A study of Behaviour Based Safety in the Irish Construction Industry

by

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To Cathal

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Declaration

Declaration of Ownership: I declare that the attached work is entirely my own and that all sources have been acknowledged:

Signed: _____

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Abstract

The accident record of the Irish construction industry is poor, HSA statistics report that injury rate in the construction sector is consistently higher than any other sector since 2001. The researcher had a personal interest in exploring what drives people to behave unsafely at the risk of personal injury, having developed this interest while working as a safety officer in the construction sector, and wanted to explore the application of a behaviour based safety initiative to the Irish construction industry

The method used was qualitative research by postal questionnaires, specifically designed for this thesis, one questionnaire aimed at management and a second for operatives, to include the views of both parties, the questionnaires followed up on findings from previous similar Irish studies. A pilot study was undertaken to improve the questionnaires and research technique. The research sample was small to medium sized construction companies based in predominately in the west of Ireland, one Dublin based company.

The research found that organisations have a strong ability to influence the behaviour of their workforce, management commitment, having a strong safety culture and good supervision were identified as being the main influential factors. Contrary to previous research the role of the Safety Representative was found to be the least influential factor. Worker behaviour was found to be the biggest contributor to accident causation in participating organisations, and was considered to have a major input to the construction sector accident record.

Management and operative's survey revealed some differences of opinion between the employer and employee, the results suggested problems with communication and trust between the parties, neither the employer or the employee have taken ownership of the safety problem, while management indicated a strong will and a significant level of interest in a behavioural safety programme, a lot of ground work is needed to establish the cultural maturity and readiness of the Irish Construction Industry before its introduction. Unless there is active involvement and strong commitment by all the major stakeholders, to address the issues identified behavioural safety is very much an initiative for the future.

Abbreviations

- **ABC Model**- Antecedents, Behaviour, Consequences
- **CIF** – The Construction Industry Federation, a lobby group for the Irish Construction Industry
- **CSCS**- Construction Skills Certification Scheme, mandatory training scheme under the Safety Health and Welfare at Work (Construction) Regulations 1995, 2001, 2006
- **Co.** – Company
- **EU** – European Union
- **FAS**- Foras Aiseanna Saothair, Training and employment Authority in Ireland
- **GCW**- General Construction Worker
- **HSA** - The Health and Safety Authority of Ireland, the enforcing authority for Health and Safety Regulation in Ireland
- **HSE**- the Health and Safety Executive the enforcing authority for Health and Safety Regulation in the UK
- **HQ** - Headquarter (used in a study by Dalton M. 2002)
- **IP** – Injured Party (used in a study by Dalton M. 2002)
- **MSIC** – Managing Safely in Construction. A safety training course run by the CIF
- **NI** – Northern Ireland
- **Plant Op** – Plant Operative or driver
- **PPE**- Personal Protective Equipment
- **PSCS** - Project Supervisor Construction Stage, a duty holder under Irish health and safety law, as outlined in the Safety Health and Welfare at Work (Construction) Regulations 1995, 2001, 2006
- **PSDS**- Project Supervisor Design Stage, a duty holder under Irish health and safety law as outlined in the Safety Health and Welfare at Work (Construction) Regulations 1995, 2001.
- **PSDP**- Project Supervisor Design Process, a duty holder under Irish health and safety law as outlined in the Safety Health and Welfare at Work (Construction) Regulations 2006
- **ROI** – Republic of Ireland

- **RTA**- Road Traffic Accident
- **Safety Representative**- A person (an employee) elected by the employees to make representation on their behalf to management on matters relating to health and safety. As required by Section 25 of the Safety Health and Welfare at Work Act 2006, and the Safety Health and Welfare at Work (Construction) regulations 2006.
- **SHWWA** – Safety Health and Welfare at Work Act, (1989 & 2005)
- **SM** – Site Management (used in a study by Dalton M. 2002)
- **SSW** – Safe System of Work
- **TBT** – Tool Box Talk
- **UK** – United Kingdom

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Chapter 1

1.0 Introduction

1.1 Rationale for the Research

Having worked as a Safety Officer in the construction sector the author of this thesis developed a keen interest in what drives people to behave unsafely at the risk of personal injury. From personal experience and involvement in accident investigation, the author felt that there were issues beyond the physical and engineering problems, that were getting lost in accident investigation, and hence accident prevention. In particular there appeared to be lack of focus on the actions and decisions that created the event that actually caused the accident and the author wondered if focusing attention to such factors would serve as an effective means of accident prevention. Thus leading to the idea of applying behaviour based safety programme.

The author accepts that a Behaviour based safety programme in isolation will not work, but believes that as part of good safety management, supported by a positive safety culture with management commitment it has a lot to offer by way of accident prevention. It is the focus of this study to establish if behavioural safety programme is a suitable initiative to address the notoriously bad safety record of the Irish construction sector.

The concept of 'behaviour based safety' has only in recent years been the focus of some research in Ireland. A recent Irish study stated…

> 'We have a poor understanding of how either individual attitudes and behaviour or management action is related to safety in the construction industry'. (McDonald, Hrymak 2002, pg 1)

1.2 What is behaviour safety all about?

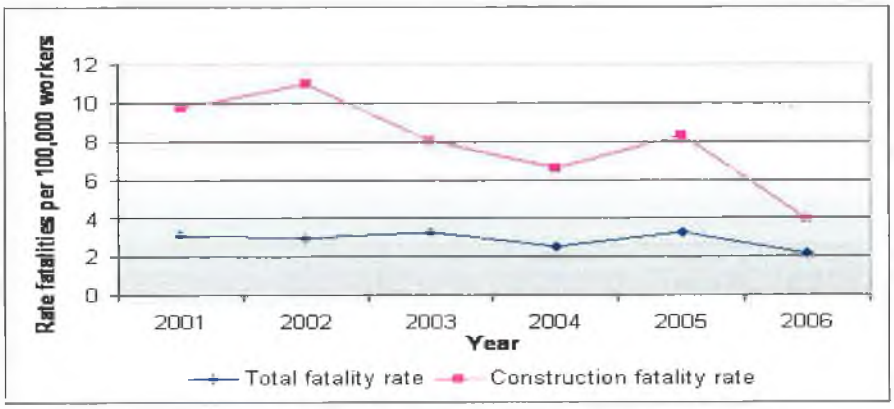
Behaviour safety techniques are based on a large body of psychological research into the factors that influence behaviour. According to the HSE research (430/2002), it is widely accepted that effective risk control depends in part on the behaviour of individuals at all levels within an organisation.

In a study by Prof. Dominic Cooper "Human Factors in Accidents", he comments on the scepticism that surrounds behavioural safety. 'Does it Work? Because the behavioural approach differs considerably from traditional ways of improving safety, a question commonly asked is 'Do these ideas work in practice? Overwhelmingly, the answer is yes! Psychologists from around the globe have consistently reported positive changes in both safety behaviour and accident rates, regardless of the industrial sector or company size. These include studies in Construction, Mining, Engineering, Food Processing, Manufacturing, Ship building and offshore installations. (Cooper, 2002)

1.3 The extent of the problem in Irish Construction Sector

The HSA has reported that injury rate in the construction sector is consistently higher than any other sector since 2001; (HSA 2006), statistics of the period 2004 – 2005 indicate that the Construction sector alone accounted for 20% of the non fatal accidents reported, second only to manufacturing which accounted to 25% (HSA 2006). There is some optimism however, as RTE news of July 18th 2007, reported that Construction Related Deaths-almost halved, upon the release of the HSA annual report stating that numbers have fallen from 23 in 2005 to 12 last year. (RTE news July 18th 2007) Graphical representation below demonstrates the construction fatality rate in comparison to other sectors over the past six years.

Fig. 1: Construction Industry Fatalities, compared to other Employment Sectors



(www.hsa.ie/publisher/index.jsp? Accessed: 30 April 2007))

1.4 Construction Sector and the Irish Economy

The construction industry is hugely important for the prosperity of the Irish economy; some would argue that as a nation we are over dependent on the Construction Industry. In an article by Pat McArdle, Chief Economist for Ulster bank, talked of construction being 'a pillar of the economy' and that our ever- growing dependence on it being increasingly cited as a weakness, in the event of a collapse the implications for the rest of the economy would be quite serious.(www.ulsterbank.com/economics) According to the latest figures (dated Feb 2007) construction sector currently employs 282,100 people, which represents a proportion of 14% of those in employment in Ireland. (http://www.cso.ie/qnhs/main_result_qnhs.htm). At the time of writing there are signs of a slow down in construction compared to recent years which has been a period of rapid growth of the industry, economists are concerned for its impact on the Irish economy as a whole, and it is a subject of much debate at present. The CSO have reported that the numbers employed are down 1.1% on last year. http://www.cso.ie/releasespublications/documents/construction/current/indexemp.pdf

1.5 The Challenge of Behavioural Safety for the Construction Sector

One of the great difficulties with tackling behaviour in the construction industry is the transient nature of the target audience, with frequent movement from site to site characteristic of the business, successful implementation of any change initiative is a significant challenge. 'A difficulty is the high turnover of staff on construction sites so that a lot of cultural impact is lost as personnel change rapidly…questions arise as to who carries the culture and who is the permanent on site presence to link changes in behaviour over time and across teams'. (Murray, P. 2007)

1.6 Aims and Objectives

The objectives of this thesis explore the factors influential on worker behaviour in the small to medium sized Irish construction companies. It will investigate attitude to safety, risk taking and safety culture from the operative's perspective, in addition to probing management on behavioural safety, the influential and contributory factors to accidents and the drivers for safety management.

The research question for this study was:

> **"What drives construction workers to take risks, and what if anything can organisations do to influence behaviour towards safety on site?"**

As such the aims of the study were:

- To investigate how behaviour based safety models would be received by the Irish Construction Sector
- To explore the precursors to risk taking behaviour among construction workers
- To conduct attitudinal research on the ability of organisation to influence workers behaviour.
- To obtain the opinion of management on individual behaviour as an accident causation factor in their organisation and in the construction sector.

The above aims were realised by qualitative research methods, using two specifically designed research questionnaires one for site operatives and the other for management.

1.7 Dissertation Contents

Chapter 1 of this thesis provides an introduction which gives the reader an insight into the reasons for the study, its aims and objectives, and the author's personal interest in the subject. In chapter 2, the literature review provides a comprehensive review and critical appraisal of previous work in the subject area, where such work is described and examined for links to the current study.

Chapter 3, Research Design and Methodology, details the research methods used, the formation of questionnaires and the motive for each question. Research results are presented in Chapter 4, where any significant findings are highlighted and relationships revealed. Finally Chapter 5 gives a detailed discussion of the meaning of these results and their relationship / similarity or otherwise to previous research. A brief conclusion chapter summarises the main findings of the study.

Chapter 2

2.0 Literature Review

This chapter provides a review of previous research relating to Behaviour Safety, Accident Causation, and some key research into the Irish construction sector. It also includes Behaviour Safety research carried out in other countries. The related topics of the accident causation, the science of human behaviour, and Behaviour modification techniques are also reviewed. A final section is included on Construction Industry legislation in Ireland.

2.1 Studies in the Irish Construction Sector

In recent years research in Ireland has begun to focus on Behavioural Safety, in particular some recent studies have been conducted in the construction sector. Among those are

- Hrymak, McDonald, 2002 on behalf of a joint initiative by the HSA and HSE NI.
- Marie Dalton a researcher with the HSA carried out research examining Fatal Accidents in the Construction Industry.
- Patricia Murray, Occupational Psychologist with the HSA – completed action research entitled 'Behaviour Change Programme' in August 2006.
- The Claritas Report - published by FAS and the H.S.A, their review of the Safe Pass and Construction Skills Certification Scheme (CSCS) it assess the effectiveness of both programmes includes research on behaviour and attitude to safety.

2.1.1 Hrymak McDonald, 2002 Safety Behaviour in the Construction Sector

Firstly to look at the **Hrymak McDonald,** study published in 2002.
The H.S.A and the HSE Northern Ireland jointly commissioned a research project entitled "Safety Behaviour in the Construction Sector". It was carried out over two years, and was brought about due to 'widespread concern over the level of fatal and serious accidents in the Irish Construction Industry'. It had become recognised that 'the culture in the industry generally was not conducive to health and safety,' and this

project was an effort to 'develop a better understanding of this culture and to devise practical and targeted initiatives to positively affect behaviour in the construction sector.' (McDonald, Hrymak 2002).

The research examined 18 sites, and gained responses from 244 operatives in the form of a questionnaire. An 18 item checklist was used in an observational study; the checklist was a modified form of that used in an earlier study by Duff et al 1993, as will be reviewed later. Ten HSA/ HSE inspectors were interviewed and 59 management representatives, while documentation from each site was also examined. The primary goal of the research was to investigate factors that influence safety behaviour and compliance with safety requirements on construction sites. The study focused on

- Examination of compliance with safety requirements in the industry
- Investigation of the behaviours, perceptions and attitudes associated with safety in construction
- Investigation of management practices and associated documentation related to safety
- To establish what factors are significantly associated with safe behaviours or safety compliance

This extensive research is a good precursor to the research topic of this thesis, especially as it is recent, and it has examined the influential factors on safety behaviour in the construction industry Republic of Ireland (ROI) and Northern Ireland (NI) as a whole. The main findings of (Hrymak, McDonald 2002) relevant to this study can be summarised as follows:

- The presence of a Safety Representative shows the strongest relationship with safety requirements on site, i.e. in both the response to safety audits and hazards and the fact that workers won't continue to work in hazardous situations.
- Organisational Safety Culture is weak in the construction sector
- Compliance has less to do with attitudes and more to do with systemic factors, such as reporting mechanisms and follow up on audits and hazards
- On examination of attitude towards risk as opposed to towards safety the results were fairly neutral, ambivalent.

- The preferred way of dealing with high risk situations was to report, except in the situation of working on a roof the preferred action was to stop working.
- Site workers were found to have a generally accurate perception of the level of risk involved in a given situation
- Construction is regarded as a dangerous industry sector by all
- Site workers did not perceive variables as affecting their job, and Management Commitment was perceived as moderately good. (Hrymak McDonald, 2002)

Some of the findings followed of Hrymak McDonald study followed up in this thesis are, the positive and influential role of the Safety Representative, the preferred way of dealing with a risky situation, and the attitude towards risk as opposed to safety.

2.1.2 Patricia Murray - Behaviour Change Programme 2006

In 2006 the H.S.A conducted 'Behaviour Change Pilot Project' by Patricia Murray, occupational physiologist with the H.S.A. This 'action research project' was carried out on two Dublin based construction site in 2006. It was trial project, the first of its kind, a specialist intervention which was developed to encourage safety behaviour using theories and models from organisational behaviour, applying them to a real workforce over time and measuring changes in behaviour as a result.

The outline of the project can be described as follows:

- The main aim was to identify whether a range of psychological techniques would induce voluntary behaviour change over a short time frame.
- The techniques used were goal setting, buddy system, feedback and commitment.
- All four techniques were used over an applied '21 day change programme' which was developed and implemented by change expert Mr.Andrew McGloughlin, senior specialist at the Irish Management Institute (IMI).
- Measures were taken before during and after the intervention.

The overall conclusion from this study was

'that although construction sites are challenging environments for encouraging safety behaviours, workers are liable to the same determinants of behaviour change, commitment, consistency, modelling, re enforcement and habit formation'. (P.Murray 2006)

The participating companies Bourkes Engineering Limited & Cramptons Ltd. both wished to be named after the programme and found the exercise helpful. The companies are of different size with Cramptons being a large company known nationwide and acting as the main contractor during this intervention, while Bourke's are a small to medium sized enterprise an engineering and mechanical and electrical engineering based in Dublin. (P.Murray 2006)

Why the 21 day change programme?

According to Murray's report on the project the 21 day change programme is a tried and tested method, which uses many of the psychological insights in regard to effective change at individual level, and is used widely by Mr.McGloughlin in his work. The rationale behind the 21 day change programme, is that people need support and assistance after they have made a change, as well as prior to making the change, a 21 day period is manageable as most people are determined not to fail as it impacts their self concept if they cannot keep a commitment to themselves for this short period, after the 21 days the behaviour most likely has become a habit and is a lot easier to maintain, thus throughout the 21 days of this programme there was weekly structured support, ad hoc informal support on site, and from the intervention personnel. (P.Murray 2006)

How the programme worked:

The specific behaviour targeted was the wearing of safety glasses. The programme evaluated adherence to the non mandatory safety request from management to the wearing of safety glasses over the 21 days of the programme.

Voluntary participants signed a contract to wear the glasses for the duration of the 21day programme. Small regular meetings were held to motivate and encourage participants for the 21 days of the intervention, a buddy system was used so that every participant had a colleague for the duration of the project, and discussions were held on the benefits and drawbacks of glasses wearing, feedback was given to participants

in small groups each week. Positive reinforcement served to buoy their confidence and also add to their commitment. Information on eye injuries was discussed and other general health and safety issues were often addressed during these sessions.

On day 21 a final meeting was held, all participants were wearing the glasses and had continued to wear them throughout the project.

One hundred percent compliance had been elicited; this was acknowledged in the final meeting. However, as one of the project aims was to see if behaviours change in the medium term would result from such a programme a further visit was required. One month later an unscheduled visit was made and forty percent of participants were still wearing the glasses, interestingly all of whom worked for the main contractor Cramptons the larger of the two participating companies. (Murray. P, 2006)

What we can learn from this pilot project.

- Behaviour Change Interventions can and do work on Irish Construction Sites
- The changed behaviour of wearing the glasses remained higher for the larger company, it being the company where supervisors showed a stronger commitment to the project, thus demonstrating the importance of management commitment.
- Due to the transient nature of construction workers, considerable effort is required by management at site level who 'carry the culture' to ensure the success of any safety initiative.
- The behaviour change model used in this study contained the two powerful motivators of social conformity (behaviour consistent with others), and human commitment both of which helped to achieve success and should be designed into any proposed programme.
- This project had a robust support system with positive feedback and on going reinforcement, which were key to its success, and are necessary to ensure the altered behaviour lasts.

2.1.3 Fatal Accidents in the Construction Industry

Marie Dalton carried out Research on behalf of the H.S.A, in 2002, the aim of which was to examine Fatal Accidents in the Construction Industry from 1991 to 2001, and conduct a survey of contributory factors. This study was based on questionnaires completed by investigating inspectors for the HSA, in total 132 fatalities were examined for contributory factors, three categories of contributory factors considered were

- Headquarter (HQ),
- Site Management (SM)
- Injured Party (IP).

Results of this study identified Site Factors i.e. Site Management twice as often as either Headquarter or Injured Party, with a ratio of 2:1:1 respectively as causation factors to a fatality, (Dalton, 2002,p 39) this ratio was maintained across individual years, employment status and incident type. Interestingly, the ratio of 2:1:1 for Site Management issues as causation factors has also been found by previous research by both the HSA (1998) and HSE (1998). (Dalton, M. 2002)

The research data was examined for the impact of the Safety Health and Welfare at Work, Construction Regulation 1995, no significant alteration in contributory factors was observed, following the implementation of these regulations; however it was noted that due to the lack of available data for the years 1991-1994 may have compromised the result. (Dalton, M. 2002)

The results of this study with the 2:1:1 ratio for Site Management, Headquarter, and Injured Party therefore strongly indicate that the main contributor to construction fatalities in the Irish Construction Sector (for the years examined) lie with site management (SM).

Dalton reported, the two most frequently cited contributory factors for Site Management(SM) were

- Failure to implement a safe system of work (SSW)
- Failure to identify hazards on site

It should also be noted that the Dalton study did acknowledge that regardless of where error originates it is most likely to manifest itself at site level, and this is supported by previous research with the author referencing that of, *Improvement of Living and Working Conditions 1991*... 'the site is the point of convergence for all malfunctions created upstream, and that it is where the price is paid for delays, errors and omissions in the study and planning phases'. (Dalton, M. 2002)

Headquarter (HQ) Contributory Factors most often cited were

- Failure to carry out adequate hazard and risk assessment
- Failure to take adequate consideration of design factors or features
- Competence of duty holders (Project Supervisor fir the Design Stage (PSDS)
- Project Supervisor for the Construction Stage (PSCS), Designer, Contractor

While of particular relevance to the current research the contributory factors identified at injured Party level (IP) were

- Unsafe act/ risk-taking behaviour because of inadequate Safe System of Work
- Using initiative to solve problem (not trained / experienced for the task)

(Dalton, M. 2002)

The two items identified for the injured party, refer to the actions and decisions of the worker on the frontline, it was noted that the two items are connected, the absence of an adequate SSW leads to unsafe behaviour in the form of the operator using their initiative to solve a problem, and that an effective SSW would ensure that workers were properly trained and that procedures were in place to deal with most eventualities. Dalton, notes that the problem at this level is compounded by the fact that the operative may regularly act in an unsafe manner and never suffer a negative consequence. Which would support the theories of (Dunne 2000), (Cooper 1998), (Sulzer-Azaroff 1987) on reinforcers and consequences as discussed later in this chapter. The discussion of the study continues to say that because so many factors operate at the individual level (e.g. personality type, personal relationships, time pressures), that it is more useful to aim at putting an adequate SSW in place, thereby inferring that to target initiatives at individual level is not a priority.

In the concluding comments of the Dalton study it states…

' the main point to take from the current research is an increased awareness that events on site are manifestations of events and decisions at other levels'.

2.1.4 FAS Claritas Report

The Claritas report is a review of the Safe Pass and Construction Skills Certification Scheme (CSCS) in Ireland. Published in March 2006, and gets its name from its authors Claritas consulting, who conducted the report on behalf of FAS and the HSA. The objective of this report was to carry out an assessment of both the effectiveness and the impact of the programmes, to establish if Safe Pass and CSCS objectives had been achieved. In addition the aim of the report was to ensure future management and development of schemes was consistent wit the needs of all stakeholders, which included statutory bodies, agencies, social partners, employers and employees.

The relevant parts of the Claritas report will be reviewed as part of this thesis. Both the Safe Pass and the CSCS programmes were major initiatives to improve safety in the Irish Construction sector. The Claritas report is a very comprehensive review of all aspects of the Safe Pass and CSCS programmes, including issues like administration, course delivery, quality of trainers etc...Hence a full review of the entire Claritas report is not necessary for the current research, only the sections considered relevant to safety behaviour in the industry will be reviewed. In particular this thesis is interested in the role of Safe Pass in contributing to a culture of health and safety, and to relative impact of workers behaviour on health and safety.

Following a brief outline of Safe Pass and CSCS programmes, the out come of the Claritas report of interest to the current research will now be presented.

The Safe Pass Programme:

The Safe Pass programme is essentially a one day safety awareness programme, upon successful completion of the course a Safe Pass card is issued to the participant, it is valid for four years, at which time it must be renewed. Construction workers are required by law to have a valid Safe Pass card in order to work on a construction site

anywhere in Ireland, the Safe Pass scheme was introduced in 2000 and integrated into the Safety Health and Welfare at Work, Construction Regulations 2001. The Claritas Report dated March 2006, reported over 475,000 Safe Pass Cards had been issued, at the time of writing this had increased to 824,000 cards including those that were renewed. (Dunne, P. (2007) telephone call and subsequent conversation with Paula Dunne, FAS, 16th August)

The objectives of the Safe Pass Programme were to:

- Raise the standard of safety awareness in the construction industry;
- Ensure that all workers in the construction industry, after completing the one day awareness programme, can make a positive contribution to the prevention of accidents and ill health on site;
- Maintain a register of personnel who have received training;
- Provide participants with a FÁS Safe Pass card, which is evidence that the holder has attended a formal course in health and safety awareness.

(Claritas Report pg 25)

The Claritas report found that the capacity of Safe Pass to effect cultural change was inherently limited, for two main reasons:

- The relative impact of workers' behaviour on safety;
- Safe Pass is only one element of a broad approach to creating and promoting a culture of health and safety in the construction industry;

The following are the key findings of the Claritas report that are of relevance to the current research.

- 62% felt that the course has changed their understanding of workplace safety
- 66% felt they had made or will make at least one change to the way they work.
- 71% said they had used what they learned on safe pass in their workplace (Claritas Report pg 34)

Such results would indicate that the Safe Pass programme is making a positive contribution to development of a positive safety culture on site.

Supplementary Analysis of the Safe Pass Survey Results, where a number of observations were made by use of statistical cross tabulations: Of interest to the

current research, are the results presented on how the course has changed workers understanding of workplace safety depending on the length of time working in the Construction Industry, summarised below.

Time in Industry Trends:

62% felt that the course has changed their understanding of workplace safety Those in construction less than one year least share this view
66% felt they had made or will make at least one change to the way they work. This view is held more strongly by those in the industry more than one year
71% said they had used what they learned on safe pass in their workplace. This view was strongest among those in the industry from 3-10 years
53% of workers believed they should repeat the course every few years. This view was held strongest among those in the industry between 5-10 years
74% felt what they learned was relevant to their jobs This view was strongest among those in the industry from 3-10 years
The view that the Safe Pass course had changed the understanding of workplace safety was held more strongly among those in the industry greater than one year.

(Claritas Report Pg188)

Length of time in industry has been statistically linked to accident causation, The Claritas report, refers to HSA statistics that suggest a correlation between the rate of accidents and the length of time in industry. (Claritas Report pg 65, section 9.26).

The CSCS Programme

The Construction Skills Certification Scheme (CSCS) provides for the training, assessment, certification and registration of non-craft operatives within the construction industry. The Claritas report dated March 2006, reported approximately 45,000 CSCS cards issued, at the time of writing this had increased to 73,720 including renewal cards. (Dunne, P. (2007) telephone call and subsequent conversation with Paula Dunne, FAS, 16th August)

All construction workers undertaking the tasks listed in the Ninth Schedule of the Construction Regulations, 2006, must have received training and assessments approved by FÁS under CSCS and have in their possession a CSCS registration cards

in order to work on construction sites. These include scaffolders, plant operators, roofers, crane drivers and slingers/signallers among others.

In the Claritas report the effectiveness of the CSCS was assessed in terms of the degree to which the objectives of the scheme had been achieved. The objectives of the CSCS programme being

- Raising standards of health and safety awareness
- Promoting training, assessment and certification
- Registering operatives, and providing them with cards
- Promoting the use of skilled operatives within the construction industry
- Providing certification for the international recognition of qualifications.

The Claritas Report found

- 74% felt the course had changed their understanding of workplace safety
- 78% stated they would make at least one change to the way they work
- 83% felt what they learned on the course was relevant to their job
- 71% felt that the course had helped them to do their job better

(Claritas report pg 110-112)

Supplementary Analysis of the CSCS revealed the following results that are of interest to the current thesis.

Age Group Trends

76 % of under 21's felt CSCS had helped them do their job better. The figure is lower as the age increases
84% of under 21's felt course had changed their understanding of workplace safety. This age category returning the most positive response
88% of the under 21's felt they have or will make at least one change to the way they work. Compared to 65% of the 31-40 year old age group.

(Claritas Report Pg215)

Certified Skill Area Trend

Plant Operators(48%) and Roofers (44%) showed a negative opinion on repeating the CSCS every few years, compared to construction operatives(74%) and scaffolders (59%) were more positive

(Claritas Report Pg206)

Overall, the review team who worked on the Claritas report noted a widespread acceptance of the importance and value of instilling and fostering a safety culture on construction sites, this is very encouraging for future initiatives for improving Health and Safety in the construction sector. (Claritas Report pg 110)

Commenting on the construction industry fatality rate in comparison to other employment sectors, the researchers pointed out that there has been a period of rapid employment expansion in the sector, with the construction industry accounting for 9.9% of employment in the country in the year 2000, this figure rising steadily 12.2 % of total employment by 2005, giving the sustained rise in employment, and the fact that fatalities have not increased accordingly this can be interpreted as an indicator of an underlying positive trend. (Claritas Report 2005)

Critical Appraisal -Irish Studies Construction Sector

This chapter of the literature review set out to outline any research that has been undertaken into behavioural safety in the construction sector in Ireland to date. Directly related studies uncovered were McDonald, Hyrmak 2002 on behalf of the HAS and HSE, and also the HSA study by Patricia Murray, The Behaviour Change Pilot project 2006, two recent studies specifically looking at behaviour based safety in the sector.

Of great interest to the researcher of the current thesis is that the Health and Safety Authority realise the potential of behaviour based safety initiatives as a possible way to tackle the poor safety record having focused on it in these two recent research projects. The conclusions of the Behaviour change pilot project are of particular relevance and very encouraging for the current thesis in that they have demonstrated that Behaviour change models can and do work on Irish construction sites.

The McDonald, Hyrmak 2002 study examined of the influential factors on safety behaviour in the construction industry, where it was seen that Organisational Safety Culture is weak in the construction sector, Compliance has less to do with attitudes and more to do with systemic factors, the preferred way of dealing with high risk situations was to report, an accurate perception of the level of risk involved in a given situation, Construction is regarded as a dangerous industry sector by all and Management Commitment was perceived as moderately good. This study provides some useful material to follow up in the current thesis, and material that helps to formulate the research.

The Dalton Study focusing on the causation factors into actual construction industry fatalities, revealed 2:1:1 ratio for Site Management, Headquarter, and Injured Party factors respectively, strongly indicating that the injured party is the least responsible for the poor safety record of the Irish Construction Sector. The accident contributory factors that were identified as being caused by the injured party were due to decisions made further up the hierarchy, i.e. an inadequate system of work, poor training and experience, which at some level meant the injured party was not totally in control of the situation. Dalton also noted that operatives got away with chances that they took, never suffered a negative consequence, hence they repeated the unsafe behaviour.

Which would support the theories of (Dunne 2000), (Cooper 1998), (Sulzer-Azaroff 1987) on reinforcers and consequences as discussed later in this chapter in the section on Human Behaviour.

One of the concluding comments of the Dalton study being that an increased awareness is required, of the fact that events on site are manifestations of events and decisions at other levels. This conclusion would shift the focus from the injured party to site management and headquarter influences. This conclusion is in line with the Reasons Pathogen Model of Accident Causation, reviewed in the next section.

Finally the Claritas Report published as recently as March 2006, while its function was to review the success of the Safe Pass and CSCS programmes, for the purpose of this thesis it provided a recent and detailed insight into the opinions and attitudes of construction industry operatives towards a major safety improvement initiative in their industry. It also reminded us of an important point, the rapid growth and expansion experienced by the construction sector in recent years, and put the accident statistics into context with this growth, which signifies an underlying positive trend. The Claritas report concluded that there was widespread acceptance of the importance and value of instilling and fostering a safety culture on construction sites, this is very encouraging for future initiatives for improving Health and Safety in the construction sector. Similar to the work of McDonald Hrymak above, this study provides some useful material to follow up in the current thesis, and material that helps to formulate the research.

2.2 Accident Causation Theories

The following chapter provides an overview of the predominant accident causation theories as presented by the pioneers of accident causation research, i.e. Heinrich, Bird and Loftus, and Adams to name a few. Accident causation theories merit a chapter in this review as understanding the underlying accident causation theories is fundamental to the research question for this thesis i.e. "What drives construction workers to take risks, and what if anything can organisations do to influence behaviour towards safety on site?"

Exploration of the theories will allow the researcher to examine the elements of theory that relate both to individual behaviour, and to organisational factors and apply the theories to the research results obtained.

The amount of literature on theoretical models of accident causation and theories is voluminous, a detailed overview of which is provided by Professor Dominic Cooper in his 1998 text *Improving Safety Culture*. Cooper is a leading expert, researcher and lecturer of world wide acclaim in the science of human behaviour and safety culture, and as such will be used to describe accident causation models for the purpose of this review. The most influential practitioners in this field include Heinrich, Weaver, Adams, Bird and Loftus and Reasons, whose work is commonly used among safety professionals and researchers.

2.2.1 Heinrich Domino Theory

Heinrichs domino theory dates back to 1931(http://www.sara-stewart.com/Module-Excerpt.doc) and is perhaps the most influential of accident causation theories. It is based on the theory that a chain or sequence of events that can be listed in chronological order to show the events leading to an accident.

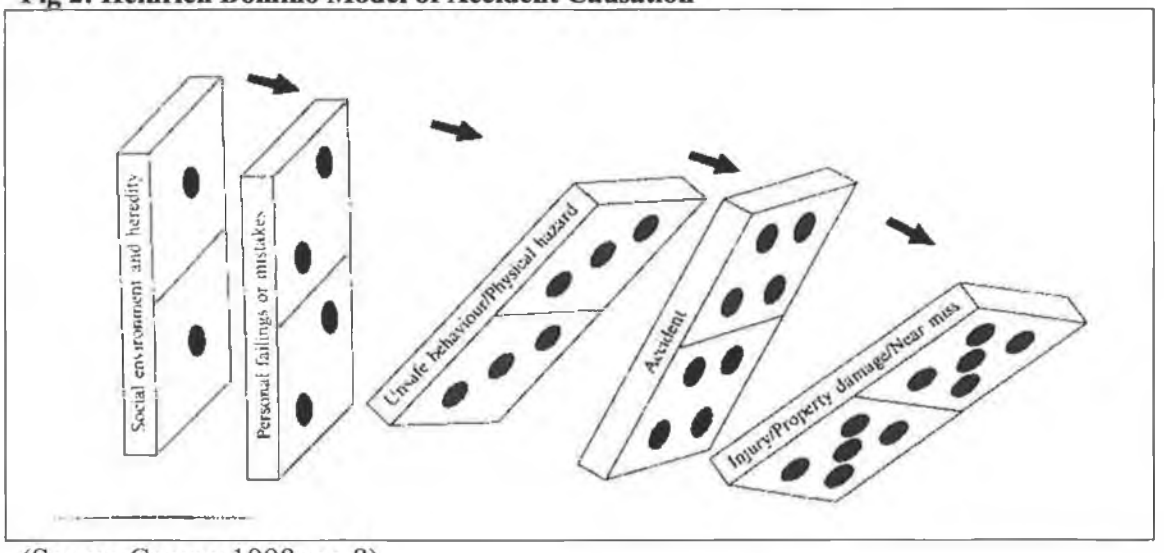
'Heinrich postulated that accidents were caused by an unsafe act, an unsafe condition or both. Termed the Domino Theory this work provided the first sequential theory of an accident causation processes. Not only was safety behaviour demonstrated to play a greater role than previously thought, but it also brought the interaction between behaviour and conditions (situation) into sharper focus at the time. In essence, the

Domino theory asserted that accidents were caused by a sequence of events which encompassed five discrete stages' (Cooper 1998 pg 8)

- Social Environment and heredity
- Personal failings or mistakes
- Unsafe behaviour/Physical Hazard
- Accident
- Injury/Property damage/Near Miss

Cooper 1998 describes the five stages of the sequence as follows, 'Begin with a persons heredity and environment which predisposes that person to behave in a certain ways (such as being an accident prone person), and which led to either an unsafe act or creation of an unsafe condition. In turn either of these caused an accident which resulted in an injury. Heinrich asserted that each stage of the accident process was analogous to a row of dominos in line with each other. If one fell, it automatically knocked down all the other dominos. Neutralising any one of the first four would prevent the fifth, the injury. Heinrich concluded that the key domino was that pertaining to unsafe acts. This perhaps reflected his findings that approximately 80% of accidents were triggered by unsafe acts, with the remaining 20% being caused by unsafe conditions (known an the 80:20 rule) (Cooper 1998 pg 8)

Fig 2: Heinrich Domino Model of Accident Causation



(Source Cooper 1998, pg 8)

An essential part of accident investigation commonly used is to focus on the chain of events that lead up to the actual event in order determine and isolate the root cause. This can largely be attributed to the Domino theory of accident causation.

2.2.2 Adaptations of the Domino Theory

Other theorists used Heinrichs domino theory as the starting point for their own work. While Heinrich concluded that the key domino was that of unsafe act's, hence removal of the third domino would prevent and accident. Cooper 2002, describes Weavers and Adams work as follows, 'Weavers 1971 focused on symptoms of operational error (management omissions) that interact with unsafe acts or conditions, while Adams 1976 emphasised that operational errors were caused by management structure; managements objectives; the synchronisation if the workflow system; how systems are planned and executed., In turn these operational errors caused 'tactical errors' (unsafe acts or conditions) (Cooper 2002)

Bird and Loftus domino model of accident causation, adapted Heinrichs Domino theory to reflect the influence of management in the accident causation processes. This model takes the view that poor management control creates either poor personal factors (e.g. lack of appropriate training), or poor job factors, (e.g. unguarded machinery). In combination these two factors lead to either unsafe acts or unsafe conditions. (Cooper 1998)

2.2.3 Reasons Pathogen Model

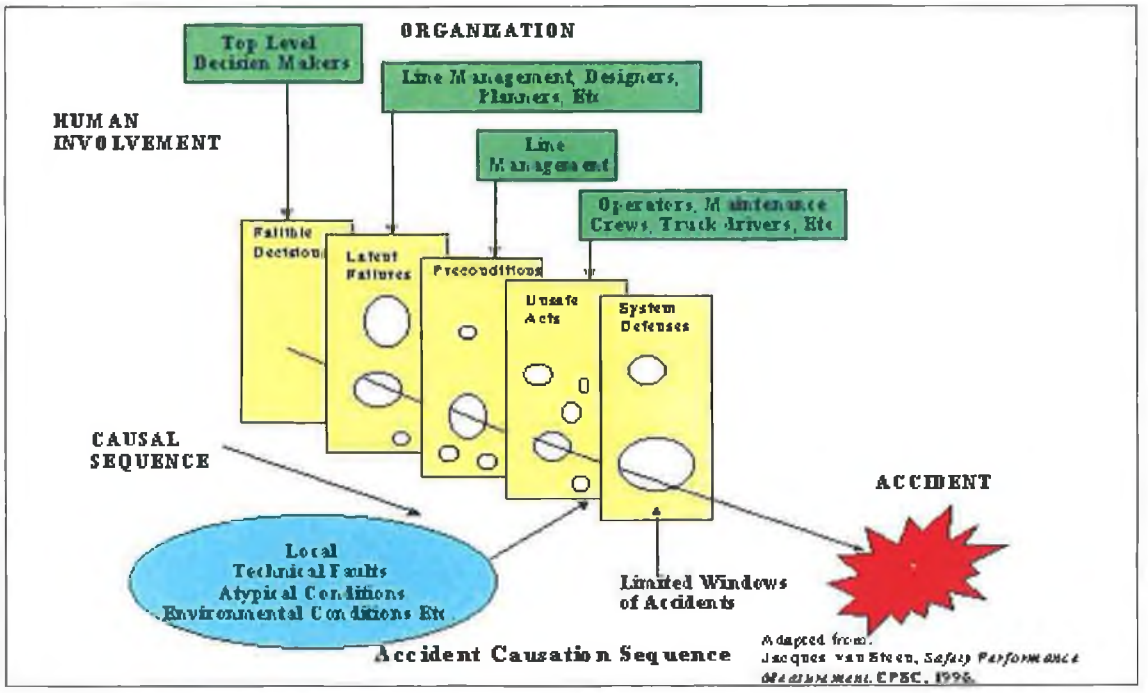
Professor James Reasons developed the *Pathogen Model* in 1993. (Cooper 1998).
The Reasons Pathogen model probed deeper into the sequence of events in the accident causation chain, focusing on how and under what conditions each of the sequential elements might interact to produce accidents. Cooper 2002 cited Reasons 1990 referring to this new model as, 'shifting the main focus of accident away from unsafe acts and more onto the organisations management system'. (Cooper 2002)

The Reason model is a general model that traces the root causes of different accidents to organizational errors (latent failures) arising in the upper levels of any organization

(Reason, 1995). Reason (1990) and other researchers contend that explanations of accidents based solely upon individual operator performance are now accepted to be inadequate as models of the accident generating process.

The Reason model develops a schematic interaction between individual error and latent factors such as faulty top level management decisions. It describes two interrelated causal sequences: (a) an active failure pathway that originates in top level decisions and proceeds through error producing situational factors at the workplace to unsafe acts committed by the individuals at the human-system interface and (b) a latent failure pathway that directly breaches the defences in a system (Reason, 1995).

Fig 3: An Accident Casual Chain



http://rutgersscholar.rutgers.edu/volume03/mauluxh/mauluxh.htm (accessed on March 14 2007)

The above accident casual chain demonstrates Reasons model, where decisions and actions (latent failures) coming down line the hierarchy of layers that exist in modern day organisations, can all line up (represented in the holes above) to eventually cause an accident that is triggered by an action individual level.

Reasons model has largely overcome the shortcomings of earlier theories that focused on unsafe acts. As a result many practitioners had continued to blame the individual for the unsafe act, or merely identify and rectify the immediate unsafe condition,

rather than examining how and why the unsafe act occurred, or how the unsafe condition was created. Reasons model was initially based on analysis of the Chernobyl disaster in 1987...Reasons argues that all organisations systems carry the seeds of their own demise in the form of these pathogens. In 1998 he termed these pathogens 'Latent failures'...he suggested that latent failures lie dormant, accumulate and subsequently combine with other latent failures which are triggered by 'active' failures (e.g. unsafe acts) to overcome the systems defences and cause accidents. Reasons proposed that the 'active' failures were caused by poor collective attitudes or by unintentionally choosing the 'wrong' behavioural response in a given situation, both of which may result in a breach of the system. (Cooper 1998 pg 12)

Critical Appraisal

The models presented in this chapter are widely accepted by research to be true of the circumstances largely surrounding accident causation, and are used time and again in the discipline of health and safety training, education etc.

Relevant to this research as they tell us about behaviour, a key part of Hienrichs theory is that of the unsafe acts. Reason's model put the emphasis more on organisation factors which will be explored in this research by question numbers, 14 and 15 of the Site Operatives questionnaire and question 4 and 5 of the Management Questionnaire. (See Chapter 3 for further details)

2.3 Human Behaviour

The next chapter reviews previous studies conducted on human behaviour in relation to occupational health and safety, and accident causation. It is not limited to the construction industry; rather it is extended to organisational psychology as a whole. Research carried out on the modification of human behaviour for the benefit of occupational health and safety is also reviewed. Similar to the Accident Causation Theories, an understanding of human behaviour is a core concept of this research and as such it is an important chapter of the review. The material reviewed in this section is linked to the research aims:

- To explore the precursors to risk taking behaviour among construction workers
- To obtain management opinion on individual behaviour as an accident causation factor in their organisation and in the construction sector.

Given that the research question for this thesis asks 'what drives construction workers to take risks?' a review of research into the science of Human Behaviour is fitting, at this point. Among the material that was found to be of particular interest to the current research on Human Behaviour is

- Dunne 2000- The psychology of working safely
- Duff *et al* 1993- *Improving Safety by the modification of behaviour*
- Cooper 2002- Human Factors in accidents
- Cooper 2004 -*Exploratory analysis of the safety climate and safety behaviour relationship*
- Cooper (1998) Improving Safety Culture – A practical guide
- Azaroff-Sulzer, 1987- *The modification of occupational safety behaviour*
- HSE 2002-*Strategis to promote safe behaviour as part of a health and safety management system*

2.3.1 The Psychology of Human Behaviour

Examination of individual behaviour, as a means to understanding what drives people to behave in a certain way, leads us to the study of human behaviour and the Psychology behind working safely. According to Dunne 2000 (pg 74) a key researcher in Ireland in the discipline of Organisational Psychology, 'errors in human

performance can occur when there is a mismatch between the way the human mind processes information and the way a work system operates.' The truth of the matter is that risks are taken in everyday life, e.g. driving cars above the legal speed limit, smoking, even though it is clearly a health risk, there are many examples. Dunne p28, states that 'people learn from experience'... 'we get away with the chances that we take, whether at work or at home, commuting or in leisure activities. The psychology of this state of affairs means that we learn to take chances. All behaviour is governed by its consequences; initially the consequences are actual events in the world, i.e. actual positive or negative outcomes that follow our actions...Because so much of our unsafe behaviour at work is not followed by a negative outcome, we learn to behave in unsafe ways and to take risks'. The very fact that we took a risk and didn't have an accident then in itself becomes a 'reinforcer' encouraging us to behave this way again. (Dunne (2000) the effects of 'reinforcers' are detailed in much of the work below.

Cooper 1998, notes that 'people often behave unsafely because they have never yet been hurt while doing their job in an unsafe way; I've always done the job this way being a familiar comment when asked why they behave in that way...over an extended period of time, therefore the lack of any injuries for those who consistently engage in unsafe behaviours is actually reinforcing, the very same behaviour pattern that in all probability will eventually cause a serious injury. The principles being illustrated here is that consequences of behaving unsafely will nearly always determine future unsafe behaviours, simply because reinforced behaviour will nearly always tend to be repeated.' (Cooper 1998, pg 266)

A paper by Sulzer-Azaroff, detailing the modification of occupational safety behaviour, refers back to an early study by Skinner (1938) to explain why people sometimes take risks. 'Skinner (1938) and other behaviour analysts have demonstrated repeatedly, behaviour is a function of contingencies (i.e. relations between responses and stimuli). When unsafe behaviour occurs, we can assume that past and present contingencies have played a role'. (Sulzer-Azaroff 1987)

Sulzer- Azaroff noted that 'safety in the workplace depends on a number of factors, including how hazardous the task is, or the physical or social environment might be, also quoting setting factors such as hunger, fatigue, stress, distraction and upon the

ongoing behaviour of the individual.' The Sulzer- Azaroff paper noted that upon examination of occupational accident data 'it is apparent that accidents continue to happen even in minimally hazardous environments, and training does not guarantee safe performance. Workers often behave unsafely, even when they are fully appraised of the risks involved and capable of taking preventive action, and injuries sometimes result. Consequently, although careful job analysis and the efforts of ergonomists, safety engineers, officers, and trainers do contribute toward reducing risk of injury, unsafe human performance continues to be a major challenge.' (Sulzer-Azaroff 1987)

The author of the current thesis notes the similarity of the above statement, 'workers often behave unsafely, even when fully appraised of the risks involved and capable of taking preventive action' as documented by Sulzer-Azaroff, it is closely linked to the motive behind the current research as stated in Chapter 1, i.e. "what drives people to behave in unsafely".

Consistent with the work of Dunne 2000, Sulzer-Azaroff comments on the principles of behaviour suggesting that 'as a general rule people behave in ways that have been reinforced optimally in the past. They avoid acting in ways that effectively have been punished or not reinforced.' Sulzer-Azaroff cites the work of Azrin and Holz, 1996 and Morse and Kelleher 1997 to demonstrate this statement.

Cooper 1998, also discusses the effect of '*reinforcers*' and the '*consequences*' of behaviour, commenting that the continuation of unsafe behaviours can be supported by more than one reinforcer, and that some have stronger effect on people's behaviour than others, particularly true of reinforcers that are soon, certain and positive . Cooper uses an interesting analogy of the cigarette smoker to demonstrate how reinforcers work. Smokers find it hard to give up because the consequences of smoking are soon (immediate), certain (every time) and positive (a nicotine top up), whereas the negative consequences (e.g. lung cancer) are late (some years away) and uncertain (not every smoker dies from lung cancer). According to Cooper in the same way the smoker finds it hard to quit, workers find it hard to follow some safety rules and procedures, if they are consistently (certain) rewarded by an immediate (soon) time saving that achieves extra production (positive) by behaving unsafely. (Cooper 1998, pg 266)

HSE 2002 carried out contract research, entitled 'Strategies to promote safe behaviour as part of a health and safety management system'. This research refers to promoting safe behaviour at work as being 'critical to the management of health and safety, because behaviour turns systems and procedures into reality. On their own, good systems do not ensure successful health and safety management, as the level of success is determined by how organisations *live* their systems.'

Chapter two of the 2002 study by the HSE, discussed how consequences drive behaviour, similar to Dunne 2000, above who notes that 'all behaviour is governed by it consequences' HSE 2002 notes that it is the outcome of the behaviour for the individual that influences the likelihood that the behaviour will be repeated. Therefore it follows that the frequency of behaviour can be increased or decreased by altering the consequences following that behaviour, manipulation of these consequences is a theory that is often used to modify human behaviour, e.g. ABC model discussed later.

To sum up on what has been said about human behaviour, based on the above literature there appears to be an acceptance that all behaviours are governed by their consequences,(Dunne 2000, Cooper 1998, Sulzer-Azaroff 1987) reinforces have a major affect on the way we behave, (Cooper 1998,Dunne 2000, Sulzer Azaroff 1987), and the three main consequences that influence behaviour are

(1.) Positive reinforcement

(2.) Negative reinforcement

(3.) Punishment

(Dunne 2000, Cooper 1998, Sulzer-Azaroff 1987)

2.3.2 Risk Perception

The way people perceive the risk involved in a certain situation determines their action. Several theories have been proposed to explain why different people make different estimates of the dangerousness of risk. Two major families of theory have been developed by social scientists The Psychometric Paradigm and Cultural Theories (Slovic 2000) a detailed review of which is beyond the scope of this thesis. Except to highlight the following main points,

The Psychometric Paradigm

Chancery Starr a key researcher in this area found that people use a number of heuristics to evaluate information. Heuristics being very general rules based on their impression of the situation.

- *Availability heuristic*- something people can imagine is more likely to happen.
- *Anchoring heuristic*-taking known information, adjusting it create an estimate of unknown risk.
- *Asymmetry between gains and losses*, people are risk averse with respect to gains and risk seeking about losses.
- *Threshold effect*. People prefer to move from uncertainty to certainty, over a similar gain in certainty that does not have full certainty. (Slovic, 2000)

Cultural Theories focus on culture rather than individuals to explain risk judgements. The Cultural Theory of Risk (Doughlas and Wildavsky) Found that

(a) Views of risk are produced by and support social structures, fear of certain types of risk serves to uphold social structure

(b) Four basic ways of life depending on social structure and outlook on risk – i.e. four cultural biases, defined by Grid and Group. Where Grid is defined as: Feeling of Solidarity and Group is defined as feeling of constraint in their social role. The four ways of life suggested were: Hierarchist, Egglitarian, Individualist, and Fatalist: (Thompson 1990)

Two points on Risk Perception that are relevant to this thesis are

- The role of trust
- The difference between voluntary and involuntary risk

On the role of trust Slovic stated, it is widely accepted that trust is a key factor influencing Risk Perception. An activity is more risky if people or agency managing it is perceived as untrustworthy. (Slovic, 2000) while in reference to voluntary risk, it was noted that 'People accept risk 1,000 times greater if it is a voluntary risk i.e. driving a car, as opposed to an involuntary risk, i.e. a nuclear disaster. (Slovic, P. 2000)

Dunne 2000, states that research on risk perception consistently shows that people accept a higher level of risk for themselves and for others when there is voluntary aspect to getting involved in the situation, referring to the work of Fischoff *et al* 1978 to back up this statement. Dunne continues that the voluntary factor probably accounts in part accounts for the risk sports like parachute jumping, rock climbing and rally driving. In the workplace, this fact would suggest that people who work for themselves, self employed people of all kinds would be inclined to accept higher rates of risk than would people who employees are working at the direction of others. (Dunne 2000)

2.4 Behaviour Modification Techniques

By way of definition, 'Behaviour Modification' is the psychological term for behavioural safety techniques that are based on a large body of psychological research into the factors that influence behaviour. (HSE 2002)

The techniques used in the alteration of human behaviour for the benefit of occupational health and safety are relevant to this research as the application of such techniques to the construction industry is being investigated in this thesis.

> *...'knowing about the factors that influence human behaviour, helps us to understand why people behave the way they do and how to alter those patterns'.* (Sulzer-Azaroff 1987).

HSE Contract Research 430/2002, provides good insight into an Assessment Strategy known as the ABC model of behaviour, which it describes as the core element of behaviour modification.

2.4.1 The ABC Model of Behaviour (An Assessment Strategy)

The ABC model encompasses the 'behaviour / consequences' theories as discussed in the previous section of this review, Human Behaviour, but proceeding the words Behaviour and Consequences with the word Antecedents, combining these three terms we arrive at ABC (Antecedents, Behaviour, and Consequences), a commonly used assessment strategy in behaviour modification.

An illustration of the ABC model is presented overleaf by way of explanation. The ABC model specifies that behaviour is triggered by a set of antecedents (something which precedes behaviour and is causally linked to the behaviour) and followed by consequences (outcome of the behaviour for the individual) that increase or decrease the likelihood that the behaviour will be repeated. The antecedents are necessary but not sufficient for the behaviour to occur, while the consequences explain why people adopt a particular behaviour. In HSE contract research (430/2002) the ABC model is presented by use of the following illustration:

Table 1: The ABC model of behaviour (HSE 2002)

Antecedents	**Behaviour**	**Consequences**
Casual event(trigger)preceding the behaviour	*Observable thing that someone does or doesn't do*	*Outcome of the behaviour for the individual that influences the likelihood that the behaviour will be repeated*
A Hear the telephone ring	**B** Lift the telephone receiver	**C** Have an interesting conversation with a friend
A Hear the telephone ring	**B** Do not lift the receiver, let the answering machine pick up message	**C** Continue working uninterrupted

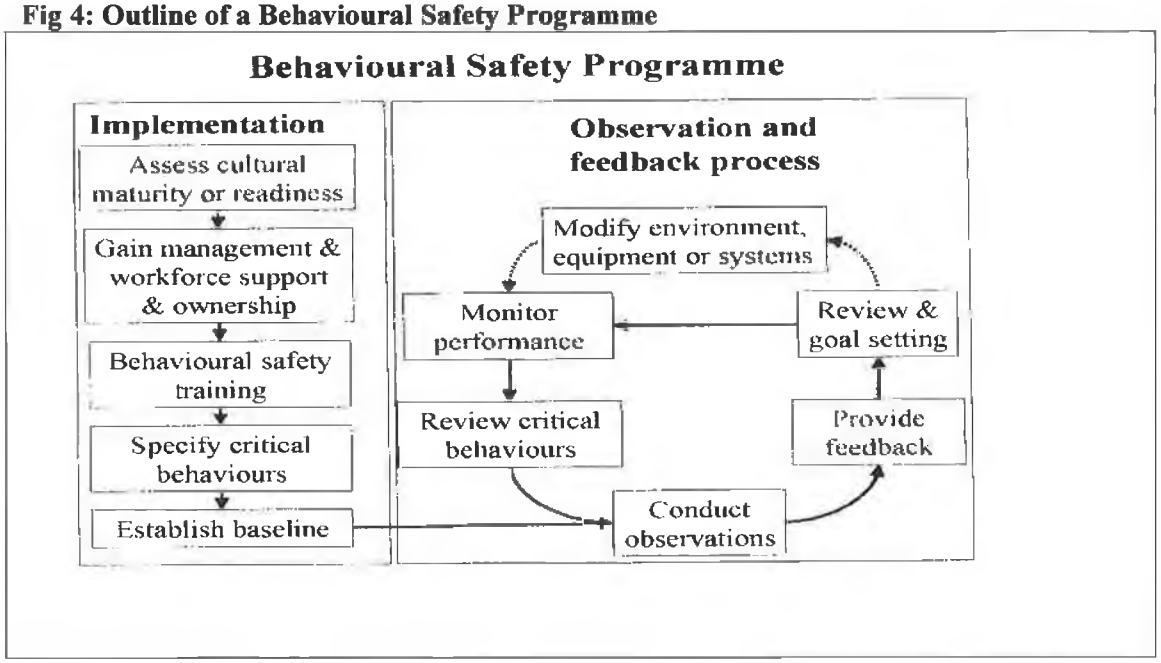
The above model demonstrates the role of antecedents, because if the individual did not hear the telephone then they would not pick up the telephone receiver. It also highlights the fact that it is the consequences for the individual that drives their behaviour (consistent with the work of Sulzer-Azaroff 1987, Dunne 2000, and Cooper 1998 as discussed above) because in both instances, the individuals heard the phone ringing, however in the second, the person did not lift the receiver because working uninterrupted was, for them, a more positive consequence than conversing with a friend. (HSE 430/2002)

ABC analysis facilitates the identification of ways to change behaviour, by ensuring the appropriate antecedents are in place and the consequences support the desired behaviour, which can be applied to promote health and safety behaviours. (HSE 430/2002 pg 3)

Antecedents help to trigger behaviour, they come before behaviour, examples of antecedents include rules and procedures, suitable tools and equipment, information signs, skill and knowledge, training and knowledge of others peoples expectations etc. However while antecedents are necessary to help trigger behaviour, their presence does not guarantee a behaviour will occur, for example, the existence of safety rules and procedures does not ensure safety behaviour will occur.(HSE 2002)

While Health and Safety behaviour observation and feedback programmes are based on the ABC model of behaviour, according to the HSE the ABC model is seldom used explicitly. As part of their research they set out to establish current practices in behaviour observation and feedback programmes, by holding interviews with eight of the UK programme providers while there were differences in the programmes (e.g. target group and the way feedback was delivered), a number of common components emerged, Figure 4 below outlines the generic overview of a behaviour safety programme as was found by HSE research.

Fig 4: Outline of a Behavioural Safety Programme



(Source: HSE 2002 pg 9)

The above model identifies the key elements of a health and safety observation and feedback programme, which are:

Implementation Stage

- To assess cultural maturity or readiness
- Gain management and workforce support and ownership
- Behavioural Safety Training
- Specify Critical behaviours
- Establish a baseline

The actual observation and feedback process

- Provide feedback (which provides positive reinforcement)
- Review of goals and setting new goal
- Make the necessary modifications to equipment, environment or systems

- Monitor performance and review critical behaviours

2.4.2 A review of modification techniques

A paper presented in the Journal of Occupational Accidents, entitled 'The Modification of Human Behaviour' written by Sulzer-Azaroff 1987, stated that because human performance is implicated in many accidents and injuries that occur in the workplace, behaviour modification has much to offer. The preferred method of modification being effectively arranged positive reinforcement, supported by clear antecedents, which cue the probability that a response will be reinforced. In the case of unsafe behaviours especially resistant to change the combination of reinforcement of the preferred alternative behaviour with punishment of the offensive act was the most successful method (Sulzer-Azaroff 1987).

The Sulzer-Azaroff paper reviewed the techniques of, Assessment Strategies, Observational Recording and Modifying Behaviour which he referred to as 'techniques and models that being used ever more frequently in the area of occupational psychology'. The review and evaluation of each of these techniques was quite long and complex and the author of this thesis found the article difficult to follow and to establish the findings. However the following brief comments were extracted from the paper.

- **Assessment strategies** – the ABC analysis was described as, reviewing records, interviews, observing safety inspections, setting priorities. The paper commented on the ABC assessment strategy as being 'Only as valuable as the information included'
- **Observational recording-** selecting and training observers, conducting baseline assessments. It was highlighted that objective, accurate observational recording is essential to an effective behaviour modification program. With important considerations being who is to conduct the recording and how are objectivity and accuracy to be maintained.
- **Modifying behaviour-** Reinforcement, arranging antecedents, goal setting, punishment, feedback, teaching complex skills and changing established habits, were stated as the preferred method of behaviour modification. Increasing safe performance through reinforcement works. Many consequences have been found

to function as reinforces for many people, among these are recognition, praise, privileges, material or monetary rewards. It was suggested that carefully selecting reinforcing consequences was the key to success, noting that they need to be delivered consistently and with minimal delay.

Considering this paper is quite dated being twenty years old, at that time Sulzer-Azaroff stated that behaviour modification had begun to demonstrate its value as a powerful tool for promoting safety and health in the workplace, at that time. However it is noted that twenty years on, these techniques are not widely known or used among safety professionals.

Interestingly the Sulzer-Azaroff study used a specific work place example subjected it to scrutiny by the science of human behaviour, to demonstrate the behavioural perspective of job safety. For the purpose of this review it is worth noting the scenario used, as it supports theories on the effects of consequences on behaviour (Cooper 1998, Dunne 2000, HSE 2002), explains this theory and presents a situation not uncharacteristic of the Irish Construction industry. The example presented is as follows:

An Illustration of the effects of Consequences and Reinforcement on Behaviour

> Eric, a cabinet maker discovers that the tool he is using requires sharpening, he goes to the sharpening wheel where his safety glasses are within reach." This will only take a second," he tells himself, "so I won't bother with the glasses". While he sharpens the tool a fragment flies off and lodges in his eye. After arranging for medical assistance, his boss and co – workers comment "How stupid of him. He knows better than that".
>
> Despite no major lasting damage, everyone including Eric can recognize the foolishness of his act: that to save just a moment, he has suffered a serious injury and lost time for himself and his company. Eric had known what precautions he was supposed to take and how serious the consequences of an injury might be, yet he went right ahead. Why?

An examination of the consequences affecting Eric's performance, according to the science of human behaviour, is as follows. Eric has three options

(a) Used the dull tool? The groove he required to cut would not be to his standards. That consequence certainly would be *immediately punishing*, so he would act to avoid it. (He has learned in the past to avoid using a dull tool because the consequences were consistently and immediately punishing)

(b) Put on his safety glasses before sharpening the tool? He would have to make an effort and loose a moment or two in returning to his work. Here the immediate consequence, putting the glasses on, would be negative. Avoiding an injury would be positive consequence but one that would be delayed and unlikely to happen (non consistent), especially during brief times at the grinder. Also he and his fellow workers had got away without wearing the glasses in the past to no ill effect. In fact workers who appeared to be overly cautious were ridiculed by their piers – another immediate somewhat uncertain but negative consequence. Avoiding the *immediate negative consequences*, the time and effort required and the possibility of being ridiculed outweighed the positive ones. Hence Eric choose

(c) Not to wear the safety glasses, why? The *reinforcement* of returning to his carving sooner would be *immediate, positive and certain*, as would to avoid the likely negative ones.

So he did not wear the glasses. Just as behavioural principles predict, he avoided the immediate, certain negative consequences, (to loose time in putting on the glasses) in favour of the immediate certain positive one, (to return to his work sooner), despite the delayed uncertain negative consequences (sustaining an eye injury) (Sulzer-Azaroff 1987)

Critical Appraisal

The above section reviewed the science of Human Behaviour and the techniques used for the modification of human behaviour in the interests of occupational health and safety.

The main conclusions to be taken from the review on Human Behaviour, is the psychology of human behaviour has told us that we learn to take risks from the chances we took and got away with in the past, we learn from our experience, and it is the consequences of our behaviour and the reinforcing factors that surround our behaviour that decides if we repeat the behaviour again or not. Authors Dunne 2000, Cooper 1998, Sulzer- Azaroff 1987 and HSE 2002 have all outlined the above theory in their work reviewed.

The study of Risk Perception, the work of Slovic and Dunne outlined that the way people perceive the risk involved in a certain situation determines their action, people make different estimates of the dangerousness of risk and several theories have been proposed to explain why this is so.

Finally a section on the modification of human behaviour outlined psychological techniques that are used in the alteration of human behaviour, providing the reader with an insight into the techniques that are used and the theory that supports such techniques.

Explaining the ABC model a core element of behaviour modification, it was shown that:

- **A**(Antecedent) A Casual event(trigger)preceding the behaviour
- **B** (Behaviour) Observable thing that someone does or doesn't do
- **C** (Consequences) Outcome of the behaviour for the individual that influences the likelihood that the behaviour will be repeated

Use of this model facilitates the identification of ways to change behaviour, and is applied to achieve improvement in occupational health and safety. Whereby the employer wishing to implement the programme ensures the appropriate antecedents are in place and the consequences for the worker will encourage the desired behaviour e.g. praise, recognition, a bonus, thus providing an incentive to repeat the desired behaviour.

It was shown that while the ABC is the core element of the modification of human behaviour it is rarely used alone, the HSE provided an outline of a generic Behaviour Modification Programme, based on the ABC model, which was the outcome of a study of behaviour based safety programme providers in the UK.

2.5 Behaviour Based Safety - Research in the Construction Sector

This chapter provides details of studies that applied the techniques of behaviour modification to the construction industry in Finland and the UK and a paper presented on the subject in Australia.

2.5.1 A study carried out in Finland

Mattila and Hyodynmaa, the authors of a study carried out in Finland, set out to determine weather behaviour analysis approach could be used effectively in the construction industry given its 'special features' that decrease occupational safety.

The special features cited in the study are:

- a changing work environment
- outdoor work
- much material handling
- house keeping is often poor
- the work is often planned at the site
- sites are different
- work may change
- the type of wages
- a new organisation at every project.

'Many of these factors affect how people behave at the site, and make it more problematic to behave in a safe way.' (Mattila, Hyodynmaa 1988).

Similar to Ireland and the UK the construction industry is one of the most hazardous industries in Finland, as this study dates back to the 1980's it reported that in 1983 a total of 17% of all industrial accidents at that time occurred in the construction sector. (Mattila, Hyodynmaa1988)

At the time of this study the authors stated that while 'the behaviour analysis approach had been used to promote safe behaviour in other industries, e.g. bakeries (Komaki, et al…1978) the process industry (Fellner & Sulzer-Azaroff, 1984a: Komaki et al 1982

and research laboratories (Sulzer-Azaroff, 1987) it has not yet been used in construction'. (Mattila, Hyodynmaa 1988)

Therefore this was the first study to investigate the effectiveness of behaviour modification in the construction sector, and indeed the most dated study of the sector sourced for the current literature review. The positive results achieved indicate that behaviour modification can work even considering that transient nature of the construction sector and the 'special features' to which Mattila, Hyodynmaa refer.

The **study design** used by Mattila, Hyodynmaa chose two typical building sites an apartment house and an office building, both were contracted by the same company therefore internal practices at both sites were similar. Two other similar sites were selected to serve as control sites, it was important that the control sites were as similar as possible to the study sites. A maximum of 100 workers and from 7 -10 foremen were working at each site of the office sites, while from 10-20 employees and two foremen were working at the apartment house sites.

Targets (or Goal Setting)

Target conditions and target behaviours were developed separately for each site, based on analysis of the companies' accident records, and interviews with the safety manager worker and supervisor representatives, the authors chose 26 targets were that had to meet the following criteria

- They must be major occupational safety problems
- Current and relevant when posted at the site
- It must be possible to attain the target, i.e. to perform safely
- Follow up should be possible
- The formulation should be positive
- The target should concern several people

The final list of targets comprised only those targets on which the employees and management agreed. Thirteen targets were chosen for the experiments at the office site and eight at the apartment house.

Meetings, Inspection and Data Collection

Information meetings were held at both sites to describe the study; selected targets or goals were displayed on posters at the site. The weekly site safety inspection served as a form of measurement, and feedback was given to all employees by means of writing a few important findings, good and bad beside the list of targets on the poster.

One of the authors made the weekly rounds with the safety inspection team, another experienced person recorded observations independently at the same time. A safety index was used to express the percentage of items performed safely at the site; hence the reliability was assessed based on a method used by Komaki et al 1978. Reliability of measurement in this study varied from 83% to 90% depending on the target group.

Data was collected over 20 week period at the apartment house and 22 week period at the office building site. Accidents were analysed according to site accident records. Information from the two control sites were used to assess the effects of the intervention on the quality and safety of the inspections, and the number and type of accidents.

Results

A very positive result was achieved for the wearing of safety helmets at the apartment house, which was recognised by all as a major problem, during the experiment the percentage of workers wearing a helmet improved continually and by the end of the study had reached a 90% wear rate.

Occupational accidents and first aid cases at the building site and its control site were analysed for the following variables, number of accidents, accidents causing more than 30 lost workdays, accident rate and severity rate all were assessed before during and after the study all of which yielded a lower result.

Overall the authors were satisfied that study suggested that a behavioural approach and a simple target and feedback programme can affect safety conditions even in the difficult setting of construction.

The study noted that the safety performance improved more on the small site than on the large one, an interesting finding and one that had not previously been encountered by the author of this thesis. Mattila, Hyodynmaa remarked however that achieving greater improvement on small site is a natural result and they cite earlier studies of Sulzer Azaroff and de Santamaria 1980 to have yielded similar results.

A major finding of the Mattila, Hyodynmaa study is that the authors claim their results support the hypothesis that the behaviour modification technique may also be successful in *preventing* accidents. Their basis for coming to this conclusion was that the accident rate was lower at the site where the experiment was being conducted, than that of the control site where the behaviour modification was not applied.
However presentation of their results does not clearly demonstrate that this was proven. The author of the current research would question this finding. Based on presentation of results by Mattila, Hyodynmaa, it appeared that while the accident rate was lower at experimental sites in comparison to the control site during and after the experiment, in addition the results showed that the accident rate of the experimental site were also lower to that of the control site before the study began, thus questioning the claim that behaviour modification techniques can get the credit for the lower accident rate.

Results of the Mattila, Hyodynmaa study consistent with those of Duff et al 1993, and P.Murray 2006, Sulzer – Azaroff 1980 and HSE 2002 are the importance of target development, (or goal-setting) and feedback to the success of the programme.
The significance of goal-setting was demonstrated by the fact that when new targets were posted improvements in performance were noted, the commitment of management and workers to the targets is one crucial element for success, and this was assured by accepting targets that were agreeable to all.

Feedback in this case was given by the companies own personnel at the site, which was integrated into the usual weekly routine, this shows that behaviour modification can be an effective tool in the companies own safety programme. The researchers of the Mattila, Hyodynmaa study felt that the integration of the behaviour observations with the routine safety inspections made the inspections more effective and meaningful. (Mattila, Hyodynmaa 1988)

The author of the current research feels that the method of integrating observations with already established inspections may be something that would encourage companies to try out a behaviour modification programme.

Another interesting observation of the Mattila, Hyodynmaa study, was the 'new visible attraction' at the site, which drew attention to safety at the site, the programme was noted by participating companies to place a new emphasis on safety at the site and had some positive spin off effects, workers appreciated the programme as a positive effort, it offered a new forum for co-operation between workers and management, proving to workers that safety and well being of workers really is taken seriously. (Mattila, Hyodynmaa 1988)

2.5.2 A UK Study

A study by Duff *et al* 1993, very relevant to the current research entitled "improving safety by the modification of behaviour" tested the development and effects of behaviourally based management techniques of goal setting and feedback on six construction sites in the northwest of England. Goal setting and feedback are commonly used applied 'behavioural analysis techniques', Duff *et al* cite the work of McAfee and Winn 1989, as 'having shown improvements in safety behaviour in several industries'.

The Duff *et al* project was financed by the HSE and was undertaken due to the failure of previous attempts to improve the unenviable safety record of the construction industry in the UK, and due to the fact that in the years preceding this study sentiments of grave concern were being expressed for the safety of construction workers.(Duff *et al.* 1993 pg 67)

Therefore the UK having a poor accident record for the construction industry is quite similar to the Irish story makes this study very fitting with the current research, the fact that this very successful intervention was in the construction sector is very encouraging for this thesis subject matter.

The general aim of the Duff *et al* project was to evaluate the benefits of using goal setting, feedback and training techniques to improve safety on UK construction sites. In order to achieve this accurate and reliable measure of safety performance was required, which could be used before, during and after their application.

Carried out over a 40 week period, it was the first attempt to apply behavioural safety techniques to the UK construction industry. The specific objectives of the research were

- To develop a test method of measuring safety performance on construction sites,
- To use the method to evaluate specific management procedures based upon proven techniques for changing work behaviour to improve site safety.

Research Design

In the work of Duff *et al* the researchers describe their work 'as longitudinal research design in which measures of safety performance were taken before during and after the application of these methods'. (Duff *et al.* 1993)

Considerable work went into developing an objective and quantifiable method of safety measurement, which involved identifying contributory factors in accident causation chains, analysis of various types of fatal and serious accidents, a detailed literature review of construction journals, HSE publications among others. A total of 24 items were selected and incorporated into a safety audit checklist, used to evaluate safety performance of construction sites in the experiments to change safety behaviour. Four categories were chosen for measurement during the research, namely Access to heights, site housekeeping, scaffolding and use of personal protective equipment. The interventions of goal setting, feedback and training were developed for the research and applied as follows.

Goal setting scripts were devised and explained the experiment, how the safety performance levels were determined, and what the current performance level was also including detail on how frequently feedback would be given.

Feedback, graphical method of feedback was chosen for this project, performance feedback charts capable of showing graphically 42 weeks of measures were designed and mounted in locations visible to all site personnel.

Training, a standard training package was devised for each experiment category, the objective of the training intervention was to ensure that site personnel understood fully the basis of goal setting and feedback activities and in particular the items that were contained in the measurement checklist.

The **data collection** process was also carefully designed, with an initial baseline period of 12 weeks to dissipate any effects caused by the presence of observers on site, followed by intervention and withdrawal periods, the PPE category was used as a control, the expectation being that if the interventions were effective, safety performance would improve in the experimental categories as the study progressed but the control category would remain constant. Independent observers were

employed to conduct the safety audits, to reduce the likelihood of experimenter bias, observations on each site were taken three times a week at different times of the day and different days of the week, to overcome any systematic effects or participants expectations affecting the results. (Duff *et al.* 1993)

The main conclusion of this research stated that

- Safety behaviour can be objectively and reliably measured w*ithout* excessive use of managerial or supervisory resource, producing performance data which could be used in many different safety management strategies
- Goal setting and feedback can produce large improvements in safety performance; at least in the short term, the question remains whether the improvement can be maintained.
- Re intervention after withdrawal of feedback did not produce the same level of improvements as the first interventions.
- Commitment of site management appears to enhance the effectiveness of the goal setting and feedback approach. (Duff *et al* 1993 pg 76)

Of interest also is the comparison of the three different interventions, there was no conclusive difference in the results of the three intervention protocols, but they did suggest that goal-setting and feedback were better than feedback alone, and the addition of training didn't offer any benefit. (pg 76)

- accident rate and severity rate all were assessed before during and after the study all of which yielded a lower result.

- Overall the authors were satisfied that study suggested that a behavioural approach and a simple target and feedback programme can affect safety conditions even in the difficult setting of construction.

The study noted that the safety performance improved more on the small site than on the large one, an interesting finding and one that had not previously been encountered by the author of this thesis. Mattila, Hyodynmaa remarked however that achieving greater improvement on small site is a natural result and they cite earlier studies of Sulzer Azaroff and de Santamaria 1980 to have yielded similar results.

A major finding of the Mattila, Hyodynmaa study is that the authors claim their results support the hypothesis that the behaviour modification technique may also be successful in *preventing* accidents.

2.5.3 An Australian Perspective

Biggs *et al* presented a paper to the conference at the Queensland University of Technology Research Week International Conference July 2005, the paper entitled 'Utilising a safety culture management approach in the Australian construction industry', outlines a familiar situation to the Irish, UK and Finland construction industries with regard to accident history and injury rates, while it does not directly address Behaviour Based Safety it is of relevance as will be reviewed.

In this paper Biggs *et al* stated that the injury rates remain a matter of concern, are reported to have reached a plateau and continue to resist push for safer work sites; as a consequence, new innovations in construction safety management are required. (Biggs *et al* 2005) The paper notes that the traditional approaches to safety management such as the identification of work hazards, minimisation of risks, improving the design of plant and machinery, providing training, development of better work methods and provision of personal protective equipment are often used. Despite the application of all of these 'traditional' efforts the Australian construction industry in all of the jurisdictions continues to report higher injury rates and fatalities than most other industries. (Biggs *et al* 2005) therefore suggesting that the traditional approach is not working.

A key concept of Biggs *et al* work was that the industry and regulators need new approaches that can affect workers motivation, and its main proposition was that an improvement in safety culture can be achieved through the development and application of a system of specific components linked to safety critical roles.

Although the situation of the Australian Construction sector is not dissimilar to the Irish, UK and Finish stories the paper suggests the use of the related concept of 'safety culture' as an overall management approach, rather than application of

behaviour based safety techniques, it does however discuss safety culture as a means to influence motivation and behaviour.

Biggs *et al* provide a good synopsises of the problems associated with transitory nature of the construction industry and how this creates a barrier to the effective implementation of the safety climate approach.

Among they note are a large proportion of the work is completed by sub contractors, the majority of whom will shift regularly between projects and primary contractors, as the work is project based, a positive safety culture is difficult to establish and maintain as people and jobs are regularly changing. In addition when a proficient safety culture is present, the knowledge about how to develop and maintain this culture is often lost when the project ends and the work disbands. A new system is required that facilitates rapid development of safety culture, when a project begins and a further challenge is to maintain the culture even when the workforce is changing. Not only is the workforce changing on site bit there is also a high degree of movement of subcontractors between primary contractors.

The system proposed by Biggs *et al* to improve the safety record, and to develop and maintain good site safety culture included the following

- To establish a list of safety critical roles
- Further develop a system of Safety Competencies (similar to Safe Pass and CSCS)
- Integration of Safety Competencies into existing Human Resource Management Strategies (Biggs *et al* 2005)

Critical Appraisal

While earlier review chapters described behaviour modification techniques, this section of the review demonstrated the actual application of the methods of goal setting, observation, feedback, and reinforcement, in the construction industry, in what proved to be successful interventions.

The work of Duff *et al* 1993 in the UK found that:

- safety behaviour can be objectively and reliably measured,
- Goal setting and feedback can produce large improvements in safety,
- The first intervention provides more powerful improvements than re-intervention the effectiveness of the goal setting and feedback approach is enhanced by the commitment of site management.

Mattila, Hyodynmaa 1988 in Finland achieved similar positive results, their main findings being

- Wearing of safety helmets which been a particular problem continually improved and by the end of the study had reached a 90% wear rate.
- A behavioural approach and a simple target and feedback programme can affect safety conditions even in the difficult setting of construction.
- performance improved more on the small site than on the large one,
- Behaviour modification technique may also be successful in *preventing* accidents.
- The importance of careful target development, (or goal-setting) and feedback were central to the success of the programme.
- commitment of management and workers to the targets is one crucial element for success
- Integration of the behaviour observations with the routine safety inspections made the inspections more effective and meaningful.
- The 'new visible attraction' at the site, drew attention to safety, the programme was noted to place a new emphasis on safety and had some positive spin off effects,

In a paper by Biggs *et al* 2005 which focused on the Construction industry in Australia.

- It was noted that the traditional approaches to safety management such as the identification of work hazards, minimisation of risks etc…is not working.
- Regulators need new approaches that can affect workers motivation
- They proposed an improvement in safety culture, involving the following
    - To establish a list of safety critical roles
    - Further develop a system of Safety Competencies (similar to Safe Pass and CSCS)
    - Integration of Safety Competencies into existing Human Resource Management Strategies
- They highlighted the problems associated with transitory nature of the construction industry and how this creates a barrier to the effective development of safety culture.

2.6 Casual Factors in Construction Accidents- a UK Study

A study by the HSE UK, research report 156 entitled 'Casual Factors in Construction Accidents' carried out in 2003 provides interesting results that are relevant to the current research. Following a detailed study of one hundred accidents across construction build type. It is of interest to the thesis subject matter, as to the best of the researcher's knowledge this type of analysis has not been conducted on construction industry accidents in Ireland. The findings that relate to individual factors are of particular interest, while the entire report provides many interesting insights into accident causation only those linked to the thesis subject matter will be reviewed.

The remarkable results linked to the current research was

'Problems arising from workers or the work team, especially workers actions or *behaviour* and worker capabilities, were judged to have contributed to over two thirds (70%) of the accidents. This points to inadequate supervision, education and training.'(HSE 2003, pg viii)

A summary of accident causes provided in the HSE study, clearly highlights 'Worker and Work Team Factors' as a major contributor to the poor accident record of the Construction Sector. (Table 15 pg 26).With this category being identified as the causal factor in a startling 70 out of the 100 accidents analysed.
'Worker Actions / Behaviour 'were identified as causal factor in 49 accidents out of 70, this being the single biggest causal factor identified, followed closely by the related category of 'Worker Capabilities' (including knowledge/skills) as the causal factor identified in 42 of the 70 accidents. These figures are encouraging for the current research, as the concept of tackling workers behaviour is being suggested as a means to improve health and safety and reduce accident rates in the construction industry.

During the discussion of these results the research team, noted that worker or work team factors in construction accidents involve the actions of individuals, their capabilities and communication problems. Possible influences on these arising from

worker attitudes and motivation, pay and remuneration, supervision and deployment, education and training, health, and working hours…the term 'worker' in this context is broadly used and includes operatives, trade personnel and specialist professionals.(HSE 2003)

The **research design** of the HSE 2003 study used was a combination of focus groups and studies of individual accidents, with the following aims;

(1.) To collect rich detailed data on the full range of factors involved in a large sample of construction accidents
(2.) Using this information to describe the process of accident causation, including the contribution of management, project, site and individual factors in construction accidents. (HSE 2002, pg 2)

The use of focus groups allowed room for the subjective opinions from a cross section of construction industry personnel. While the accident studies were site based, and data collection entailed interviews with actual accident involved personnel and their supervisor or manager, inspection of the accident site (where possible), and a review of related accident documentation. Seven focus groups were selected from among industry stakeholders, the groups comprised of 5-7 participants and were a combination of the client team, senior managers, site managers, operatives from both a large and a small site, construction safety professionals and a mixed group. The combination of this mixed bunch removed the possibility of any bias. Each group was asked to consider where failure occurs and why accidents still happen, the ensuing discussion was structured under the headings of, project concept, design and procurement, work organisation and management, task factors and individual factors. The focus group discussions were wide and varied 'with strong opinions expressed regarding the sources of problems with safety and the cause of accidents'.

One hundred accidents were studied in detail to collect information on the issues raised by focus groups; the accidents used in the research were actual accidents were obtained from organisations participating in the research, and were generalised as being 'more serious accidents'. The research findings suggested an interaction between the work team, workplace, equipment and materials as factors causing

construction industry accidents. The significant contribution of the 'work team' which is the focus of the current research has been discussed above. (See HSE research report 156 for the full report.)

2.7 Safety Legislation, in the Irish Construction Industry

Foremost among the efforts to improve safety in the Irish Construction Industry, has been the introduction of increasingly more stringent legislative requirements leading to tighter regulatory control. Revisions to the Construction Regulations have had an impact on how safety is managed on construction projects with very specific duties and legal responsibility clearly defined for many of the stakeholders.
A brief overview of Health and Safety Legislation, and the Safety Health and Welfare at Work, (Construction) Regulations and its amendments will now be provided.

The first specific piece of legislation in Ireland to address Occupational Health and Safety was the Safety Health and Welfare at Work Act (SHWWA) 1989, prior to this there was very little regulatory control over occupational safety and health in the Irish workplace, apart from statutory instruments that were in existence in specific industries such as The Factories Act 1955 the Mines and Quarries Act 1965 and such similar sectors. The 1989 Act brought about a new era of regulation for maintaining health and safety at work, outlining legal responsibilities for the employer and the employee; it has since been revoked by the Safety Health and Welfare at Work Act, 2005 with some new provisions and tighter regulatory control, the discussion of which is beyond the scope of the current review.

While there are specific construction industry regulations made under the Act, Section 17 of the 2005 Act, also has '*duties related to construction work*' the provisions therein relate to the duty of the client, designers and contractors of construction projects. The inclusion of this section is new to the 2005 Act, the Act which is of general application to every workplace in the land, does not single out any other sector, for inclusion in this piece of primary legislation, is a signal that the Construction Industry has a major problem with health and safety and is therefore in need of increasingly more legislative control.

2.7.1 Specific Construction Industry legislation

Irish Construction Industry Legislation has its origins in the 1992 Construction Sites Directive (92/57/EEC). There are different opinions on the success of this Directive and the success of the subsequent legislation in member states to reduce accident rates. Dalton 2002, reports in her work that ten years on attempts are being made to assess the impact of the directive across Europe, citing reports from the European Federation of Building and Woodworkers, that accident rates on construction sites have remained extremely high, while others Dias 2002, were cited as saying that 'safety and health in construction is now an issue that most stakeholders are aware and take care of'. (Dalton M, 2002). Consistent with the literature the Irish story of a poor accident record in the construction sector is similar to that found in other countries in Europe and beyond.

The Safety Health and Welfare at Work (Construction) Regulations 1995, transposed the Construction Sites Directive into Irish Law, these regulations have since been superseded by The Safety Health and Welfare at Work (Construction) Regulations 2001 and subsequently The Safety Health and Welfare at Work (Construction) Regulations 2006.

With each revision of the legislation tighter controls were applied, some major changes for managing construction projects were brought about in the 1995 and the 2001 regulations:

Safety Health and Welfare at Work (Construction) Regulations 1995, the main changes brought about was, the introduction of 'Duty Holders' namely,

- The project Supervisor Design Stage (PSDS),
- Project Supervisor Construction Stage (PSCS),
- The Client,

Brining into focus for the first time in Ireland, definite roles and responsibilities concerning safety and health for all the major stakeholders involved in a construction project.

Safety Health and Welfare at Work (Construction) Regulations 2001

- New rules for mandatory safety training – i.e. the introduction of Safe Pass and CSCS on a phased basis for the first time on a legal footing in Ireland.
- New provisions on the appointment and rights of Safety Representatives
- Appointment of Safety Officers not only where 20 persons or more are employed on a site, but where 30 or more persons are normally engaged in construction work at any one time.

Safety Health and Welfare at Work (Construction) Regulations 2006, as this is the current applicable regulation, a summary of the key duties as presented by the (HSA 2006, (b)) are outlined below:

2.7.2 A summary of duty holders

Duties of the Client:

- To appoint in writing a competent PSDP for the project
- To appoint in writing a competent PSCS for the project
- Ensure the competence of each designer and contractor appointed, in terms of training, knowledge, experience and resources for the work to be performed
- Co-operate with the project supervisor and supply necessary information
- Retain and make available the Safety File for the completed work
- Provide a copy of the safety and health plan prepared by the PSDP to everybody person tendering for the job
- Notify the Authority of the appointment of the PSDP where construction is likely to take more than 500 person days or 30 working days.

Designer Duties

- Identify any hazards that your design may present during construction and subsequent maintenance
- Where possible eliminate hazards or reduce the risk
- Communicate necessary control measures, design assumptions or remaining risks to the PSDP so they can be dealt with in the Safety and Health Plan

- Co operate with other designers and the PSDP or PSCS
- Take account of any existing safety and health plan or safety file
- Comply with the directions issued by the PSDP or PSCS
- Where no PSDP has been appointed inform the client that a PSDS must be appointed

Duties of PSDP - Project Supervisor for the Design Process: (who must be appointed in writing by the client for each project)

- Identify any hazards arising from the design or from the technical organisational, planning or time related aspects of the project.
- Where possible, eliminate hazards or reduce risk
- Communicate necessary control measures, design assumptions or remaining risks to the PSCS for inclusion in the Safety and Health Plan
- Ensure that the work of designers is co-ordinated to ensure safety
- Organise co-operation between the designers
- Prepare a written safety and health plan for any project where PSDP where construction is likely to take more than 500 person days or 30 working days or there is particular risk and deliver it to the client prior to tender.
- Prepare a safety file for the completed work and give it to the client
- Notify the Authority and client of any non-compliance with any written direction issued.
- The PSDP may issue directions to the designers or contractors or others

Duties of PSCS - Project Supervisor for the Construction Stage (must be appointed in writing by the client for each project.)

- Co ordinate the identification of hazards, the elimination of the hazards or the reduction of the risks during construction
- Develop the Safety and Health Plan initially prepared by the PSDP before construction commences
- Organise co operation between contractors and the provision of information
- Co ordinate the reporting of accidents to the authority
- Notify the authority before construction commences, where construction is likely to take more than 500 persons days or 30 working days
- Provide information to the safety representatives

- Co-ordinate the checking of safe working procedures
- Co-ordinate measure s to restrict entry to site
- Co-ordinate the provision and maintenance of welfare facilities
- Co-ordinate arrangements to ensure that craft, general construction workers and security workers have Safe Pass and CSCS card where required.
- Co-ordinate the appointment of a site safety representative where there are more than 20 persons on a site
- Appoint a safety advisor where there are more than 100 on site
- Provide information for the Safety File to the PSDP
- Monitor compliance of contractors and others and take corrective action where necessary
- Notify the Authority and the client of non-compliance with any written directions issued.

Duties of Contractors

- Co operate with the PSCS, provide a copy of your safety statement and relevant information to the PSCS
- Promptly provide the PCSC with information required for the safety file
- Comply with directions of the Project Supervisors
- Report accidents to the Authority and to the PSCS (reportable i.e. those over 3 day absence)
- Comply with site rules and safety and health plan and ensure that employees comply
- Identify Hazards, eliminate hazards or reduce risk during construction
- Facilitate the Site Safety Representative
- Ensure that relevant workers have Safe Pass and CSCS cards as required
- Provide workers with site specific induction
- Appoint a safety officer where there are more than 20 on site or 30 employed
- Consult workers and Safety Representatives
- Monitor compliance and take corrective action

(HSA 2006, (b))

Chapter 3

3.0 Research design and methodology

This chapter describes the formation of research questionnaires, stating the objective and rationale behind each question in the survey.

Qualitative research methods were used by means of a survey through postal questionnaires. Two questionnaires were designed, one aimed at site management and the second at construction site operatives. A pilot study was carried out using both questionnaires before the final draft was issued. (See Appendix 3 & 4 for draft questionnaires, and Appendix 5 & 6 Final Questionnaires)

3.1 Designing the questionnaires:

Questionnaires used for previous research in the construction industry were reviewed; some ideas were applied to the current research, as detailed below. (See Appendix 7 for final questionnaire with listed sources of previous work highlighted)

The general design and layout of the questionnaire is an adapted form of that used by "Claritas Consulting" when they undertook a formal review of the FAS Safe Pass and Construction Skills Certification Scheme, 'The Claritas Report'. Using the format of the Clartias questionnaire as a template had the following advantages,

- To compare findings of the Claritas report to the current thesis
- The format had been recently tried and tested in the industry

The options used in questions relating to accident history were those of the HSA summary statistics 2004-2005, the reasons being

- The terms and language used will be familiar to some respondents
- To compare findings of this thesis to current statistics

(It should be highlighted here the author did intend to use the categories of the IR1 which a greater number of people may be more familiar with, however the options on the IR 1 were not suited to the question type, hence the Summary Statistics document was the closest similar source)

Some of the questions relating to Behavioural Safety were adopted from the McDonald Hrymak 2002 study, of Behavioural Safety in the Irish Construction Sector. The reason for using this study was

- To further explore their findings on behavioural safety and related issues
- To compare the findings of this thesis to their work

Chapter 6 'Questionnaire Construction' by Dr. S.G. Naom, in his book *Dissertation Research and Writing*, was also consulted in forming the questionnaires.

3.1.1 Site Management Questionnaire

The Management questionnaire contains three parts; the purpose of the first two parts is to establish the background of the organisation, and its status with regard to safety management. While part three focuses on Behaviour Safety, address the specific research aim, "what can employers do to influence workers behaviour towards safety on site".

Part 1 – General Information

The purpose of questions 1-3 is to get details from the respondents in order to categorise them accordingly in accumulation of research results.

Question 1 determines the position by job title of the respondent, while questions 2 and 3 ask about the size of the organisation, the staff turnover and the type of construction activity in which they are involved.

Question 2, employee turnover is particularly relevant to the current research as having a high employee turnover has been linked to difficulties with change or improvement initiatives, and is a particular problem in the construction industry, according to (Murray 2006, Biggs *et al* 2005 and Mattila, Hyodynmaa1988).

Question 3, requires participants to indicate the type of construction work in which they are involved, in order to compare any similar results or trends that may emerge per construction type. In addition different 'build types' may have different risks, management styles, influences etc.

Questions 4 and 5 are both included to explore the influence of organisational factors (as in Reasons Accident Model, chapter 2). While question 4 is also included to examine the drivers for managing safety in the organisation, question 5 explores their level of compliance with the main legislative requirements for the construction industry. Use of the same options in question 4 of this section as in question 13 of part 3, allows the researcher to explore further, the drivers for managing safety, and to establish if respondents choose the same options for managing safety as they do for partaking in a purposed pilot study on behaviour based safety.

Part 2- Accident History, contains question numbers 6 and 7 relating to the five year accident history. The researcher felt it was important to put a definite timeframe on the question, ensuring all responses related to the same timeframe. Five years was chosen by the researcher as a sufficient period of time to meet the requirements of this research. Establishing the accident history of the participating organisations, will allow the research form an opinion as to how the companies are performing, and use it as a measure of their success or otherwise in terms of Occupational Health and Safety Management.

Question 6 establishes the number of accidents and dangerous occurrences that occurred in this time.

Question 7 asks about the type of accident most common, the options presented in question 7 are those used in the HSA summary statistics 2004 – 2005 (H.S.A 2006(a)) which were used to compare findings to national statistics. A rating scale was used in this question as a means of establishing the most common accident type.

Part 3 – Behavioural Safety, comprising of eight questions it is the longest section of the questionnaire, is different from the other sections as it has one open question. Key to the achieving the aim's of this thesis, this part of the questionnaire is designed to fulfil the research question which was.

'What if anything can organisations to influence behaviour towards safety on site? '

Question 8 asks participants to identify the top 5 contributory factors to accidents in their organisation. This an opinion type question and a subjective measurement of contributory factors, the rating scale method was chosen, to allow ranking of opinion.

The options presented in question 8 were typical causation factors often associated with construction accidents, and shown in the literature to as problems associated with the industry

- Unsafe Behaviour – by injured party (Dalton 2002)
- Lack of Training / Poor Skills(McDonald Hrymak 2002, Dalton 2002)
- Poor Supervision / Management (McDonald Hrymak 2002, Mattila, Hyodynmaa 1998)
- Lack of Procedures / Risk Assessments (McDonald Hrymak 2002, Dalton 2002)
- Time Pressure on the job

Participants were also prompted to include other contributory factors, providing the freedom to answer outside of the closed question.

Question 9 is included to fulfil the research aim, 'to conduct attitudinal research on the ability of organisations to influence workers behaviour'. Respondents are asked to rate the ability of their organisation to influence workers behaviour, with options ranging from having a 'good ability' to having 'no influence'. The four options were chosen by the researcher to represent a range of ability; this question also uses a rating scale to provide participants with a way of ranking their choices.

Question 10, investigates the factors that influence behaviour, seeking the opinion of management on which factors are the most influential. The rating method is again chosen as means of obtaining this subjective information in order of priority. Ten influencing factors were presented based on the literature and the researchers own experience as follows.

- Age (very young or too old)
- Personal Care and attention to safety
- Length of time in the industry
- Competency at a given task
- Safety conscious workmates
- Good Supervision
- Strong Safety Culture & Management Commitment
- Active Disciplinary Procedure
- Presence of a Safety Officer
- Presence of a Safety Representative

Question 11 focuses specifically on individual behaviour as a contributor to construction industry accidents. Getting the opinion of management on the level of its contribution as is an aim of this research. Three options were presented 'some extent' 'a major causation factor' and 'not at all'.

Question 12, refers to the findings of (McDonald, Hrymak pg 69) where 'the presence of a safety representative is the only factor which is significantly related to safety behaviours' the researcher wanted to probe management reaction to this finding, believing that the potential positive influence that this demonstrates is underestimated in the industry at large, and safety representatives are a valuable resource that is not effectively used.

Question 13 refers to the behaviour change model of goal setting, reinforcement and feedback as used in previous studies by Duff *et al* 1993, Murray, P 2006, Mattila, Hyodynmaa 1988. The purpose of this question is to determine if construction companies have any faith in applying such models in their organisations.

A comment option was also included in both question 12 and 13, to allow for some freedom of answering outside of the closed question format, with the intention of assessing the readiness of the participants for behaviour change initiative.

Question 14 is the only open question of the survey, its purpose being to allow management express their own ideas on what can be done to influence workers behaviour towards safety. The reason for positioning this question at the end of the questionnaire is to ensure the respondent understands the concept of Behavioural Safety, and at this stage allows there thoughts to roam freely outside the 'closed' restricted question type. According to Dr. S.G.Naom 1998, presenting some of the replies to open ended questions in your final report helps to give the reader some of the flavour of the replies.

Finally **Question 15** investigates the willingness of construction site management to partake in a pilot study on behaviour safety. The reason for this question is to determine if any real interest exists and to fulfil the aims of this research, which

investigated how behaviour based safety models would be received by the Irish Construction Industry.

For those who express an interest in such a pilot study, they are also asked to indicate their reason for doing so, in order to establish what motivates them to agree to take part. Six possible reasons are presented in a tick box format, the reasons presented in this question are identical to those of Question 4, which investigated the reasons for health and safety management, presenting the same choices in both questionnaires allows exploration of the possibility that the same drivers exist for both.

3.1.2 Site Operatives Questionnaire:

Designed similar to the management questionnaire it is divided into three parts, the first two parts establish the background of respondents while part three focuses on Behaviour Safety.

Part 1 – General Information: Questions 1-4 are included to get a snapshot of the respondents, providing personal and professional information i.e. the length of time they have worked in the industry, their nationality, age and the specific type of work in which they are involved.

Question 1, asks operatives to indicate the number of years they have spent working in the industry. **Question 2**, asks operatives to indicate their nationality, **Question 3** asks the age of operatives and **Question 4** asks what their job is.

- The options presented in questions 1, 2 and 3 are those used in the FAS Claritas report. (Claritas Consulting, pg 171,175).

- The options presented in Question 4, is an edited form of question 10 of the Claritas report, pg 171, where some different options were added including, Foreman and Site Agent, Trade was included instead of 'Craft Worker', 'new entrant' and 'full time education' categories were excluded.

- The reason for their exclusion being that new entrant will be determined by the length of time in the industry, (Q1) and full time education can be included in the category, "other" if applicable.
- The addition of Foreman and Site Agent, the researcher felt was necessary due to the existence of these roles on Irish Construction sites.
- The job title of Site Agent while is commonly used in the Civil Engineering and Construction Sectors, is a term not everybody might be familiar with; it usually means this person is the manager of a particular portion or type of work, a Drainage Agent, or Structures Agent being typical examples.

Question 5 investigates the extent of safety training completed, providing six training options, based on Legislative requirements and good management practice, as follows.

- Safe Pass – required by Safety Health and Welfare at Work (Construction) Regulations 2006
- CSCS - required by Safety Health and Welfare at Work (Construction) Regulations 2006
- Managing Safely in Construction –good safety management practice specifically designed for construction site management by the CIF
- Apprentice or Trade – as required to qualify for any of the trades, e.g. FAS apprentice
- Site Safety Induction- required by Safety Health and Welfare at Work (Construction) Regulations 2006
- Ongoing Tool Box Talks- Good Safety Management Practice for ongoing communication of the risk

Questions 6-8 are to establish the employment arrangements, e.g. self employed, directly employed, being paid price work or a direct wage, Full Time or Part Time, and if operatives are employed by the main contractor or subcontractor.

Including these questions is important as previous studies have shown that possible influences on worker attitudes and motivation include education and training, among others (HSE 2003) Employment arrangements have been found to be related to risk

taking behaviour, where self employed people have been shown to accept a higher level of risk for themselves, known as voluntary risk. (Dunne 2000, Slovic 2000)

Part 2- Personal Safety Record. This part investigates if the respondent was ever involved in a workplace accident. This section is included to obtain details on some typical accidents that will be useful for the research, i.e. what are the accident types, and who is involved in the accidents, it also helps to further establish the group profile.

Question 9 and 10 simply ask about the involvement in an accident and the type of injury. The options presented in questions 10 and 11 are those that are used by the H.S.A in their summary statistics of reported injuries in the construction sector 2004 – 2005.(H.S.A. 2006 pg 38) the use of which will allow for ease of comparison of research results to national statistics.

Part 3 – Your Honest Opinion

Having established general information and accident history, this part of the questionnaire focuses on the research question,

"What drives construction workers to take risks"?

The questions in part 3 are designed with the overall goal of answering this research question.

Question 12 probes the attitude of respondents to given statements, this idea is adapted from an approach used by the HSA/HSE study (McDonald, Hrymak Pg 40), and extended to suit the current research.

- Sixteen statements are presented in question 12, ten of those statements were towards being safety conscious and show a positive attitude while the remaining six were towards risk taking and indicate a negative attitude towards the concept of safety management.
- Participants are asked to agree or disagree, their responses will indicate attitudes towards various aspects of site safety management, and will indicate their perception of the risks.

- The statements towards 'Risk' and towards 'Safety' are scattered through the sixteen statements, as opposed to being grouped, the researcher felt that grouping the statement may results in a sway of the results, by simply ticking boxes, this design was preferred as being more thought provoking.

    - The first statement presented is towards safety and determines weather they believe they are safety conscious or not, secondly their perception of the risk that is involved in the construction industry.
    - Followed by two conflicting statements investigating who they see as having responsibility for their safety i.e. I am responsible for my own safety at work or my employers are responsible for my safety at work.
    - The following three statements are designed towards safety and relate to compliance with site safety rules, legislation, and mandatory safety training.
    - Two statements are included on risk perception, i.e. the statement of there being a good chance they could be involved in an accident, which indicates a responsible attitude towards safety, or the reverse statement that the chance of they being involved in an accident is quite low, which shows tendencies towards risk.
    - The next four statements are designed towards risk and relate to safety rules, but are carefully worded from a negative outlook, probing respondent's thoughts and attitude to compliance with site safety on how necessary safety rules are.
    - The statement "safety slows down the job" is included to investigate the time pressure factor in behaviour towards risk
    - The final three statements probe at attitude towards the role of the safety officer, management commitment and finally the site safety representative, to follow up on the findings of McDonald, Hrymak 2002 i.e. the strong

Question 13 is included to determine the preferred behaviour in a given risk situation, again the idea originated from the HSA/HSE study McDonald, Hrymak Pg 38, and is extended to suit the current research.

- Ten situations are presented based on the authors personal experience of typical situations that occur on site, while a number of the situations are similar to those used in McDonald, Hrymak study.
- The options of preferred behaviour has been extended to seven in this research whereas McDonald Hrymak study had the four options of Report it, Fix it, Stop Working, Continue Working. The three extra options were
    - Report to the Safety Officer or Safety Representative, to further explore reporting tendencies, the Safety Representative option is to follow up on McDonald, Hrymak positive findings for this role
    - Fixing the problem yourself and continue working- to follow up on a finding of the Dalton 2002 study, where this category was identified as a contributory factor in Construction Industry Fatalities
    - A "not sure" category to investigate uncertainty of action in a risky situation.

Question 14, investigates the safety culture to which participating operatives are exposed, by requesting a "Yes" or "No" answer to six statements. Safety culture was also investigated in research by McDonald, Hrymak (pg 41) somewhat different statements were used.

- The first and last statements explore management commitment; providing the two extreme options one positive and one negative
    - Site Management take the breaking of rules very seriously
    - Site Management only comply with Safety because they have to

Commitment of site management has been shown to enhance the effectiveness of the goal setting and feedback approach, in behaviour based safety initiatives as found by (Duff *et al* 1993, Mattila, Hyodynmaa 1988)

- Four statements investigate the level of Management Control by exploring the use of disciplinary procedures, the allocation of financial resources and speed of response to safety concerns.
    - Disciplinary procedures are strictly enforced
    - A disciplinary procedure is in place but not always enforced
    - Equipment and materials needed to work safely are available at all times
    - Safety problems are addressed immediately

  Poor management control has been linked to either unsafe acts or unsafe conditions. In the Bird and Loftus accident causation model (Cooper 1998)

Question 15 explores organisational factors, and investigates the level of safety awareness that is generated at the key stage of induction to a new site. Probing at safety culture and enforcement of Safe Pass and CSCS requirements in addition to communication of method statements, safety statements and risk assessment.
Six statements are listed, and in a style similar to that if the Likert scale, operatives were invited to indicate if their experience with these statements has been , Always, Regular, Seldom, Never, On big sites only.

The statements presented related to:

- The provision of Safety Induction Training – required by Safety Health and Welfare at Work (Construction) Regulations 2006 (duty of contractor)
- Producing a Method Statement and explaining it to operatives before a specific job starts – as is good management practice
- Inspection of Safe Pass Card at commencement of employment – required by Safety Health and Welfare at Work (Construction) Regulations 2006 (duty of contractor)
- Inspection of CSCS card at commencement of employment- required by Safety Health and Welfare at Work (Construction) Regulations 2006 (duty of contractor)
- Communication of Safety Statement- Safety Health and Welfare at Work Act 2005, (sections 8, 9 and 20)
- Communication of Risk Assessment- Safety Health and Welfare at Work Act 2005, (sections 8, 9 and 19)

3.2 Method of Contact

Telephone contact was made with the safety personnel of ten construction companies; one site where two different companies operated was approached in person all of whom were asked to partake in the research, bringing the research sample to a total of twelve companies who were selected based on the following:

(a) Construction type

(b) Company size

(c) Likelihood of response.

Criteria (a) Construction Type and (b) Company Size were used with the hope of achieving an evenly distributed sample for the study, while (c) Likelihood of Response is somewhat a practicality issue.

Contact was initially made with five companies to whom the researcher was known, in the hope that this would help achieve good response rates, all five companies who operate in the Civil Engineering / Commercial Construction Sectors agreed to take part, following this six companies were chosen at random, with the intention of having an even spread of responses across the different categories of construction activity, i.e. house building, civil engineering etc. Five of those contacted were willing to participate; all five were involved in the construction of housing. Hence a list of contacts was finalised and cover letters were prepared. See cover letters (Appendix 1 & Appendix 2).

A cover letter was attached to each questionnaire a package with agreed number of questionnaires were sent to the contact person, with self addressed envelopes for return within a specified timeframe. Two of the companies known to the researcher requested the questionnaires by e-mail, while the remaining companies preferred the postal method. The total number administered by post was 50 operative's questionnaires and 24 of the management questionnaires. Most of the companies felt they would be in a better position to have the operative's questionnaire completed while one person had more access to management personnel.

Due to the low response rates commonly associated with postal surveys, the researcher decided to take advantage of a local construction site to distribute some questionnaires by hand in addition to those sent by post. Two different companies were access through this site contact, bringing the total number of companies approached to twelve.

Fifty questionnaires were sent by post, i.e. twenty management and forty operatives, two companies also received the questionnaire in electronic format.

3.3 Pilot Study

Based on the advice of Dr.S.G. Noam (Noam 1998, pg 87) 'whenever you construct a questionnaire it is advisable to complete a pilot study before you collect the final data from the whole sample', Noam refers to Bell, 1996, who described pilot work as 'getting the bugs out of the instrument'. Hence the researcher felt that a pilot study would be beneficial to the research, testing draft questionnaires for any ambiguous questions, testing the wording of questions and the techniques used to collect data, while a trial run on cover letters would ensure the survey, its purpose and motives were clearly explained in order to encourage a high response.

A construction site for pilot work was chosen through a personal acquaintance of the researcher, who kindly permitted site access and made people available to facilitate this request. The Pilot study was carried out in April 2007, and involved the participation of eight operatives and five management personnel who performed a trial on each questionnaire and cover letter.

It was explained to participants that they were partaking in a trial study and they were asked to be critical, and to question any part of the questionnaire or cover letter that they did not understand. In particular they were asked to review the cover letter for ease of understanding, the wording of questions in the questionnaire, the clarity of answer categories and ease of answering the rating systems.

The group were very responsive and it proved to be an interactive session of comments on the survey. Following this work changes were made to the

questionnaires, while the cover letters remained unchanged. The draft and final questionnaires can be found in the appendices as follows.
(Appendix 3 & 4 – Draft Management and Operatives Questionnaires)
(Appendix 5 & 6 – Final Questionnaire Management and Operatives)

The outcome of the pilot study resulted in the following changes being made to the questionnaires. The thirteen people who took part in the pilot study later participated in the actual research using the revised questionnaire.

Changes to Operatives Questionnaire:

- Question 9: caused some confusion over the interpretation of 'near miss' hence it was omitted and the question focused on accident only.

- Question 12: Respondents were unsure of the meaning of some of the statements; consequently they were re phrased as follows:

    - My safety on the job is my own responsibility, became "I am responsible for my own safety at work"
    - Management are responsible for my safety while at work, was re phrased to "My employers are responsible for my safety at work"
    - Safety slows down the job, was changed to "Complying with Safety Rules slows down the job"
    - Safety in the Construction Industry has gone too far, "There are too many construction safety rules"
    - Statements about the role of the safety representative and the safety officer were re phrased to ask respondents if there presence "makes for a safer site"
    - The addition of the word "having" management committed to safety clarified what was being asked.

- Question 13: During the pilot study the researcher realised a category for reporting to Safety Representative had been omitted from the options, hence this option was included in the final questionnaire.

Changes to Management Questionnaire:

- Question 6: Three of the participants found the use of the word 'incidents' ambiguous; following a discussion on this the researcher opted for a category on 'Dangerous Occurrences' instead.

- Question 12: The word "potentially" was removed after questions were raised by pilot study participants as to what exactly was this study reporting, i.e. "actual or potential" strength of the safety representative role. Given the findings of McDonald, Hrymak Pg 69 the researcher chose to remove the word "potentially".

Chapter 4

4.0 Results

This chapter of the thesis displays results obtained from postal questionnaires, which are displayed by use of graphs and tables, supported by explanatory text.

The research sample and survey response rate are initially presented, followed by Management and Operative questionnaire results.

4.1 Survey Response Rate

Twelve construction companies were asked and agreed to take part in this research.

A total of 74 questionnaires were sent by post, while both questionnaires were also distributed electronically to two companies who requested the questionnaires in this format. Due to the unknown factor of how many people actually received the questionnaires once they were sent electronically, the total number distributed cannot be accurately stated. A figure of 74 will be taken as the total distributed due to its certainty.

Thus the survey achieved an overall response rate of 65% from the postage questionnaires, which can be considered a good response rate overall, as surveys carried out through postal questionnaires often suffer from low response, and typical employee surveys have are reported to have a response in the range of 25-60%. (http://knowledge-base.supersurvey.com/survey-response-rate.htm, (Accessed on, August 21 2007)) The operative's questionnaire had the highest success rate of 68% (34 operatives) while the management questionnaire had a lower response rate of 58% (14 management), which was disappointing, an explanation may be there are typically fewer management than operatives in most organisations.

Six of the twelve companies returned completed questionnaires, 14 of which were the management questionnaires and 34 were operative's questionnaires. In total there were 48 completed questionnaires returned. Tables 2 & 3 provide an overview of the survey response. http://knowledge-base.supersurvey.com/survey-response-rate.htm

Table 2: Survey Response

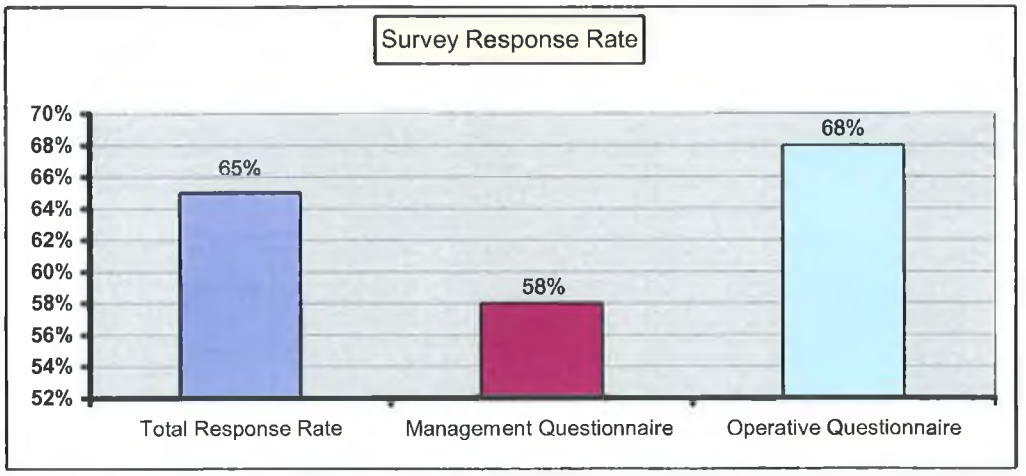
Number of Companies Contacted	Number who Returned Questionnaires
12	6

A break down of the overall response into management and operative's response is provided in Table 3

Table 3: Research Sample, number and rate of response by category

Questionnaire Type	Total Sent	No. of Replies	% Response
Management	24	14	58%
Operatives	50	34	68%
Total	74	48	65%

Fig: 5.0 Survey Response Rate



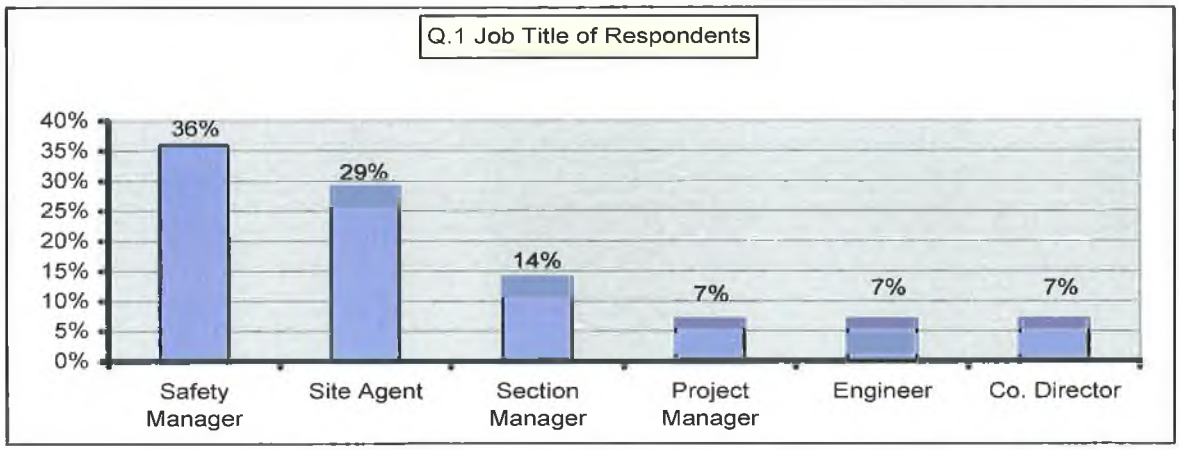
4.1 Management Survey Results

All results below are represented as percentage of response for ease of presentation and discussion of results.

Part 1 of the management questionnaire gathers General Information on the participating companies by size, staff turnover, and construction type, in questions 1, 2 and 3. Questions 4 and 5 determine their reasons for managing safety and the level of safety management that is practiced.

Question 1: This question relates to the position in the organisation held by those completing the questionnaire. Four typical management positions were listed on the questionnaire with an additional 'other' category, Fig 6.0 below displays the results for this question.

Fig: 6.0 Job titles of respondents to the Management Questionnaire



Safety personnel accounted for the biggest single category of respondents, accounting for 36% (5 people), the contact person in each organisation was the safety officer hence this is an expected outcome. All the other job categories combined account for 64% (9 people) therefore overall the majority of respondents are non-safety personnel. The non safety personnel were made up of Site Agent and Section Manager accounting for 29 and 14% respectively. The more senior positions of Project Manager and Co. Director accounted for the lease percentage response of 7%. This questionnaire was intended to target the hierarchy of management positions hence a more evenly distributed response sample would have been desirable.

Question 2: This question is twofold and establishes the size and the employee turnover of participating organisations. Firstly looking at company size, which was asked in terms of the number of employees three tick-box options were given in the questionnaire, 10-50, 50-100 or 100 + employees.

Fig: 7.0 Participating Company Size (represented by number of employees)

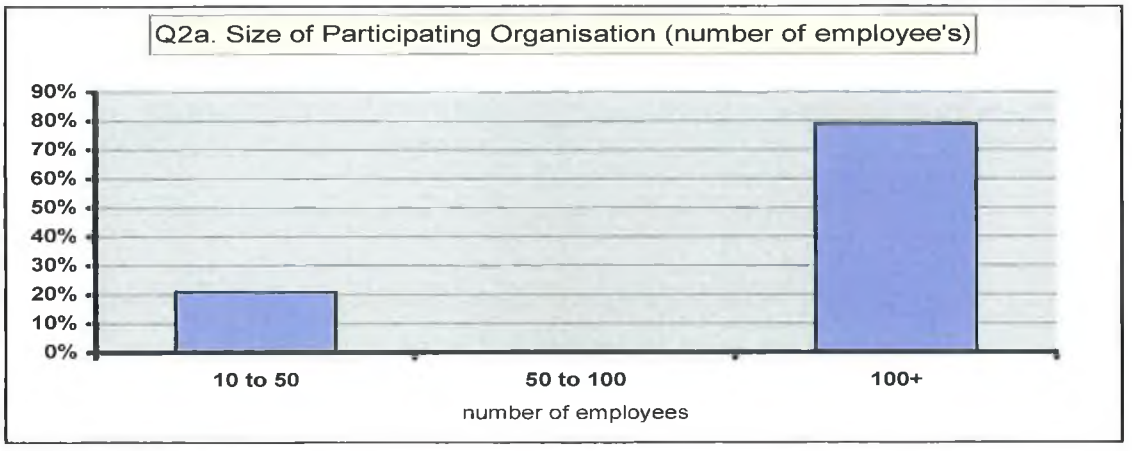


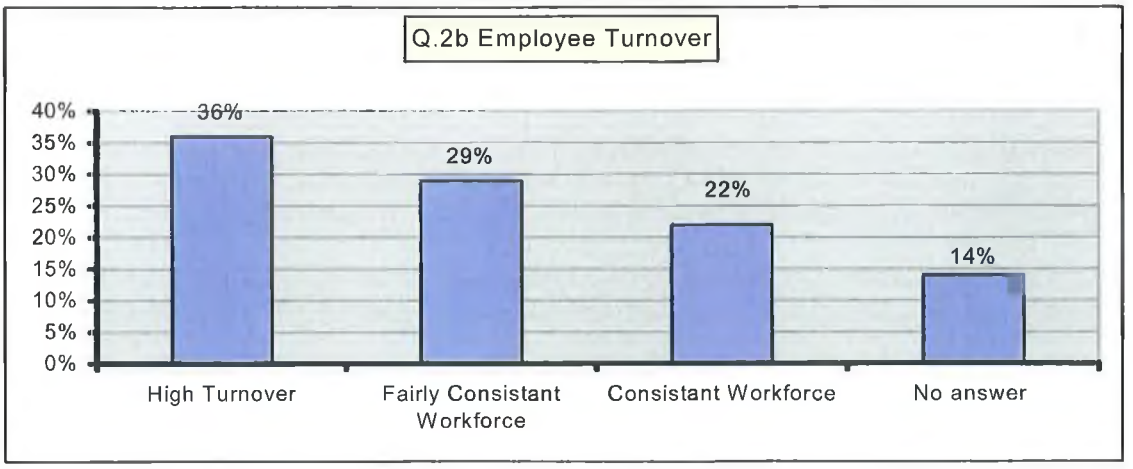
Fig. 7.0 above clearly shows that a sizeable majority (79%) were relatively large companies having over 100 employees, while 21% of participating companies were in the 10 – 50 category. 79% and 21% correspond to those involved in the Civil Engineering sector and the construction of houses respectively.

Question 2 (b) asked about the frequency of employee turnover, three options were presented, and each was qualified as follows:

- a high turnover was considered being 1-6 months,
- a fairly consistent workforce was from 12 months to 2 years,
- a consistent workforce was those that stayed in employment 2 years or more

The findings on employee turnover are presented below in Fig 7.1

Fig: 7.1 Employee Turnover



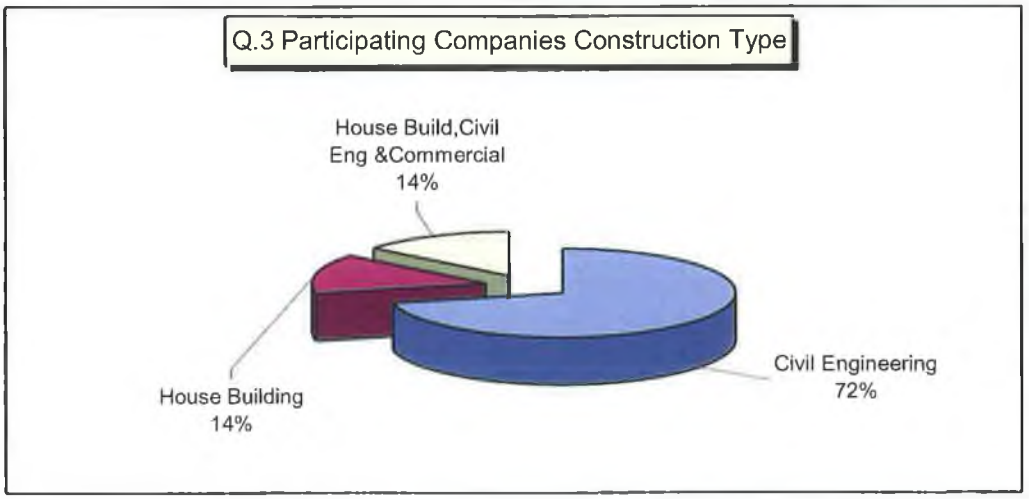
On examination of 7.1 above the percentage response rate per category are quite clustered, having only a slight increase from one option to the next. Combining the categories helps establish the overall position of the group.

36 %(high turnover) and 29 %(fairly consistent workforce) combined means that 65% of the response group can be categorized as having a high turnover to a fairly consistent workforce, while 29 %(fairly consistent workforce) and 22% (Consistent Workforce) combined show that 51% of the respondents had a fairly consistent to consistent workforce, staying with the same employer for two years or more.

Therefore the majority of organizations who partook in this research can be reported as having a high employee turnover, with 65% of respondents reporting a high turnover to a fairly consistent workforce, which means employees remain in their employment for a short time period ranging from one month to two years.

Question 3, places participating companies in a category according to the type of construction work in which they are involved. The four options of House Building, Civil Engineering, Commercial Developments and an 'Other' option were presented in a tick box format.

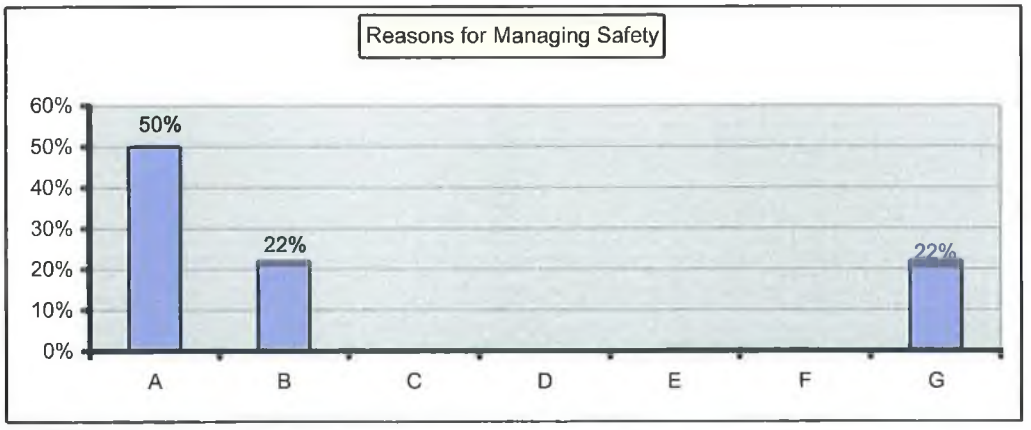
Fig: 8.0 Participating Company Type (by construction work type)



In Fig: 8.0 above one can clearly see a sizeable majority of 72% (10 respondents) of those who partook in the survey were from the Civil Engineering sector, the reason being that the researcher was personally known to this group, hence there was a greater willingness to take part. The significant majority of response from this sector could be considered a bias in the results.

Question 4: Aims to establish the reasons for managing safety in participating organisations. Six possible reasons were presented and an 'Other' option. The results obtained are presented in Fig. 9 below.

Fig. 9 Participating Organisations - Reasons for Managing Safety



A =	To reduce Accidents and ill health
B =	To comply with legislation
C =	To reduce insurance costs
D =	Client Requirements
E =	Head Office Requirements
F =	Employee Representative Groups
G =	Other (combination of accident reduction, insurance reduction & comply with legislation

In Fig 9 above the results tell us that the main reason for managing health and safety in the participating organisations is to reduce accidents and ill health, with 50% of respondents opting for this category. Other drivers for safety management were to comply with legislation which achieved a 22% response as a stand alone reason to manage health and safety, while a combination of compliance with legislation, to reduce accidents and ill health and to reduce insurance costs also received a percentage response of 22%. Hence it can be stated that the three main drivers for safety management among the response group, in order of priority are

1. To reduce accidents and ill health – 50%
2. To comply with legislation – 22%
3. To reduce insurance costs and comply with legislation – 22%

Question 5 investigates the level of compliance with current Irish safety legislation and specific construction industry legislation. The two main statutory provisions i.e. The Safety Health & Welfare at Work Act 2005, and the Safety Health & Welfare at Work (Construction Regulations) 2006 were asked first, followed by a list of the main requirements and asking respondents to indicate YES or NO whether they have provision in place to meet these statutory requirements, in a tick box style question.

Table 4: Compliance with Legislation

Legislative Requirement	% YES	% NO
Safety Health & Welfare at Work Act 2005	100	
Safety Health & Welfare at Work (Construction Regulations) 2006	100	
Do you have a Documented Safety Statement	93	7
Do you have Documented Risk Assessments	93	7
Do you have a full time safety person(s) employed	93	7
Health and Safety Training Programme	86	14
Health and Safety Committee	86	14
Is there an appointed Safety Representative	100	
Appointment of PSCS, PSDS	100	
Operatives trained CSCS	100	
Full time on Site Safety Officer – where 20 people or more	93	7

Table 4 indicates very strong compliance with the main provisions of Health and Safety and construction regulations.

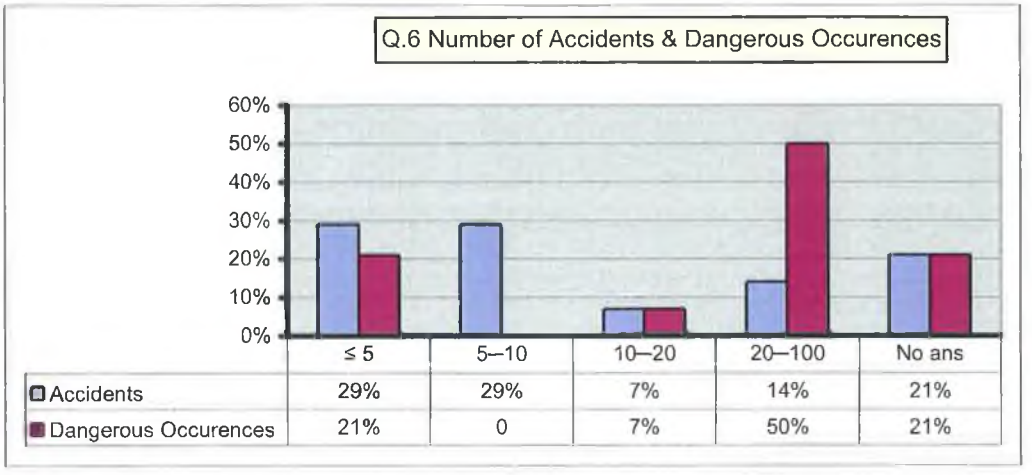
Accident History

Part 2 of the questionnaire places participating organisations in a category based on their five year accident history, including both accidents and dangerous occurrences, asked by question 6. The most common accident type was investigated by question 7, the results obtained for part 2 are summarised in graphs and tables below.

On examination of the response it was established there was a problem with over representation of results. Part 2 of the questionnaire referred to the overall statistics of the organisation, one person was sufficient to provide this information thus representing the accident history of the entire company. However not everybody fully understood this part of the questionnaire, and hence it is now considered a design fault of the questionnaire, for not providing better instruction about completion of Part 2.
As 6 companies took part in the management survey, 6 sets of accident data was the desired response. However 11 management respondents included accident history in their questionnaires, and there is a replication of accident data, to the extent of 35% (5 respondents). Therefore what can be extracted from these results is questionable, as they are not a true representation of the percentage response per construction companies who took the survey. However the following observations are made:

Question 6: Was divided in two parts and asked respondents to tick off the appropriate number of accidents and dangerous occurrences that happened in their organisation. Four options were listed ≤ 5, 5-10, 10-20 and 20 -100 in tick box format, the results obtained are presented in Fig 10 below.

Fig: 10 Accident History of Participating Organisations



	≤ 5	5–10	10–20	20–100	No ans
Accidents	29%	29%	7%	14%	21%
Dangerous Occurences	21%	0	7%	50%	21%

Examination of Fig 10 indicates:

- Most of the companies reported having less than 5 or between 5-10 reportable accidents in the past 5 years, each of which received a 29% response
- Half of the companies reported having between 20-100 dangerous occurrences in the past five years.
- 21% of companies has less than 5 dangerous occurrences in the past five years
- 21% didn't answer the question, as the question investigated the companies accident history as opposed to individual accident history, not all persons were required to answer, one person per organisation was sufficient. It follows that 21% non response is lower than expected is indicative of the problem of over representation of results as highlighted above.

Question 7, is a follow on from Question 6, asking respondents to identify and rate in order of frequency the accident type most common in their organisation. The accident type categories used were those of the HSA summary statistics 2004 – 2005 (H.S.A 2006(a) pg 38) for ease of comparison of results, the results obtained are presented below in Tables 5 and 6 and Fig. 11.

Table 5: Top 5 most common accident types, in order of priority

Top Five Incident Types	% Response
Underground Service Strike	36%
Slip Trips and Falls	29%
Hand tools and Equipment	22%
Overturning of Plant	21%
Transport Incident in the Workplace	14%

(Calculated based on the results of Table 1 in Appendix 7: Raw Data)

Fig: 11 Top Accidents & Dangerous Occurrence Type

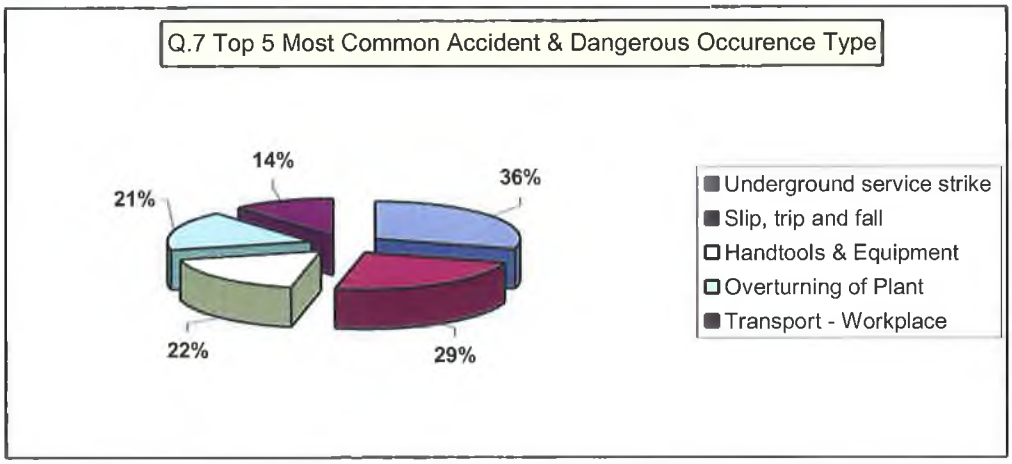


Fig 11 provides a visual representation of the most common accident and dangerous occurrence type as calculated from Table 5 above

Table 6: Top Five accident types compared to HSA Statistics, Construction Sector

Top Five Incidents – This Research	**Top Five Incidents (HSA statistics for Construction-2005)**
Underground Service Strike – 36%	Stress or Strain – 20%
Slip Trips and Falls – 29%	Slips Trips and Falls – 18%
Hand tools and Equipment – 22%	Fall from a height – 15%
Overturning of Plant - 21%	Falling object – 14%
Transport Incident in the Workplace – 14%	Sharp Object – 11%

Part 3 of the Management questionnaire comprises of 8 questions (Q8 – Q16) and focuses exclusively on **Behavioural Safety**, having established the position of participating organizations in the categories presented in Parts 1 and 2 of the questionnaire, Part 3 seeks the opinion and the level of interest of these organizations management representatives in the concept of Behavioural Safety.

Question 8 relates to contributory factors in accident causation, 5 factors were presented and respondents asked to rate them from 1-5, 1 being the most serious contributor and 5 being the least). Based on the ratings given the main or the second most serious accident contributory factors in order of ranking were calculated and are presented in table 7 below.

Table 7: Top 5 - Accident Contributory factors

Contributory Factor	% Response
Unsafe Behaviour by injured party	79%
Poor Supervision and Management	50%
Time Pressure	28%
Lack of Training, Poor Skills	14%
Lack of Procedures / Risk Assessments	7%

(Calculated based on the results of Table 2 in Appendix 7 Raw Data)

Fig: 12 Top 5 Accident Contributory Factors

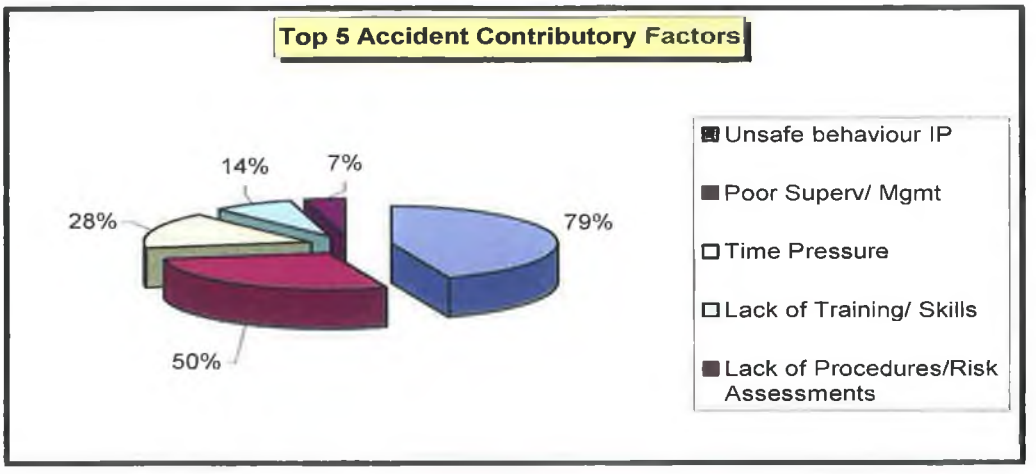


Table 6 and Fig. 12 identify unsafe behaviour by the injured party as being the biggest contributory factor to accident causation, in the opinion of management.

Question 9, asked respondents to rate their ability to target and influence the behaviour of their employees, (it has been demonstrated in Q.8 above a sizeable majority felt that behaviour had contributed to their accident record). Their response can be seen in Fig 13 below.

Fig: 13 The Organisations ability to influence individual behaviour

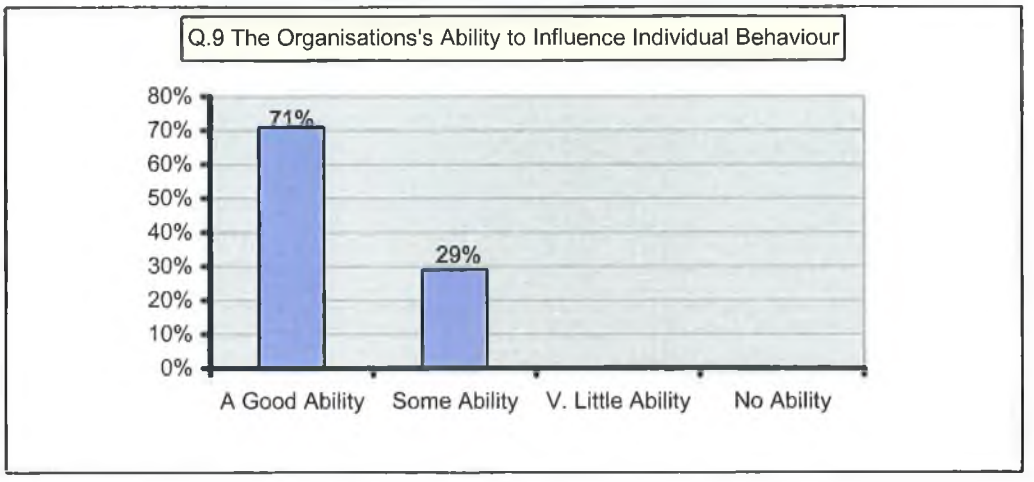


Figure 13 indicates a very strong belief among the management surveyed that the organization has the ability to target and exercise influence over the behaviour of their individual workers, with

- 71% felt they have a 'good ability'
- 29 % felt they have 'some ability'

None of the management surveyed felt they have 'v. little ability' or 'no ability' options on the questionnaire.

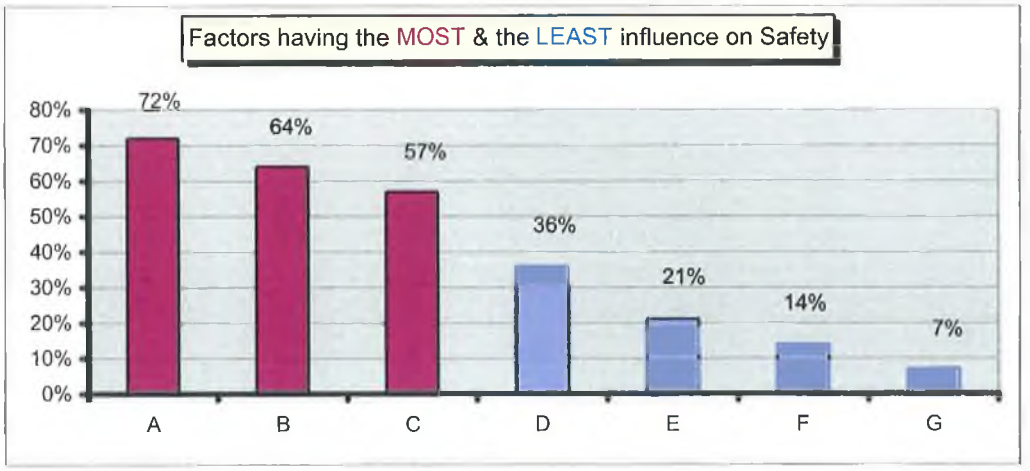
Question 10 is a follow up to question 9, asking management to rate in their opinion what the most common influencing factors are, to encourage safety on site. The ten factors presented are based on previous research and the researcher's personal experience. The rating is based on 1 = the most influence, 10 = the least influence.
The factors that management consider as being the most influential, to having some influence towards safety, (i.e. a rating of 1 – 5), emerged in order of ranking as

Table: 8 Most Common factors that influence Safety

Influential Factor	% Response
Safety Culture and Management Commitment	72%
Supervision	64%
Safety Conscious Workmates Competency Personal Care & Attention to Safety	57%
Disciplinary Procedures	36%
Age	21%
Presence of a Safety Officer	14%
Presence of a Safety Representative	7%

The Raw data from which this ranking was calculated is detailed in (Table 3. Raw Data, Appendix 7). Figure 14 provide a graphical representation of the factors that emerged as having the most and the least influence.

Fig: 14 Factors considered as being Influential towards Safety – Most & Least



Purple Column = those with Most Influence Blue Column = those with Least Influence

A =	Safety Culture and Management Commitment
B =	Supervision
C =	Safety Conscious Workmates. Competency. Personal Care & Attention to Safety
D =	Disciplinary Procedures
E =	Age
F =	Presence of a Safety Officer
G =	Presence of a Safety Representative

Question 11 explores management's perception of individual behaviour as a contributor to construction accidents as a whole, asking them to indicate which statement best describes their opinion

- A causation factor to some extent
- A major cause of accidents
- Does not contribute at all

Fig. 15 Managements perception of Individual Behaviour as an Accident Causation Factor

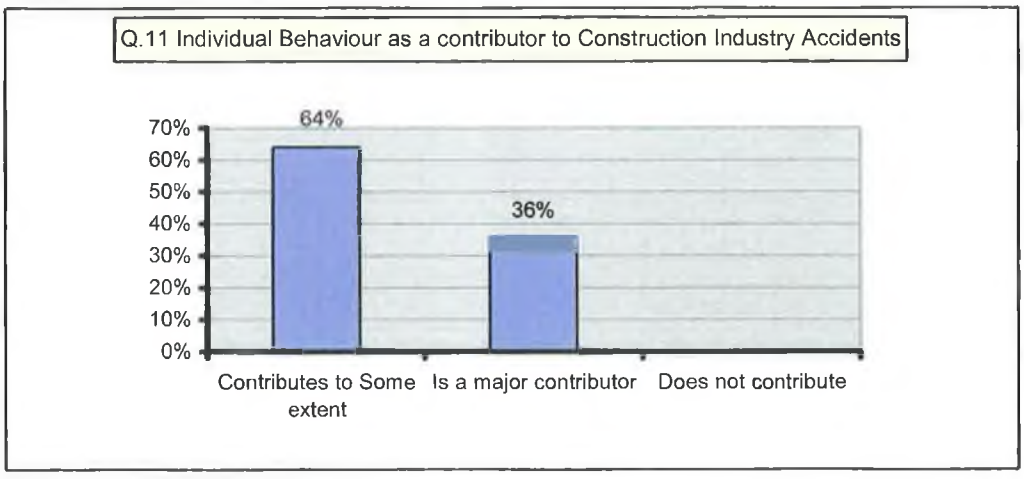


Fig 15 results reveal that management strongly believe individual behaviour is a contributory factor to accidents in their industry.

- 64% believe individual behaviour contributes to accidents to some extent
- 36% believe individual behaviour is a major contributor
- None of the management surveyed felt individual behaviour does not contribute

Question 12, Follows up on one of the main findings of a previous study in the Irish Construction Industry, McDonald, Hrymak 2002. Where it was found that the strongest relationship with the main safety compliance factor of the study was the presence or absence of a Site Safety Representative, the study found that the presence of the site safety representative is the only factor which is significantly related to safety behaviours.

Giving the strength of the relationship revealed by McDonald, Hrymak and its similarity to the current research, respondents were asked to indicate their view on this result for the strong and influential role of the safety representative. Two options were presented,

- Surprise- and underestimation of the ability of the Safety Representative to Influence
- As Expected- I have experienced the positive and influential role of the safety representative.

Fig.16 represents the reaction as percentage response.

Fig. 16 Managements Reaction to the Strong Role of Safety Representative

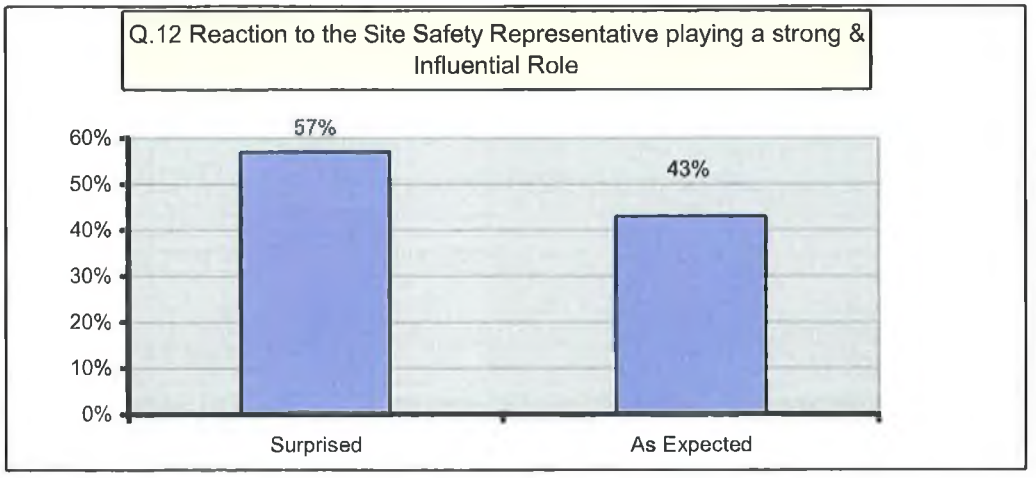


Fig. 16 indicates a somewhat neutral response to safety representative being a strong and influential role, with only a slight majority of 57% expressing surprise while 43% opting for the 'as expected' option, having experienced the positive and influential role of the safety representative.

Respondents were invited to make comments on this question. The following remarks were made, (all negative remarks from those who expressed surprise)

- *Somewhat sceptical of any report that would find it a strong role*
- *I have yet to witness a good safety representative on site*
- *Safety Representatives need to show better example, I speak to them weekly if not daily but they rarely come to me.*
- *Most Safety Representatives do not want to be seen working on the safety officers side*

Question 13 gave a brief description of a behaviour change model, that of Goal Setting, Observation and Feedback which has previously used in other studies, management were asked to provide a YES or NO answer when asked if they thought this model would work in their organisation, and to make comment on their choice of answer.

Fig: 17 Managements opinion on the likely success of a Behaviour Change Model in their organisation.

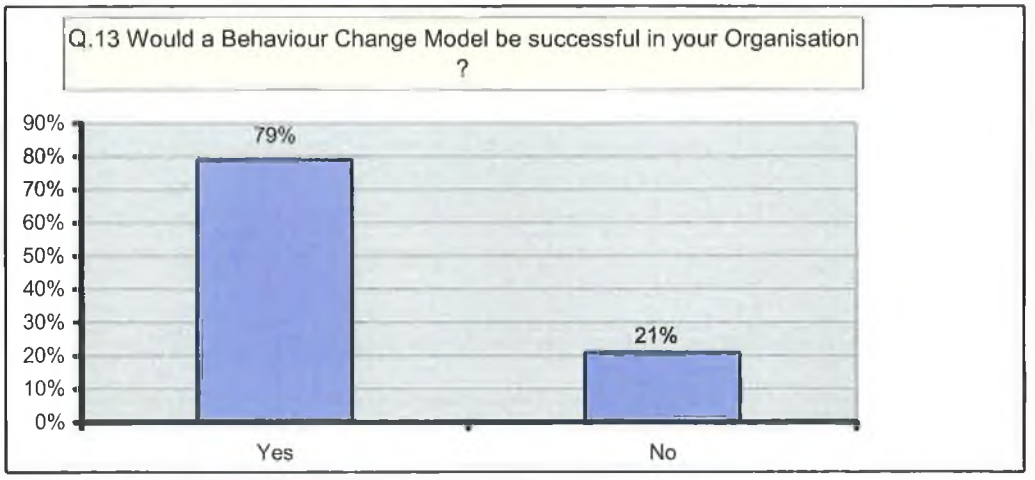


Fig. 17 strongly indicates management believe the Behaviour Change Model would be successful in their organisation, with a clear majority 79% choosing a YES response.

All of those who didn't think this model would work, 21% (3 people) provided a comment to explaining why.

Comments accompanying the 'NO' answers:

- *In theory this could work, however I am not aware of an actual practical model which works*
- *Targeting behaviour of long term employees could be possible, however with high turnover it is difficult to see this achieving any long term results*
- *It would be difficult to see this being successful in a construction site situation; in the manufacturing sector I do believe it would work well.*

Four out of eleven who believed the model would work explained why in their comments:

Comments accompanying the 'YES' answers:

- *It would focus all management on site to be observant and to take corrective action instead of walking past, thus changing their own behaviour, the way the site operates and the behaviour of employees.*
- *Setting a goal contributes to the daily, weekly monitoring of the target*
- *Get feedback from the workforce*
- *Yes, but it is expensive to the employer, in terms of time and people required, safety professionals can facilitate this but it turns into a class on Risk and probability, can be difficult to get concrete results, and you could end up with a list of grievances.*

Question 14, the only open question of the survey, asking participants for their opinion on what industry can do to influence workers behaviour towards improving safety on construction sites. Achieving an 86% response rate, (12 of the 14 management surveyed) provided comments, and some made a number of comments.

Q. 14 asked 'What in your opinion can industry do to influence workers behaviour, towards improving safety on construction sites?'

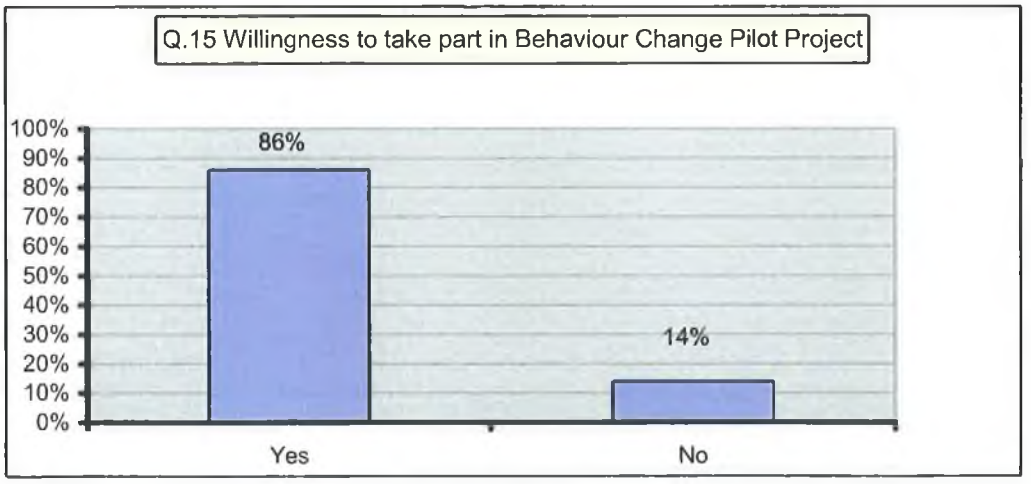
Answers provided by the Management Surveyed:

- *Continued high level of training*
- *Awareness and language skills*
- *Continuous Improvement*
- *Continued influence on the ground by foremen to ensure that safety is first*
- *Remove employment agencies, opt for all employees to be part of the organization*
- *The employer to have an appreciation of site operatives*
- *Do not use employment agencies; such employees are difficult to control.*
- *Training, knowledge and experience need to be focused on, with safe systems of work and adequate supervision*
- *Monitoring of younger workers*

- *Communicate, Communicate, Communicate...safety culture needs to be within subcontractor in order to achieve improved safety, inspect sub contractors safety record before coming on site.*
- *Lowest price subcontractor with a bad safety record should not get the job; this is often not the case.*
- *Agency workers are hard to control, they are always changing and it is very difficult to influence behaviour.*
- *Industry should be giving good example; all management staff should strictly follow the safety rules. Industry should make sure all personnel on all sites are complying with safety regulations without exception.*
- *All Construction companies should be working to the same safety standards, so that operatives have to abide by the same rules on all sites.*

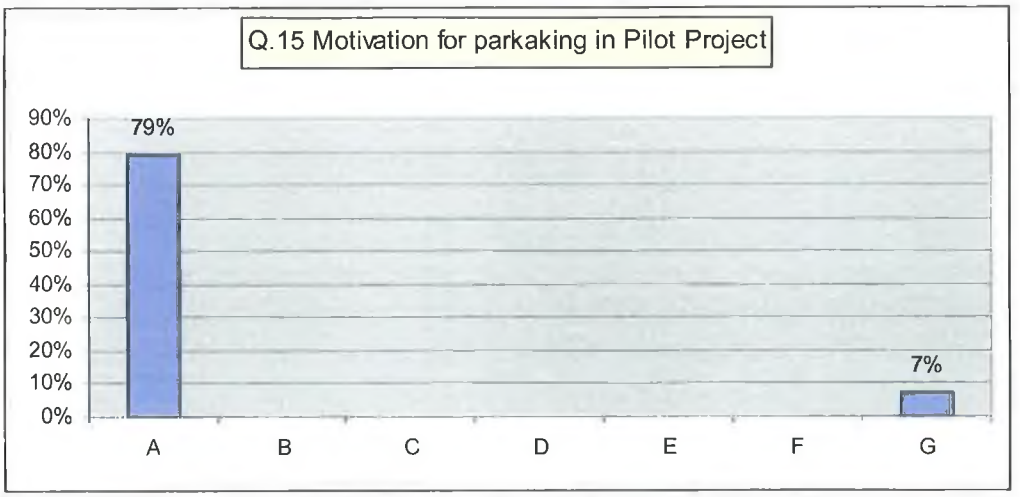
Question 15 investigated willingness to take part in a pilot project on behaviour safety. Management were asked to answer YES or NO, and if they answered YES to indicate their reasons for taking part in a tick box style question of six possible reasons. The tick box options were those that were also presented on question 4 (reasons for managing safety).

Fig: 18 Willingness to take part in Behaviour Change Pilot Project



The bar chart presented in Fig 18 indicates a significant interest of 86 %(12) of management willing to take part in a behaviour change pilot project, with only 14% (2) not interested.

Fig: 19 Reasons for taking part in Behaviour Change Pilot Project



A =	To reduce Accidents and ill health
B =	To comply with legislation
C =	To reduce insurance costs
D =	Client Requirements
E =	Head Office Requirements
F =	Employee Representative Groups
G =	Other (combination of accident reduction, insurance reduction & comply with legislation

- Fig 19 establishes that the only significant reason management would take part is behaviour change pilot project is to reduce accidents and ill health, as indicated by 79% of those surveyed.
- A very small portion (7%) expressed an interest in taking part for a combination of reasons, to reduce insurance cost, comply with legislation in addition to accident reduction.

Comparing the reasons stated by management for managing safety in their organisation, and those stated for taking part in a pilot project, Table 9 shows that the same drivers were cited for both.

Table 9: Comparison of Reasons for Managing Safety & Taking part in Pilot Project on Behaviour Based Safety

Options presented in Q4 and Q 15	Q4 Results	Q15 Results
A To reduce accidents and ill health	50%	79%
B To comply with legislation	22%	
C To reduce insurance costs		
D Client Requirements		
E Head Office Requirements		
F Employee Representative Groups		
G Other (A, B,C combined)	22%	7%
No response	6%	14%

Table 9 establishes:

- The same factors emerged, in the same order of priority as driving forces for both Safety Management and partaking in an industry pilot study
    1. To reduce accidents and ill health – (50% & 79%)
    2. To comply with legislation – 22%
    3. To reduce insurance costs & comply with legislation – (22% & 7%)

- To reduce accidents and ill health is the main driver behind both safety management and expressed interest in an industry pilot study.
- Management are also driven by achieving legislative compliance but to a lesser extent
- A combination of accident reduction, legislative compliance, and a reduction in insurance costs are also driving factors

4.3 Operatives Survey Results:

Similar to that of the management survey the operative's questionnaire has three parts, and the results are presented in tables, pie charts and graphs represented as percentage response, and explained by text.

Part 1 General Information has eight questions 1-8, and seeks to categorise participants based on the answers given.

Question 1 asked participants to indicate the number of years spent working in the construction industry, five options were given, less than 1, 1-2, 3-5, 5-10 and 10+. Fig. 18 presents the results obtained for the number of years spent in the construction industry.

Fig: 20 Number of year's working in Construction

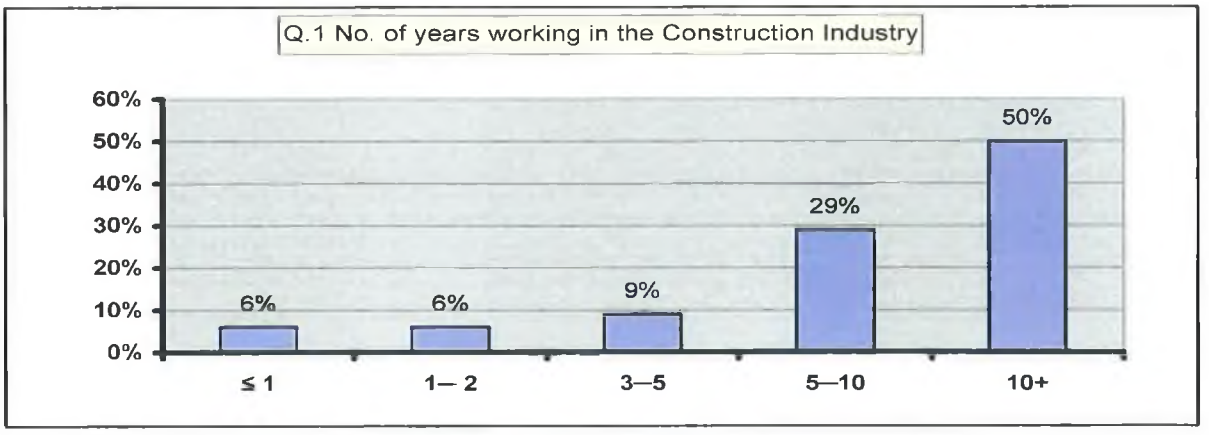


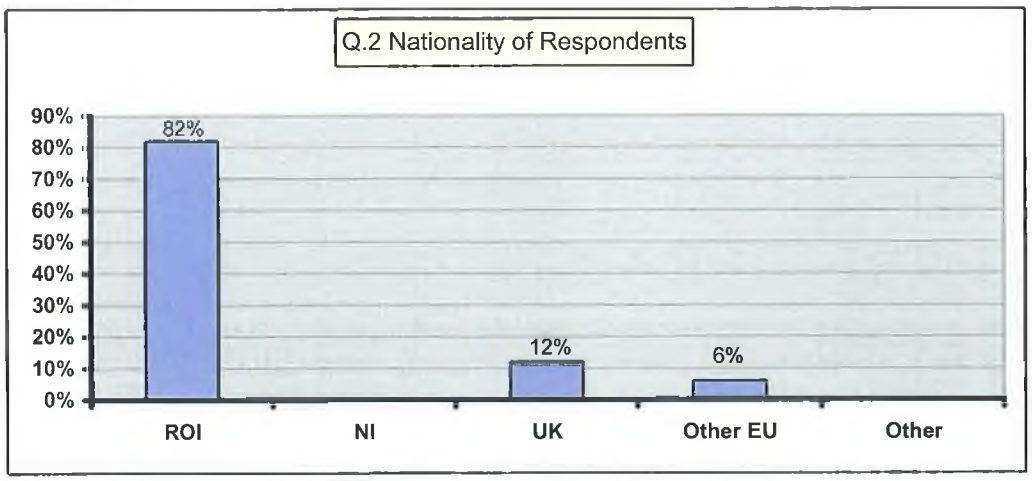
Fig.20 above demonstrates

- Half of the operatives have spent over 10 years working in construction
- 29% of the operatives are between 5-10 years working in construction
- Therefore a large majority of 79% have spent from 5-10 years or over working in construction
- This suggests that the operatives surveyed are established in the industry and should provide valuable research input in the form of their responses.
- In the lower end of the time scale, only 9% of respondents have spent 3-5 years working in the industry, while 12% reported being less than two years in construction.

- Overall these results suggest an under representation of those working in construction for five years or less, who combined only provided an input of 21% to the operatives survey.

Question 2 relates to nationality of those who completed the questionnaire, five options were presented and participants were asked to tick one of the options or the 'other' category and detail their nationality, response is shown in Fig. 21

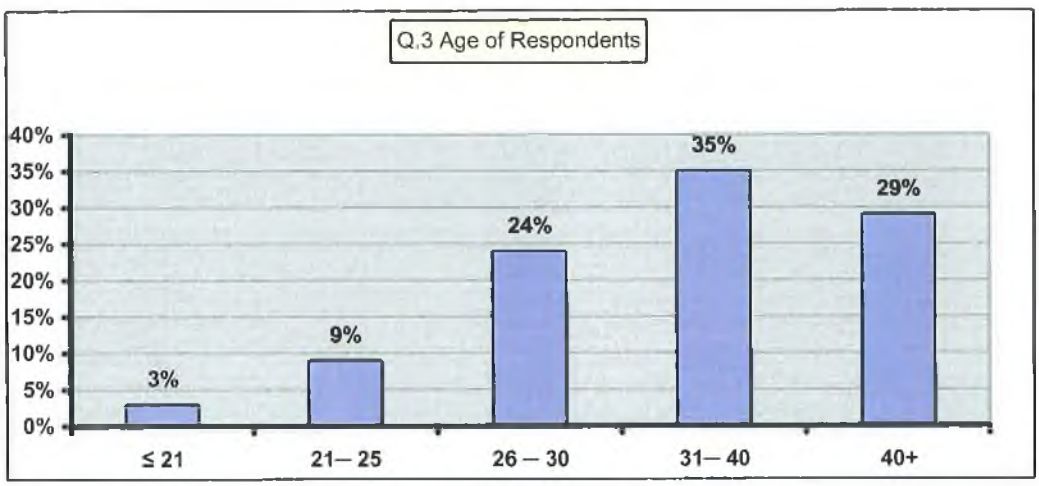
Fig. 21 Operatives Nationality, by % response



- The majority of operatives who completed the survey were from the republic of Ireland (82%)
- 12% were from the United Kingdom
- 6% from other European country.

Question 3 asked participants to indicate the age category to which they belong, in a tick box format with 5 options presented ranging from younger than 21 to over 40.

Fig: 22 Operatives Age profile

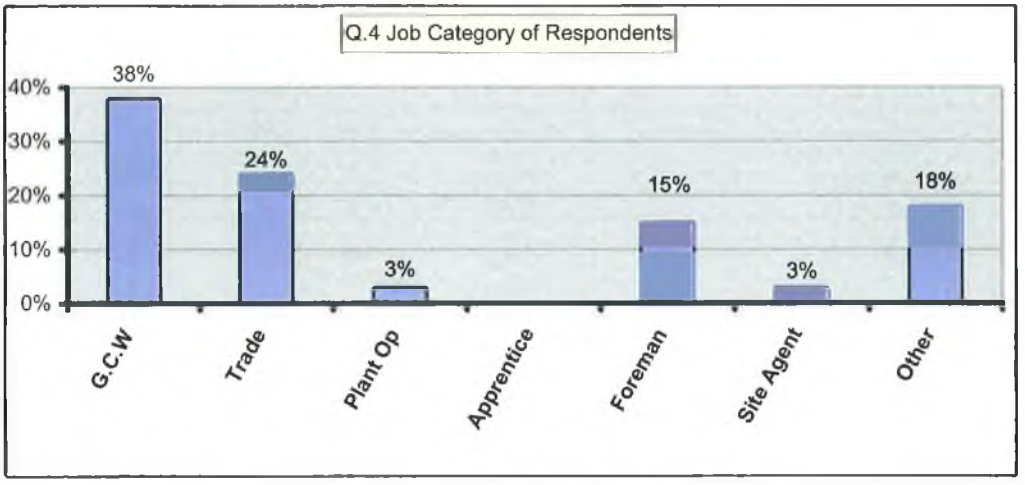


The age profile of the participating operatives,

- 64% of the group are aged over 30.
- The majority of operatives are in the 31 – 40 years old age category (35%)
- The second biggest age group represented is the over 40's accounting for 29 %
- The younger age groups of 26 -30 accounted for only 9 %
- The youngest group of under 21's is represented by just 3% of operatives
- While having the more mature operatives opinion and views is important for this research, these results indicate that the younger construction industry operatives are underrepresented in this survey.

Question 4 asks respondents to indicate their job with six options presented and an 'other' option, the results achieved for each are presented below in Fig. 23

Fig 23 Job Category of participating operatives

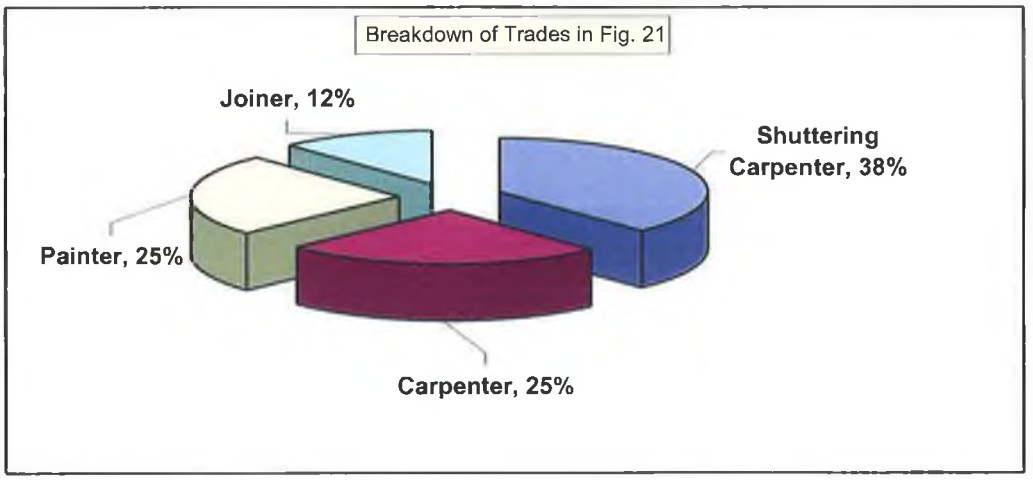


(GCW= general construction worker)

- The majority of operatives who took part in the survey were employed as general construction workers 38%
- The second biggest category represented were those having a trade at 24 %
- Construction Site Foremen accounted for 15% of the response
- 18% selected the 'other' category, this amounted to 6 people who stated their job as being either Engineer (3people), Assistant Engineer, (1 person), 1 Engineering Technician, while one person did not qualify what their job was.

Considering the high percentage response of 24% of trades a further breakdown of this group is required. Fig. 24 below provides a breakdown of the trades involved.

Fig. 24 Breakdown of the 24% of Respondents belonging to a Trade

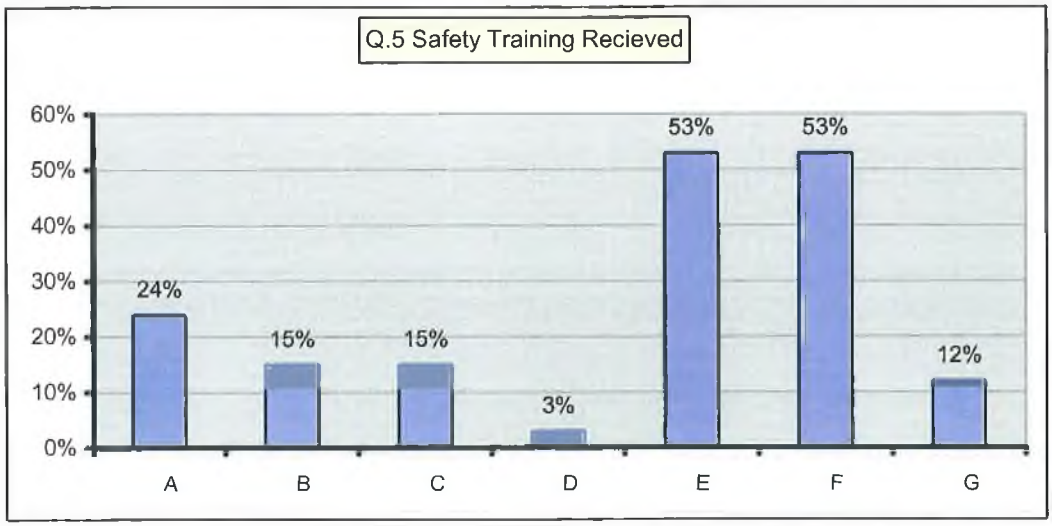


- Carpenters were the largest number of trade professionals represented in the survey 38% being shuttering carpenters, and 25% accounting for carpenters, (it is quite possible that the entire 63% are shuttering carpenters, some of the replies just stated carpenter, this is speculation based on the fact that the most likely work for carpenters on construction sites is in the capacity of shuttering work)
- Two other trades are represented, painters 25 % and joiner 12 %

This breakdown provides insight into the type of the work the respondents are involved in and the type of risk they are exposed to and thus a better appreciation of their responses to the questionnaire.

Question 5 relates to safety training received by participating operatives. Six types of training were listed in a tick box question format, Safe Pass, CSCS, Managing Safely in Construction; Training received during an Apprenticeship or Trade, Site Safety Induction Training and ongoing Tool Box Talks, finally an 'other' category was also included. The training received by operatives is represented in Figures 25, 26 & 27 and Table 8 below.

Fig: 25 Operatives Safety Training received



A=	Safe Pass Training Alone
B=	CSCS & other
C=	MSIC & other
D=	Apprentice or Trade
E=	Safety Induction & other
F=	Ongoing Tool Box Talks & other
G=	Other

Fig. 25 above shows the overall results for the safety training received by operatives, the following results stand out as being significant.

- It is striking that only 3% indicated being trained as an apprentice or receiving training for their trade. Remembering that Fig. 21 earlier showed that 24% of respondents accounted for those having a Trade. The 3% response corresponds to only one person out of eight working in a trade, receiving training.
- Just over half the operatives receive ongoing tool box talks and site induction training. (53% response for both)
- 24% reported that Safe Pass training alone was the only form of safety training received
- A 15% response rate was yielded for the Managing Safely in Construction (MSIC), considering the job categories of participants in Fig. 21 above one would expect this to correspond to 15% response by foremen, being the target group for this course. However the MSIC was completed by a mixed group including one of the five foremen. Table 10 presents an overview of the training received by site foremen.

Table 10: Training received by Site Foreman

Foreman No	Safe Pass	Induction	TBT	MSIC	Other
1			X	X	X
2	X	X	X		
3	X				
4	X				
5	X				X

TBT = Tool Box Talk, MSIC = Managing Safely in Construction (by the CIF)

Table 10 results indicate the level of training received by the Foremen is very poor

- Two of the five foremen have received Safe Pass Training only
- One has not completed Safe Pass training at all
- Only one out of five has completed the MSIC
- Only one out of five has had safety induction training
- Two out of five received ongoing Tool Box Talks
- Two indicated they had 'other' training e.g. First Aid, Banksman Signalling

Compliance with the mandatory Safe Pass training requirement is outlined in Fig. 26 below.

Fig: 26 Results relating to Safe Pass Training

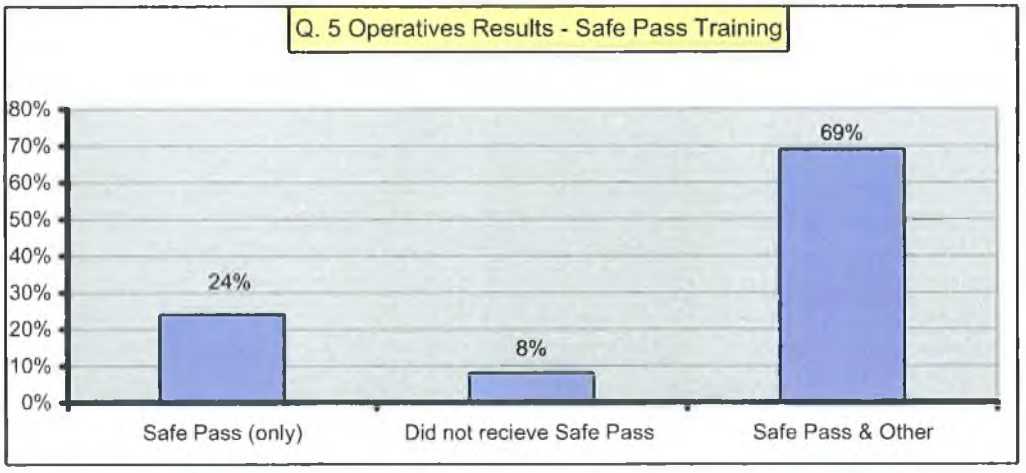
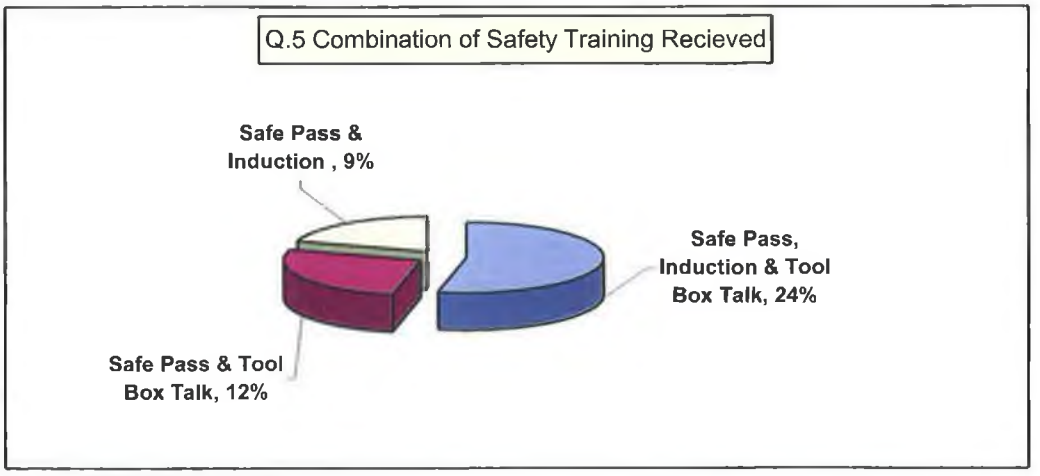


Table 26tells the story about compliance with Safe Pass Training:

- 24% of respondents indicated that the one day safety awareness training programme that is Safe Pass was their only form of training.
- 8% had not completed Safe Pass Training, which is legal requirement in the Safety Health and Welfare at Work, (Construction) Regulation 2006.
- 69% reported having safe pass training and other safety training complete

Some operatives received a combination of training and hence ticked a number of boxes on the questionnaire, combination of training received are represented in the pie chart below.

Fig. 27The most common training combination



- Safe Pass, Site Induction Training and Tool Box talks was the most common training combination - 24% of operatives represented by the blue portion of the pie chart.
- While it is good that the majority have received a combination of all three training types, 24% is a low figure for basic training that should be well established and achieving 100% response.
- The lesser portions of the pie represent 12% receiving safe pass and tool box talks but not having a site safety induction
- 9% reported the combination of safe pass and induction training but are not subject to ongoing tool box talks.

Questions 6, 7 and 8 investigated the employment arrangements that existed among the participating operatives. Firstly question 6 asked about employment arrangements, with the options of self employed, directly employed (set wage), directly employed (price work), or placed by an agency. An 'other' category was also included,

Question 7 asked about employment status, the options being either full time permanent, part time permanent, having a temporary fixed contract, no fixed contract or other arrangement.

Question 8 simply asked operatives who they usually worked for, i.e. was it the main contractor or a subcontractor.

The following three figures paint the picture of the employment arrangements in the operatives group, represented as percentage response.

Fig. 28 Employment Arrangements

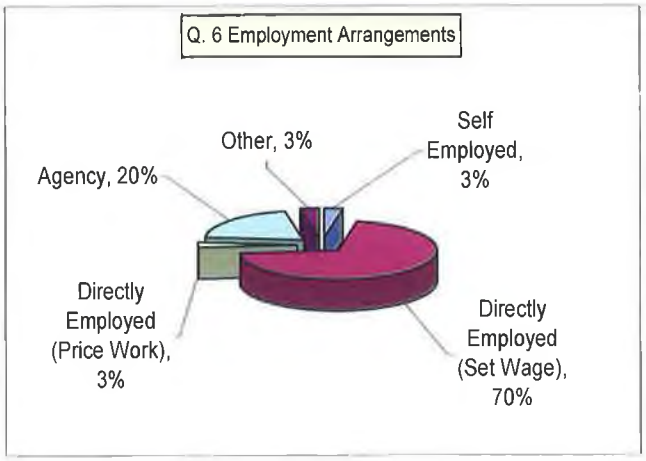


Fig. 29Employment Status

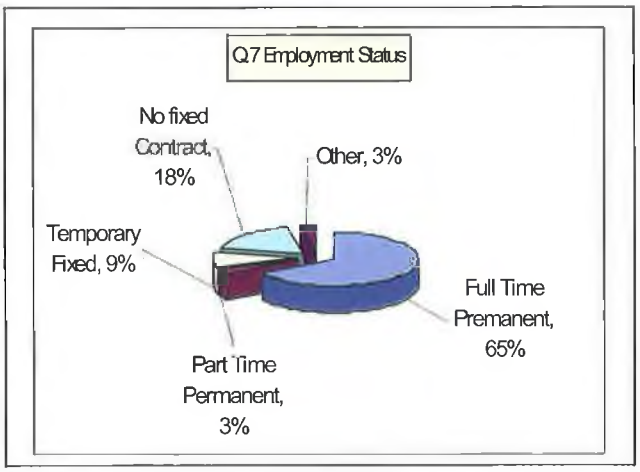
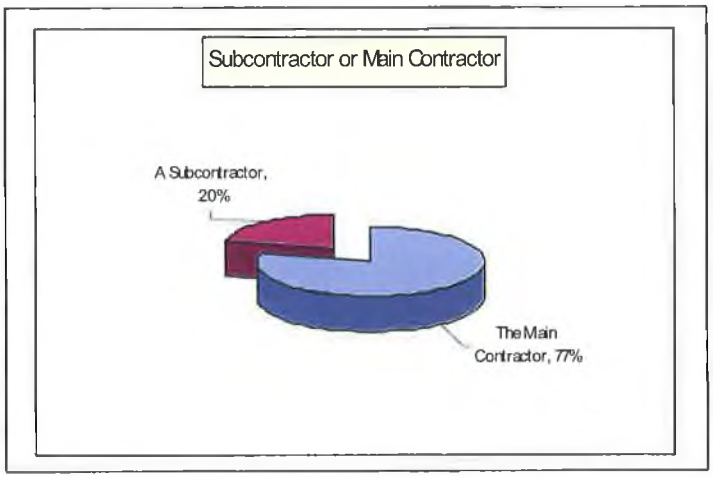


Fig. 30 Employed by Main Contractor or a Subcontractor



The pie charts above indicate that

- A sizeable majority, in the region of (70%) of the operatives were full time permanent employees who worked for the main contractor.
- Other employment arrangements existed in small numbers among the group, such as directly employed but being paid by price work (3%) and self employed (3%).
- Temporary fixed contract accounted for only 9% of the response group,
- Just 3% indicated being in part time permanent employment.
- A finding of note is the high portion of operatives working through the services of an employment agency, accounting for 20% of the group as indicated by Fig 28, which corresponds closely to the 18% having no fixed contract as shown in Fig 29.

Part 2 Accident History investigates Operatives involvement in a workplace accident, Question 9 asked if respondents were involved in an accident, and if so to state the type and cause of the injury, while question 10 asked about body part injured and question 11 the incident type. Fig. 31 shows that 15% of the operatives who partook in the survey had been involved in an accident; table 11 provides further detail on the accidents.

Fig: 31 Operatives involvement in a workplace accident

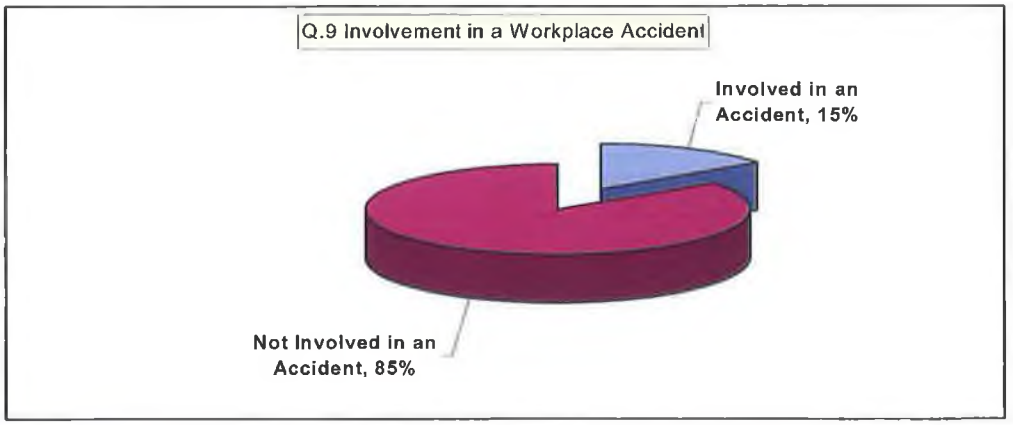


Table 11: Summary of Accidents revealed by operatives questionnaire

Accident No.	Job Category	Age	Years in Industry	Injury Type	Training Received	Employment Arrangements
1	Foreman	40+	10+	Pelvic Fracture	Safe Pass, Induction, TBT	Directly Employed, Full Time Permanent
2	GCW	31-40	5-10	Crushed Thumb	Safe Pass, Induction, TBT	Directly Employed, Full Time Permanent
3	Shuttering Carpenter	31-40	10+	Didn't answer	Safe Pass, Induction	Agency Worker No Fixed Contract
4	Shuttering Carpenter	31-40	10+	Back and Leg	Safe Pass, CSCS, Induction, TBT, Apprentice training	Agency Worker Temporary Fixed Contract
5	Shuttering Carpenter	31-40	10+	Back and Shoulder	Safe Pass, Induction, TBT	Agency Worker No Fixed Contract

GCW= General Construction Worker, TBT = Tool Box Talk

Table 11 summaries the information on accidents and injuries as indicated by 15% of operatives. It details the results obtained for question 10, body part injured.

The questionnaires did not reveal any clear or useable results for question 11 i.e. the type of incident that caused the injury; hence they cannot be presented in this results chapter.

In table 11 some trends become obvious.

- Three of the five who were involved in an accident were in the job category 'trade', working as shuttering carpenters, and only one had received formal training.
- All of those involved in accidents were from the more mature age group categories with 4 out of the 5 involved in an accident were of the age group 31-40, the remaining one individual was older being over 40.
- All of those involved in accidents were experienced construction industry workers, with four out of five of those involved in accidents, over 10 years working in the industry, the remaining other reported having between 5-10 years experience.
- All five had received Safe Pass and site Safety Induction training, while all except one individual reported receiving ongoing tool box talks.
- In three out of five accidents Agency workers were the injured party, having no fixed contract.

Table 12 Operatives Injury Type compared to National Statistics

Top six Injury Types **% of reported construction incidents** **(HSA statistics for Construction-2005 pg 43)**	**Injury Type** **This Research**
Back Injuries – 24%	Back and Shoulder Back and Leg Injury
Fingers – 18%	Crushed Thumb
Hand -10%	
Shoulder and leg 7%	Ankle Injury
Arm – 6%	

Table 12 highlights that the type of injuries sustained by the operatives are typical of those in the construction sector, with four out of five injuries corresponding to the top six injury type as stated by the H.S.A summary statistics 2004 -2005. (HSA 2006(a))

Part 3 of the questionnaire focuses on **Behavioural Safety** it has four questions from 12-15 and was entitled 'Your **Honest Opinion**' seeking the opinions and views of participating operatives on the information presented.

Question 12 investigated the attitude of the response group, with sixteen statements presented. Ten of those statements were towards being safety conscious and show a positive attitude while the remaining six were towards risk taking and indicate a negative attitude towards safety management. Respondents were asked to agree or disagree with these statements in a tick box format.

The results obtained are presented in Table 13 and Fig 30 below

Table 13: Results for Safety Attitude by percentage response

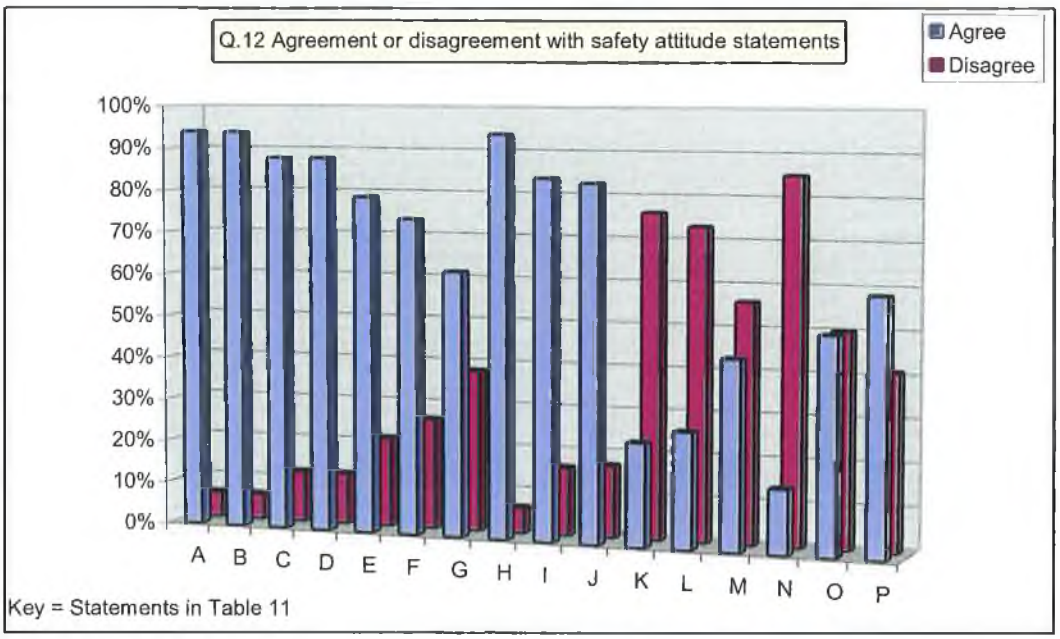
	Statement	Safety or Risk	% who Agreed	% who Disagree
A=	I am very conscious of my own safety	S	94	6
B=	Construction is a high risk job	S	94	6
C=	I am responsible for my own safety at work	S	88	12
D=	It is important to abide by safety rules	S	88	12
E=	All of the new safety laws are helping to manage the risks on site	S	79	21
F=	Safe Pass and CSCS training have been a good idea	S	74	26
G=	There is a good chance I could be involved in an accident	S	62	38
H=	Having management committed to safety is important	S	94	6
I=	Having a safety officer on site makes for a safer site	S	84	16
J=	Having an employee Safety Representative makes for a safer site	S	83	17
K=	There are too many safety construction safety rules	R	24	76
L=	Complying with safety rules slows down the job	R	27	73
M=	Some safety rules are unnecessary	R	44	56
N=	I can do my job just as safely without all these rules	R	15	85
O=	The chance of me having an accident is quite low	R	50	50
P=	My employers are responsible for my safety at work	R	59	41

S= Safety R= Risk

Table 13 presents the sixteen statements that were given in the questionnaire, the category to which it belongs (i.e. towards safety or towards risk, denoted S or R as appropriate) and the percentage response given, agreement or disagreement with the statements. To ensure better presentation of the result the 'Risk' and 'Safety' options have been grouped together, while in the questionnaire the opposing statements were scattered through the question.

Figure 32 below is included to show a graphical representation of the peaks and troughs associated with the survey, thus proving a better visual of the findings.

Fig. 32 Response to Safety Attitude Statements



In Fig 32 shows that:

- Overall there is strong agreement with the 'towards safety' statements in the first part of the graph, where the blue column represents agreement with these statements and is clearly the highest percentage response.
- There is a total switch from agreement to disagreement for the last six statements, represented by the dramatic decrease in blue column and a sharp increase in the purple columns when the statements 'towards risk' appear.
- The final two statements while not exactly statements towards risk taking are negative in terms of responsible health and safety management.
- The statement 'The chance of me having an accident is quite low' achieved a 50/50 response where equal numbers agreed and disagreed with this statement.

- The final statement 'my employers are responsible for my safety at work' had only a slight majority of 59% who agreed, while 41% disagreed. This statement contradicted the earlier statement 'I am responsible for my own safety at work' which yielded an 88% agreement, considering these two results there is at least 29% overlap of those who have agreed with both conflicting statements, or this could also be interpreted that this 29% of the group feel that both parties have a responsibility.

Question 13 investigated the preferred behaviour of respondents in a given risk situation. Eight situations were presented with seven possible actions to choose from, in a grid style question requiring tick box answers. Table 14 provides an overview of response for each risk situation, while Fig 31 presents it in line graph below.

Table 14: Matrix of Preferred Behaviour in a given Risk Situation (by % Response)

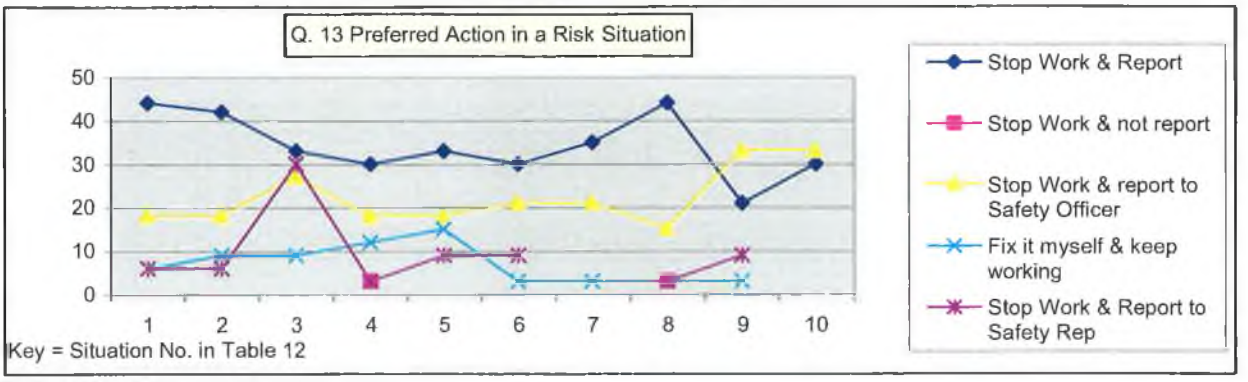
Risk Situation	Stop Work & Report	Stop Work & not report	Stop Work & report to Safety Officer	Fix it myself & keep working	Stop Work & Report to Safety Rep	Keep Working	Not Sure
1. Using defective ladder	44		18	6	6		
2. Using scaffold not fully boarded	42		18	9	6		
3. Using scaffold missing handrails	33		27	9	30		
4. Climbing up and down scaffold	30	3	18	12	3		
5. Using ladders too short for landing place	33		18	15	9		
6. Working on fragile roofs without crawling board	30		21	3	9		
7. Operate plant / machinery without specific training	35		21	3			
8. Operate hand tools without specific training	44	3	15	3	3		
9. Operate plant in an area with overhead powerlines that are not marked with bunting etc	21		33	3	9		
10. Operate plant in an area known to have underground services, and you are unsure of their exact location	30		33				

Table 14 reveals:

- The preferred action in nine out of the ten situations is to 'Stop Work and Report'.
- In nine out of ten situations operatives would report to the safety officer.
- One risk situation 'using scaffold with missing handrails' showed a slightly stronger tendency to report to the Safety Representative.
- Fixing the problem and continuing to work is not a favoured option, being the least favoured in five out of ten situations.
- To continue working and not sure did not feature as an option for any of the respondents in all ten risk situations.
- In general there appears to be an accurate perception of the risk presented in the situations, both for the eight situations that involve working at heights and the two situations that involve working near utility services.

While Table 14 provides a general overview of the results for question 13, use of a line graph in Fig. 33 below provides a graphical image of the trend in preferred behaviour.

Fig. 33 Line Graph showing preferred action in a Risk Situation

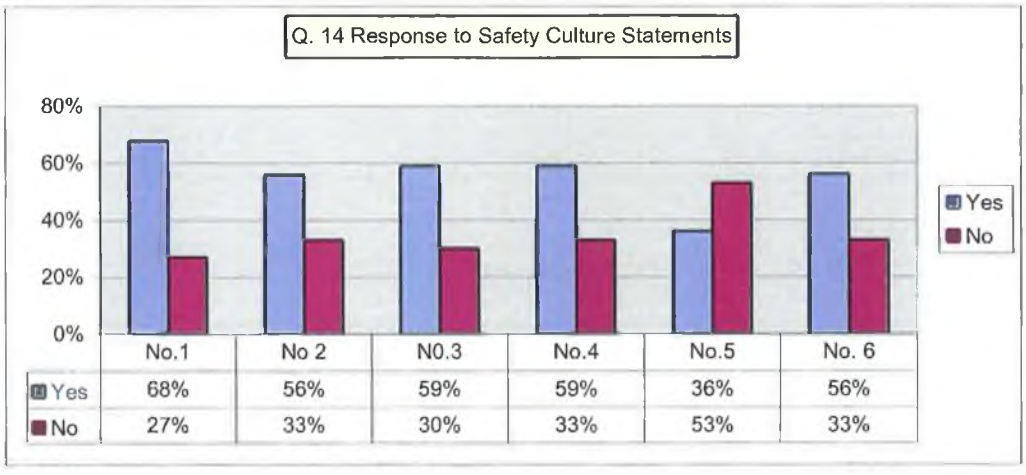


From Fig. 33 we can state

- The blue line in Fig. 33 demonstrates the preference for 'Stop Work and Report' where between 30-50% respondents choose this option for 9 out of 10 risk situations.
- The second choice of action is the 'Stop Work and Report to Safety Officer' indicated by the yellow line with all risk situations receiving a 20-30 % response rate for this option.
- The yellow and blue lines follow a similar trend for risk situations No. 3 to No. 8 options, indicating that stop work and report to safety officer being the preferred action in all of these situations.
- In situation number 9, which was to operate plant in an area unmarked or highlighted by bunting, there is marked decrease in the stop work and report, while at also at number 9 there is an increase in the line, indicating that the operatives would make a point of reporting this situation to the safety officer.
- A low response rate in the range of 3-15% response was yielded for 'Fix it my self and keep working', represented in the aqua coloured line, indicating this is not a preferred action in any of the risk situations.
- The least preferred action among the response group was the 'stop work and report it to the safety rep' represented by the purple line in Fig: 31 having results in the range of 3-9% across all but one risk situation, i.e. risk no. 3 which was using a scaffold with missing handrails, where this option jumped to 30% of respondents saying they would stop work and report to the safety representative.

Question 14 explored safety culture / climate in the experience of participating operatives, six statements were presented, four of which (No's 1-4) that were positive statements towards proactive safety management, and two negative statements (No's 5-6) that would indicate an ad hoc approach to safety management. Operatives were asked to respond by ticking YES or NO based on their experience.

Fig 34: Summary of responses to safety climate statements



	No.1	No 2	N0.3	No.4	No.5	No. 6
Yes	68%	56%	59%	59%	36%	56%
No	27%	33%	30%	33%	53%	33%

Statement category	Statement Key
+ve	**No. 1** Site Managers take the breaking of safety rules very seriously
+ve	**No. 2** Disciplinary procedures are strictly enforced
+ve	**No. 3** Safety problems are always addressed immediately
+ve	**No. 4** Equipment & materials needed to work safely are available at all times
-ve	**No. 5** Site Management only comply with safety because they have to
-ve	**No. 6** A Disciplinary procedure is in place but not always enforced

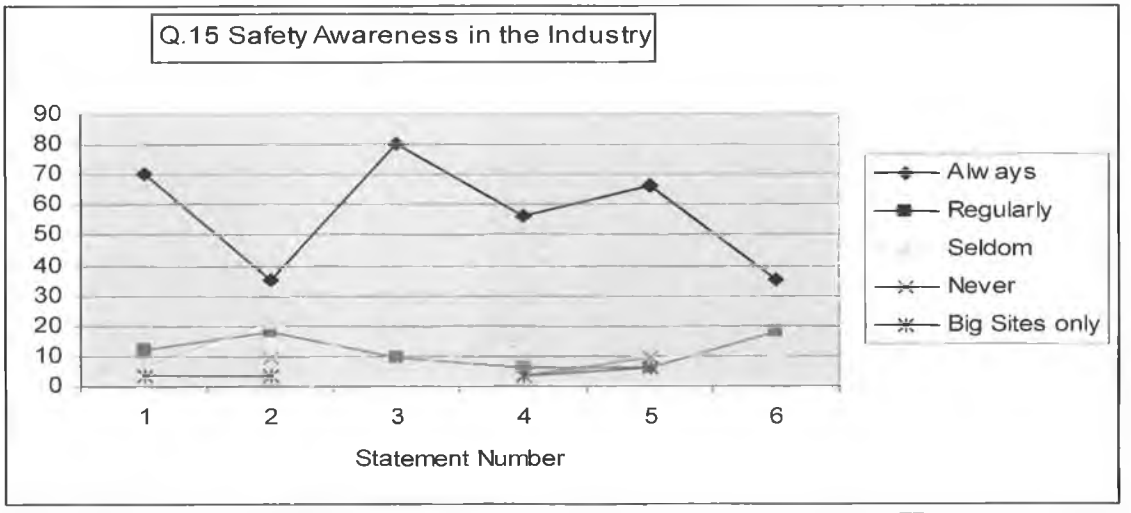
Examining the results displayed in Fig.34

- There was strong agreement with all four positive statements, as represented by the blue column in Fig 34, in the range of 56-68 %. In the experience of participating operatives, this indicates a good result overall for safety culture and management control.
- Of the two negative statements only one of them achieved a useable result, as The results for statement number 6 and statement number 2 relating to the enforcement of disciplinary procedures, receiving equal but opposite responses for opposing statements cancel each other out.

- The negative statement, Number 5, exploring management commitment revealed that 53% of operatives agree with the statement that management only comply with safety because they have to. Just over half of the operatives feeling this way demonstrate a very negative motive for safety management in their opinion.
- The first statement also explored management commitment, but from a positive perspective and the results indicated that 68% of operatives agree that management take the breaking of safety rules very seriously.
- Therefore the operative feel that while there is good management control demonstrated by prompt response to safety issues, allocation of materials and resources, management commitment is believed to be strong, having low tolerance for breaking of safety rules but only because they have to.

Finally **Question 15** investigated safety awareness in the industry asking participants about their experiences with safety induction, training requirements, familiarity with employer's safety statements, risk assessments and method statements. Question 15 was a tick box style with the 5 following options, always, regularly, seldom, never and on big sites only. The results are presented in Fig. 35 below.

Fig.35 Operatives Experience of Safety Awareness in the Construction Sector



Statement No.	Statement
No. 1	Safety Induction training is carried out…
No. 2	A new method statement is written and explained before every job
No. 3	Safe Pass Card is required before starting on a new job / site
No. 4	CSCS is requested before starting on a new job / site
No. 5	My employers safety statement has been shown and explained to me
No. 6	I am familiar with Risk Assessments for my job

Fig 35 provides a graphical overview of the response to question 15. The ideal answer to all six statements that would signify good safety management in the construction industry was '*Always*', hence it is encouraging that the '*Always'* option received the highest percentage response across all six statements, presented in blue above.

However from examination of the graph the following can be stated of the results:

- There are two obvious 'dips' in the blue line in fig 33, firstly for statement No. 2 '*A new method statement is written and explained before every job'* with only 35% of respondents reporting that this is always the case, while 18- 21% stated that method statements were written and explained regularly or seldom, represented by the pink and yellow lines respectively. The categories '*regularly*' and '*seldom'* received the highest response for Statement No 2.
- The second major 'dip' in the '*always'* category was for statement No. 6, '*I am familiar with the Risk Assessment for my job'* where just 35% of respondents saying that this was always the situation. In a similar trend to the previous dip of statement No. 2 the Seldom and Regularly options increased accordingly to 12-18% respectively.
- Statement No. 4, '*CSCS is requested before starting a new job'* received a surprisingly low result of 65% for the '*Always*' option.
- It would appear from the results that there is good compliance with the requirement to produce safe pass before starting on site, which achieved an 80% response in the '*Always*' category.
- Three of the six statements received a low percentage response in the '*Never'* category.
    - Statement No.2 '*A new method statement is written and explained before every job'* - 9% stating that this never happens.
    - Statement No.4 '*CSCS is requested before starting on a new job or site,-*

      -3% opting for the never option.
    - Statement No. 5 '*My employer's safety statement has been shown and explained to me.* - 9% indicating this was never the case.

Chapter 5

5.0 Discussion

This chapter of the thesis provides a discussion of the results that were presented in Chapter 4, outlining what the results mean for this thesis and how they compare to the results of similar research. This chapter will refer to the figures and tables presented in Chapter 4 to illustrate the matter under discussion.

The management questionnaire is first discussed followed by the operatives.

5.1 Discussion of Management Questionnaire

Part 1 of the questionnaire categorized the companies by size, staff turnover, and construction type, established their status with legislative compliance and what it is that motivates them to manage safety.

Participating Companies Profile

Respondents were identified as being mostly from middle management positions, the majority of whom were Safety Personnel and Site Agents, while senior management were poorly represented. Overall the company profile can be described as mainly large companies having over 100 employees; most of the companies were involved in Civil Engineering, and most had a high employee turnover rate. Figures 7 and 8 provide the details of company size and construction type.

It was important to establish the type of construction work participants were involved in, as the different sub groups within the overall 'construction' umbrella can have different risks, influencing factors and different styles of managing safety. The Civil Engineering Sector contributed to 72% of the overall response, as seen in Fig. 8 due to a greater inclination of respondents to complete and return questionnaires to somebody known to them. Other sectors, house building and Commercial Developments, had a low percentage response. Given the dominance of the Civil Engineering Sector in comparison to the others, this could be considered a bias in the

results of this survey, and hence a limitation of this research, as such must be taken into account when considering the findings and conclusion of this thesis.

Employee turnover, is an important part of this research as, high employee turnover is synonymous with difficulties in maintaining safety culture, and exercising influence over the workforce, as has been demonstrated by previous research (Murray 2006, Biggs *et al* 2005 and Mattila, Hyodynmaa1988). Interpretation of the results presented in Fig 7.1 places the majority of organizations as having a high employee turnover, with 65% of respondents reporting a high turnover to a fairly consistent workforce, which means employees remain in their employment for a short time period ranging from one month to two years.

The literature would suggest (Biggs *et al 2005,* Murray *2006* and Mattila Hyodynmaa *1988),*that this places the majority of respondents as having a barrier to improving safety on site, Biggs *et al* 2005, noting the transient nature of the construction industry workers due to high employee turnover created 'a significant barrier' to the effective implementation of the safety climate management approach, while the Murray 2006, remarked that a difficulty to maintaining successful intervention is the high turnover of staff on construction sites, and that a lot of cultural impact is lost as personnel change rapidly. Murray commented that this is a 'cultural phenomenon of most building sites and their high turnover rates mean that a culture of compliance can be particularly difficult to achieve, raising the question as to who carries the culture on a construction site?' (Murray P, 2006). The work of Mattila, Hyodynmaa 1988, detailed the high turnover among its 'special features' that decrease occupational health and safety, by particular reference to 'a new organisation at every site' and 'sites are different' listing these among other change factors that affect how people behave at the site, and make it more problematic to behave in a safe way. (Mattila, Hyodynmaa1988)

Motivation and Legal Compliance

Having established the size, construction type and employee turnover the questionnaire focused on what motivates these organisations to manage safety in the first instance, and to gather information on how in depth their safety management is.

The three main drivers for safety management emerged as.

1. To reduce accidents and ill health
2. To comply with legislation
3. To reduce insurance costs

It is interesting to note that nobody indicated Client Requirements, Head Office Requirements or Employee Representative Groups (Union Groups) as reasons for managing safety. These results as shown in Fig, 9 demonstrate that the reasons for safety management expressed by the management surveyed are in line with common teaching on why organisations bother with health and safety management in the first instance, which are

1. Moral and ethical requirements- (to reduce accidents and ill health)
2. Legal requirements - (to comply with legislation)
3. Economic requirements - the business case (To reduce Insurance)

Table 4 indicates that most of the legal requirements achieved 100% response for the YES option, while a small proportion of 7% of respondents admitted to not having a documented safety statement, risk assessments or a full time safety person employed. Safety Statement and risk assessment have been a legal requirement in Ireland since the introduction of the Safety Health and Welfare at Work 1989 Act, therefore one would expect that some 18 years later this survey should have recorded 100% compliance, while the 7% response who indicated not having this information is very low, it signifies that non compliance remains a feature of the industry. In addition both the PSCS and the Contractors involved in a construction project have duties relating to Safety Statements and their inherent Risk Assessments, as outlined in the literature. While the duty of the PSCS in this regard is not explicit, it is part of their duties to co –operate.

Similarly 7% of respondents admitted to not meeting the requirement to have a full time safety officer on site, this also represents a small portion of the group, but it too

is a legal requirement of both 2005 Act and the Construction Regulations. Sections 8 (General Duties) and Section 18 (Protective and Preventive Measures) of the 2005 Act, while the responsibility for a safety officer or safety advisor in the Construction Regulations 2006 differ depending on the duty held by the company, being PSCS or a Contractor, and also depends on the number of people employed on a project.

14% of respondents do not have a safety training programme, which while it is good management practice, an actual training programme is not a legal requirement, with the exception of some specific training e.g. Safe Pass and CSCS. Not investing in training may be a symptom of having a high employee turnover, as was noted in the paper by Biggs *et al* 2005 commenting that 'the inherent transience implies that there is little incentive or value for individual construction organizations to invest large sums of money and time training workers that will move on to work for a competitor'.

Summary of Part 1

From Part one of the Management Questionnaire it has thus been established that Safety Personnel and Site Agents accounted for the majority of professionals that completed the questionnaires. The majority of participating companies (79%) were large companies employing 100 or more people, and the majority reported having a high employee turnover a factor that has been known to create difficulties with safety improvement initiatives. The Civil Engineering sector are more strongly represented than any other construction type, the main drivers for managing safety in the response group were in order of importance, to prevent accidents and ill health, to meet legislative requirements and to reduce insurance costs. There is a high level of compliance with the main provisions of Occupational Health and Safety and Construction Industry Legislation.

Accident History

Part two of the management questionnaire investigated the five year accident history of the response group; the results are presented in Tables 5 and 6 and Figure 11 of the results chapter. Overall the accident figures appeared low in comparison to most recent industry statistics, and the most common incident types revealed were not typical of those stated in HSA statistics. The following section of the discussion explains these findings.

Accidents and Dangerous Occurrences:

The majority of participants indicated accident occurrences in the lower end of the questionnaire options, ≤ 5 and 5-10 reportable accidents both yielded a percentage response of 29% (4 out of 14 respondents). While half of the companies reported having between 20-100 dangerous occurrences in the past five years, most of which corresponded to the high incidents of underground service strike.

It was noted in the introduction chapter that the construction industry consistently reports higher accidents than any other economic sector, taking account that the results obtained by this survey are most likely an over representation of the actual results, they would appear to be low compared to construction industry statistics. A possible explanation for this being most of the companies were large companies of 100 or more employees who typically have better management systems, and a problem that has been commented on in recent months by the HSA has been a culture of underreporting exists in all economic sectors may also be a factor here.

Most Common Accident Type

Comparing the top five most common accident type of the response group to those of most recent construction industry statistics, it was shown that Slips Trips and falls were present in both lists, ranking in second place, being an accident type that is a feature of all industries, its presence as one of the main accident types in any study on occupational accidents is not surprising.

The comparison presented in Table 6 shows that the top 5 accident types of this research are characteristic of the Civil Engineering Sector, who it has been shown account for the biggest portion of the response group. In the experience of the

researcher underground service strikes are a commonly occurring incident type of the sector. However rather than being an accident, striking of underground services are considered a Dangerous Occurrence, in accordance with the legislation, The General Application Regulations 1993.

The five incident categories that were identified are all features of this sector and result from the risks associated with this type of work, where there is typically a lot of plant operating in rough terrain, hence this accounted for 21% of the incidents, and transport incidents amounted to 14%. At least two of the incident types of the HSA statistics are related to working at heights, i.e. fall from a height and falling object which accounts typically for only a small portion of Civil Engineering work, i.e. Structures, and the number one incident type of stress or strain is largely associated with manual handling which also is more typical of other construction types, i.e. house building.

Summary of Part 2

The five year accident history of participating companies was relatively low considering national statistics; the comparison of results has clearly indicated that the common incident types identified by this research correspond to the profile of the response group.

Behavioural Safety

Part 3 focused on the thesis subject matter of Behavioural Safety, where specific questions relate to the research aims, having established the company profile in the first two parts of the research.

Accident Contributory Factors

Question number 8 revealed that management strongly believe that unsafe behaviour by the injured party is the most serious or the second most serious contributor to accidents in their organization, an opinion expressed by 79% of those surveyed. Thus fulfilling the research aim, 'to *obtain the opinion of management on individual behaviour as an accident causation factor, in their organisation and in the construction sector'*

Question 8 results identified the most serious accident contributory factors as

- Unsafe Behaviour by injured party-79%
- Poor Supervision and Management -50%
- Time Pressure – 28%
- Lack of Training, Poor Skills – 14%
- Lack of Procedures / Risk Assessments – 7%

A study be the HSE, entitled research report 156 'Casual Factors in Construction Accidents' found that, problems arising from workers or the work team, especially workers actions or *behaviour* and worker capabilities, were judged to have contributed to over two thirds (70%) of the accidents (HSE 2003), management opinion found in this research concurs with these results.

An Irish study, Dalton 2002, that focused on contributory factors to fatal accidents 1991- 2002, found that a ratio of 2:1:1 existed for Site Management (SM), Head Quarter (HQ) and Injured Party (IP) factors respectively, based on Site Management Factors being identified by HSA inspectors twice as often as either HQ or IP factors when assessing the cause of a fatality. The results of the current study do not support these findings; rather it has found that unsafe behaviour by the injured party is by far the largest contributor to accident causation. It is important to remember however the

result of this survey is based on the opinion of management. The results for question 8 are presented in Table 6 and Figure 12.

In response to the research aim, '*to conduct attitudinal research on the ability of organisation to influence workers behaviour*' specifically addressed in question 9 the results in Fig. 13 reveal a very strong belief among management that their organization has the ability to target and exercise influence over the behaviour of their individual workers.

While 71% of management believe they have a 'good ability' to influence workers behaviour, the remaining 29% believe they have 'some ability' to influence, interestingly none of the management believe they have little or no ability in influencing workers behaviour.

Factors that influence behaviour towards safety

Having established that management have the ability, they were asked to clarify what they felt the influential factors on safety were. On examination of the response given to Question 10 the following factors were ranked as having influence, as is shown graphically in Figure 14 of the results chapter.

2. 72% - Safety Culture and Management Commitment
3. 64% - Supervision
4. 57% - Safety Conscious Workmates
   - Competency
   - Personal Care & Attention to Safety
5. 36% - Disciplinary Procedures
6. 21% - Age
7. 14% - Presence of a Safety Officer
8. 7% - Presence of a Safety Representative

Contrary to the findings of McDonald Hrymak 2002, the presence of a safety representative was rated as having the least influence on safety. This finding was stated with some strength, it being the biggest percentage response given to any of the factors, i.e. 43% of management rated it at the least influential, assigned a rating of 10.(see Table 3 Raw Data, Appendix 7) Whereas in the McDonald Hrymak study the

presence of a safety representative showed the strongest relationship with the main safety compliance factor was the presence or absence of a safety representative. (McDonald, Hrymak 2002)

Safety Culture – the most influential factor

Safety Culture being expressed as the most influential factor is somewhat expected outcome as it has already been shown above that management has a strong belief that their organizations have a good ability to influence employee behaviour.

Age and Time in Industry

Workers age and length of time in industry have been linked with accident causation in the past, however in the opinion of management in this survey these variables are not considered to have any significant influence on workers behaviour. Age being considered as one of the least influential factors at 21%, and length of time in industry was considered even less influential and did not feature with any significance from the rating of 1-5.

A study of Training and Safety Performance in the UK construction industry found that, workers age and duration of career have an impact on the level of safety performance, with a greater accident involvement among the older workers, and those who have been employed for more than 16 years. (O'Sullivan N, 2000)

While in Ireland the HSA summary statistics 2004 – 2005 indicate that it is the younger age groups that are at higher risk of injury, where as those in the older age groups suffer from higher rates of illness. Age range from 15-19 showed particularly high injury levels across all sectors, including construction. (HSA summary statistics 2004-2005 pg 28)

The link between - personal care & attention, competency and your workmates

Personal Care and attention to safety is another way of asking about, the individuals behaviour, but refers to their habitual behaviour rather, than a once off action, it was rated by management as the third most influential factor at (57%) in joint place with, having safety conscious workmates, and the competency of the individual also emerging as 57%. .

The researcher notes that each of these three factors are related, the way that your workmates behave has been shown to influence your own actions, and competency determines how you weigh up the risk, which determines how much care and attention you apply to the task. Referring back to the example of Eric the cabinet maker in the literature on Human Behaviour, Eric and his fellow workers had got away without wearing the glasses in the past to no ill effect, and workers who appeared to be overly cautious were ridiculed by their piers, both of these factors influenced Eric's decision not to wear the safety glasses, and as a consequence he sustained an eye injury. (Sulzer-Azaroff 1987) Thus illustrating the effects of consequences and reinforces on our behaviour as seen in the literature, and linking the three influential factors of personal care and attention to safety, competency and having safety conscious workmates.

In Question 11, Individual Behaviour was presented as an accident causation factor, 36% of management indicated they believe it to be a major contributor and 64% indicated they believed it contributed to some extent, none of the management surveyed felt it was not a contributing factor. (See Fig. 15)

Therefore it can now be stated this research has found management holds a strong belief that their organization has the ability to target and influence workers behaviour, Safety Culture, Management Commitment and good supervision are factors considered as being the most influential. Thus fulfilling the research aim: '*To conduct attitudinal research on the ability of organisation to influence workers behaviour*'

The Role of the Safety Representative

Moving on from individual contributory factors, the following question on the management survey followed up on the findings of Hrymak, McDonald 2002, who found the presence or absence of a Site Safety Representative plays a strong and influential role in construction site safety, as seen in the literature. This research has already established that the presence of a safety representative is considered by management as the least influential factor in encouraging safe behaviour on site, as found in question 10 and discussed above.

However when presented with a specific finding from previous research, management reaction indicated a somewhat neutral response, where just over half (57%) indicated they were surprised to learn of their positive influence, and the remaining 43% opted for the 'as expected' option, having experienced positive and influential role of the safety representative, indicating that their good work is recognized by some, as presented in Fig. 16. Management were then invited to make comment on their answer to this question, four out of fourteen people did so, all making negative comments as listed in the results section. These negative remarks serve to highlight the thoughts of the 57% who were surprised at the conclusive findings of Hrymak McDonald research, and somehow their surprise appears to be expressed stronger than those who choose 'as expected' and did not follow it up with a comment .

Comparing the two results suggests a level of uncertainty among the management about the role of the Safety Representative and what it achieves. While the question 10 result was strongly expressed, it clearly being identified as the least influential safety factor, in question 13 response only slightly over half of management expressed surprise at the safety representative being found to play a strong and influential role, taking somewhat from the strength of the Q.10 finding.

Considering the strength of the role revealed by Hrymak McDonald, and some uncertainty revealed in the conflicting results of this research, indicates that perhaps the role is not fully understood by all. Possible reasons for this being, while it is a legal requirement in the Construction Regulations 2006 and the Safety Health and Welfare at Work Act 2005, their function is an informal one, and in the experience of the researcher its application varies considerably from one organisation to another, is greatly influenced by industrial relations, and depends on the individual representative.

It is often the situation that nobody runs for election and management use the options available to them under Schedule 5 of the Construction Regulations, to nominate a safety representative, in order to achieve legal compliance. Such safety representative may not always have the support of all persons employed on the site and take on the role unwillingly in the absence of a suitable and willing candidate.

One of the recommendations of the Hrymak McDonald study was that all sites should have safety representatives and their role and function should be reinforced as part of the safety management system, the results of this thesis reiterates the Hrymak McDonald recommendation as a possible way to utilise this role to its full potential.

A Behaviour Change Model

Question 13 provided an outline of a behaviour change safety model that was shown in the literature to be successful when applied to the construction Industry, Duff *et al* 1993, Mattila, Hyodynmaa 1988, HSE 2002, Sulzer Azaroff 1987 and Murray 2006, and was included to fulfil the research aim, '*to investigate how behaviour based safety models would be received by the Irish Construction Industry.*'

These results indicated a sizeable majority of management personnel believe that this type of safety initiative could work in the Irish Construction Industry, as shown by Fig. 15 where a clear majority of 79% (11) believed it would be successful in their organization, and only 21 % (3) didn't believe so.

The comments that were made to accompany the YES and NO answers on the questionnaire provide some insight into the thoughts of the management.

Among those that answered NO, was a comment linked to the problems associated with having a high employee turnover and the difficulty of achieving long term results due to the transient nature of the sector, as discussed earlier and supported by the work of Biggs, Murray, and Mattila, Hyodynmaa in the literature. All highlighting it as creating a difficulty, Biggs noted 'the inherent transience implies that there is little incentive or value for individual construction organisations to invest large sums of money and time training workers that will move on to work for a competitor, (Biggs *et al* 2005).

One interesting comment made by a respondent who believed the behaviour change model would be successful, related to the investment involved by the employer in terms of people's time, at the risk of not achieving any concrete results.

In the literature one of the main findings of Duff *et al* 1993, was that Safety behaviour can be objectively and reliably measured *without* excessive use of managerial or supervisory resource, thus providing a reply to address this respondent's fear.

Management's thoughts on how to influence behaviour

The only open question of the management survey achieved a high level of response; where management were happy to include their thoughts and ideas for improvement. Among the comments made were, were two specific comments relating to use of employment agencies where it was felt agencies should not be used, having all employees as part of the organisation was preferable and that agency employees were difficult to control.

Another interesting comment related to price, noting that the lowest price subcontractor with a bad safety record should not get the job which is often the case. Built into the duties assigned under the Construction regulations 2006, it is a duty of the client to ensure the competency of each contractor appointed, if this was being enforced contracts would not be awarded based on price only, which this respondent has correctly identified brings with it a lot of inherent safety problems.

Level of Interest in a Behaviour Change Pilot Project

Management expressed a significant level of interest and a strong will to partake in an industry lead behaviour change pilot project, and would be strongly motivated to do so by the possibility of reducing accidents and ill health.

In comparing the motivating factors to those of Part 1, of the questionnaire, Motivation for safety management, the main driver behind both safety management and expressed interest in an industry pilot study is the reduce accidents and ill health.

Summary of the Part 3

It has been established from Part three of the survey that, management strongly believes that unsafe behaviour by the injured party is a significant accident contributing factor, and they feel they have a 'good ability' to influence the behaviour of their workers. Safety Culture, Management Commitment, and Supervision were identified as major factors that influence safety, contrary to the findings of McDonald Hrymak 2002, the presence of a safety representative was considered to have the least influence on safety. Individual behavior is considered by all to be an accident causation factor.

There was an element of uncertainty among the management about the role of the Safety Representative and it achievements, revealed by findings that somewhat contradicted each other.

A large majority believed a behaviour change model would be successful in their organization, and expressed significant interest to partake in an industry lead behaviour change pilot project. The main driver behind both safety management and expressed interest in an industry pilot study is the reduction accidents and ill health.

5.2 Discussion of Operatives Questionnaire

In a similar style to that of management the operatives questionnaire followed the same sequence of questioning, Part 1 established the operatives profile, Part two focused on their personal accident record and Part 3 investigated behaviour safety

Profile of the Operatives Group

Part 1 of the questionnaire identified the operatives as being experienced construction industry employees, having spent between 5 to 10 years working in this sector, most were from the Republic of Ireland, aged between 30-40 years old.

A good mix of construction industry job types were represented among them being general operatives, trades, foremen and various engineering staff, with the highest response being from general construction workers, which is the target audience for this questionnaire. Ideally the researcher would have preferred a greater input than 15% from site foremen.

The employment arrangements of the group were identified as being mostly full time permanent employees working for the main contractor, which indicated a largely stable group, rather than a transient group, and those that are under the influence of the main contractor, who is in a good position to have a consistent influence on their workforce. However a high portion of operatives, 20% were using the services of an employment agency, which emerged as the second biggest employment category.

Operatives reported having different levels and combinations of training completed and in some case a very poor level of training.

Non Irish Nationals in the Construction Industry

The CSO reported in 2006 that 1 in 8 workers in the Irish workplace was a non Irish national, accounting for a total of 49% of the workforces, 14.2% of whom were employed in construction sector. (CSO censes results, 2006, www.CSO.ie) The strong presence of non Irish nationals did not feature in this research; the operative group was predominately from the Republic of Ireland, (82%) as demonstrated by Fig 19. While the presence of the foreign workforce is a very real one has many issues and health and safety concerns attached, it is not however the focus of this research.

Level of Safety Training Completed

The results presented in Figures 23, 24, 29 and Table 9 indicated training received by operatives varied greatly, there were various combinations of training complete, in some cases very poor levels of training; remembering that most of these operatives (79%) have been working in the industry for between 5-10 years, the results indicate a poor training culture.

It was established earlier that 24% of operatives were working as tradesmen, yet the training results revel that only 3% have received training or completed apprentice training, indicating that people working in a professional trade capacity in the construction sector have not received any formal training.

Of note also is the low percentage response of 53% of operatives that have received site safety induction and ongoing safety tool box talks, while safety induction is a legal requirement falling under the duty of the Contractor in the Construction Regulations, Tool Box talks are not statute based but are good safety management and a widely used safety management tool. One wonders if such poor training is representative of the Irish Construction Industry as a whole, and it is certainly a lost opportunity for the organization to influence workers behaviour. Setting the standard on entry to a job or a site in the form of a safety induction and maintaining this with regular focused tool box talks a safety culture evolves, and without these two fundamentals a safety culture is difficult to establish.

A 15% response rate was yielded for the Managing Safely in Construction (MSIC), considering the profile of the group above one would expect this corresponds to the 15% response represented by foremen, however the results indicate only one of five foremen have undertaken this course. The Foremen surveyed indicated a very poor level of safety training considering their responsibility and proximity to the frontline workers, details of their training are provided in table 9.

Safe Pass Training- Overall there was good compliance with mandatory Safe Pass training, although a very small 8% not having the training signified that the non compliance does exist. Safe Pass training being a one day safety awareness training

programme is very little training for operatives working in this high risk sector, and needs to be done in conjunction with other safety training. Figure 25 outlines the combinations of training received by the operatives, site safety induction, tool box talks and Safe Pass being the most common. This combination is the very least that employers should do to ensure minimum standards of Health and Safety Training are carried out.

24% of operatives reported Safe Pass as their only form of safety training, and 69% reported safe pass and other training, other training mostly being safety induction and tool box talks. This 24% receiving safe pass training only, signifies an over reliance on the Safe Pass course on the behalf of the employer who should follow it up with some form of regular safety training, and raises a question about the employer only providing the training that is necessary for their legal compliance.

Employment Arrangements

It is accepted in literature that employment arrangements have been found to be related to risk taking behaviour, Dunne 2000, Slovic 2000, however the majority of operatives who partook in this research were full time permanent employees of the main contractor, accounting for some 70% of the group, therefore any risk taking tendencies that may be revealed in part 3 of the survey, cannot be attributed to this factor.

A high portion of operatives, 20% were using the services of an employment agency, which emerged as the second biggest employment category of those surveyed. Agency workers are typically transient in nature moving from job to job, having no loyalty to any employer and not under the specific guidance or influence of any organisation when it comes to safety issues. In the experience of the researcher, agency workers often miss out on safety improvement initiatives, training and safety awareness campaigns due to their temporary employment arrangements, however they are continuously exposed to the same level of risk as other construction workers, and spend equally as much time exposed to the risk. The details of employment arrangements are presented in Figures 28, 29 and 30.

Accident History

Part 2 of the questionnaire established that 15% of the group had been involved in a workplace accident, which relates to 5 people. Relating the accident record to the operative group profile, it emerges that all were from the more mature age group, and were experienced construction industry workers, three out of five were working as shuttering carpenters and three were agency staff having no fixed contract while the remaining two were in full time permanent employment being paid a set wage.

The type of injuries sustained were typical of those of the construction industry, corresponding to four out of five injuries corresponding to the top six injury type as stated by the H.S.A summary statistics, presented in Table 12. Fig 31 and Tables 11 and 12 detail accident information.

Time in Industry and Accident Causation

Time in industry, age and experience are all factors commonly examined for links to accident causation. A study of Training and Safety Performance in the UK construction industry found that, workers age and duration of career have an impact on the level of safety performance, with a greater accident involvement among the older workers, and those who have been employed for more than 16 years. (O'Sullivan. N 2000), the accidents revealed by this research fit this profile, four out of the five accidents happened to those over 10 years in the industry, and all being from the more mature age groups.

While Irish construction industry statistics indicate that it is the younger age groups that are at higher risk of injury; while the older age groups suffer from higher rates of illness. Age range from 15-19 showed particularly high injury levels across all sectors, including construction. (HSA 2006(a) pg 28)

Accident Causation and Employment Arrangements

Three out of five accidents reported in this research happened to an employment Agency worker, who it was shown above accounted for 20% of the response group, and were identified as being a transient group, not under the influence of any employer in particular, who often miss out safety and training initiatives.

Agency workers were considered a concern in the Management Survey of this research, discussed earlier, when management were asked to express their opinion what industry could do to influence workers behaviour, not using agency workers was suggested by a number of people, there was also a comment on difficulties with controlling agency workers.

Summary of Part 2:

It has therefore been established by part two that 15% of operatives have been involved in a workplace accident, most of who were mature, experienced workers, using the services of an employment agency, had no fixed contract, and most of them were carpenters. The types of injuries received were typical of those of the industry.

Behaviour Safety

Part 3 focused on behavioural safety, in the opinion of frontline workers, i.e construction industry operatives. In a sequence similar to that of the management questionnaire, parts one and two established the profile of the operatives group, in terms of age, experience, employment arrangements before zoning in on specific research aims.

Attitude to Safety

Despite the fact that the 'towards safety' statements and the 'towards risk' statements were spread out through question 12 as they appeared in questionnaire, the results revealed a definite trend in the replies, as is clearly demonstrated in Fig. 32.

Strong agreement with the statements that indicated a good attitude towards safety, and strong disagreement with the statements inclined towards risk. The operatives therefore have demonstrated a good appreciation of health and safety, of the level of risk involved and the need for training and regulation in the industry. To single out some replies of particular interest:

Risk Perception

- '*The chance of me having an accident is quite low'* was the only statement to receive a totally neutral response, 50 % suggesting a division of opinion.
- The opposite to this statement i.e. '*There is a good chance I could be involved in an accident*', yielded a 62% agreement,
- When presented with the statement 'construction is a high risk job' 94% agreed

The above three statements indicate that while the large majority (94%) agrees that construction is a high risk job, 88% (i.e. 38% + 50%) perceive their chances of accident involvement as being low. This set of replies indicate a certain...'it will never happen to me attitude', if we recall the work of Cooper 1998, in the literature 'people often behave unsafely because they have never yet been hurt while doing their job in an unsafe way; I've always done the job this way being a familiar comment when asked why they behave in that way. (Cooper 1998), remembering that only 15% of the response group have been involved in a workplace accident.

In the literature the effects of *reinforces* and *consequences* on our behaviour were detailed, and perhaps this is being demonstrated here among the operatives, who have indicated that the risk is high but do not believe it will affect them. Referring to the work of Dunne 2000, 'The very fact that we took a risk and didn't have an accident then in itself becomes a 'reinforcer' encouraging us to behave this way again...'people learn from experience'…'we get away with the chances that we take (Dunne 2000).

Attitude to Management Commitment

- 94% of operatives recognise the importance of management's commitment to safety, agreeing with the statement *'having management committed to safety is important'*

This is a strongly expressed opinion on behalf of the operatives surveyed, while it is in keeping with that of McDonald Hrymak, their study found that management commitment was perceived as being moderate, (McDonald, Hrymak 2002), while the operatives who partook in this survey expressed a stronger opinion, both studies indicate the operatives in the Irish construction sector do understand the necessity of management commitment to safety.

Attitude to legislation and training

The majority of operatives were in agreement with statements presented on the usefulness of safety legislation and mandatory training, largely agreeing with positive statements, like new safety laws help to manage the risks on site, Safe Pass and CSCS have been a good idea, and disagreeing with negative statements that there are too many rules, safety rules slow down the job, and that they could do their job just as safe without all the rules.

The statement 'some safety rules are unnecessary ' was the only one of this group of statements to receive a result tending towards neutral, with just over half, 56% disagreeing with it. While the operatives do appreciate and understand the importance of rules and regulation in order to manage safety, there is a feeling that some of the rules are unnecessary. There was 74% agreement with the statement that Safe Pass and CSCS had been a good idea, which is a strong positive statement from the operatives. These results are similar to the positive findings of the Claritas Report as reviewed in the literature, who found that the programs were well received.

Both results indicate that the Safe Pass and CSCS program is making a positive contribution to the construction industry safety and are valued by the construction industry operatives.

Attitude to Safety Officer and Safety Representative

In the opinion of construction site operative's safety officers and safety representatives both making a positive contribution to improving safety on site, which is strongly indicated by results of 83% and 84% respectively, where respondents believe their presence makes for a safer site. Of note here is the difference in opinion of the Operatives to that of the Management on the role of the Site Safety Representative.

Responsibility for Safety

When questioned on who has responsibility for their safety, results for these statements were not quite as clear as the others of the survey, the majority (88%) believes that they are responsible for their own safety at work, and 59% stated that their employers were responsible for their safety at work. As both parties do have responsibility neither answer is right or wrong in this instance, however it is important that operatives realise their own responsibility, in the experience of the researcher this is often not the situation. Considering these two results there is at least 29% overlap of those who have agreed with both conflicting statements, possibly representing 29% of the group feel that both parties have a responsibility.

The results for the Attitude to safety as explored by question 12 are presented in Table 13 and Figure 32.

Risk Perception and Reporting Tendencies

In question 14, operatives were tested on their perception of risk and reporting tendencies when presented with ten actual work situations. The results showed a preference to stop work and report the situation; overall the results would suggest the opinion of the operatives expressed in question 12 above, where 94% of operatives believed they were very conscious of their own safety was an accurate statement.

None of the operatives indicated that they would 'Keep Working' in any of the risk situations, demonstrating a responsible safety attitude. None of the operatives

indicated that they were 'Not Sure', in any of the risk situations, which shows a good level of communication where everybody chooses some course of action. Table 14 and Fig 33 present the results of question 14.

The Role of Trust

In part one of the operative questionnaire 70% of participants were identified as being in full time permanent employment for a main contractor, and 79% have between 5 to 10 years working in this industry, an element of trust between the employer and the employee could be assumed here, and could possibly play a part in their accurate perception of the risk. In the literature it was shown that trust is an important element when discussing risk and risk perception, and is linked with having an influence on ones perception of the level of risk involved in an activity. Referring to the work of Slovic, 'it is widely accepted that trust is a key factor influencing risk perception, an activity is more risky if people or agency managing it is perceived as untrustworthy'(Slovic 2000).

Fixing a problem, not trained for the task

Operatives did not indicate with any strength of response that they would fix a problem themselves and continue working, an option which has been identified as contributing factor to fatal accidents in the construction industry, as seen in the Dalton study in the literature, where 'using initiative to solve a problem, not trained or experienced for the task', was identified as being a contributor to fatal accidents at injured party level. This option yielding a low response ranging from 3-15% for all of the situations presented.

Reporting Preference

Reporting preference in the given risk situations clearly showed the Safety Officer was the preferred choice, as opposed to the Safety Representative. Considering 83% of operatives felt that the presence of a safety representative made for a safer site, as indicated in question 12 above, yet in this question they chose to report to the safety officer this is not the result one would expect. However it could be evidence pointing to the importance of having both a safety officer and a safety representative, and it shows that both of these roles are having an impact.

Perhaps the safety officer is the preferred reporting choice as they have are the trained professional working in a formal safety function, a stand alone role that is free of bias to employer or employee, in comparison to the safety representative who has an informal role, has another full time function on the site, has little training and may not been seen in a great position to actually do something about the problem, other than report it to the safety officer themselves. This is further evidence that there is a need to improve the profile of the safety representative role.

Safety Culture

Question 14 investigated safety culture in the experience of the operatives, where it has been shown in Fig. 34 that commitment was perceived as being good, management were seen to have a prompt response to safety issues, to allocate materials and resources as required and take the breaking of safety rules very seriously.

The only negative finding for the safety culture question was that the operatives felt that site management only complies with safety because they have to. What leads operatives to this conclusion is not explored by the question, perhaps the operatives are referring to a legal requirement to comply with safety legislation, or senior management in an organization insisting on it, one can only speculate.

One of the aspects of safety culture, the use and enforcement of disciplinary procedure yielded a neutral result, as opposing statements had equal but opposite responses, the purpose of this question was to investigate how the systems are 'lived' in organisations, or are they merely a paper exercise, considering the results no comment can be made on this.

Management Commitment

The commitment of site management is necessary for any improvement initiative, and has been shown in the literature to be an important element in the successful application of behaviour based safety model in the construction sector.

Duff *et al* 1993 and Mattila, Hyodynmaa 1988 both found that having management commitment enhances the effectiveness of the goal setting and feedback approach, in their application of behaviour based safety in the UK and Finland. On the other hand

poor management control has been linked to unsafe acts or unsafe conditions, as in the Bird and Loftus accident causation model (Cooper 1998) also in the literature.

The Behaviour Change Pilot project (Murray 2000) noted that following the intervention, the changed behaviour of wearing the safety glasses was not maintained by all; and the supervisor of those that did not maintain the behaviour had not demonstrated commitment to the project and had not felt the glasses were helpful. (Murray 2000), this example demonstrates the effect that poor management commitment can have, in addition to the role modelling effect of the supervisor.

Safety Awareness

The final question of the operative's questionnaire investigated their experience with the level of safety awareness and compliance in the industry, following the same theme as the previous one, also relating to safety culture. It focused specifically on site induction stage, familiarity with safety statements and risk assessments and compliance with statutory safety training requirements.

Overall the response was very positive with operatives providing the answer 'Always' more frequently than any of the other options which included, regularly, seldom, never and on big sites only. Fig. 33 represents the higher percentage response for the Always category in all of the statement presented, shown by the blue colored line.

Mandatory Training

This survey has indicated that there is stronger enforcement with the regulatory requirement to request safe pass before commencing on site, than there is for CSCS. In considering this result the researcher wonders if some of the respondents were not familiar with the CSCS card system, if it didn't directly apply to them they may have answered the question accordingly, hence there is a little doubt over the validity of this result.

Site Safety Induction

There is a good culture of carrying out site safety induction; it is always carried out according to 70% of the response group, while a slightly less 68% were familiar with their employer's safety statement. Both relatively positive findings in terms of safety

culture, however the follow through in making employees aware of the risk assessment that relates to their job is weak, with only 35% of respondents saying this is always the situation. The method statement, safety statement and CSCS requirements, yielded 'never' response in the experience of a small number of operatives, 9%, 3% and 9% respectively.

Therefore in the opinion of the this study has established that safety culture and compliance with statutory requirements is predominately good, this concurs with the findings of McDonald Hrymak where Management Commitment was perceived as moderately good. (McDonald, Hrymak 2002), however there was some evidence to suggest that there is poor compliance with statutory requirements on safety statement, risk assessment and CSCS requirements, and that most sites start off well with safety induction and safety statement but follow through thereafter is weak, in terms of the use of method statement and risk assessments.

Summary of Part 3

The results of part 3 revealed there is a good attitude to safety among site operatives, strongly disagreeing with statements inclined towards risk, and agreeing with statements towards responsible safety management, demonstrating a good appreciation of health and safety, of the level of risk involved and the need for training and regulation in the industry.

There was evidence to support the literature that our behaviour is governed by consequences and reinforcers, where the majority of operatives felt construction was a high risk job, but felt that their chance of having an accident was quite low. As it was shown in Part 2 that only 15% of the group had been involved in an accident, which according to the literature, means that 85% have never suffered the negative consequence of an injury, which acts as a reinforcer of the behaviour. Hence the findings support the theories as seen in the literature on reinforcers and consequences on our behaviour, operatives demonstrated a ...'it will never happen to me attitude', similar to that documented by (Cooper 1998, Dunne 2000)

Operatives recognise the importance of having management commitment to safety, and expressed support for the introduction of Safe Pass and CSCS training; both

findings support those of the Claritas Report. However operatives did feel that site management only complies with safety because they have to.
There is an appreciation for the need of legislation and regulation in the industry.
There was a difference in opinion of the Operatives to that of the Management on the role of the Site Safety Representative, with the opinion of operatives being that their presence makes for a safer site, yet the operatives group showed a preference for reporting to the safety officer.

The majority of operatives feel they have responsible for their own safety, however there was some overlap of response indicating that both the employer and the employee have a responsibility for safety on site.

The operatives demonstrated a responsible attitude to safety and were sure about what to do when presented with various risk situations, nobody choose to 'Keep Working' or were 'Not Sure' in any of the risk situations presented. Also fixing a problem oneself (while untrained to do so) and continue working, was not a preferred choice.

Levels of safety awareness and compliance in the industry were found to be good, with operatives providing the answer 'Always' more frequently than any other options when questioned on safety induction, method statements etc...there was evidence to suggest stronger compliance with presentation of safe pass cards than that of CSCS before commencing on site and most sites start off well providing safety induction and safety statement but follow through with use of method statement and risk assessments was weak.

5.3 Some Final Thoughts

The author set out to establish if a behaviour based safety programme is a suitable safety initiative to address the poor accident record of the Irish Construction Industry, obtaining the opinion of both construction industry operatives and management was central to completing this task. Some interesting differences of opinion were expressed, indicating quite a gap between the two parties, indicative of problems with communication, ownership and trust a summary of these views are outlined below.

1.Views on the Safety Representative:

Operatives and management showed a considerable difference in their opinion of the role and impact of having a safety representative on site. A large majority of operatives (83%) believe that the presence of a Safety Representative makes for a safer construction site, (Table 13) while management clearly identified the presence of a safety representative as the factor having the least influence on site safety. (Fig 14)

2. Responsibility for Safety

Half of the operatives believe their employer has responsibility for their safety, (Table 13) therefore in the event these operatives having an accident they consider it occurred through no fault of their own, but through that of their employer.

Management on the other hand have clearly identified unsafe behavior by the injured party as the biggest contributory factor to accident causation in their organization, also indicating a strong belief that the injured parties' behaviour is a significant contributor to construction industry accidents as a whole. (Fig 14 & Fig 15)

3. Compliance with Legislation and Accident Reduction

Management stated their reason for managing safety is to reduce accidents and ill health, stating accident reduction as their motivating factor twice in this survey. (Fig. 9 & Table 9) However in the opinion of the operative's management only manage safety because they have to, suggesting perhaps it was for legal compliance rather than any real wish to reduce accidents and ill health. (Fig.34)

4. Safety Management Systems

Management feel they have good systems in place, indicated by strong compliance with the main provisions of relevant legislation as in Table 4, yet the operative's survey identified some holes in management system. (Table 13)

- 65% of operatives reported not being familiar with risk assessments relating to their job,
- 35% say CSCS cards are not always checked,
- 65% indicated that method statement are not written and explained before every job, and some indicated that this was never done on site.

These findings clearly indicate communication problems, and both parties see things very differently. How can management possibly lead and improve a situation with such a divide. The opinion difference highlighted by numbers 3 and 4 above, raise the question, are management just ticking the boxes to achieve legal compliance, rather than proactively engaging in safety management. Further evidence which questions management's motivation is in (Fig 26) where 24% of operatives had safe pass as their only form of training, showing no real interest on the part of the employer in developing the competency of their employees, again achieving minimum legal compliance only.

Is the Irish Construction industry suited for Beahvioural Safety?

At present behavioural safety techniques are not widely used as part of safety management in the Irish construction Industry, completion of this thesis poises the question is the industry suited to this type of initiative, and how far away from implementing these techniques are we? Comparing the findings of this research to a generic behavioural safety model, as developed by HSE research, it appears that the Irish Construction Industry is not quite ready for this intervention, while some ground work is required it could be achieved with the co operation of all stakeholders.

The Key Elements of a behavioural safety programme (HSE 2002)

- Cultural Maturity & Readiness
- Management and Work force support and ownership
- Specify critical behaviours
- Establish a Baseline

❖ **Cultural Maturity & Readiness**

- Management Commitment has been demonstrated, was shown to be strong in the opinion operatives while management showing a strong will to partake in a pilot project on Behaviour safety pilot project. Management also expressed a view that such a programme would be successful.
- Communication: There would appear to be poor communication between both parties, highlighted by some of the different views expressed above.
- Trust: In the research an element of trust was assumed at one point due to the length of time in industry, however there are definite tones of a divide between employer and employee, 'them and us scenario' in particular in accident causation factors, the management were strong in their blame for the individual while the individual feels they are safety conscious, all symptomatic of distrust.

- **Management and Work force support and ownership**

  Neither the management nor the Workforce is taking ownership of the safety problem. Operatives have shown lack of ownership of the safety problem by believing that their employer is responsible for their safety, while management attribute a high proportion of blame to the operative for the accident record of their organisation and the industry as a whole

- **Specify critical behaviours**

  Have not been identified by industry at present, while there are provision is place that infers activities are more critical than others, e.g. CSCS categories for safety critical jobs, implementation started with the most critical, and some element of construction are more heavily regulated than others, e.g. working at heights.

- **Establish a Baseline**

  The first actual implementation step

What needs to be done to bridge the gap?

So it appears there is quite a gap, it is the author's opinion that if a few key stakeholders of the Irish Construction industry took it on board and set out to promote Behavioural Safety as a new safety improvement initiative, it would be taken up and replicated across the country and achieve success.

If one considers the trend in the industry at the moment where use of the red card disciplinary system; has only developed in the past five years, it started in the larger companies and spread across the country, and is now widely used on sites and in companies of all sizes, in a similar way the use of Tool Box Talks have become commonplace. This too could happen with Behavioural Safety, and as was found by Duff *et al* in the UK, it could achieve more success than any previous intervention. (Duff *et al* 1993)

Where to start?

1. Commitment of Stakeholders, the HSA, the CIF and a few of the larger construction companies need to get involved work together, make a commitment and become project leaders.
2. Identification of safety critical behaviours, Identification of the safety critical behaviours is an essential first step, in order to do this on an industry wide basis grouping of job or task would be a good start, e.g. working at heights, or pouring concrete some of the ground work is already established as CSCS categories and specific construction regulation already identifies safety critical jobs. A generic section could identify common problems like wearing PPE e.g., helmets and vests a critical behaviour to change might be, not taking them off at lunch break and forgetting to put back on, to use a simple example.
3. Establish a baseline: The project leaders need to conduct baseline observations, which are initial observations to establish the current level of safe behaviours, focusing on the critical behaviours they have identified. This will be useful to provide feedback and measure the success in changing behaviour.
4. Cultural Maturity and Readiness of the Industry: This is where there is quite a bit of work to be done by all the major stakeholders if this initiative is to be successful. Particular problems to be addressed highlighted by this research were lack of communication and trust between employer and employee, there is no ownership of the safety problem by either party. In some instances there is still a struggle for construction companies to achieve minimum legal compliance, and there was evidence to suggest that some were only ticking boxes rather than having any real interest in safety management.

If the industry could overcome the problems outlined with cultural maturity and readiness, the author believes that Behavioural Safety would work and have a lasting impact on safety in the industry, referring again to comments made by Duff *et al,* they felt it was pertinent to contrast their Behaviour Safety project with the minimal effects that previous research had recorded for other interventions, such as information safety campaigns and safety training. (Duff *et al* 1993) This research has established there is a will amongst construction industry management to give it a try, at present however behavioural safety is very much an initiative for the future.

Chapter 6

6.0 Conclusion

This thesis investigated the suitability of a Behaviour based safety initiative to combat the poor accident record of the Irish Construction Industry, the opinion and attitude of operatives and management from the industry on behaviour safety and related issues.

Fulfilling the aims of this study the following conclusions are suggested

- *To investigate how behaviour based safety models would be received by the Irish Construction Sector*

The results strongly indicate that behaviour based safety model would be welcomed as a safety initiative. A significant level of interest was expressed in taking part in a behaviour change pilot study, and a large majority of management believes it would be a successful safety initiative in their organisation.

- *To explore the precursors to risk taking behaviour among construction workers*

On completion of this thesis the following are suggested as possible precursors to risk taking behaviour, and subsequent accident causation

  - Poor levels of training - or having no formal training for the work carried out
  - Employment Arrangements – not having a fixed contract, and working for an employment agency
  - Having Good Supervision - the foremen in this study were poorly trained for their job
  - Previous involvement in an accident - operative's showed an accurate perception of the risk, but as most had not been involved in an accident they felt it unlikely they would be, supporting the theories of behaviour and consequences.
  - The effects if transience - where due to moving around a lot workers have less exposure to the positive influences on safety, such as a good safety culture, management commitment and a sense of belonging to an organisation.

- Poor Safety Culture Management Commitment – management committed to safety has been shown as having the strongest influence on workers behaviour, the absence of this commitment would have many knock on effects for the culture and subsequent behaviour of the employees.

- *To conduct attitudinal research on the ability of organisation to influence workers behaviour.*

All management surveyed believed they have an ability influence the behaviour of their workers, while the majority 71% indicated having a good ability the remaining 29% indicated having some ability to influence.

- *To obtain the opinion of management on individual behaviour as an accident causation factor in their organisation, and the construction industry.*

Results strongly indicate management believes individual behaviour is an accident causation factor of significance. The majority identified unsafe behaviour by the injured party as being the biggest contributory factor to accident causation in their organisation. All of the management surveyed believed individual behaviour to be a causation factor to construction industry accidents. Most regarded it as being a causation factor to some extent 64%, while the remaining 36% considerer it a major contributing factor. While operatives are of the opinion they are very conscious of their own safety.

6.1In response to the Research Question

"What drives construction workers to take risks, and what if anything can organisations do to influence behaviour towards safety on site?"

The findings would suggest that construction workers are driven towards risk by the following conditions:

- Poor Safety Culture
- Management not commitment to safety
- Poor Supervision
- Poor levels of safety training
- No fixed employment arrangements, or temporary arrangements
- Previous involvement in an accident
- The effects of transience workforce in the industry

Organisations have been found to have a strong ability to influence the behaviour of their workers. Their influence manifests itself by

- Having management commitment to safety
- A good safety culture
- Good supervision.

Management was motivated to do so by a wish to reduce accidents and ill health.

Among the specific ways suggested by management to influence behaviour was to stop using agency staff, provide more training and continuous improvement, maintain good levels of communication and do not put price over safety in selection of subcontractors.

6.2 Recommendations

On conclusion of this thesis the following recommendations are made:

- The HSA should follow up on the 2006 Behaviour change pilot study, undertaken by Patricia Murray, following the success of that action research with an agency lead initiative, inviting large construction companies and the CIF to get involved. This research has found that there is significant interest and a strong will to take part in this type of project, but there are issues with cultural maturity and readiness to be addressed. Section 5.3 of this thesis outlines a possible starting point.

- Echoing a recommendation from the Hrymak McDonald study, all sites should have safety representatives and their role and function should be reinforced as part of the safety management system.

- Industry and the regulations should investigate ways to improve the profile of the Safety Representative, and make it a more attractive and well respected function of safety management systems.

- The Insurance industry should put greater emphasis on providing safety incentives and using their position as a major stakeholder to play a stronger role in motivating companies to manage safety, thus improving the accident record of the construction industry.

6.3 Study Limitations:

Limitations of this study were recognised as:

- Both questionnaires contained too many questions, often with too many options given in each, and the theme of questioning in some instances was very similar. This manifested itself as a problem during analysis, presentation and subsequent discussion of the results, where some of the longer questions were difficult to present in a meaningful way that allowed ease of interpretation for the reader.

- Part 2 of the management questionnaire was not adequately explained leading to an over representation of accident history data.

- The Civil Engineering Sector were represented more strongly than any other type of construction work, hence the findings are largely limited to this sector.

- The younger age groups in the operative's questionnaire were underrepresented with the response being mostly from those aged 31 to over 40.

6.4 Further Research

In relation to further work on this topic it is suggested that

- Further exploration of the difference in opinion of management and operatives; by asking more of the same questions to both groups and comparing the answers.

- Compare the answers given to attitude and risk taking type questions to the profile of the individual, to establish if their profile effects their replies, time allocated this thesis did not permit undertaking this type of analysis.

- Explore the roles of all the major stakeholders in the construction industry; identify weakness in input to improving the safety record and target specific areas for improvement.

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Appendices

Taverane
Cloonloo
Via Boyle
Co.Sligo

Re: Safety in the Construction Industry - Research

Dear Sir,

I am currently undertaking a Master of Science (M.Sc) in Health Safety and Environmental Management at Sligo Institute of Technology. As part fulfilment of this course I am required to do research and produce a dissertation.

My chosen topic is Safety in the Irish Construction Industry. In particular I will investigate the following areas,

- Accident Causation and Contributory factors
- Individual behaviour as a contributor factor to accidents / poor safety
- The possibility of influencing individual behaviour to encourage safety
- The influencing factors towards safety

It is my intention to extract this information from a representation of the construction sector by means of a questionnaire. Two questionnaires have been formulated. One Is designed for Site Management the other for Construction Operatives and site staff. Both of which you will find enclosed.

I would really appreciate if you would complete the enclosed Management Questionnaire, and return it in the addressed prepaid envelope provided, before May 21st. In addition if you would please distribute the Operatives Questionnaire to appropriate personnel in your organisation to do likewise.

As somebody who has worked in the industry I fully understand the many demands on your time, and I have designed the questionnaire with this in mind, and truly appreciate your time in completing the attached.

Needless to say, the information provided will be treated with strict confidence and individual organisations or participants are not identified.

Yours Faithfully,

Deirdre McKeon

Appendix 2- Cover letter to Operatives

Taverane
Cloonloo
Via Boyle
Co.Sligo

Re: Safety in the Construction Industry - Research

Dear Sir,

I am a student, currently undertaking a Master of Science (M.Sc) in Health Safety and Environmental Management at Sligo Institute of Technology. In order to complete this course I am required to do research and produce a written report.

My chosen topic is Safety in the Irish Construction Industry. I intend to survey a number of Irish Construction Companies, getting the opinions and thoughts of construction industry workers on:

- The causes of Accidents
- What does individual behaviour have to do with accidents
- How to encourage people to behave safely

I would really appreciate if you would partake in my survey by completing the enclosed Questionnaire, and return it in the addressed prepaid envelope provided, before May 21st. It is very important that I get a high number of responses to make the research meaningful.

As somebody who has worked in the industry I fully understand the many demands on your time, and I have designed the questionnaire with this in mind, and truly appreciate your time in completing the attached.

Needless to say, the information provided will be treated with strict confidence as individuals or organisations are not named.

Yours Faithfully,

Deirdre McKeon

Appendix 3 – Draft Questionnaire – Management

Management Questionnaire

Please respond to the following questions by either ticking the appropriate box or writing your answer in the space provided.
Please Note: All information provided is completely anonymous

PART 1 - General Information

1. Please indicate your position in the organisation

- Project Manager ☐
- Contracts Manager ☐
- Site Agent ☐
- Safety Advisor / Officer / Manager ☐
- Other……..Please Specify ☐

2. Which category best describes the size of your organisation?

- 10 -50 employees ☐
- 50 – 100 employees ☐
- 100+ ☐

Please tick the category that best describes your turnover of staff

- High Turnover (1-6months) ☐
- Fairly Consistent Workforce (12 months – 2 years) ☐
- Consistent Workforce (2 years +) ☐

3. Which category best describes the type of construction carried out by your organisation. (Please tick more than one box if appropriate)

- House Building ☐
- Civil Engineering ☐
- Commercial Developments ☐
- Restoration ☐
- Other……..Please specify ☐

4. Which of the following statements represent the reasons for Managing Safety in your Organisation. (You can select more than one where appropriate)

- To reduce Accidents and ill Health ☐
- To comply with legislation ☐
- To reduce insurance costs ☐
- Client requirements ☐
- Head Office requirements ☐
- Employee representative group requirements ☐
- Other……Please specify ☐

Management Questionnaire

Please respond to the following questions by either ticking the appropriate box or writing your answer in the space provided.
Please Note: All information provided is completely anonymous

5. Does your organization have provision in place to meet the requirements of the following Legislation?

	YES	NO
▪ Safety Health & Welfare at Work Act 2005	☐	☐
▪ Safety Health & Welfare at Work (Construction Regulations) 2006	☐	☐

Do your provisions include the following?

o Do you have a Documented Safety Statement	☐	☐
o Do you have Documented Risk Assessments	☐	☐
o Do you have a full time safety person(s) employed	☐	☐
o Health and Safety Training Programme	☐	☐
o Health and Safety Committee	☐	☐
o Is there an appointed Safety Representative	☐	☐
o Appointment of PSCS, PSDS	☐	☐
o Operatives trained CSCS	☐	☐
o Full time on Site Safety Officer – where 20 people or more	☐	☐

Management Questionnaire

Please respond to the following questions by either ticking the appropriate box or writing your answer in the space provided.
Please Note: All information provided is completely anonymous

PART 2 – Accident History

6. Please tick the appropriate number of accidents & incidents that have occurred in your organization over the past 5 years

Accidents (results in the injured party being 3 days or more away from work)

- Less than 5 ☐
- 5-10 ☐
- 10-20 ☐
- 20-100 ☐

Incidents (less than 3 days) If recorded in your organisation

- Less than 5 ☐
- 5-10 ☐
- 10-20 ☐
- 20-100 ☐

7. Rate in order of frequency (from 1-12), the type of accident most common in your organisation (1 being the most frequent 12 being the least)

- Slip, trip and fall ☐
- Stress or Strain ☐
- Transport – Workplace ☐
- Falling Object ☐
- Fixed Object ☐
- Sharp Object ☐
- Overturning of plant ☐
- Fall from a height ☐
- Trapped or Crushed ☐
- Hand Tools or equipment ☐
- Chemical Skin …Chemical Inhalation… ☐
- Burns ☐
- Other……Please specify ☐

Management Questionnaire

Please respond to the following questions by either ticking the appropriate box or writing your answer in the space provided.
Please Note: All information provided is completely anonymous

PART 3 – Behavioural Safety

8. In relation to the accidents and incidents most common in your company. Based on your opinion, please identify the top 5 contributory factors.
Rating them from 1-5 in order of seriousness (i.e. 1- being the most serious – 5 being the least)

Factor	**Rating from 1-5**
▪ Unsafe Behaviour – By injured party	☐
▪ Lack of Training / Poor Skills	☐
▪ Poor Supervision / Management	☐
▪ Lack of Procedures / Risk Assessments	☐
▪ Time Pressure on the job	☐
▪ Other……Please specify	☐

Please note any other contributory factors, while not in the first 5, you feel are worth noting.

……
……

9. Where you feel behaviour has contributed to an accident or a near miss. Rate in your opinion, the ability of your organisation to target and influence the behaviour of your employee's

- A good ability to influence ☐
- Some influence ☐
- Very little influence ☐
- No influence ☐

10. What in your opinion influences good behaviour (towards safety) on site? Please give your rating from 1-10 on each of these statements.
1 being the most serious, 10 being the least

Statement	**Rating out of 10**
▪ Age (very young or too old)	☐
▪ Personal Care and attention to safety	☐
▪ Length of time in the industry	☐
▪ Competency at a given task	☐
▪ Safety conscious workmates	☐
▪ Good Supervision	☐
▪ Strong Safety Culture & Management Commitment	☐
▪ Active Disciplinary Procedure	☐
▪ Presence of a Safety Officer	☐
▪ Presence of a Safety Representative	☐
▪ Other(s)……..Please Specify	☐

Management Questionnaire

Please respond to the following questions by either ticking the appropriate box or writing your answer in the space provided.
Please Note: All information provided is completely anonymous

11. Please consider the following statement and tick the box that best describes how you feel.

- Individual Behaviour as contributor to construction industry accidents
  - Is a causation factor to some extent ☐
  - It is a major cause of accidents ☐
  - Does not contribute at all ☐

12. A previous study has shown that Safety Representatives have a potentially strong role in influencing both behaviour and compliance within the industry.

Please indicate which of the following best describes your view on the above finding?

- Surprise & underestimation of the ability of Safety Representative to influence ☐
- As expected, I have experienced the positive and influential role of the safety representatives ☐
- Any Comment

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13. From your experience, do you think the behaviour change model below would be successful in your organisation?

- **Goal Setting, Observation & Feedback**
  This involves the identification of safety critical behaviours. Targeting behaviour(s) to be changed and setting specific goals. Observation of progress on the changed behaviour is a key feature, in addition to giving consistent formal feedback to the participants. It involves significant workforce participation. The regular focused feedback drives continuous improvement.

Yes ☐ **No** ☐

Please give reasons for your answer
Any Comments:

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Management Questionnaire

Please respond to the following questions by either ticking the appropriate box or writing your answer in the space provided.
Please Note: All information provided is completely anonymous

14. What in your opinion can industry do to influence workers behaviour, towards improving safety on construction sites?

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.....
.....

15. If the industry were to run a pilot project specifically focusing on Behaviour Safety. Would you take part?

Yes ☐ No ☐

What would your reasons be for taking part?

- To reduce Accidents and ill Health ☐
- To comply with legislation ☐
- To reduce insurance costs ☐
- Client requirements ☐
- Head Office requirements ☐
- Employee representative group requirements ☐
- Other(s).....Please Specify. ☐

<u>Thank you</u> for your time in completing this questionnaire.

Please put in the Stamped Addressed Envelope for return.

Appendix 4 – Draft Questionnaire – Site Operatives

Site Operatives Questionnaire

Please respond to the following questions by either ticking the appropriate box or writing your answer in the space provided.

Please Note: All information provided is completely anonymous

Part 1: General Information

1	Please tick the box indicating the number of years you have spent working in the construction industry:	**1.** ☐ Less than 1 **2.** ☐ 1 - 2 **3.** ☐ 3 - 5 **4.** ☐ 5 - 10 **5.** ☐ Greater than 10
2	Please tick the box indicating your country of nationality?	**1.** ☐ Republic of Ireland **2.** ☐ Northern Ireland **3.** ☐ Other UK **4.** ☐ Other EU country **5.** ☐ Other European country **6.** ☐ Other (Please Specify)
3	Please tick the box indicating your age:	**1.** ☐ Younger than 21 **2.** ☐ 21 - 25 **3.** ☐ 26 - 30 **4.** ☐ 31 - 40 **5.** ☐ Older than 40
4	Please tick the box that best describes what you do:	**1.** ☐ General Construction Worker **2.** ☐ Trade. Specify..... **3.** ☐ CSCS (Plant) Operative. **4.** ☐ Apprentice **5.** ☐ Foreman 6. ☐ Site Agent 7. ☐ Other (Please Specify)

Site Operatives Questionnaire

Please respond to the following questions by either ticking the appropriate box or writing your answer in the space provided.

Please Note: All information provided is completely anonymous

5	Please tick the appropriate boxes to highlight the safety training you have received	**1.** ☐ Safe Pass **2.** ☐ CSCS **3.** ☐ Managing Safely in Construction **4.** ☐ Apprentice - Trade **5.** ☐ Site Safety Induction **6.** ☐ Ongoing Tool Box Talks **7.** ☐ Other (Please Specify) Please Specify the CSCS category(s)
6	Please tick the box indicating your employment arrangements:	**1.** ☐ Self Employed **2.** ☐ Directly Employed – Set Wage **3.** ☐ Directly Employed – Price Work **4.** ☐ Placed by an Agency **5.** ☐ Other (Please Specify)
7	Please tick the box indicating your employment status:	**1.** ☐ Full Time Permanent **2.** ☐ Part Time Permanent **3.** ☐ Temporary Fixed Contract **4.** ☐ No fixed Contract **5.** ☐ Other (Please Specify)
8	Please tick the box indicating who you mostly work for. (On a large Construction Site)	**1.** ☐ The Main Contractor **2.** ☐ A subcontractor

Site Operatives Questionnaire

Please respond to the following questions by either ticking the appropriate box or writing your answer in the space provided.

Please Note: All information provided is completely anonymous

Part 2: Personal Safety Record

9	**Have you ever been involved in a "near miss"** (i.e. an incident which didn't actually result in an injury)	**If Yes, please state:** Type of Incident What Caused the Incident
10	**Have you been involved in a workplace accident, which resulted in** (a) Absence from work of 3 days or more (b) Less than 3 day's absence **If no proceed to Question 12**	**If Yes, please state:** Type of Injury What Caused the Injury
11a	**In relation to your workplace accident, please tick the box indicating the body part injured** Please tick the box indicating the type of injuries received.	**1.** ☐ Back **2.** ☐ Shoulder **3.** ☐ Fingers **4.** ☐ Hand **5.** ☐ Arm **6.** ☐ Leg **7.** ☐ Head Injury **8.** ☐ Eye Injury **9.** ☐ Other.....Please Specify.....
11b	**Please tick the box provided indication the type of incident you were involved in**	**1.** ☐ Slip, trip and fall **2.** ☐ Stress or Strain **3.** ☐ Transport - Workplace **4.** ☐ Falling Object **5.** ☐ Fixed Object **6.** ☐ Sharp Object **7.** ☐ Overturning of plant **8.** ☐ Fall from a height **9.** ☐ Trapped or Crushed **10.** ☐ Hand Tools or equipment **11.** ☐ Chemical Skin **12.** ☐ Chemical Inhalation **13.** ☐ Burns **14.** ☐ Other.....Please Specify.....

Site Operatives Questionnaire

Please respond to the following questions by either ticking the appropriate box or writing your answer in the space provided.

Please Note: All information provided is completely anonymous

PART 3 – Your Honest Opinion

12. For each of the following statement(s) please indicate if you agree or disagree
(You may tick more than one as appropriate)

Statement	Agree	Disagree
▪ I am very conscious of my own safety	☐	☐
▪ Construction is a high risk job	☐	☐
▪ My safety on the job is my own responsibility	☐	☐
▪ Management are responsible for my safety while at work	☐	☐
▪ It is important to abide by safety rules	☐	☐
▪ All of the new safety laws are helping to manage the risks on site	☐	☐
▪ Safe Pass and CSCS training have been a good idea	☐	☐
▪ The chance of me having an accident is quite low	☐	☐
▪ There is a good chance I could be involved in accident	☐	☐
▪ I can do my job just as safely without all these rules	☐	☐
▪ Safety slows down the job	☐	☐
▪ Some safety rules are unnecessary	☐	☐
▪ Safety in the construction industry has gone too far	☐	☐
▪ Having a safety officer on site is very helpful	☐	☐
▪ Management committed to safety is important	☐	☐
▪ Have an employee Site Safety Representative is important	☐	☐

13. If faced with the following situations on site, please indicate what you would do to correct the situation. (Only answer situations that are relevant to your work)

Situation	Stop Work & Report	Stop Work & Not Report	Stop Work & Report to Safety Officer	Fix it Myself & continue working	Keep Working	Not sure
Using defective ladder						
Using scaffold not fully boarded						
Using scaffold missing handrails						
Climbing up and down scaffold						
Using ladders too short for the landing place						
Working on fragile roofs without crawling boards						
Operate plant or machinery without specific training						
Operate hand tools without specific training						
Operating plant in an area with overhead power lines that are not marked with bunting etc						
Operate plant in an area known to have underground services, when you are unsure as to their exact location						

Site Operatives Questionnaire

Please respond to the following questions by either ticking the appropriate box or writing your answer in the space provided.

Please Note: All information provided is completely anonymous

14. Based on your experience in construction, please tick YES or NO as appropriate to the following statements.

Statement	YES	NO
▪ Site Managers take the breaking of safety rules very seriously	☐	☐
▪ Disciplinary procedures are strictly enforced	☐	☐
▪ A disciplinary procedure is in place but not always enforced	☐	☐
▪ Safety problems are always addressed immediately	☐	☐
▪ Equipment and materials needed to work safely are available at all times	☐	☐
▪ Site Management only comply with safety because they have to	☐	☐

15. Please tick the box that best describes your experience of the following

	Always	Regularly	Seldom	Never	On big sites only
Safety Induction Training (site safety training before you start on a new site) is carried out.					
A new method statement is written and explained before every job					
Safe Pass Card is requested before starting on a new job / site					
CSCS is requested before starting on a new job / site					
My employers safety statement has been shown and explained to me					
I am familiar with Risk Assessments for my job					

Thank you for your time in completing this questionnaire. Please put in the Stamped Addressed Envelope for return.

Appendix 5 – Final Questionnaire – Management

Management Questionnaire

Please respond to the following questions by either ticking the appropriate box or writing your answer in the space provided.
Please Note: All information provided is completely anonymous

PART 1 - General Information

1. Please indicate your position in the organisation

- Project Manager ☐
- Contracts Manager ☐
- Site Agent ☐
- Safety Advisor / Officer / Manager ☐
- Other……..Please Specify ☐

2. Which category best describes the size of your organisation?

- 10 -50 employees ☐
- 50 – 100 employees ☐
- 100+ ☐

Please tick the category that best describes your employee turnover

- High Turnover (1-6months) ☐
- Fairly Consistent Workforce (12 months – 2 years) ☐
- Consistent Workforce (2 years +) ☐

3. Which category best describes the type of construction carried out by your organisation. (Please tick more than one box if appropriate)

- House Building ☐
- Civil Engineering ☐
- Commercial Developments ☐
- Restoration ☐
- Other……..Please specify ☐

4. Which of the following statements represent the reasons for Managing Safety in your Organisation. (You can select more than one where appropriate)

- To reduce Accidents and ill Health ☐
- To comply with legislation ☐
- To reduce insurance costs ☐
- Client requirements ☐
- Head Office requirements ☐
- Employee representative group requirements ☐
- Other……Please specify ☐

Management Questionnaire

Please respond to the following questions by either ticking the appropriate box or writing your answer in the space provided.
Please Note: All information provided is completely anonymous

5. Does your organization have provision in place to meet the requirements of the following Legislation?

	YES	NO
▪ Safety Health & Welfare at Work Act 2005	☐	☐
▪ Safety Health & Welfare at Work (Construction Regulations) 2006	☐	☐

Do your provisions include the following?

o Do you have a Documented Safety Statement	☐	☐
o Do you have Documented Risk Assessments	☐	☐
o Do you have a full time safety person(s) employed	☐	☐
o Health and Safety Training Programme	☐	☐
o Health and Safety Committee	☐	☐
o Is there an appointed Safety Representative	☐	☐
o Appointment of PSCS, PSDS	☐	☐
o Operatives trained CSCS	☐	☐
o Full time on Site Safety Officer – where 20 people or more	☐	☐

Management Questionnaire

Please respond to the following questions by either ticking the appropriate box or writing your answer in the space provided.
Please Note: All information provided is completely anonymous

PART 2 – Accident History

6. Please tick the appropriate number of accidents & incidents that have occurred in your organization over the past 5 years

Accidents (Reportable, i.e. 3 days or more absence from work)

- Less than 5 ☐
- 5-10 ☐
- 10-20 ☐
- 20-100 ☐

Dangerous Occurrences (Reportable according to General Application Regulations, 1993)

- Less than 5 ☐
- 5-10 ☐
- 10-20 ☐
- 20-100 ☐

7. Rate in order of frequency, the type of accident most common in your organisation (Assign the number 1 to the most frequent; continue in increasing order to the least)

- Slip, trip and fall ☐
- Stress or Strain ☐
- Transport – Workplace ☐
- Falling Object ☐
- Fixed Object ☐
- Sharp Object ☐
- Overturning of plant ☐
- Fall from a height ☐
- Trapped or Crushed ☐
- Hand Tools or equipment ☐
- Chemical Skin …Chemical Inhalation… ☐
- Burns ☐
- Other……Please specify

Management Questionnaire

Please respond to the following questions by either ticking the appropriate box or writing your answer in the space provided.
Please Note: All information provided is completely anonymous

PART 3 - Behavioural Safety

8. In relation to the accidents and incidents most common in your company. Based on your opinion, please identify the top 5 contributory factors.
Rating them from 1-5 in order of seriousness (i.e. 1- being the most serious – 5 being the least)

Factor	**Rating from 1-5**
▪ Unsafe Behaviour – By injured party	☐
▪ Lack of Training / Poor Skills	☐
▪ Poor Supervision / Management	☐
▪ Lack of Procedures / Risk Assessments	☐
▪ Time Pressure on the job	☐
▪ Other……Please specify	☐

Please note any other contributory factors, while not in the first 5, you feel are worth noting.

……
……

9. Where you feel behaviour has contributed to an accident or a near miss. Rate in your opinion, the ability of your organisation to target and influence the behaviour of your employee's

- A good ability to influence ☐
- Some influence ☐
- Very little influence ☐
- No influence ☐

10. What in your opinion influences good behaviour (towards safety) on site? Please give your rating from 1-10 on each of these statements.
1 being the most serious, 10 being the least

Statement	**Rating out of 10**
▪ Age (very young or too old)	☐
▪ Personal Care and attention to safety	☐
▪ Length of time in the industry	☐
▪ Competency at a given task	☐
▪ Safety conscious workmates	☐
▪ Good Supervision	☐
▪ Strong Safety Culture & Management Commitment	☐
▪ Active Disciplinary Procedure	☐
▪ Presence of a Safety Officer	☐
▪ Presence of a Safety Representative	☐
▪ Other(s)……Please Specify	☐

Management Questionnaire

Please respond to the following questions by either ticking the appropriate box or writing your answer in the space provided.
Please Note: All information provided is completely anonymous

11. Please consider the following statement and tick the box that best describes how you feel.

- Individual Behaviour as contributor to construction industry accidents
  - Is a causation factor to some extent ☐
  - It is a major cause of accidents ☐
  - Does not contribute at all ☐

12. A previous study has shown that Safety Representatives have a strong role in influencing both behaviour and compliance within the industry.

Please indicate which of the following best describes your view on the above finding?

- Surprise & underestimation of the ability of Safety Representative to influence ☐
- As expected, I have experienced the positive and influential role of the safety representatives ☐
- Any Comment

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13. From your experience, do you think the behaviour change model below would be successful in your organisation?

- **Goal Setting, Observation & Feedback**
  This involves the identification of safety critical behaviours. Targeting behaviour(s) to be changed and setting specific goals. Observation of progress on the changed behaviour is a key feature, in addition to giving consistent formal feedback to the participants. It involves significant workforce participation. The regular focused feedback drives continuous improvement.

Yes ☐ No ☐

Please give reasons for your answer
Any Comments:

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Management Questionnaire

Please respond to the following questions by either ticking the appropriate box or writing your answer in the space provided.
Please Note: All information provided is completely anonymous

.....

14. What in your opinion can industry do to influence workers behaviour, towards improving safety on construction sites?

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15. If the industry were to run a pilot project specifically focusing on Behaviour Safety. Would you take part?

Yes ☐ **No** ☐

What would your reasons be for taking part?

- To reduce Accidents and ill Health ☐
- To comply with legislation ☐
- To reduce insurance costs ☐
- Client requirements ☐
- Head Office requirements ☐
- Employee representative group requirements ☐
- Other(s).....Please Specify. ☐

<u>Thank you</u> for your time in completing this questionnaire.

Please put in the Stamped Addressed Envelope for return.

Site Operatives Questionnaire

Please respond to the following questions by either ticking the appropriate box or writing your answer in the space provided.

Please Note: All information provided is completely anonymous

Part 1: General Information

1	Please tick the box indicating the number of years you have spent working in the construction industry:	**1.** ☐ Less than 1 **2.** ☐ 1 - 2 **3.** ☐ 3 - 5 **4.** ☐ 5 - 10 **5.** ☐ Greater than 10
2	Please tick the box indicating your country of nationality?	**1.** ☐ Republic of Ireland **2.** ☐ Northern Ireland **3.** ☐ Other UK **4.** ☐ Other EU country **5.** ☐ Other European country **6.** ☐ Other (Please Specify)
3	Please tick the box indicating your age:	**1.** ☐ Younger than 21 **2.** ☐ 21 - 25 **3.** ☐ 26 - 30 **4.** ☐ 31 - 40 **5.** ☐ Older than 40
4	Please tick the box that best describes what you do:	**1.** ☐ General Construction Worker **2.** ☐ Trade. Specify..... **3.** ☐ CSCS (Plant) Operative. **4.** ☐ Apprentice **5.** ☐ Foreman 6. ☐ Site Agent **7.** ☐ Other (Please Specify)

Site Operatives Questionnaire

Please respond to the following questions by either ticking the appropriate box or writing your answer in the space provided.

Please Note: All information provided is completely anonymous

5	Please tick the appropriate boxes to highlight the safety training you have received	**1.** ☐ Safe Pass **2.** ☐ CSCS **3.** ☐ Managing Safely in Construction **4.** ☐ Apprentice - Trade **5.** ☐ Site Safety Induction **6.** ☐ Ongoing Tool Box Talks **7.** ☐ Other (Please Specify) Please Specify the CSCS category(s)
6	Please tick the box indicating your employment arrangements:	**1.** ☐ Self Employed **2.** ☐ Directly Employed – Set Wage **3.** ☐ Directly Employed – Price Work **4.** ☐ Placed by an Agency **5.** ☐ Other (Please Specify)
7	Please tick the box indicating your employment status:	**1.** ☐ Full Time Permanent **2.** ☐ Part Time Permanent **3.** ☐ Temporary Fixed Contract **4.** ☐ No fixed Contract **5.** ☐ Other (Please Specify)
8	Please tick the box indicating who you mostly work for. (On a large Construction Site)	**1.** ☐ The Main Contractor **2.** ☐ A subcontractor

Site Operatives Questionnaire

Please respond to the following questions by either ticking the appropriate box or writing your answer in the space provided.

Please Note: All information provided is completely anonymous

Part 2: Personal Safety Record

9	**Have you been involved in a workplace accident, which resulted in** (a) 3 days absence from work or more (b) Less than 3 day's absence **If no proceed to Question 12**	**If Yes, please state:** Type of Injury What Caused the Injury
10	**In relation to your workplace accident, please tick the box indicating the body part injured**	**1.** ☐ Back **2.** ☐ Shoulder **3.** ☐ Fingers **4.** ☐ Hand **5.** ☐ Arm **6.** ☐ Leg **7.** ☐ Head Injury **8.** ☐ Eye Injury **9.** ☐ Other.....Please Specify.....
11	**Please tick the box provided indication the type of incident you were involved in**	**1.** ☐ Slip, trip and fall **2.** ☐ Stress or Strain **3.** ☐ Transport - Workplace **4.** ☐ Falling Object **5.** ☐ Fixed Object **6.** ☐ Sharp Object **7.** ☐ Overturning of plant **8.** ☐ Fall from a height **9.** ☐ Trapped or Crushed **10.** ☐ Hand Tools or equipment **11.** ☐ Chemical Skin **12.** ☐ Chemical Inhalation **13.** ☐ Burns **14.** ☐ Other.....Please Specify.....

Site Operatives Questionnaire

Please respond to the following questions by either ticking the appropriate box or writing your answer in the space provided.

Please Note: All information provided is completely anonymous

PART 3 – Your Honest Opinion

12. For each of the following statement(s) please indicate if you agree or disagree
(You may tick more than one as appropriate)

Statement	Agree	Disagree
▪ I am very conscious of my own safety	☐	☐
▪ Construction is a high risk job	☐	☐
▪ I am responsible for my own safety at work	☐	☐
▪ My employers are responsible for my safety at work	☐	☐
▪ It is important to abide by safety rules	☐	☐
▪ All of the new safety laws are helping to manage the risks on site	☐	☐
▪ Safe Pass and CSCS training have been a good idea	☐	☐
▪ The chance of me having an accident is quite low	☐	☐
▪ There is a good chance I could be involved in accident	☐	☐
▪ I can do my job just as safely without all these rules	☐	☐
▪ Complying with safety rules slows down the job	☐	☐
▪ Some safety rules are unnecessary	☐	☐
▪ There are too many construction safety rules	☐	☐
▪ Having a safety officer on site makes for a safer site	☐	☐
▪ Having Management committed to safety is important	☐	☐
▪ Having an employee Safety Representative makes for a safer site	☐	☐

13. If faced with the following situations on site, please indicate what you would do to correct the situation. (Only answer situations that are relevant to your work)

Situation	Stop Work & Report	Stop Work & Not Report	Stop Work & Report to Safety Officer	Fix it Myself & continue working	Stop Work & Report to Safety Rep	Keep Working	Not sure
Using defective ladder							
Using scaffold not fully boarded							
Using scaffold missing handrails							
Climbing up and down scaffold							
Using ladders too short for the landing place							
Working on fragile roofs without crawling boards							
Operate plant or machinery without specific training							
Operate hand tools without specific training							
Operating plant in an area with overhead power lines that are not marked with bunting etc							
Operate plant in an area known to have underground services, when you are unsure as to their exact location							

Site Operatives Questionnaire

Please respond to the following questions by either ticking the appropriate box or writing your answer in the space provided.

Please Note: All information provided is completely anonymous

14. Based on your experience in construction, please tick YES or NO as appropriate to the following statements.

Statement	YES	NO
▪ Site Managers take the breaking of safety rules very seriously	☐	☐
▪ Disciplinary procedures are strictly enforced	☐	☐
▪ A disciplinary procedure is in place but not always enforced	☐	☐
▪ Safety problems are always addressed immediately	☐	☐
▪ Equipment and materials needed to work safely are available at all times	☐	☐
▪ Site Management only comply with safety because they have to	☐	☐

15. Please tick the box that best describes your experience of the following

	Always	Regularly	Seldom	Never	On big sites only
Safety Induction Training (site safety training before you start on a new site) is carried out.					
A new method statement is written and explained before every job					
Safe Pass Card is requested before starting on a new job / site					
CSCS is requested before starting on a new job / site					
My employers safety statement has been shown and explained to me					
I am familiar with Risk Assessments for my job					

Thank you for your time in completing this questionnaire. Please put in the Stamped Addressed Envelope for return.

Appendix 6 – Final Questionnaire – Site Operatives

Appendix 7 – Final Questionnaires listing sources used in design

Management Questionnaire

Please respond to the following questions by either ticking the appropriate box or writing your answer in the space provided.
Please Note: All information provided is completely anonymous

PART 1 - General Information

1. Please indicate your position in the organisation

- Project Manager ☐
- Contracts Manager ☐
- Site Agent ☐
- Safety Advisor / Officer / Manager ☐
- Other……..Please Specify ☐

Authors Own

2. Which category best describes the size of your organisation?

- 10 -50 employees ☐
- 50 – 100 employees ☐
- 100+ ☐

Authors Own

Please tick the category that best describes your employee turnover

- High Turnover (1-6months) ☐
- Fairly Consistent Workforce (12 months – 2 years) ☐
- Consistent Workforce (2 years +) ☐

Authors Own

3. Which category best describes the type of construction carried out by your organisation. (Please tick more than one box if appropriate)

- House Building ☐
- Civil Engineering ☐
- Commercial Developments ☐
- Restoration ☐
- Other……..Please specify ☐

Authors Own

4. Which of the following statements represent the reasons for Managing Safety in your Organisation. (You can select more than one where appropriate)

- To reduce Accidents and ill Health ☐
- To comply with legislation ☐
- To reduce insurance costs ☐
- Client requirements ☐
- Head Office requirements ☐
- Employee representative group requirements ☐
- Other……Please specify ☐

Authors Own

Management Questionnaire

Please respond to the following questions by either ticking the appropriate box or writing your answer in the space provided.
Please Note: All information provided is completely anonymous

5. Does your organization have provision in place to meet the requirements of the following Legislation?

	YES	NO
▪ Safety Health & Welfare at Work Act 2005	☐	☐
▪ Safety Health & Welfare at Work (Construction Regulations) 2006	☐	☐
Do your provisions include the following?		
o Do you have a Documented Safety Statement	☐	☐
o Do you have Documented Risk Assessments	☐	☐
o Do you have a full time safety person(s) employed	☐	☐
o Health and Safety Training Programme	☐	☐
o Health and Safety Committee	☐	☐
o Is there an appointed Safety Representative	☐	☐
o Appointment of PSCS, PSDS	☐	☐
o Operatives trained CSCS	☐	☐
o Full time on Site Safety Officer – where 20 people or more	☐	☐

Authors Own

Management Questionnaire

Please respond to the following questions by either ticking the appropriate box or writing your answer in the space provided.
Please Note: All information provided is completely anonymous

PART 2 – Accident History

6. Please tick the appropriate number of accidents & incidents that have occurred in your organization over the past 5 years

Accidents (Reportable, i.e. 3 days or more absence from work)

- Less than 5 ☐
- 5-10 ☐
- 10-20 ☐
- 20-100 ☐

Authors Own

Dangerous Occurrences (Reportable according to General Application Regulations, 1993)

- Less than 5 ☐
- 5-10 ☐
- 10-20 ☐
- 20-100 ☐

7. Rate in order of frequency, the type of accident most common in your organisation (Assign the number 1 to the most frequent; continue in increasing order to the least)

- Slip, trip and fall ☐
- Stress or Strain ☐
- Transport – Workplace ☐
- Falling Object ☐
- Fixed Object ☐
- Sharp Object ☐
- Overturning of plant ☐
- Fall from a height ☐
- Trapped or Crushed ☐
- Hand Tools or equipment ☐
- Chemical Skin …Chemical Inhalation… ☐
- Burns ☐
- Other……Please specify ☐

Options source-

HAS Summary Statistics 04-05, Injuries in the Construction Sector, by Incident Type. Fig: 31, Pg. 38.

Options in red are Authors Own

Management Questionnaire

Please respond to the following questions by either ticking the appropriate box or writing your answer in the space provided.
Please Note: All information provided is completely anonymous

PART 3 - Behavioural Safety

8. In relation to the accidents and incidents most common in your company. Based on your opinion, please identify the top 5 contributory factors.
Rating them from 1-5 in order of seriousness (i.e. 1- being the most serious – 5 being the least)

Factor	**Rating from 1-5**
▪ Unsafe Behaviour – By injured party	☐
▪ Lack of Training / Poor Skills	☐
▪ Poor Supervision / Management	☐
▪ Lack of Procedures / Risk Assessments	☐
▪ Time Pressure on the job	☐
▪ Other……Please specify	

Authors Own

Please note any other contributory factors, while not in the first 5, you feel are worth noting.

……
……

9. Where you feel behaviour has contributed to an accident or a near miss. Rate in your opinion, the ability of your organisation to target and influence the behaviour of your employee's

- A good ability to influence ☐
- Some influence ☐
- Very little influence ☐
- No influence ☐

Authors Own

10. What in your opinion influences good behaviour (towards safety) on site? Please give your rating from 1-10 on each of these statements.
1 being the most serious, 10 being the least

Statement	**Rating out of 10**
▪ Age (very young or too old)	☐
▪ Personal Care and attention to safety	☐
▪ Length of time in the industry	☐
▪ Competency at a given task	☐
▪ Safety conscious workmates	☐
▪ Good Supervision	☐
▪ Strong Safety Culture & Management Commitment	☐
▪ Active Disciplinary Procedure	☐
▪ Presence of a Safety Officer	☐
▪ Presence of a Safety Representativ	☐
▪ Other(s)……..Please Specify	

Authors Own -Except those in red

Age/Time in Industry –O'Sullivan N
Culture,Mgmt. Commitment & Safety Rep. – Hrymak McDonald

Management Questionnaire

Please respond to the following questions by either ticking the appropriate box or writing your answer in the space provided.
Please Note: All information provided is completely anonymous

11. Please consider the following statement and tick the box that best describes how you feel.

- Individual Behaviour as contributor to construction industry accidents
  - Is a causation factor to some extent ☐
  - It is a major cause of accidents ☐
  - Does not contribute at all ☐

Authors Own

12. A previous study has shown that Safety Representatives have a strong role in influencing both behaviour and compliance within the industry.

Please indicate which of the following best describes your view on the above finding?

- Surprise & underestimation of the ability of Safety Representative to influence ☐
- As expected, I have experienced the positive and influential role of the safety representatives ☐
- Any Comment

Refers to Main Findings of McDonald, Hrymak 2002, pg 69

13. From your experience, do you think the behaviour change model below would be successful in your organisation?

- **Goal Setting, Observation & Feedback**
  This involves the identification of safety critical behaviours. Targeting behaviour(s) to be changed and setting specific goals. Observation of progress on the changed behaviour is a key feature, in addition to giving consistent formal feedback to the participants. It involves significant workforce participation. The regular focused feedback drives continuous improvement.

Yes ☐ No ☐

Please give reasons for your answer
Any Comments:

Similar Behaviour Change Models used by:

1. **Murray P, 2006**
2. **Duff *et al* 1993**
3. **Mattila, Hyodynmma 1998**
4. **HSE 2002**
5. **Sulzer-Azaroff 1987**

Studies 1, 2 and 3 are specific to the construction industry

Management Questionnaire

Please respond to the following questions by either ticking the appropriate box or writing your answer in the space provided.
Please Note: All information provided is completely anonymous

14. What in your opinion can industry do to influence workers behaviour, towards improving safety on construction sites?

Authors Own - open question

15. If the industry were to run a pilot project specifically focusing on Behaviour Safety. Would you take part?

Authors Own **Yes ☐ No ☐**

What would your reasons be for taking part?

- To reduce Accidents and ill Health ☐
- To comply with legislation ☐
- To reduce insurance costs ☐
- Client requirements ☐
- Head Office requirements ☐
- Employee representative group requirements ☐
- Other(s).....Please Specify. ☐

Thank you for your time in completing this questionnaire.

Please put in the Stamped Addressed Envelope for return.

Site Operatives Questionnaire

Please respond to the following questions by either ticking the appropriate box or writing your answer in the space provided.

Please Note: All information provided is completely anonymous

Part 1: General Information

1	Please tick the box indicating the number of years you have spent working in the construction industry:	**1.** ☐ Less than 1 **2.** ☐ 1 - 2 **3.** ☐ 3 - 5 **4.** ☐ 5 - 10 **5.** ☐ Greater than 10 **The Claritas Report. Appendix C Q. 11. Page 171**
2	Please tick the box indicating your country of nationality?	**1.** ☐ Republic of Ireland **2.** ☐ Northern Ireland **3.** ☐ Other UK **4.** ☐ Other EU country **5.** ☐ Other European country **6.** ☐ Other (Please Specify) **The Claritas Report. Appendix C Q. 12 Page 171**
3	Please tick the box indicating your age:	**1.** ☐ Younger than 21 **2.** ☐ 21 - 25 **3.** ☐ 26 - 30 **4.** ☐ 31 - 40 **5.** ☐ Older than 40 **The Claritas Report. Appendix C Q. 9 Page 170**
4	Please tick the box that best describes what you do: **Adopted from the Claritas Report. Appendix C Q. 10 Page 171**	**1.** ☐ General Construction Worker **2.** ☐ Trade. Specify……. **3.** ☐ CSCS (Plant) Operative. **4.** ☐ Apprentice **5.** ☐ Foreman 6. ☐ Site Agent **7.** ☐ Other (Please Specify)

Site Operatives Questionnaire

Please respond to the following questions by either ticking the appropriate box or writing your answer in the space provided.

Please Note: All information provided is completely anonymous

5	Please tick the appropriate boxes to highlight the safety training you have received Authors Own	**1.** ☐ Safe Pass **2.** ☐ CSCS **3.** ☐ Managing Safely in Construction **4.** ☐ Apprentice - Trade **5.** ☐ Site Safety Induction **6.** ☐ Ongoing Tool Box Talks **7.** ☐ Other (Please Specify) Please Specify the CSCS category(s)
6	Please tick the box indicating your employment arrangements: Authors Own	**1.** ☐ Self Employed **2.** ☐ Directly Employed – Set Wage **3.** ☐ Directly Employed – Price Work **4.** ☐ Placed by an Agency **5.** ☐ Other (Please Specify)
7	Please tick the box indicating your employment status: Authors Own	**1.** ☐ Full Time Permanent **2.** ☐ Part Time Permanent **3.** ☐ Temporary Fixed Contract **4.** ☐ No fixed Contract **5.** ☐ Other (Please Specify)
8	Please tick the box indicating who you mostly work for. (On a large Construction Site) Authors Own	**1.** ☐ The Main Contractor **2.** ☐ A subcontractor

Site Operatives Questionnaire

Please respond to the following questions by either ticking the appropriate box or writing your answer in the space provided.

Please Note: All information provided is completely anonymous

Part 2: Personal Safety Record

9	**Have you been involved in a workplace accident, which resulted in** (a) 3 days absence from work or more (b) Less than 3 day's absence **If no proceed to Question 12**	**If Yes, please state:** Type of Injury Authors Own What Caused the Injury
10	**In relation to your workplace accident, please tick the box indicating the body part injured** **Options Source:** **1-6 are the top 6 most reported injured body part in the construction sector** **HAS Summary Statistics 04 – 05. Fig. 39, Page No. 43.** **Options 7-9 Authors Own**	**1.** ☐ Back **2.** ☐ Shoulder **3.** ☐ Fingers **4.** ☐ Hand **5.** ☐ Arm **6.** ☐ Leg **7.** ☐ Head Injury **8.** ☐ Eye Injury **9.** ☐ Other……Please Specify……
11	**Please tick the box provided indication the type of incident you were involved in** **Options source-** **HAS Summary Statistics 04-05, Injuries in the Construction Sector, by Incident Type. Fig: 31, Pg. 38.** **Options 7 & 10 Authors Own**	**1.** ☐ Slip, trip and fall **2.** ☐ Stress or Strain **3.** ☐ Transport - Workplace **4.** ☐ Falling Object **5.** ☐ Fixed Object **6.** ☐ Sharp Object **7.** ☐ Overturning of plant **8.** ☐ Fall from a height **9.** ☐ Trapped or Crushed **10.** ☐ Hand Tools or equipment **11.** ☐ Chemical Skin **12.** ☐ Chemical Inhalation **13.** ☐ Burns **14.** ☐ Other……Please Specify……

Site Operatives Questionnaire

Please respond to the following questions by either ticking the appropriate box or writing your answer in the space provided.

Please Note: All information provided is completely anonymous

PART 3 – Your Honest Opinion

12. For each of the following statement(s) please indicate if you agree or disagree

Source: The idea is adapted from McDonald, Hrymak 2002, pg 40. Options are authors own

Statement	Agree	Disagree
▪ I am very conscious of my own safety	☐	☐
▪ Construction is a high risk job	☐	☐
▪ I am responsible for my own safety at work	☐	☐
▪ My employers are responsible for my safety at work	☐	☐
▪ It is important to abide by safety rules	☐	☐
▪ All of the new safety laws are helping to manage the risks on site	☐	☐
▪ Safe Pass and CSCS training have been a good idea	☐	☐
▪ The chance of me having an accident is quite low	☐	☐
▪ There is a good chance I could be involved in accident	☐	☐
▪ I can do my job just as safely without all these rules	☐	☐
▪ Complying with safety rules slows down the job	☐	☐
▪ Some safety rules are unnecessary	☐	☐
▪ There are too many construction safety rules	☐	☐
▪ Having a safety officer on site makes for a safer site	☐	☐
▪ Having Management committed to safety is important	☐	☐
▪ Having an employee Safety Representative makes for a safer site	☐	☐

13. If faced with the following situations on site, please indicate what you would do to correct the situation. (Only answer situations that are relevant to your work)

Situation	Stop Work & Report	Stop Work & Not Report	Stop Work & Report to Safety Officer	Fix it Myself & continue working	Stop Work & Report to Safety Rep	Keep Working	Not sure
Source: The Idea and the categories in red are taken from McDonald, Hrymak 2002, pg 38. Others categories, authors own. Options in blue are an adoption of McDonald, Hrymak 2002, pg 38							
Using defective ladder							
Using scaffold not fully boarded							
Using scaffold missing handrails							
Climbing up and down scaffold							
Using ladders too short for the landing place							
Working on fragile roofs without crawling boards							
Operate plant or machinery without specific training							
Operate hand tools without specific training							
Operating plant in an area with overhead power lines that are not marked with bunting etc							
Operate plant in an area known to have underground services, when you are unsure as to their exact location							

Site Operatives Questionnaire

Please respond to the following questions by either ticking the appropriate box or writing your answer in the space provided.

Please Note: All information provided is completely anonymous

14. Based on your experience in construction, please tick YES or NO as appropriate to the following statements.

Adapted from McDonald, Hrvmak 2002. Pg 4. Categories are authors own.

Statement	YES	NO
▪ Site Managers take the breaking of safety rules very seriously	☐	☐
▪ Disciplinary procedures are strictly enforced	☐	☐
▪ A disciplinary procedure is in place but not always enforced	☐	☐
▪ Safety problems are always addressed immediately	☐	☐
▪ Equipment and materials needed to work safely are available at all times	☐	☐
▪ Site Management only comply with safety because they have to	☐	☐

15. Please tick the box that best describes your experience of the following

Authors Own	Always	Regularly	Seldom	Never	On big sites only
Safety Induction Training (site safety training before you start on a new site) is carried out.					
A new method statement is written and explained before every job					
Safe Pass Card is requested before starting on a new job / site					
CSCS is requested before starting on a new job / site					
My employers safety statement has been shown and explained to me					
I am familiar with Risk Assessments for my job					

Thank you for your time in completing this questionnaire. Please put in the Stamped Addressed Envelope for return.

Appendix 8 – Raw Data

Table 1: Percentage response for accident type most common in their organisation

Accident Type	Rating 1	Rating 2	Rating 3	Rating 4	Rating 5
Slip, trip and fall	22	7	14	22	
Stress or Strain			7	14	7
Transport Workplace	7	7			22
Falling Object		7		7	
Fixed Object			7		7
Sharp Object		7		7	7
Overturning of plant	14	7	7		7
Fall from a height		7		7	
Trapped or Crushed					
Hand Tools or equipment		22	14		
Chemical Skin …Chemical Inhalation…					
Burns			7		
Other	36				

(Where Rating 1 – The most frequent, and Rating 5 – the least frequent)

Response to question 7 management questionnaire

Table 2 Accident Contributory Factors – Ratings Received

Contributory Factor ↓	Rating 1 (/%)	Rating 2 (/%)	Rating 3 (/%)	Rating 4 (/%)	Rating 5 (/%)
Unsafe behaviour by injured party	(50%)	(29%)		(7%)	(14%)
Lack of training poor skills	(7%)	(7%)	(36%)	(14%)	(29%)
Poor supervision management	(14%)	(36%)	(14%)	(22%)	
Lack of procedures / Risk Assessment		(7%)	(14%)	(36%)	(29%)
Time Pressure	(14%)	(14%)	(22%)	(14%)	(22%)
Other	(7%)				

Response to Question 8 Management Questionnaire

Table 3: Factors that influence behaviour towards safety

Q. 10 Options	Rating Number									
	Most			Some				Least		
	1	2	3	4	5	6	7	8	9	10
Age			(7%)		(7%)	(14%)	(22%)	(14%)	(14%)	(14%)
Personal Care & Attention to Safety	(14%)		(7%)	(22%)	(14%)	(14%)	(7%)		(22%)	(7%)
Time in Industry			(14%)		(7%)	(22%)		(22%)	(22%)	(7%)
Competency	(7%)	(29%)	(7%)	(7%)	(7%)		(29%)	(7%)	(7%)	
Safety Conscious Workmates	(22%)	(14%)	(7%)	(7%)	(7%)	(7%)		(7%)	(29%)	
Supervision	(14%)	(14%)	(7%)	(22%)	(7%)	(7%)		(7%)	(14%)	
Safety Culture & Management Commitment	(14%)	(14%)		(22%)	(22%)			(14%)		(14%)
Disciplinary Procedures			(36%)			(14%)	(22%)	(14%)		(14%)
The Presence of a Safety Officer		(7%)			(7%)	(7%)	(36%)	(22%)	(14%)	(7%)
The Presence of a Safety Representative			(7%)				(14%)	(14%)	(22%)	(43%)
Other										

Response to question 10, Management Questionnaire