cannot afford to purchase outright the equipment that they need. The group rated this factor highly which reflects the major organisations, but not the smaller ones.	2–7/8
Existing	There was thought to be a difference here between larger and smaller companies with the former costing in the right equipment whereas the latter keep it to a minimum to boost profit margins. The situation is difficult to understand given that some of the equipment is relatively cheap. **This was thought to be down to workers' poor perception of the risks and the value of having the right equipment**. People do not think about getting a piece of equipment which can be used for several work at height jobs. 60% to 30% to 10% ratio of poor to moderate to excellent.	

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

Work-shop	Comments	Rating
New build	In discussion of this factor, differences were drawn out between larger companies using major plant and smaller operators using harnesses etc. Major companies will generally carry out inspection and maintenance of major plant to a high standard. The opposite was felt to be true for small organisations. Painters were mentioned as a group who are particularly bad at looking after harnesses. Inspection and maintenance might come as a package from a hire company. Again, the rating that was given reflected the major contractors end of the market.	(2)–7/8
Existing	Again, there was thought to be a **better maintenance regime in refurbishment work compared with that in maintenance work**. There may be information on the health and safety file regarding inspection requirements but this may not be used. This CDM requirement is relatively recent, and it was thought to be too early to judge progress. Refurbishment – Moderate; Maintenance work – Poor.	2-5

O11 Pay and Conditions - The remuneration package and benefits in the context of working hours and conditions and welfare facilities

Work-shop	Comments	Rating
New build	It was felt that apart from labourers, people in construction are generally paid well especially steel erectors. Due to the labour shortage, workers need to be paid well otherwise they will go elsewhere to make a living. Some workers are paid on a productivity basis for example roofers and sheeters. Welfare conditions are generally good. The discussion on this factor did not indicate that it is relevant to falls from height.	8
Existing	Pay and conditions received limited discussion and did not seem to be linked to the risk of falls from height. Most maintenance workers will be paid by the hour because they it is often difficult to estimate the extent of the work. Although pay may only be average at best, it was not thought that the method of pay would influence safety. Moderate.	5

O12 Process Design – The process of engineering and ergonomic design (conceptual and detailed) of the structures, plant and equipment to ensure fitness for purpose, operability and safety during either maintenance or operation

Work-shop	Comments	Rating
New build	This factor received considerable discussion suggesting it to be **particularly relevant to work at height**. One of the fundamental problems is that **designers do not consider how the structure will be built, or have much perception of how it will be built**. Bridge designers are not as bad in this respect because they base their design on an assumed erection sequence (even though the contractor can propose alternatives). It was felt that designers need to somehow be made aware of how structures are built and the problems that can be faced. It is a difficult topic because there is usually more than one correct solution. A design safety case was mentioned whereby designers would have to demonstrate that they had considered safety issues such as working at height in the design. Designers need more information on how structures are built in order to do this, and even then it was thought that it would still be difficult for HSE to enforce. Site experience was offered as another measure which would improve designers' awareness. Several problems with tackling safety through design were mentioned including: **designers being unable to cost in safety due to the competition for work reducing their fees**, different designers have different concepts of how things should be built and often foundations are being built whilst the detailed design of the superstructure is taking place thus limiting the design scope.	3
Existing	It was stressed that process design as a means of improving safety only applies to on-going design but has no application to older buildings. New buildings do tend to be better in terms of safety but there are still some unusual designs where appearance is the prime driver. It was thought that the client is the only one who has the potential to change architects' minds. Planning supervisors have no power in this respect. Although architects are starting to consider safety more it is often too late in the design process when the issues are raised. Other problems include conflicts with English Heritage requirements from influential/controlling bodies such as English Heritage and a lack of information for designers. Users need to see that they can reap benefits from the application of CDM. Poor to moderate.	2-5

D.3 POLICY LEVEL INFLUENCES

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

Work-shop	Comments	Rating
New build	The overall feeling was that at the larger end of the market the major companies will consider safety in contracts but smaller companies will not. One of the group participants was from a company who are clients as well as contractors and made the point that **it is in the client's best interests to have an emphasis on safety throughout procurement**. Major contractors will carry out safety audits to ensure that they make it onto major clients lists of approved contractors (which includes consideration of safety). This is an ongoing practice. In reality, it was felt that **safety often comes secondary to cost especially at the lower end of the market**. In addition, fragmentation is inevitable in construction due to the nature of the industry with 3 or 4 different layers of contractors. This reduces capital outlay but makes it more difficult to ensure that adequate responsibilities for safety are identified. **Many contractors may be aware of the safety issues but may get the job too late in the programme to make a difference**. They can have greatest influence if they are taken on at the beginning when they can influence the design, but this was felt to be rare. At the larger end of market the rating was considered to be around 8, whilst for smaller companies the rating was felt to be lower.	(2)-8
Existing	This was **thought to be an important factor** if the client can put themselves in the position where they can say no to a contractor for safety reasons. In construction large contracts will generally be good, but **for small maintenance jobs there may not even be as much as a written contract**. Purchase orders containing terms and conditions that have nothing to do with maintenance work are often used. In order to have a good procurement system it was thought necessary to have a good health and safety department, but even large companies may only have one health and safety professional. A view was expressed that perhaps it should be a legislative requirement to have at least one health and safety professional in an organisation. One factor which has affected procurement is that main contractors do not have many staff on site anymore. As such, it is more difficult for them to coordinate health and safety, as they do not have enough staff to exercise power. (see also discussion under E3). Large companies – Moderate to Excellent; Small companies – Poor.	2-8

P2 Ownership and Control - The extent to which their is ownership and control taken over sustained safety performance

Work-shop	Comments	Rating
New build	This factor was discussed in terms of the ownership of safety taken by the client. There was a feeling that **more companies have taken more interest in safety over the last few years as they start to realise the benefits**. However, it was suggested that, with the exception of the petrochemical industry, clients will take little interest and may be rarely, if ever seen, on a site. It all comes down to the principal contractor taking responsibility, and this happens less in smaller companies. The rating was felt to be typically about 7, with major contractors at 8 and the petrochemical companies at 8-9.	7 - 8/9
Existing	This was thought to be an area of improvement with a greater appreciation of the need for a health and safety management system. **In large companies the path of responsibility for safety will lead to someone in the health and safety department, but this will not happen in smaller organisations**. Responsibilities may be set out in the health and safety management system but there is a question as to whether or not they are fulfilled. The corporate manslaughter issue has raised awareness of responsibility among directors. Moderate to Low Excellent	5-7

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

Work-shop	Comments	Rating
New build	This factor was also considered in terms of the culture of the client with respect to safety. As such, this factor was similar to the previous one and discussion was short. An additional point was made that a long-term view is needed in terms of health and safety but many clients are only interested in selling the building once it is complete. Also, overall safety culture can depend heavily on the site manager. Whilst those organisations that owned their buildings were considered to have a rating of around 8, those who built to sell were likely to rate lower.	(2)-8
Existing	The group found this factor difficult to rate due to the range depending on variations between companies. Much was thought to depend on a company's interpretation of the law. It was thought necessary to address this on a company by company basis. Moderate.	5

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

Work-shop	Comments	Rating
New build	The feeling was that the moderate description for this factor summed up current practice in the industry i.e. some definition of safety responsibility but there are gaps especially in terms of communication.	5
Existing	Roles and responsibilities were said to be fairly well established on modern CDM sites but for smaller jobs there may be no recognition of roles and responsibilities. It is the client's responsibility to assure the competency of contractors but they may not have the technical expertise to do this. The planning supervisor then has a responsibility to advise the client, but during the work it comes down to the contractor to carry through the work plan. 70% to 20% to 10% ratio of poor to moderate to excellent.	1-9

P5 Safety Management - The management system which encompasses safety policies, the definition of roles and responsibilities for safety, the implementation of measures to promote safety and the evaluation of safety performance

Work-shop	Comments	Rating
New build	Effort was thought to have been made into individual areas of safety such as PPE and risk assessment, but there was a lack of a cohesive health and safety management system (HSMS). The effort in different areas tended not to have been pulled together. Alternatively, a system may be in place but it is not used in practice. Often part of the HSMS loop is missing, especially the monitoring of the system. The group gave this factor a relatively high rating (6-7) which no doubt reflects the larger contractors. Smaller contractors probably have less developed systems, and would be rated lower.	(2)–6/7
Existing	Companies were thought to broadly fit into one of 3 categories which map against the rating scale: Poor - One man companies not required to have a written system; Moderate – Medium sized companies; Excellent – Large corporations with accredited health and safety management system systems.	1-9

P6 Labour Relations - This extent to which there is a harmonious relationship between managers/owners 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

Work-shop	Comments	Rating
New build	There was little discussion of labour relations suggesting that it was not seen as relevant to falls from height. Construction workers have rights to union membership by law, but many only join if they have an accident and thus something to gain. It was felt difficult to get safety representatives in the industry. Smaller contractors tend to want nothing to do with unions, as they do not want demands placed on them (e.g. in terms of improving standards). Overall, there were felt to be less welfare concerns now compared with the past.	6
Existing	This factor was thought to be neutral overall. Not many would fit the poor category because that would almost be illegal. There is not a great system for the negotiation of pay. It tends to be dictated by supply and demand and the state of the industry at that time. Moderate.	5

P7 Company Profitability - The extent to which the owner is subject to competition over market share and constrained as to the price that they can charge

Work-shop	Comments	Rating
New build	The quality of this factor was thought to depend on the end of the market at which the company operates. The directors of larger companies will not allow cost to get in the way if something is vital for safety. Such companies probably have enough money to be able to afford such expenditure. Senior managers need to be targeted to realise that this is the case. However, at the other end of the market companies might barely have enough money to break even let alone invest in safety. A rating of 5 was chosen as an average but it appears that some larger companies will be above this and many smaller companies will be below it.	5
Existing	This factor was felt to have been covered in the discussion of P6 – *Labour Relations*. Low moderate	4

D.4 ENVIRONMENTAL LEVEL INFLUENCES

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

Work-shop	Comments	Rating
New build	The group felt that the government were not doing enough to get the safety message across to the industry, with most of the talk being at a superficial level. No one knows who is fighting the construction corner in the government and it was felt that the industry deserved a higher profile given its size.	5
Existing	It was felt that there is considerable political influence since the infrastructure of the country has been brought into question by the public and the government are pushing to upgrade. The government were said to be supporting initiatives and generally the influence was rated as moderate.	5

E2 Regulatory Influence - The framework of Regulations and guidance governing the industry and the profile and actions of the Regulator

Work-shop	Comments	Rating
New build	There was anecdotal evidence to suggest that other government departments have not helped to promote the health and safety message and that HSE needs to communicate better with these other departments. In general, the **Regulator was thought to be under resourced**. It was felt that **sometimes the HSE shows an unwillingness to take action**. There was a feeling that tougher enforcement is needed, especially in relation to individuals. The recent inspection blitzes are only a temporary solution and perhaps they should not be publicised so much. **More work is needed to change attitudes and eliminate hazards**. Goal setting can give too much leeway in construction and **perhaps there is a need for more prescription**.	4-5
Existing	It was acknowledged that the HSE are under resourced which limits the amount they can do. However, it was said that they **should concentrate efforts on getting out and being more proactive**, for example, by getting involved with design teams. Some parts of HSE are proactive in this sense but there are differences across regions. Advice is available but can sometimes be guarded if HSE do not have the necessary expertise. A recognised source of advice from a neutral party was thought to be a good idea in theory with perhaps the planning supervisor used in this capacity. The HSE information line was mentioned but the participants had limited awareness of it and thought that often there are more questions than answers from HSE. Moderate.	5

E3 Market Influence - The commercial and economic context affecting the industry

Work-shop	Comments	Rating
New build	This factor raised a similar point to *company profitability* in that **larger contractors will not let cost compromise safety whereas smaller contractors may not be in a position to do the same**. Also raised, was the point that those involved in major works can cost in safety because it is expected whereas at the lower end of the market it is not, and costing it in would price a company out of the job. As such, there is not a level playing field for smaller companies trying to improve safety because other companies are operating differently. At the top end of market, the rating was felt to be around 5, whilst at the lower end it was only felt to be 2.	2 - 5
Existing	The market was said to be at a moderate level currently but is prone to fluctuation. People will sometimes bid lower to get the work and then worry about the risks that are involved. This was compared to other countries on the continent such as Germany and Holland where companies nearest to the average tender price get the job. This means there is no incentive to try to undercut competitors and so there is more chance safety costs will be included in the tender. The result is that everyone works to a similar standard and innovation is encouraged. Moderate.	5

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

Work-shop	Comments	Rating
New build	This factor was thought to be neutral, at least in terms of the risk of falls from height. On one hand, the public does not want to see construction workers hurt and there may be a reaction to well publicised cases such as Canary Wharf. On the other hand, people do not generally think about the welfare of construction workers. They are often seen as a nuisance who should be behind the scenes. Engineers probably have a better reputation on the continent.	5-6
Existing	There was said to be a fairly low regard for the construction industry in general. People tend to see the industry as made up of either ‘cowboys’ or large money making organisations. People might have slightly different perceptions of trades within construction; for example, a maintenance technician is thought to be more skilled than a bricklayer is. Poor to moderate.	1-4

APPENDIX E

ROOFING WORKSHOP

DETAILED DISCUSSIONS

E. ROOFING WORKSHOP

Summaries of the workshop discussions are presented in the following sections. These summaries have been reported against the individual influence factors. The key issues that feed through to the conclusions (Section **Error! Reference source not found.**) are highlighted in bold type face.

E.1 DIRECT LEVEL INFLUENCES

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

Competence in roofing was thought to be at a moderate level, with a few examples of excellent and poor competence at either end of the scale. **Training was thought to be indispensable for roof work with experience also vital for developing competency in this area. Rating(s): 6**

D2 Motivation / Morale - Workers incentive to work towards business, personal and common goals

Initially, it appeared that there is low self-esteem and low morale in the industry, but it has been found that once workers are engaged in something like an NVQ then there is a lot interest and motivation. People generally want to do well and improve themselves. They want to develop their skills and be recognised as a professional trade. The NVQ scheme was felt to be providing a good incentive in this respect. Although motivation may be high in certain parts of the industry, this is not necessarily related to safety. With subcontractors the motivation is to earn as much money as possible. Overall, this factor was thought to be neutral in the industry. **Rating(s): 5**

D3 Teamworking - The extent to which individuals work in teams and look out for each other's interests

There was very little discussion of this factor, suggesting it was not seen as particularly relevant to falls from height in roofing. Workers may talk about hazards in teams, but not necessarily falls from height. There can be negative peer pressure from both younger and older workers. **Rating(s): 6-7**

D4 Situational Awareness - The extent to which workers are aware of the hazards and risks associated with falls from height

It was suggested that the **younger and older age groups are liable to poor risk perception. In the former case, it is because they lack awareness due to limited experience, whilst older (35-40) workers become complacent** and feel like they know it all from being in the industry for so long. However, this was thought to be true of all trades not just roofing. **Rating(s): 1-9 (younger and older workers at the poor end)**

D5 Fatigue - The degree to which performance is degraded, for example, through sleep deprivation, or excessive / insufficient mental or physical activity, or drugs / alcohol

This factor was thought to be at a moderate rating for roofers. **Incidents are known about which were due to sleep deprivation or the effects of alcohol.** The workshop participants felt that this is perhaps more of a problem than is thought, but is one which is difficult to identify. Larger companies will have drugs and alcohol policies. Whilst the issue is being addressed more, a significant change in culture is required. However, culture is shifting in that lunchtime drinking has reduced significantly. Some roofers may have a second job which makes fatigue even more of an issue. It was felt that more research is required to identify how serious the issue is. **Rating(s): 6-7**

D6 Health - The well being of body and mind of the workforce

Roofing tends to be a self-selecting trade, in that only relatively fit people can undertake the work. It is rare to see people in roofing much over the age of 40 as most roofers have bad knees by this time. As people become physically less able around this age they move out of the industry. Generally the workforce is fit and healthy, but one area of health that may be overlooked is eyesight. **It was estimated that about 20% of the workforce may have deficient eyesight**, and this was felt to require further investigation. **Rating(s): 7-8**

D7 Communications - The extent to which the frequency and clarity of communications are appropriate for ensuring effective task and team work

As roofers work in gangs there is familiarity within teams. This encourages communication, and people tend to look out for one another. However, communication may deteriorate when more than one gang is involved. If roofers have the opportunity to communicate, they will. However, other trades may not be on site at the same time. Issues may be raised but not always carried forward. Training was thought to be important for good communications. **Rating(s): 6-7**

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

The provision of information to workers was seen as a major issue that needs to be addressed. It was felt that **method statements are too detailed, and are not in a simple usable form for those who need to use them**. Some form of aide memoir that can be kept in the van may be one way in which this could be improved. One barrier to this is that insurers want reams of detail in case litigation arises. Risk assessments need to be job specific unless the same job is being carried out all the time. Generic information is no good in this respect. The quality of information needs to be monitored and controlled. On a positive note it was thought that things have improved greatly since 1992, prior to which there was little information available. The workshop participants were unsure about the level of literacy in the industry.

They thought it was probably like any other construction trade, but that it would be beneficial to check this for roofing. **Rating(s): Information passed to workforce – 2, Workers seeking information – 0**

D9 Compliance - The extent to which people comply with rules or regulations

Compliance in the industry was generally thought to be poor, especially if a job is running late. This tends to change the principal contractor's attitude to how a roofing contractor should carry out the work i.e. they may be encouraged to take shortcuts. Roofers were likened to scaffolders in that they will only take the precautions that they feel are necessary. An example was given whereby roofers would only comply when they had a prohibition notice even though they had the right equipment in the back of the van. **Trained people will still take risks as this attitude tends to be ingrained in the culture**. The more people are allowed to get away with safety violations, the less chance there is of changing attitudes. It can be a difficult situation for managers since they may not want to sack a worker in case they cannot find a replacement. In terms of changing culture, it was suggested that the industry would need to wait until a new generation of workers becomes established. **Rating(s): NFRC perspective – 1-3, HSE perspective – 1**

D10 Availability of 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

There was felt to be a shortage of skilled roofers around the country. People may have experience without the necessary training to complement this. The shortage in the industry at the moment could lead to more casual labour being used. Subcontractors are paid enough such that they do not have to work excessive hours if they do not wish to. The use of foreign labour to supplement this is an issue in that the foreign labour may not have the necessary skills. It was felt necessary for roofing be viewed as a skilled trade. Slating and tiling used to be viewed as a respectable profession, but there has been a dilution of skills, which is thought to have been detrimental to safety. People new into the trade, especially young workers, are at more risk because they do not have as much appreciation of the hazards. Management have an important role to play here, but often they do not know how skilled the roofing subcontractors are. Overall, although there is a shortage in the industry at the moment, there is still a reasonable supply of roofers. **Rating(s): 4**

D11 Conditions - The extent to which internal factors (such as noise, vibration) or external factors (weather etc.) affect workplace activity

Weather was cited as a continual hazard in roofing either through rain / wind or health risks from exposure to the sun. **Many accidents have been seen with sheets being blown out of control**. Some jobs cannot be done in certain conditions, e.g. felt roofing when it is wet. However, on occasions, work pressure makes things difficult. The NFRC have guidance on working in bad weather and set parameters. **Rating(s): 2**

D12 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

It was thought that equipment is generally available, but may not always be used as intended. Also, there are **differences depending on the size of the firm and whether it's a new build or maintenance project**. In new build roofing, scaffolding will be provided by another contractor, and this is usually reasonably good. NFRC provide laminated check cards for roofers to check scaffolding against. When larger organisations are involved on a project the checks on scaffold are usually good, whereas smaller organisations may not be so vigilant in this area. They may use whatever equipment is available. Lack of supervision during dismantling was cited as a cause of major scaffolding collapses. **The quality of equipment is a function of its type, with larger mechanical equipment generally being better than ladders**, in part due to the LOLER and PUWER Regulations, with ladders often being neglected. **Rating(s): New build - 8-9, Domestic/maintenance – 5**

D13 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

An important point to come out of the discussion of this factor was that there are significant differences between the equipment used in new build roofing compared with that used in smaller maintenance jobs. There was felt to be a **much higher risk of falls in maintenance work, as safety equipment is less widely used and is of lower quality**. **In addition, the levels of training, supervision and inspection/maintenance are lower**. Nets are now the preferred option in all roofing including industrial buildings, housing and refurbishment projects, but in small maintenance job there may be no safety equipment at all. In most roofing, PPE is generally not considered, and sometimes it may not be appropriate anyway. Neither harnesses nor crawling boards are used very often. Edge protection is sometimes lacking and access can be poor. Inflatable fall arrest systems only have limited use in new build. **Rating(s): New build – 7, Maintenance – 4**

E.2 ORGANISATIONAL LEVEL INFLUENCES

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

It was stated that there are selection criteria for roofers but these tend to be informal and subjective. However, despite this, people with the necessary experience and competence will typically be employed. The problem arises with those people who work with roofers, but who will not be as competent or experienced. Selection of these people tends to be more difficult to control. In addition, there a number of non-roofers who will take on roof work, but may not be suited to the job demands. This in effect creates a two-tier system in roofing. **Rating(s): Professional roofer – 6-7, Roofers mate – 2-3**

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

There are effectively two levels of standards for training in the industry, with the more responsible professional companies providing training to a moderate level whereas **the self-employed see no reason to undertake training, and are unlikely to have had any training**. The crux of the problem is that there is a system in place for training, but the take up is lower than desired. **Rating(s): Professional roofer – 6, Self employed – 0**

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

Procedures were thought to be an area where roofing companies could improve. The main problem is that companies do not put enough focus on what is actually needed. Some procedures are over complicated and bulky, but most are over simplified. More and more companies are putting systems in place. This is an improvement, but they need to think more about getting the level of detail right. Another shortcoming is that procedures are not updated systematically. **Rating(s): 4**

O4 Planning - The system that designs and structures work activities

This factor again brought out the differences between large and small firms. The nature of roof work requires that at least some level of planning is undertaken, but only the larger contractors will carry out risk assessments. Smaller contractors will plan the work, but not necessarily with safety in mind. It may depend on what the client requires from the contractor in terms of safety. Major contractors will require that subcontractors take reasonable measures. If there are less than 5 people in a company then there is no legal obligation to record risk assessments and, as such, treatment of safety tends to be less formal anyway. **Rating(s): Larger contractors – 6-7, Smaller contractors – 1-2**

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

This factor was rated as very poor in roofing. **The only way in which any kind of incident feedback is happening in the industry is through the NFRC** who are trying to drive this area. For example, part of the criteria for membership is that companies have at least one copy of HSG 33. Companies left to their own discretion are doing nothing in this area. An example was given of a company who do produce near miss memos, but nobody reads them. **Rating(s): 1**

O6 Management / Supervision - The system that ensures human resources are adequately managed/supervised

The discussion of this factor centred on **supervision, which was thought to be a key issue**. Supervision was rated as being poor, in that often it is in place but workers are left to get on with the work. The intention may be there, but the actual carrying out of the supervision is poor. However, it was pointed out that there are some examples of good supervision. **One of the main problems is the link between the office and the site**, which may not be good. In addition, some supervisors have been promoted despite not having the necessary experience. **Their main role tends to be on the operations side as opposed to looking at safety**. In order to improve management/supervision it was felt important that the right people are employed in the first place, and that there is commitment from directors. **Rating(s): 3**

O7 Communications - The system that ensures that appropriate information is communicated clearly to its intended recipients

Communications at the organisational level were thought to fit into the moderate rating category. There may not be a 'system' for getting information through and breakdowns do occur. Practical job issues tend to be communicated, but not necessarily in relation to safety. Little thought is given to what information is needed by workers. **Rating(s): 5**

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

Safety culture was thought to have improved in recent years, but it is **still an area where much improvement could be made**. It was felt that people would not knowingly put themselves or others at risk, but it comes down to different perceptions of what needs to be done in terms of safety. Too many companies do not have high enough standards in terms of what is necessary. Some companies do apply high standards, but they are the exception. Even so-called experts sometimes show lapses in culture. On a positive note, culture was thought to have improved over the last 10 years or so. For example, fewer people would tolerate not using safety nets now. **Rating(s): General – 6, Maintenance activity - 2**

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

It was suggested that companies do have budgets for equipment, since such equipment is necessary to carry out the work. Most companies will hire equipment. Problems arise because safety is not considered when obtaining equipment, and subsequently that equipment may not be used appropriately. For example, a lot of companies are going for tower scaffolds at the moment because of the ease of putting them up, even though they may not always be appropriate in terms of safety. A further complication is that some workers are not competent in the use of equipment. Risk assessments should be carried out to address whether or not equipment is suitable for a job. However, this is likely to be rare. **Ladders were flagged as the equipment causing most concern since they are often the piece of equipment that is least suited to the job**. **Rating(s): General – 5-6, Ladders – Low**

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

The workshop comments revealed that there are two different sides to inspection and maintenance of the equipment used in roofing. Mechanical equipment is covered by the LOLER Regulations and, as such, the standard is fairly good. On the other hand, harnesses, lanyards, ladders etc. are often abused and there is little maintenance. Larger companies tend to look after equipment better than smaller companies. Smaller companies are more inclined to hire equipment, and the standard of that hire equipment is not always good. In addition, there are new netting companies emerging who were not felt to pay enough attention to proper inspection and maintenance. It was felt that the standard of inspection for netting should be the same as that for scaffolding. **Rating(s): Mechanical e.g. MEWPS – 8-9, PPE e.g. harnesses – 2**

O11 Pay + Conditions - The remuneration package and benefits in the context of working hours and conditions and welfare facilities

This factor was thought to differ depending on whether a worker is an employee or is self-employed. It was thought that around 90% of the self-employed are on piecework, which might be detrimental to safety, whereas employees tend to be on an hourly rate. The general consensus was that relative rates have not changed much since the 1970s and are sufficient so as to not put financial constraints on safety. **Rating(s): 7**

O12 Design – The process of design of the structures to ensure buildability, operability and safety during construction or maintenance.

Designing in safety was thought to be an area that is largely being neglected at the moment. Designs were thought to be getting more complicated, and driven by how they look as opposed to safety. This was thought to be an area in which CDM is not working at the moment. **Although designing for safety can help to reduce risks, it was also said that sometimes designers can only take things so far**. However, **more consideration of designing in attachments for safety nets/lines would be beneficial**. Sometimes safety features are only for show, and are not of much practical use. Designers may only be paying lip service to safety. **Rating(s): 2-5**

E.3 POLICY LEVEL INFLUENCES

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

Contracting strategy can be used as a lever to improve safety. However, such an approach is not adopted widely enough, and there is much room for improvement. Only larger organisations would tend to use contracts in this way, and even then only to a moderate standard. **Smaller contractors, especially those undertaking domestic and maintenance work, were felt to be appointed on the basis of best price, with safety being ignored**. In the facilities management sector, organisations were thought to have limited awareness of their safety responsibilities. **Ratings(s): Bigger companies – 5-6, Small contractors – 0**

P2 Ownership + Control - The extent to which their is ownership and control taken over sustained safety performance

The feeling was that larger companies with corporate images associate safety with efficiency, but in roofing there are not many of these. Many companies try to divorce themselves from their responsibility by passing it on to someone else. Accountability for safety is poor. Not enough interest is taken in safety at board level. **Rating(s): 3**

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

This factor received little discussion, perhaps being regarded as similar to safety culture at the Organisational level. Company culture was generally thought to be poor, in that companies are naive of their safety responsibilities and have safety low on their list of priorities. **Rating(s): Poor**

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

As with ownership and control, only the largest companies were felt to have clear roles and responsibilities for safety. More typically, business is driven by cost. Relationships between companies of all sizes can be confrontational and competitive. **Rating(s): 3-4**

P5 Safety Management - The management system which encompasses safety policies, the definition of roles and responsibilities for safety, the implementation of measures to promote safety and the evaluation of safety performance

If roofing contractors have safety management systems they are likely to be very basic and generic. It is typical for the main contractor to send their health and safety policy out to the roofing contractor, who will then send back a generic method statement. It usually does not go any further than this. Any system that does exist will probably not be monitored or maintained. The main aim will be minimum compliance with the Regulations. **Rating(s): 4**

P6 Labour Relations - This extent to which there is a harmonious relationship between managers/owners 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

Labour relations were thought to be fairly good in the industry, with very little if any relation to work at height. Typically there are mechanisms in place to facilitate relations between employers and employees. It is not always easy to get things to change, however. Timescales and costs are often constraints. **Rating(s): 6**

P7 Profitability - The extent to which the owner is subject to competition over market share and constrained as to the price that they can charge

Roofing was felt to suffer from the same problem as the construction industry in general in terms of profitability. Margins are negligible, and financial pressures can be great with a lot of companies going bust. **Rating(s): 3**

E.4 ENVIRONMENTAL LEVEL INFLUENCES

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

This factor was discussed in terms of the influence of the government on the construction industry in general. It was acknowledged that there has been a high profile lately but still some government departments could do more. Generally, improvements have been seen. **Rating(s): Central government – 8, Government departments – 6**

E2 Regulatory Influence - The framework of Regulations and guidance governing the industry and the profile and actions of the Regulator

It was acknowledged that HSE are doing a lot at the moment to address safety in the industry. Guidance was thought to be good, and the recent 'blitzes' on construction sites were thought to be of benefit. **The main area of concern was that HSE are under resourced** in terms of inspectors and, as such, are not able to be proactive but simply react to incidents. It was felt that **more visits and warnings are needed and that visits need to be followed up**. This, along with the dissemination of information through trade associations would help to raise awareness of safety issues, which would hopefully filter down to smaller companies. **Rating(s): Guidance – 7, Resources – 2**

E3 Market Influence - The commercial and economic context affecting the industry

The market influence was thought to have been addressed by the discussion of profitability (P7). Market influence was generally thought to be neutral. **Rating(s): 5**

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

It was felt that the public have little knowledge or awareness of the industry. They will only come across roofers in domestic jobs. The factor was regarded as having a neutral influence. **Rating(s): 5**

APPENDIX F

SPECIALIST OCCUPATIONS WORKSHOP

DETAILED DISCUSSIONS

F. SPECIALIST OCCUPATIONS WORKSHOP

Summaries of the workshop discussions are presented in the following sections. These summaries have been reported against the individual influence factors. The key issue that feed through to the conclusions are highlighted in bold type face.

F.1 DIRECT LEVEL INFLUENCES

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

The message from the group was that in specialist working at height **competence is directly related to training**. In rope access there are three different levels of training which were briefly described. A Level 1 (trainee) is defined as a technician who can carry out a limited number of rope access tasks under the supervision of a Level 3 (supervisor). To achieve Level 1 requires an intensive 5-day training course including a one-day assessment carried out by an independent IRATA qualified assessor. To achieve Level 2 (lead technician) certification, the Level 1 must have completed at least 500 logged hours on rope and have been working in a wide variety of rope access situations for at least 6 months. A Level 2 certified worker is defined as a technician who is capable of rigging working lines, undertaking rescues and performing other rope access tasks under the supervision of a Level 3. To achieve Level 3 (supervisor) certification, the Level 2 must have a further 12 months experience with at least another 500 logged hours on ropes, be recommended by an IRATA member company and undergo a full independent assessment for competency in advanced rope access techniques. Training is carried out either by specialised training companies or in-house by operator companies.

Although there is an excellent system in place to ensure the competence of those working for IRATA companies, it was acknowledged that smaller organisations are less able to afford training. Competence of those installing safety nets is particularly poor. The utilities noted that competence and training for their workers was good and also that this had been seen to filter down to contractors. **Rating(s): Rope access – 8, Utilities – 7, Use of nets – 3-4**

D2 Motivation / Morale - Workers incentive to work towards business, personal and common goals

Rope access workers were said to be highly motivated to work (through their training). They see themselves as specialists, and unless they work hard they will not get another contract. Pay and conditions are generally good. There was a different picture in the utility companies with one reporting that morale is quite low due to a merger and organisational change and the other stating morale is moderate to good. **Rating(s): Rope access – 8-9, Utility A – 6-8, Utility B – 3-4**

D3 Teamworking - The extent to which individuals work in teams and look out for each other's interests

Rope access teams are subject to a lot of change but, despite this, teamwork is generally good. In utilities some incidents are known where an older peer has encouraged a younger worker to cut corners, but this is very much discouraged. It was suggested that teamwork may start to break down when people from different companies have to work together e.g. when scaffolders get involved in erecting nets. **Rating(s): Rope access – 7-8, Utilities – 6**

D4 Situational Awareness/Risk Perception - The extent to which workers are aware of the hazards and risks associated with falls from height

The feeling here was that **risk perception is excellent among specialists working at high levels but only moderate for those workers working at low levels**. For example, people on scissor lifts or using portable ladders **do not always appreciate the risks of a low fall**. Often there is appreciation of the hazards and the associated risks but this does not always translate into behaviour modification. Risk perception was thought to depend heavily on the context, e.g. people have different perceptions of risk at work compared with their perception of risk at home. **Rating(s): All – 6**

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

The companies represented had alcohol and drugs policies. Alcohol and drugs were thought to sometimes have an effect among younger people, and in the entertainment industry where people would think nothing of having a few drinks and then climbing. The fact that rope access work tends to be transient with people living away from home does not help matters. There may be particular risks from fatigue during night work, e.g. on railways, if people have been working through the day. Such issues should be screened for. If people were working on ropes for a long time especially in bad weather, then fatigue could set in but good supervision tends to prevent this from happening. **Rating(s): All – 8-9**

D6 Health - The well being of body and mind of the workforce

The point was made that because of the nature of rope access work, workers have to be fit. Those who are not tend to be weeded out in training. There is a question over the long-term health effects of sitting in a harness for long periods. There may be screening for work at height to an extent (e.g. to recommend that someone should not work over a certain height), but this is not usually done on a regular basis. There are cases of manual handling and RSI injuries in the utilities but not usually related to climbing. The weight of a person was said to be relevant in that the mass used for testing harnesses etc. is 100kg, but it was unclear how this affects the performance of the harness if the wearer is over this weight. **Rating(s): Utility B – 6, Others – 8-9**

D7 Communications - The extent to which the frequency and clarity of communications are appropriate for ensuring effective task and team work

This factor received very little discussion, and suggests that it is not a major issue in working at height in specialist occupations. To start with, rope access often involves lone work so there may be very little communication. Work on pylons is always in teams and communication is good. Radio communication is compulsory in offshore rope access and mobile phones are often used in other work. **Rating(s): All – 8-9**

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

The general feeling from discussion of this factor was that **good information does exist but either it is difficult to get it to those who need it or it is not always used when it should be**. The utility companies spoke of instructions and handbooks but could not be sure that they are always referred to. In addition, **some of the information can be difficult to interpret**. Trainers often come into contact with people who for whatever reason have not seen the right information. **The difficulty with dissemination comes from the fact that many rope access workers are self-employed**. There are as many industry people not in IRATA as there are members and it can be difficult to reach the non-members. The filtering of best practice information downwards to smaller contractors does not always happen. **Rating(s): All – 5-7**

D9 Compliance - The extent to which people comply with rules or regulations

The point was made that in rope access work, a person has to be attached in order to get to the place of work. **The nature of the work means that non-compliance is often not an option.** This is one reason for the low incident rate. In utilities, compliance was thought to be dependent on risk perception. A worker was thought to be typically more careful climbing a pole than using a ladder against the side of a house, i.e. at lower levels there is less appreciation of the risk and so less compliance. Supervision was thought to be a partial solution, as people will only comply if the supervisor is there. An example was given of someone who was removed from a site by HSE for not being tied on but 4 weeks later the person was found doing the same again. It is difficult to stamp out blatant examples of non-compliance because of the nature of the industry. **Rating(s): All – 2-4**

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 suitability of people for working at height seems to vary depending on the company and the particular sector of the industry. One common theme appears to be the use of contract staff who outnumber employees by around 3 to 1 and are the first to go in any downsizing. It can be difficult to maintain a stable workforce in utility companies because of market pressures. In rope access, the industry is made up of the self-employed and large companies. People can sometimes get a 'ticket' to work but they may not be appropriate for the job as they may have chosen the wrong training course. **Rating(s): Utility A – 7, Utility B – 6**

D11 Environmental Conditions - The extent to which environmental factors, such as weather, affect workplace activity

The overall consensus here was that although the environment is relevant it has a minimal effect in terms of accidents/incidents. The representative from the electricity industry could not recall any accidents due to the weather. In rope access wind and rain is an issue as well as high temperatures and humidity. Workers have a right to say no to doing the work. It is difficult to be definitive about when work should cease because of the weather especially if it is an emergency but there may be limits on work in certain wind speeds for example. **Rating(s): All – 5**

D12 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

The equipment required will depend on the situation. In Scotland, for example, many distribution points are in back gardens and it is difficult to get the right equipment in and ladders become the main means of access. Ladders are of industrial specification and there are different ladders for different purposes. Utility A are leading the field with mobile access and have the largest fleet of purpose built MEWPS. Utility B tend to hire MEWPS due to the capital outlay and encourage contractors to do the same. There are some first class MEWPS available which are newly built but often they are used for the wrong purpose such as to provide access to buildings and scaffold. There can be great benefits from using MEWPS in the electricity industry because it is easier to do work with live circuits. **Rating(s): All – 9**

D13 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

The main lesson from discussion of this factor was that the equipment is good but the selection and use of it may be at fault. The utilities review the performance and use of their PPE and report it to be good to excellent although there are still some inspection and maintenance shortcomings. Utility A recently reviewed their harnesses and replaced 23,000 old style 'Figure of 8' harnesses with a more suitable design. Documentation and training is in place to accompany the PPE.

Nets are an effective form of safety equipment if used and fitted properly, but often they are not. They were thought to be inappropriate for domestic work. The issue of protection while working at low levels was raised and it was pointed out that a lot of purchases are made without knowledge of the clearances which are required. This led to the general point that selection of the right safety equipment/PPE is often poor and ill informed. Little thought is given to how the equipment might be used and whether it is appropriate for the type of work intended. One of the problems is that people do not know where to turn to for advice. Manufacturers can play a part here by issuing information on the training which is required for a certain piece of equipment. Companies should seek advice from manufacturers to ensure they get what they need.

The usability and practicability of equipment was regarded as important. Equipment needs to be easy to use as well as safe since it may only be used in a '5-minute job'. The suitability of powered access equipment such as MEWPS was also discussed. Accidents from MEWPS have been known but manufacturers are reluctant to provide information on best practice.

Finally, there was a feeling that HSE advice and standards on this type of safety equipment/PPE are inadequate. Standards can be interpreted in different ways and are thought to be inappropriate in some instances. One problem is that HSE inspectors are not experts on this type of equipment and so may not be able to advise appropriately. This is one reason why it is important for buyers to consult with manufacturers. **Rating(s): All – 8-9**

F.2 ORGANISATIONAL LEVEL INFLUENCES

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

The feeling was that it is difficult to recruit the right people for working at height for a number of reasons. One problem is that if you ask about someone's ability to work at height then you will get positive answers in an interview or on a CV. It is only when you get people on site in a working situation that you can really judge their competence. Companies may then be inclined to push people through training as opposed to looking for someone else. For rope access there are IRATA guidelines for selection, but these were only recently issued and people may not be very familiar with them. Ideally, it would be possible to screen people and only select those who are suited to working at height, but in reality qualifications alone cannot totally demonstrate someone's competence. **Rating(s): All – 6-7**

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

It is generally accepted that rope access is a safe means of work at height, and this can be put down to the high level of training (see discussion of *D1 – Competence* for description of IRATA training scheme). The group commented that it was noticeable that in the cellular phone industry (which is relatively new) workers are not so well trained. Although training for rope access is good there was a feeling that retention of knowledge is not looked at enough. **Workers may renew their ticket every 3 years but without any refresher training**. In terms of the content of training it was thought important to have an assessment component otherwise people will not take it seriously.

It was reported that there has been an upsurge in training for powered access and higher levels of skills are being attained. Handover inductions are used and a log book is provided so that skills can be recorded. There are 9 different categories of certification for MEWPS and it is necessary to have the right one to get on site. Sometimes in-house training may not be enough and the principal contractor may ask for different training from a recognised body. In the UK and Eire only IPAF and CTA are recognised providers, but this means that there is a shortage of instructors. Smaller companies are losing out on business because they do not have this training. They need to be made aware of how things are changing.

It was felt that generally in rope access the skills of the workforce match the job demands. However, **there is an issue of supervisors being very well trained technically, but not trained in man management and this needs to be addressed**. The training for the use of nets was thought to be lacking. **Rating(s): All – 8**

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

The discussion on this factor was limited suggesting that it was not regarded as particularly relevant in terms of fall from height accidents. The utilities were generally regarded as having moderate to good procedures perhaps depending on how often they are updated. Some procedures, however, were thought to be too generic and lacking detail. Sometimes there are too many of them. Procedures in rope access were thought to be good, although continual improvement is needed. In powered access more was thought to be needed on risk assessment. **Rating(s): Rope access – 8, Utility A – 8-9, Utility B – 6, Powered access – 6**

O4 Planning - The system that designs and structures work activities

Planning in the utilities was thought to be variable whereby sometimes the right questions are asked in risk assessments but there is a tendency for people to believe that planning does not require much thought because of the number of procedures. Rope access workers have to prove that their proposed work method is viable and, as such, planning has to be good. Risk assessments are an inherent part of this. **Rating(s): Rope access – 8-9, Utilities – 6**

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

This factor was thought to have two components:

- Getting accident data through reporting/investigation.
- Feeding back results to improve safety.

In terms of getting good information, there was a feeling that in powered access, HSE reports into accidents/incidents are poor and often come to the wrong conclusions as to why the accident happened. **Generally, there are systems in place for the collection of accident data**, and near miss reporting is increasing. Problems with reporting/investigating include a lack of people trained for investigation, a transient workforce and the fact that management do not like to hear about organisational failures. An element of under reporting was indicated by the feeling that although 30 net incidents had been reported over a period this could be multiplied by around four in reality. **The dissemination and feedback of accident information was thought to be an area with room for improvement**, as it often relies on word of mouth. **Rating(s): Reporting/Investigating – 6-7, Feedback – 4-5**

O6 Management / Supervision - The system that ensures human resources are adequately managed/supervised

There was discussion in the group regarding the extent to which managers take into account safety. It was felt that most of the focus is on timescales and cost and that safety is regarded as something else as opposed to an integral part of these. Managers will often say that safety is at the top of their agenda but this is rarely the case in practice. Often there are conflicting pressures put on managers by the nature of the business with a strong financial emphasis especially if they are being undercut by other contractors. They sometimes do not have the time or information to address safety which is when it is important for messages to be passed through middle management and supervisors. **In rope access there tends to be very good supervision** but again it was noted that these people are not always good man managers. **Rating(s): Rope access – 6-7, Utility A – 5, Others – 2**

O7 Communications - The system that ensures that appropriate information is communicated clearly to its intended recipients

In the utility industry, a **dispersed workforce was flagged as a problem with maintaining good communications**. The system is there but sometimes it breaks down, especially when dealing with sub contractors. Utility A are thought to have a good system of communicating information on safe climbing if previous faults have occurred. In rope access, operating companies have got to prove their system of work with communication being an important part of this. IRATA is involved with collating this information and it was acknowledged that their dissemination could be better. **Rating(s): All - 6-8**

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

Safety culture in specialist work was thought to be very good. **People who work regularly at height have a strong interest in what they do and the associated safety issues**. **Rating(s): All – 9**

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

In the non-specialist parts of the industry this factor was thought to be poor with a lot of people realising they have the wrong equipment when they are on training courses. A major reason for this is that **organisations tend to buy the cheapest available equipment as opposed to the right equipment**. It was pointed out that ultimately this will cost more when the equipment is not used and something more appropriate has to be bought in. **It can be difficult for buyers if they do not appreciate what workers need to be protected from, and this can lead to ill-informed purchases**. This happens in large as well as small companies. It is particularly difficult to control the equipment which contractors use. In powered access a salesperson goes out to demonstrate the equipment, and this usually ensures the right equipment is supplied. **Rating(s): Rope access / powered access – 9, Utilities – 9, General – 4**

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

Inspection and maintenance was discussed in a way to suggest that it could have a significant bearing on the risk of falls from height. There was concern that there is a lack of effort directed towards inspection and maintenance of equipment for working at height. People tend to shy away from strict inspection because of the liability issues. **There is a lack of people who are competent enough to carry out good inspections**. The nominated person for inspection often does not have the right training. It is often left to insurance companies to make decisions on equipment but these companies do not have the necessary competence. Equipment may not be scrapped because it would be too expensive.

In terms of testing which does take place, Utility A take 5% of harnesses out for tests every so often to check for wear. Destructive testing would be too expensive. They found there to be a 5% degradation over a 10 year period. It was felt that more research into degradation is needed and that joint industry projects on this topic are the best way forward.

The care of equipment for working at height was raised. People are often seen to abuse equipment and generally not look after it very well. They may be trained in how to look after it but will fall into bad habits after the training. As a way around this, Utility B make equipment personal issue (as opposed to communal) and find that it is better looked after this way. **Rating(s): Rope access / Utilities – 9, General – 3-4**

O11 Pay + Conditions - The remuneration package and benefits in the context of working hours and conditions and welfare facilities

The discussion on this factor was brief but focused on how pay incentives could be used to improve safety. The feeling seemed to be that penalties/bonuses related to safety performance could make a difference. **Rating(s): General – 5, Utility B – 7**

O12 Process Design – The process of engineering and ergonomic design (conceptual and detailed) of the structures, plant and equipment to ensure fitness for purpose, operability and safety during either maintenance or operation

Rope access workers have found that many buildings are difficult to maintain even with rope access. It was thought that designers need to be educated in this respect. There are certain design changes relating to providing access for maintenance that could be made which would reduce the risk of falls from height. **Rating(s): All - 7**

F.3 POLICY LEVEL INFLUENCES

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

This factor was perhaps more relevant to the utilities representatives since these companies are contracting out work. This is in contrast to rope access industry, who are contractors themselves. The message from the utilities was that safety is an important part of their contracting. Potential contractors are subject to checks on their safety performance including submitting a health and safety method statement. The rope access representatives reported that clients are always looking for them to prove their case in terms of safety (i.e. doing work which the client clearly perceives to present risks). **Ratings(s): All – 9**

P2 Ownership + Control - The extent to which their is ownership and control taken over sustained safety performance

The feeling was that **specialist occupations do take ownership of safety. Safety is an integral part of IRATA marketing and contractors in the utilities sector also take a strong interest**. **Rating(s): All – 9**

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

Safety culture among specialist workers was thought to be excellent. Part of the reason is that individuals have a self-interest in safety, and **often rope access contractors will demand higher safety standards than their clients**. It was felt that whilst there may be a good safety culture higher up in the company it is not always easy to filter this down to workers at the direct level. **Rating(s): All – 9**

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

The main finding from discussion of this factor was that **within specialist companies the roles and responsibilities for safety are very clearly defined**. Difficulties arise when different contractors come together. Rope access people would tend to get on with the job and although they may see other groups involved in unsafe work they would not necessarily do anything about it. Similarly, in powered access there can be arguments about who is responsible for shoring up the vehicles. **Rating(s): Powered access – 6, Others – 8-9**

P5 Safety Management - The management system which encompasses safety policies, the definition of roles and responsibilities for safety, the implementation of measures to promote safety and the evaluation of safety performance

There was a general feeling that in many companies, safety management falls into the moderate category in that they will do the minimum that they have to. The utilities representatives reported higher standards including active monitoring of the safety management systems with the possibility of safety defects hitting management bonuses. IRATA have safety management guidelines and companies are audited on their systems before they can become members. **Rating(s): Rope access – 9, Utilities – 8, General – 4**

P6 Labour Relations - This extent to which there is a harmonious relationship between managers/owners 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

IRATA provide a vehicle for discussion in the rope access industry, and unions do play a role in utilities. However, this factor was not considered to be an issue in terms of falls from height. **Rating(s): All – 9**

P7 Profitability - The extent to which the owner is subject to competition over market share and constrained as to the price that they can charge

Different industries had different viewpoints on this factor. Companies in the telecommunications sector have found things difficult, but are still showing growth and are able to invest. In the electricity industry, the regulator helps to ensure stable returns. Profitability can be high in rope access. The exception to good profitability was powered access hire despite the fact there is a boom in training. The message from discussion of this factor was that in specialist occupations, profitability should not present a barrier to investment in safety. **Rating(s): Powered access – 5-6, Others – 7**

F.4 ENVIRONMENTAL LEVEL INFLUENCES

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

Political influence in the utilities was discussed in terms of the industries' financial watchdogs OfGen and OfTel. Both were felt to have a negative influence due to their requirements for price cuts. Neither have anything to do with safety. Government promotion of the construction industry is a good thing in terms of work for IRATA members. Also, IRATA have been involved at a European Standards level. **Rating(s): Utilities – 3-5, Rope access – 5**

E2 Regulatory Influence - The framework of Regulations and guidance governing the industry and the profile and actions of the Regulator

There is a specific set of Regulations affecting the industry off the back of the temporary work at height directive. Overall, however, the inspectorate was felt to have a minimal effect on the industry. **Guidance is thought to be weak and inspectors tend to ask IRATA for advice rather than the other way around**. The Technology Division of HSE were felt to **make a significant difference as they employed inspectors who want to work with companies to make improvements rather than just look at the Regulations**. There was perceived to be a problem with younger Inspectors who want to make a name for themselves. **Rating(s): Rope and powered access – 4, Utility A – 7, Utility B – 4**

E3 Market Influence - The commercial and economic context affecting the industry

As already stated under the *profitability* factor at the *Organisational* level, market conditions in rope access were thought to be favourable except in the entertainment sector where there appears to be less money. In utilities the market conditions tend to fluctuate but are generally moderate. **Rating(s): Rope access – 8, Utility A – 5, Utility B – 7**

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

The main point against this factor was that corporate image does matter and can possibly influence safety culture positively. **Rating(s): All – 8**

APPENDIX G

TRANSPORT WORKSHOP

DETAILED DISCUSSIONS

G. TRANSPORT WORKSHOP

At the outset of the workshop, a clear distinction was made between dedicated and non-dedicated operations. Dedicated operations are when delivery of the same load is made to the same outlets on a regular basis. Examples are petroleum deliveries to service stations and wholesale delivery to supermarkets. These operations are usually well planned and organised and everyone is familiar with the operations involved. This is in contrast to non-dedicated operations when the load could potentially be anything during a one-off delivery to somewhere the driver has never been before. It was generally agreed that safety is better during dedicated operations because, among other things, sites are well organised and designed for loading/unloading which improves safety. It was felt that this was an important distinction and so ratings were gathered for dedicated and non-dedicated operations where appropriate. There is a further distinction between large companies with a fleet of vehicles and smaller road haulage operators with versatile flat bed vehicles. 'Flat bed' was used to characterise the latter group, with the distinction being made because of the type of operation, and not just the type of vehicle.

Summaries of the workshop discussions are presented in the following sections. These summaries have been reported against the individual influence factors. The key issue that feed through to the conclusions are highlighted in bold type face.

G.1 DIRECT LEVEL FACTORS

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

There was thought to be a difference between drivers working on dedicated and non-dedicated deliveries, with the former having greater competence. Also**, there is a higher competence level in specialist industries as a result of specific training**. However, smaller operators with flat bed lorries who undertake a variety of work without any training other than their HGV licence counter this. They **need to be more aware and know when not to do a job because of the risks**. This will probably rely solely on experience, as they are unlikely to have had any formal training. The point was also made that **it is possible to design out the potential for human error** which means that competence for work at height becomes less important in certain situations e.g. bottom loading tankers. **Rating(s): Generally - 3-4, Specialist - 8-9**

D2 Motivation / Morale - Workers incentive to work towards business, personal and common goals

There are differences between dedicated and non-dedicated companies, and between large and small firms. Money is not the only motivating factor. The standard of equipment and vehicle, and working hours are also relevant. Feedback through unions and incident reports is a good way to improve motivation. However, it is indicative that there are still drivers leaving the industry. Other industries are becoming more attractive because people can earn more money with less stress, and can be at home more. The public perception of lorry drivers is low, and this does not help the situation. **Rating(s): 1-5**

D3 Teamworking - The extent to which individuals work in teams and look out for each other's interests

Goods delivery work is very much a one-man job nowadays. A driver's mate is very rare, with only breweries and removals being the exceptions and, as such, teamwork is not really an issue. However, there may be team issues during loading/unloading operations. This will generally be better in dedicated deliveries where workers are more likely to be familiar with each other. This factor gets a low rating as it is not particularly relevant, not because it is of a poor standard. **Rating(s): No team work - 0, Dedicated delivery – 5**

D4 Situational Awareness/Risk Perception - The extent to which workers are aware of the hazards and risks associated with falls from height

There is an 'it wont happen to me attitude' in the industry. It may be that the hazards, especially those associated with low falls, are not obvious enough e.g. getting out of the cab. Hazards are more obvious when on the top of a tanker. **Rating: 5**

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

Some companies have an alcohol and drug policy that involves random testing. The alcohol level allowed is considerably less than the legal limit. Alcohol was not thought to be a major issue. Attitudes have changed over the past 10 years. **The unsociable hours that drivers have to work was thought to be more of a problem in terms of fatigue**. Many drivers have to start work at 4am for a number of reasons including avoiding traffic congestion, delivering fresh produce before shops open and because of loading/unloading restrictions. It is known that the human body's rhythms are at a low ebb during the night when many drivers will be working. **To make matters worse, some drivers may have two jobs, which will increase their fatigue**. **Rating(s): 4**

D6 Health - The well being of body and mind of the workforce

Drivers need to have a medical to get an HGV licence. After the age of 45, they need to be checked every 5 years. These checks certify that a person is medically fit, but it does not follow that they are physically fit. Many drivers may have a poor lifestyle and may experience stress from so much driving on congested roads. Driving is primarily a sedentary occupation but can be punctuated by bouts of fairly heavy work. This is not a good combination. Stress may account for seemingly silly accidents. **Rating(s): 3-4**

D7 Communications - The extent to which the frequency and clarity of communications are appropriate for ensuring effective task and team work

It was felt that **communications are generally poor and responsibilities are unclear**. Sometimes the driver is not required to communicate with anyone e.g. some tanker unloading operations. When other people are involved, a driver cannot be expected to ask for a demonstration of competence every time he was to work with different people. He must rely to a certain extent on whoever is going to unload. In one-off deliveries, in particular, communication may be poor, which could be detrimental to safety. **Rating(s): Not an issue e.g. tankers – 0, Generally – 1-4**

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

There was thought to be a distinct difference between dedicated and non-dedicated operations for this factor. In dedicated operations, such as those involving tankers, there is information available on the hazards and risks e.g. a driver's handbook. However, **in non-dedicated operations, e.g. involving flatbeds, there is no such information**. Such work is not perceived as involving much risk and, as such, people are expected to pick up the job as they go along without any formal information. The wide variety of loads in this work can create problems, but it would not be practicable to have a procedure for every possible type of load. **Rating(s): Non-dedicated – 0, Dedicated - 9**

D9 Compliance - The extent to which people comply with rules or regulations

There are a number of difficulties with compliance. Often, an organisation would not find out about it unless a customer complains. Companies are providing more training, but the practices are not necessarily enforced. People have a tendency to do what human nature tells them is the easiest way to do a job, even if it is not the safest method. In well-run companies there are procedures that drivers try to follow, but problems can occur in novel situations. HSE would like simple rules for unloading. Drivers like independence, and like to think they know what they are doing. Managers do not like calls about 'what should I do here'. Drivers are expected to work it out for themselves. In non-dedicated operations there will be no supervision to encourage compliance either. **Rating(s): 3-4**

D10 Availability of 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

There is a recognised shortage of drivers in the industry due to work conditions and pay. Drivers used to be recruited from other areas such as the army, but that does not happen any more. The shortage of workers is worse for the more specialised roles. In the South East, there are a lot of petrol deliveries but sometimes it is not possible to get cover and some jobs need to get left. The working time directive will mean that working more hours is not an option. Companies may try to use agencies where people have had basic training, but this is becoming more difficult. A problem is that agency drivers are allowed to do jobs that they are not trained to do. **Rating(s): 5**

D11 Conditions - The extent to which internal factors (such as noise, congestion) or external factors (weather etc.) have an affect on the workplace activity.

The feeling was that weather can create difficulties, but drivers may have to unload whatever the weather as there may be limited hours in which to get the job done. There is also the issue of commitment to the job – drivers will want to make the delivery. This may not be such an issue in dedicated operations where there is greater use of environmental sealing, and warehouses have canopies and good lighting. **Rating(s): General – 3-4, Dedicated – 9**

D12 Equipment Operability - The extent to which equipment is available, conforms to best practice, meets the usability needs of the operator and is inspected and maintained. In this case relates to the suitability of hardware/equipment which are part of the vehicle as well as equipment separate to the vehicle.

There is a wide variety of equipment from purpose built gantries to remote delivery points where there is little to assist with unloading. **The most effective way to reduce the risk is to keep people on the ground**. The latest tanker designs are bottom loading, but it will take some time for the transition to affect a significant number of vehicles on the road. Some retrospective modifications are possible, but there are products where bottom loading is impossible. In the main, equipment is good if it is part of a dedicated fleet. Generally, tail lifts affect drivers while scissor lifts are the concern of whoever is unloading on site. It is feasible to put simple protection on scissor lifts, so that you do not have to rely on the operator for safety. This can be retro-fitted. Vehicle lock-in devices are another way to improve safety at loading bays. **The suitability of hardware for getting in and out of cabs was discussed. The point was raised that this may be something that has been overlooked with different and steep 'step' spacings**. Access to containers was seen as a particular problem. They cannot be fitted with ladders etc. since they need to be loaded from train to ship to road etc. Suitable protection to prevent falls from the back of flatbed lorries was also discussed. **The final point from the discussions was that equipment may be used in a way other than for what it was designed for. It is not the quality of equipment per se which is the problem but how it is used**. **Rating(s): Dedicated – 9, Non-dedicated - 0**

G.2 ORGANISATIONAL LEVEL INFLUENCES

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

It is necessary to have an HGV licence before a driver can be considered for this work. Consideration of working at height would not be part of recruitment – if the recruitment and selection system is too strict, there will be an excessive shortage of drivers. In terms of potential selection criteria, there are industry led NVQs which involve workplace based assessments. However, these would not cover falls from height. There are courses for managers on falls issues, but there is nothing for drivers. **Rating(s): 5**

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

It was felt that there is a huge range in the standard of training across the industry. Major companies will have driver training schemes, but flatbed drivers will only have their HGV licences. There is no industry standard training – it is reliant on individual companies and managers. If too much training is required then potential drivers may be turned away from the industry. A lot depends on how training is implemented. It is likely to have a positive effect but it is difficult to measure this. **There is a draft European Directive on driver training which covers much more than driving, and includes health and safety but it is up to individual countries to decide how it should be implemented**. The concept is a good one but a lot depends on its implementation. Another problem is that in other EU countries state funding exists for such training, but not in the UK. **People may be turned away from the industry by the potential extra costs that the new Directive will create**. **Rating(s): Major companies – 8-9, Flatbed drivers – 0**

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

The bigger companies will have generic procedures. These need to be generic due to differences between points of loading/unloading and different types of vehicle. The distribution company represented at the workshop pulls together procedures centrally and distributes them to individual depots. Some depots tailor them but some leave them untouched. The driver's handbook refers to the procedures. It is doubtful how familiar drivers are with the procedures. For many drivers there will be no procedures available. In any case, **there are only procedures for where there is a recognised risk and this does not include getting in and out of cabs or on/off the back of a lorry**. **Rating(s): No procedures – 0, Major companies – 5**

O4 Planning - The system that designs and structures work activities

The subject of risk assessment was discussed under planning. The question was raised as to whether drivers should be expected to carry out risk assessments, or should it be someone else's responsibility. Either way, it was recognised that formal **risk assessments are important, otherwise a driver may adopt the wrong approach**. In the chemicals industry hauliers do look at destinations and brief drivers. They also have generic risk assessments. It was thought that this could be modified for other operations. Smaller non-dedicated operations will have no formal planning. Planning may depend on the level of cooperation available on site. On stricter sites drivers will tend to take more care. **Rating(s): No planning – 0, Chemicals – 7-8**

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

It was suggested that drivers may provide good feedback if they feel strongly enough to report on an issue or incident. This is true more of dedicated operations. If deliveries are regular there is more likely to be a feedback system. However, a driver may not always be sure what to do if they encounter something that is not right, especially if it is a one off delivery. **It could make commercial sense to obtain feedback regarding the facilities available at a site**. **Rating(s): No feedback – 0, Bigger companies – 5**

O6 Management / Supervision - The system that ensures human resources are adequately managed/supervised

There has been a move away from supervision to driver-controlled deliveries. In some cases the driver may not see anyone at all. Human checks can be replaced by equipment such that reliability is maintained. People on site are more concerned that they are receiving the right delivery as opposed to the safety of the driver. It was thought the person checking goods could be used as a way in to safety, but the point was made that this person has a lot to do as it is. **Rating(s): 3**

O7 Communications - The system that ensures that appropriate information is communicated clearly to its intended recipients

Communications were thought to be fundamental for safety in the industry. An important part of this is getting the different stakeholders to communicate before each new type of delivery. A company should not enter into an arrangement unless they have an agreement with their opposite number at the delivery site. This may only amount to running through a simple checklist. **Feedback from drivers is important in this respect in that this can start the communication process**. Good communication makes commercial sense e.g. making sure the vehicle can ‘get in’ so that time is not wasted. It was pointed out, however, **that a job may go through 4 or 5 hands before getting to the driver**, and this process creates communication difficulties. Because of this, it is too idealistic to think there can be direct communication in all cases. In some instances, there is sub sub-contracting and information simply does not get through even on dangerous goods. **Rating(s): Small chain – 5, Long chain – 2**

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

Safety culture was discussed in terms of incident reporting. Drivers are encouraged to report in the chemicals industry. When reports are received they are followed through and shared. It was also stated that culture is generally good with supermarket chains. However, it was thought to be important that the other end of the market (i.e. small non-dedicated operators) are reflected in the rating. These operators are perhaps aware that they should be doing something but they are not doing the right things or not soon enough. In this respect, culture is not focussed. **Rating(s): Large dedicated companies – 6, Small non-dedicated – 0**

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

It was stressed that the purchase of new vehicles is a considerable long-term investment. There is no vehicle standard at the moment, which can make this a difficult decision to make. Retrofitting is a good alternative in some cases, but there is not much of a take-up, perhaps because of poor communications in terms of what is available and the advantages. The economic benefits of certain equipment need to be emphasised. Safety can be used as a good marketing tool. **Rating(s): If new equipment – 5-6**

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

There are regulatory requirements for inspection and maintenance e.g. PUWER. The HSE has seen accidents due to maintenance failures e.g. grab handles falling off. In many cases people are relying on straps and slings that may be unsuitable. Visual inspection becomes important here. It was agreed that there may be systems in place but they are not comprehensive enough. **Rating(s): 5**

O11 Pay + Conditions - The remuneration package and benefits in the context of working hours and conditions and welfare facilities

Facilities in the industry are generally good – better than they used to be although you still get a range from very good facilities to very poor. Drivers are generally paid on an hourly rate. There are many owner/operators where they have a tractor unit and pull trailers for big companies. Traditionally there is a low basic but high overtime wage. The long hours can put people off the industry. In any case this will be curtailed by the working time directive (although smaller firms and those on piece-work may be a source of problems). **Rating(s): 5-6**

O12 Design - The process of design of vehicles and the areas where they are loaded/unloaded to ensure safe operations.

There are some poor designs, but new vehicles have been designed taking safety into account, and some retrofitting is taking place. However, it is still the case that in the UK there are many work places simply not designed for safety, particularly those that may have been in existence for 50-100 years. In terms of the design of vehicles there is a grey area between road vehicle construction requirements and HSE legal requirements. It was thought to be possible to find the right vehicle for the right job, but all too often the wrong design is used, or attempts are made to diversify into other work with vehicles that are not quite suited. In many cases design is not the answer due to the age and access of many sites. Often design had not been used as a control because the risk cannot be designed out. **Rating(s): 1-8**

G.3 POLICY LEVEL INFLUENCES

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

Safety will be part of the contracting strategy in larger organisations moving dangerous goods. However, even at the better end of the market, subcontracting is still used to avoid responsibility. Furthermore, many larger companies have taken out top tiers of management and, as such, do not have the resources to address safety in contracts. Better operators will carry out audits to check that suppliers are complying. Some contractors may not even make it on the tender list. It is unlikely that specific transport accidents will be covered in arrangements, just general health and safety. In contrast to the larger dedicated companies, **at the other end of the market (spot work estimated to account for about 20% of the industry) there will be no contracts, just a verbal order on trust**. **Rating(s): 20% spot work – 0, Chemicals – 8**

P2 Ownership and Control - The extent to which their is ownership and control taken over sustained safety performance

It was thought that many companies aspire to be excellent in terms of safety, but not many are there. They either do not identify the best course of action, or go about it in the wrong way. However, the group felt it was unlikely that anyone was unaware of their responsibility in this respect. Short-term thinking is a problem in many companies. It was generally agreed that the ownership of risk is important. **Sometimes it is unclear whether it is the responsibility of the site, the contractor or the driver**. There needs to be agreement to share responsibility and avoid blame. **Rating(s): 4-7**

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

It was agreed that this factor was similar to P2, Ownership and Control, and that there is a range of company standards. **Rating(s): 0-7**

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

The group felt that this factor is closely linked to P1, Contracting Strategy. Ideally, contracts should set out who is responsible for what. This is the key to everything, and in many industries, not just transport, this is very poorly done. It was felt that you can still make it clear to people what you expect of them without necessarily having a contract. **Rating(s): 0-8**

P5 Safety Management - The management system which encompasses safety policies, the definition of roles and responsibilities for safety, the implementation of measures to promote safety and the evaluation of safety performance

The chemicals industry is covered by COMAH and, as such, safety management systems will need to be in place. **Health and safety management systems are becoming standard, but this is at the top end of the market. The group were doubtful that smaller companies would employ formal safety management systems**. **Rating(s): No SMS – 0, Chemicals – 8**

P6 Labour Relations - This extent to which there is a harmonious relationship between managers/owners 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

The perception was that the transport industry is getting larger, but with fewer main players. As such, these companies are becoming more unionised. This is generally a good thing in terms of safety in that unions tend to push things more. Some smaller companies have been forced to recognise unions, although many still do not. Generally, union membership is declining but some parts of the industry show greater take up than others. There may be a knock-on effect from unions to smaller companies. **Rating(s): 6**

P7 Profitability - The extent to which the owner is subject to competition over market share and constrained as to the price that they can charge

This factor can only be rated moderate at best except for some niche markets. Transport is a service industry and, as such, has no value in itself. Some companies (e.g. P&O) are trying to run the whole supply chain in order to boost profits. The industry is generally very up and down. **Rating(s): 1-5**

G.4 ENVIRONMENTAL LEVEL INFLUENCES

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

There is a 10-year white paper on transport that aims to move goods haulage on to the railways. Generally, government departments are of little help to the industry. Many of the regulations pertaining to the industry, e.g. dangerous goods, come from the UN or Europe. The Government seems to show a reluctance to try to influence Europe in the best interests of UK industry. **Rating(s): 2-3**

E2 Regulatory Influence - The framework of Regulations and guidance governing the industry and the profile and actions of the Regulator

HSE stressed that it was still very much early days for them in terms of transport risks, but progress is being made with the Workplace Transport Priority Programme. Some in the industry thought that HSE needed to issue better guidance in terms of what they will and will not prosecute. It was felt that information from the regulator could be in the form of information on the internet or hard copy pocket guides for drivers. There was an appeal from HSE for industry to provide them with examples of good practice that they could disseminate. **Rating(s): 5**

E3 Market Influence - The commercial and economic context affecting the industry

Some organisations will pay a little extra for safety, but on the spot market they want the cheapest price. Complying with safety regulations can sink those on the margins e.g. in hazardous goods which must comply with COMAH. This tends to leave the more responsible operators. **Rating(s): Poor end of market – 0, Niche markets – 7**

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

It was generally felt that the industry is not well respected. Lorry drivers are seen as a nuisance, especially on the motorway. The public may well support the idea of transporting more goods by rail. The public does not realise the importance of the industry in the supply chain. Even the fuel crisis has not changed the public's attitudes. **Rating(s): 1-2**

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