OHS Performance Measurement in the Construction Industry

Development of Positive Performance Indicators

NATIONAL OCCUPATIONAL HEALTH & SAFETY COMMISSION

OHS Performance Measurement in the Construction Industry

Development of Positive Performance Indicators

NATIONAL OCCUPATIONAL HEALTH & SAFETY COMMISSION

DECEMBER 1999

Foreword

This report results from high degrees of collaboration between the National Occupational Health and Safety Commission (NOHSC), industry, unions and state jurisdictions to drive the development of positive performance indicators for the construction industry.

It is the report from an extensive project undertaken by NOHSC, with a working group of employer and union representatives drawn directly from the construction industry and representatives from a number of state OHS authorities. It was part of the work program overseen by the Performance Measurement Advisory Committee of NOHSC. The report would not have been possible without this level of shared commitment to enhancing the base of knowledge and response in occupational health and safety (OHS) in Australia.

The report contains timely information for the construction industry which is traditionally relied on outcome measures for assessment of their OHS performance. The report does not advocate the abandoning of outcome-oriented indicators for monitoring OHS performance. To the contrary, it seeks to contribute to an ongoing debate about the importance of developing positive performance measures to permit the use of an appropriate mix of positive and outcome indicators when monitoring OHS performance.

The development and use of positive performance indicators will allow construction enterprises to assess how successfully their enterprise is performing. They offer the opportunity to intervene in a meaningful way to permit immediate identification of where improvement strategies can be targeted.

The Construction Working Group recommended that positive performance indicators identified in this report be the basis of the development of the positive performance measurement framework at the enterprise level in the construction industry in Australia. A number of state jurisdictions have indicated their enthusiasm for facilitating that recommendation in their respective states.

As Chair of the Performance Measurement Advisory Committee and the Construction Working Group it has been my great pleasure to work with individuals dedicated to the cause of improved health and safety performance in Australian workplaces. The construction companies who so generously participated in case studies to test the positive performance indicators are thanked for their support of the project. Further research is now planned to consider issues including the validity and practicality of positive performance indicator frameworks. My express appreciation for the excellent work undertaken by Rebecca Mitchell, Senior Officer, Epidemiology Unit, National Occupational Health and Safety Commission as Co-ordinator for the project. She was very ably supported by Dr Tim Driscoll of the Epidemiology Unit.

Tony Cooke
Chair, Construction Working Group
Member, National Occupational Health & Safety Commission

Table of Contents

List of Tables and Figures

List of Tables:

List of Figures:

Acknowledgements

NOHSC wishes to acknowledge the contributions of the following people and organisations:

Construction working group:

Mr Tony Cooke	Trades and Labour Council, Western Australia
Mr Lindsay Fraser	Construction, Forestry, Mining and Energy Union, New South Wales
Mr George Gay	Housing Industry Association, Victoria
Mr Daren McDonald	WorkCover Authority, New South Wales
Ms Rose Mitchell	WorkCover Corporation, South Australia
Mr Peter Moylan	Australian Council of Trade Unions, Victoria
Mr Dino Ramondetta	Master Builders' Association, Victoria
Mr David Shaw	Australian Chamber of Commerce and Industry, Victoria
Ms Anne-Louise Slack	Housing Industry Association, New South Wales (Observer)
Mr Peter Tighe	Communication, Electrical and Plumbing Union (Engineering and Electrical), New South Wales

Construction companies:

Abigroup Limited
Adelaide Civil (ADCIV)
Atrium Homes
AV Jennings Homes Ltd
Baulderstone Hornibrook
Clarendon Homes
Consolidated Constructions
Clough Engineering Ltd
Hansen Yuncken
John Holland
Multiplex
Stonehenge Homes
Transfield Construction - NSW
Thiess Contractors Pty Ltd
VICRoads
Walter Construction Group

Consultants:

New Horizon Consulting
Shaw-Idea
Workability
First Principles for Business Sustainability

Executive Summary

The measurement of occupational health and safety (OHS) performance has traditionally focused on the measurement of outcomes, such as the lost time injury frequency rate.

The limitations associated with reliance on outcome measures as an indication of OHS performance have made it necessary for industries to consider alternative ways of measuring their health and safety performance.

Enterprises conduct many health and safety activities that could be used as additional measures of OHS performance. These measures, termed process or positive performance indicators, focus on how successfully an enterprise or industry is performing regarding OHS initiatives.

This report outlines the process that was taken to develop positive performance indicators of OHS for the construction industry and recommends positive performance indicators for the construction industry in Australia. It also includes a workshop worksheet that will aid enterprises to develop their own positive performance indicators.

Information regarding OHS performance measurement was gathered from construction enterprises using case studies in the commercial, civil, heavy engineering and domestic housing sectors of the construction industry.

Summaries of the case study findings are provided for each sector of the construction industry. For each sector, the drivers of good OHS performance and the strategies that are used to manage OHS are described. A list of OHS performance indicators that were being used by enterprises, and other indicators that would be of benefit in the sector are presented. Identification of issues that may influence the OHS improvement in each industry sector are also identified.

Key drivers of good OHS identified in the case studies were:

- senior management commitment;
- competitive advantage obtained through demonstrating and marketing successful OHS;
- OHS obligations to employees and the public;
- external enforcement; and
- reducing costs associated with poor OHS (e.g. insurance premiums, lost time, rehabilitation).

Strategies that were undertaken by enterprises as a result of the drivers were:

- leadership in OHS;
- design and planning initiatives;
- methods for consultation, communication and participation;
- management of sub-contractors;
- systems and processes to manage OHS;
- training and education initiatives;
- risk management and control of hazards; and
- auditing procedures.

Issues identified in the case study enterprises that may have a significant impact on OHS performance were:

- the standard of vocational education and training in the industry;
- the management of sub-contractors;
- the type of system (formal versus informal) for managing OHS; and
- design and constructability of the structure.

The list of positive performance indicators presented in this report is not exhaustive. Enterprises wishing to identify and tailor specific positive performance indicators for their OHS management system are encouraged to use the workshop worksheet to perform this function.

It is suggested that a range of positive performance indicators for OHS be adopted by an enterprise to enable a reasonable picture of the enterprise's OHS performance to be generated. Measuring OHS performance will help enterprises identify and evaluate OHS improvement strategies. It is critical that enterprises use this information to better understand and monitor their OHS performance. Positive performance indicators allow for timely and detailed information regarding the process of managing OHS to be recorded. That is, the type and frequency of health and safety activities that are undertaken by the enterprise. This information can then be used to identify strategies that are working well and other areas in health and safety that require improvement.

A number of the positive performance indicators identified in this report relate to OHS management systems, communication, consultation and training, as well as to management processes and planning and design. These indicators reflect processes designed to maintain a high level of OHS. It is often suggested that this is best achieved by the development and implementation of the processes and systems through close consultation and agreement with workers. This consultative approach aims to generate recognition and ownership of, and to improve, the processes and systems. It also aims to allow for a high level of cooperation, and for behaviour by employers, management and the workforce, to lead to improved OHS performance.

The construction working group recommend that the 22 positive performance indicators identified in this report be the basis for the development of a positive performance measurement framework at the enterprise level in the construction industry in Australia.

Performance Measurement

The monitoring of OHS performance has traditionally focused on measuring outcomes, such as lost time injuries. However, enterprises are involved in numerous health and safety activities in an attempt to reduce possible adverse work-related health and safety outcomes. Measurement of these health and safety activities and/or their outcomes could form the basis for additional measures of OHS.

Performance measurement

Enterprises typically measure performance to determine whether objectives or targets are being met. There are numerous areas within an enterprise where performance monitoring can take place. Some examples include production, finance or costs, environmental aspects and the health and safety of workers.

Performance measurement is an essential aspect of monitoring and evaluating OHS performance in an enterprise and/or industry. One of the primary objectives of measuring OHS performance is to provide feedback regarding health and safety performance.

The benefits associated with the introduction of a performance measurement system for OHS include:

- the ability to provide an indication of how an enterprise is performing in relation to OHS issues;
- the ability to identify problem areas where adverse outcomes are occurring and subsequently to identify where preventive action should take place;
- the ability to document effects of attempts to improve OHS. For example, a measurement system could provide feedback as to whether implemented safety interventions are operating adequately;
- the ability to promote OHS reviews of existing work practices and work organisation; and
- the use of performance measures for benchmarking or comparative performance assessments.

Performance indicators

In order to measure particular aspects of an enterprise's OHS performance, performance indicators are developed for areas that are to be monitored. The New South Wales Health Department (1998) defines a performance indicator as "a statistic or other unit of information which reflects *directly* or *indirectly*, the extent to which an anticipated outcome is achieved, or the quality of processes leading to that outcome" (p3).

Performance indicators can be either:

Quantitative - an indicator that can be counted or measured and is described numerically. For example, number of safety audits conducted.

Qualitative - an indicator that would describe or assess a quality or a behaviour. For example, worker ratings of management commitment to achieving 'best practice' in OHS.

Types of performance indicators

Measurement of safety performance can involve either outcome-focused or process-focused (also known as positive) indicators of performance.

Traditionally, many enterprises have used outcome measures of performance to monitor their OHS performance.

Outcome indicators - have typically focused on the measurement of loss, such as lost time injury frequency rates (LTIFR), workers' compensation costs or fatality incidence rates.

Outcome indicators are:

- relatively easy to collect;
- easily understood;
- obviously linked with safety performance;
- easily compared for benchmarking or comparative purposes; and
- are able to be used to identify trends.

However, relying solely on outcome measures of OHS performance as a means of providing information regarding the performance of OHS has its limitations. For instance:

- injuries and fatalities have a low probability of occurring, and so the absence of unlikely events alone is not a useful indicator of OHS management;
- outcome indicators largely measure negative performance, i.e. failure;
- outcome indicators are subject to random variation;
- outcome indicators may involve under- or over-reporting of work-related injuries or disease;
- outcome indicators do not accurately measure long latency occupational diseases. For example, musculoskeletal disorders and cancers can be difficult to attribute to work;
- outcome indicators measure actual injury severity, not necessarily the potential seriousness of the incident;
- when LTIFR is low, this rate does not provide adequate feedback for managing OHS; and

- outcome indicators generally reflect the outcomes of past OHS practices, because there is often a time lag before OHS outcomes reflect changes in OHS practices.[1]

Many enterprises use LTIFR as the primary measure of their OHS performance. Hopkins (1995, 1999) warns of the dangers of focusing on the LTIFR as the only indicator of safety performance because the LTIFR can also be influenced by factors other than improvements in safety - for example, by improvements in injury management. For instance, injured workers may return to work after experiencing a serious injury, still injured, but continue to work by performing alternative, light duties or through attending training courses. This has the effect of reducing the lost time injuries recorded without a reduction in the number of injuries that are occurring.

As a result of the failure of outcome indicators on their own to provide an adequate indication of how OHS is managed in an enterprise, health and safety professionals and organisations have identified a need for additional measures of OHS performance (Ojanen et al, 1988; Amis & Booth, 1992; Kletz, 1993; NOHSC, 1994; Glendon & Booth, 1995; Shaw & Blewett, 1995). Such measures would focus on the management of OHS in an enterprise and highlight areas in health and safety where systems and procedures could be improved.

There are many health and safety activities conducted by enterprises that could be used to generate additional measures of OHS. These indicators would focus on 'how successfully' an enterprise or an industry is managing and performing in relation to OHS. These indicators are often described as process or positive measures of performance.

1. Amis & Booth, 1992; Shaw & Blewett, 1995; European Process Safety Centre, 1996.

Positive performance indicators - focus on assessing how successfully a workplace or enterprise is performing through monitoring the processes which should produce good OHS outcomes. Positive indicators can be used to measure relevant OHS systems, processes, management and compliance with OHS practices in the workplace. Examples of positive performance indicators include the number of safety audits conducted; the percentage of sub-standard conditions identified and corrected as a result of a safety audit; and the percentage of workers receiving OHS training.

Advantages of utilising positive indicators of OHS performance to supplement outcome indictors include:

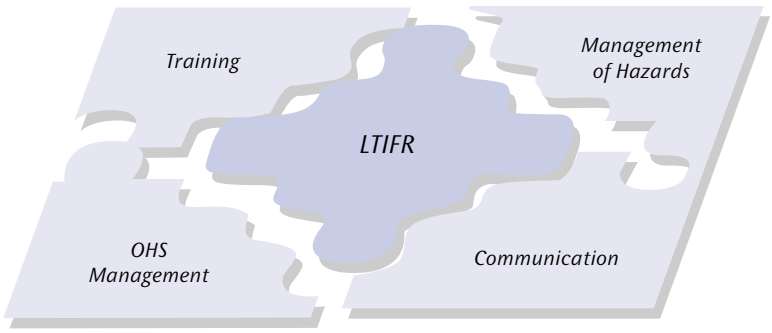
- the ability to measure and evaluate the effectiveness of OHS management;
- the provision of immediate feedback mechanisms regarding the management of OHS; and
- provision for immediate improvements to be made to OHS performance, if required.

There are also weaknesses if only positive indicators of performance are used to monitor OHS performance, as:

- they may not directly reflect actual success in preventing injury or disease;
- they may not be easily measured;
- they may be difficult to compare for benchmarking or comparative purposes;
- they may be time consuming to collect;
- they are subject to random variation;
- the measurement system may introduce incentives to mis-reporting. For example, under- or over-reporting; and
- often the relationship between positive performance indicators and outcome measures is not known.

By adopting both outcome-oriented (for example, LTIFR) and positive-oriented (for example, percentage of workers completing OHS training) indicators of OHS performance, an enterprise should be provided with a more comprehensive view of their OHS performance (Figure 1).

Figure 1.
OHS Performance Measurement Jigsaw



Source: Shaw & Blewett (1994), In NOHSC (1994)

OHS performance measurement in an industry

NOHSC sought to develop a set of indicators (both outcome-oriented and positive-oriented indicators) to measure the OHS performance of an industry. A number of industry characteristics were examined to identify the most appropriate industry for the project. These characteristics included:

- an industry that had similar work requirements across jurisdictions;
- an industry that had the ability to adjust for differences in work requirements across jurisdictions;
- there was a significant risk of fatal injury, non-fatal injury or disease in the industry;
- there was a significant absolute number of occurrences of death, non-fatal injury and disease in the industry;
- the industry had the ability to develop appropriate approaches to prevention;
- there was significant scope for success with prevention efforts in the industry;
- there was interest from the jurisdictions in the particular industry; and
- the industry was important in economic terms.

The construction industry was chosen as the most appropriate industry for the development of performance indicators for OHS.

The construction industry is reasonably standard across jurisdictions in Australia, was appropriate for the development of performance measures at the workplace level and had scope for significant improvement with workplace-based interventions.

The development of performance indicators for OHS in the construction industry also has relevance for other industries. That is, the process used to develop the indicators and the outcomes of this report should be relevant to a number of other industries.

During the 1997-98 financial year, the construction industry in Australia was estimated to have employed 597,000 people (including employees and self-employed). This figure represents 7% of employment in all industries (ABS, 1999a).

In May 1999, the construction industry employed 647,300 workers in Australia (231,100 workers in general construction and 416,600 in construction trade services) (ABS, 1999b). The majority of workers were male (87.8%) and were employed full-time (94.8%). Approximately 5% of full-time construction workers were female, with more female workers employed part-time than males (59.3%) (Table 1).

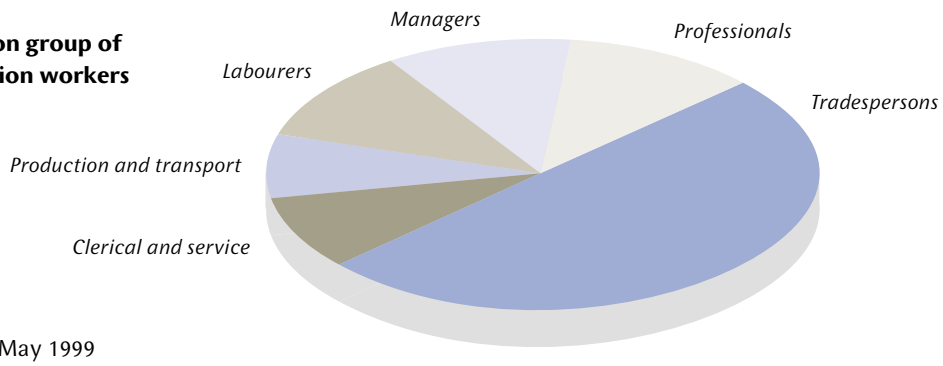
Table 1.
Gender and employment status of construction workers

Gender	Full-time		Part-time		Total	
	number	%	number	%	number	%
Male	534,600	94.8	34,100	40.7	568,700	87.8
Female	29,400	5.2	49,600	59.3	79,000	12.2
Total	**564,000**	**100.0**	**83,700**	**100.0**	**647,700**	**100.0**

Australia, May 1999

Half of the workers employed in the construction industry in May 1999 were tradespersons and related workers (49.9%) (ABS, 1999b) (Figure 2).

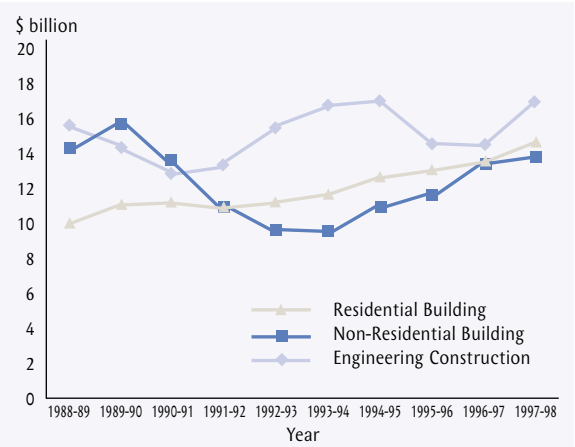
Figure 2.
Occupation group of construction workers (percent)



Australia, May 1999

Activity in the construction industry in Australia appears to be increasing, following the relative lows experienced in the early 1990s. Figure 3 shows that the value of non-residential construction (for example, offices, shops and hotels) has risen by 2% and engineering construction (for example, roads, bridges and sewerage) has risen by 10% between the 1996-97 and 1997-98 financial years. There has been a substantial rise in residential building construction (for example, houses, townhouses and apartments) of 19% between the 1996-97 and 1997-98 financial years.

Figure 3.
Construction activity in Australia by financial year, at average 1989-90 prices



Source: Building Activity, Australia (Catalogue No. 8752.0) and Engineering Construction Activity, Australia (Catalogue No. 8762.0) cited in Year Book Australia (Catalogue No. 1301.0).

Non-fatal and fatal injuries and disease in the Australian construction industry

National Data Set

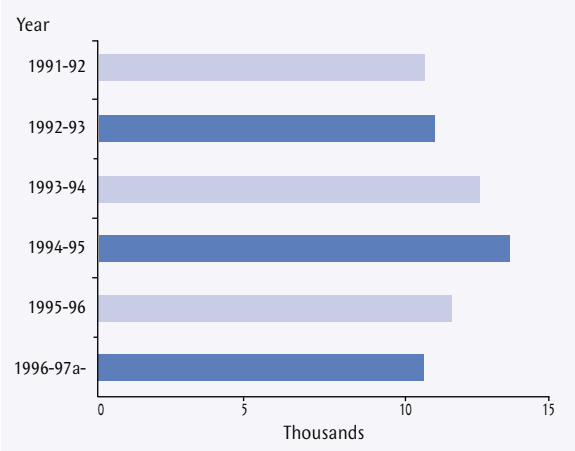
The National Data Set (NDS) contains information regarding workers' compensation claims that are made under the respective jurisdictions' or Commonwealth Compensation Acts. A workers' compensation claim is reported in the NDS if the work-related incident (excluding commuting to and from work) results in a fatality, permanent disability or temporary disability that results in an absence from work for five or more working days.

It should be noted that workers who are self-employed are not usually covered by workers' compensation and are generally not represented in information from the NDS. Where appropriate, the denominator data used to calculate the incidence rates reported per 1,000 workers and per million hours worked has been adjusted to exclude self-employed persons.

Compensated work-related injury and disease

Since 1991, on average, about 12,000 workers each year in the construction industry in Australia (excluding ACT and Victoria) have received compensation for work-related injuries and disease of five days or more duration (Figure 4).

Figure 4.
Number of new compensated cases reported in the construction industry - Australia (excluding ACT and Vic), 1991-97

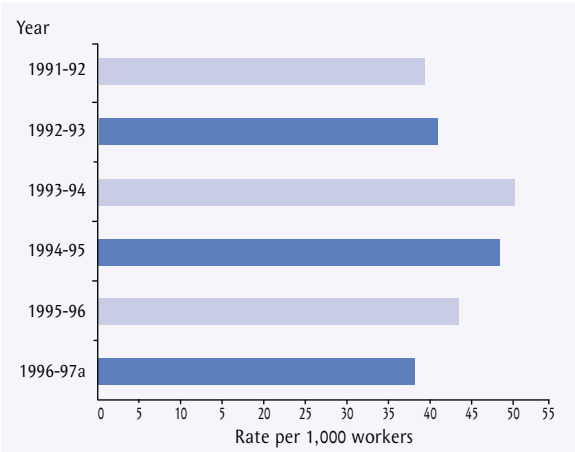


a: preliminary data.

Source: NOHSC (1998a) Compendium of Workers' Compensation Statistics, Australia, 1996-97. Commonwealth of Australia: Canberra.

It appears, after a climb in the rate of new compensated cases reported per 1,000 workers during 1993-94 and 1994-95, there has been a gradual decline in the rate of new compensated injuries and disease cases in the construction industry (Figure 5). However, the rate of compensated injuries and disease in the construction industry in 1996-97, at 37.4 per 1,000 workers, still remained higher than the all-industry rate in Australia (excluding ACT and Victoria) of 22.9 compensated injuries and disease per 1,000 workers.

Figure 5.
New compensated cases reported in the construction industry by financial year. Rate per 1,000 workers - Australia (excluding ACT and Vic), 1991-97



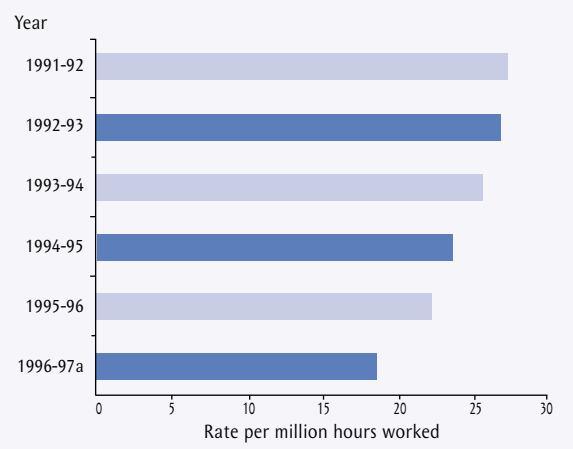
a: preliminary data.

Source: NOHSC (1998a) Compendium of Workers' Compensation Statistics, Australia, 1996-97. Commonwealth of Australia: Canberra.

Including Victorian data (adjusted to allow for under-reporting of injuries with between five and ten days off work), the construction industry in 1995-96 had a national average of 32.8 compensated injuries or disease of five or more days duration per 1,000 workers. For Victoria during the same timeframe, the rate was 29.0 per 1,000 workers who sustained a work-related injury or disease of five days or more duration (Labour Ministers' Council, 1998).

Although the rate of new compensated injuries and disease cases reported in the construction industry per million hours worked remained higher in 1996-97 (18.5 per million hours worked) than the all-industry rate in Australia (excluding ACT and Victoria) (12.9 during the same timeframe), there has been a gradual decline from 1991-92 in the rate (Figure 6).

Figure 6.
New compensated cases reported in the construction industry. Rate per million hours worked - Australia (excluding ACT and Vic), 1991-97



a: preliminary data.

Source: NOHSC (1998a) Compendium of Workers' Compensation Statistics, Australia, 1996-97. Commonwealth of Australia: Canberra.

Work-related fatalities reported in the National Data Set

Preliminary data indicate that 404 compensated work-related deaths occurred during 1996-97 in Australia (excluding ACT and occupational disease deaths in Western Australia) and that 49 of these work-related deaths occurred in the construction industry (12%).

Information from the NDS, taken during the same preliminary stage of the respective financial years in Australia (excluding ACT and occupational disease deaths in Western Australia), indicate that during 1994-95 there were 408 compensated work-related deaths (later revised to 418), of which 30 were of workers in the construction industry (7%) and that during 1995-96 there were 404 compensated work-related deaths (later revised to 409), of which 46 were of workers in the construction industry (11%).

It should be noted that not all work-related deaths involve a workers' compensation payment being made. For instance, where the worker may be self-employed or if the worker has no dependents to make a compensation claim, payment will usually not be made. The most recent national work-related fatality study showed that 30% of work-related traumatic deaths in the construction industry did not receive workers' compensation (NOHSC, 1999).

Work-related traumatic fatalities in Australia 1989-1992

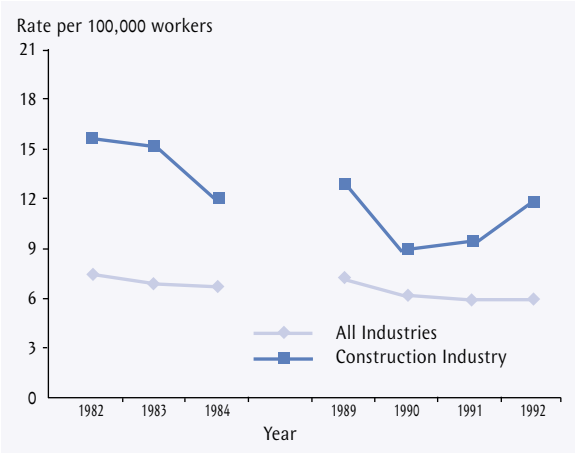
Information regarding work-related traumatic fatalities of workers employed in the construction industry during both 1982 to 1984 (Harrison et al, 1989) and during 1989 to 1992 (NOHSC, 1998b) was obtained from investigations of coronial files.

A detailed examination of fatalities in the construction industry during 1989 to 1992 is available in *Work-related traumatic fatalities involving construction activities in Australia, 1989 to 1992* (NOHSC, 1999).

During 1989 to 1992, there were 256 persons who were fatally injured as a result of construction activities in Australia. Of these 256 persons, 232 were workers who were employed in the construction industry, 18 were persons who were working, but who were not employed in the construction industry, but were fatally injured on a construction site and six were persons who were fatally injured as bystanders to construction work.

Workers who were employed in the construction industry (excluding commuting deaths) had a fatality incidence rate of 10.4 per 100,000 workers per year during 1989 to 1992. This figure is a decrease from the previous national work-related fatalities study for the 1982 to 1984 period that reported a fatality incidence of 14.1 per 100,000 workers per year (Figure 7). However, fatalities in the construction industry during 1989 to 1992 remained double the all industry average of 5.5 deaths per 100,000 person years and equate to 58 workers employed in the construction industry being fatally injured at work each year.

Figure 7.
Rate[1] of traumatic work-related fatalities for the construction industry and all industries by year - Australia, 1982 to 1984, 1989 to 1992



1: Incidence rates - deaths per 100,000 workers per year - based on Employed Civilian Labour Force (ECLF).

Development of Performance Indicators for OHS in the Construction Industry

The process of the development of the OHS performance indicators for the construction industry is detailed below.

Aim

The aim of the project was to develop in consultation with industry participants, a set of indicators (both outcome-oriented and positive-oriented indicators) for monitoring the OHS performance of the construction industry in Australia.

Construction working group

A working group was established to provide advice and to assist in the development and the progress of the project. The group consisted of NOHSC staff and representatives of industry, unions, state-based OHS agencies and the Department of Employment Workplace Relations and Small Business (Appendix 1).

Traditional OHS performance focus

The indicators that the construction industry used to monitor their OHS performance were examined. Traditionally, the construction industry has focused on outcome measures of performance to report on OHS. For example, outcome-oriented measures such as LTIFR or workers' compensation costs.

There are several limitations in relying solely on outcome measures of performance as indicators of OHS performance. These limitations are discussed earlier in this report.

However, there are also some enterprises in the construction industry who have already adopted, or are beginning to develop, alternative measures to monitor their OHS performance.

Projects of relevance to the development of performance indicators for OHS

Several related OHS projects and initiatives regarding performance measurement or the construction industry that were being or had been conducted in Australia that might be of relevance to the project were identified (Table 2). This enabled the project to draw on the work and experiences of other bodies that had considered similar issues regarding performance measurement or issues specific to the construction industry.

One of the main issues identified relevant to the construction industry was the diverse nature of the industry.

Table 2.
Projects of relevance to the development of performance indicators in the construction industry

Body	Project
NOHSC	Work-related traumatic fatalities in Australia, 1982 to 1984
	Work-related traumatic fatalities in Australia, 1989 to 1992
	Evaluation of Queensland construction safety 2000 initiative
	Report on evaluation of contractor compliance initiatives
	Safe design
	Drivers for reinforcing OHS accountability in employees with supervisory responsibilities and gaining business owner and CEO commitment to OHS
	Positive performance indicators: beyond lost time injuries
NOHSC and Construction Industry Development Agency	Occupational health and safety performance manual
Housing Industry Association	Small business safety solutions
Industry Commission	Performance measures for councils: improving local government performance indicators
Labour Ministers' Council	Comparative performance monitoring: occupational health and safety and workers' compensation
	Comparative performance monitoring: comparison of OHS arrangements in Australian jurisdictions
Master Builders' Association	Meanings of risk control in construction industry small business
NSW Health Department	Health outcome performance indicators: Monitoring health improvement
NSW Minerals Council	Moving to the new way of measuring OHS performance
Safety Performance Indicators (Shipping Industry) Committee	Safety performance indicators for the Australian shipping industry
The Chamber of Minerals and Energy, WA	Guide to positive performance indexing for management of occupational safety and health in the mining industry
WorkCover NSW	Sub-contractor management and site communication
	Strategies for OHS management systems
	Code of practice for OHS management systems
	Safety in design - Guidelines for major building and civil projects
WorkCover SA	Safer industries project
	OHW&S for contractors
WorkCover VIC	Strategic occupational injury prevention. Occupational black spots Victoria (analysis and priorities)
	Foundations for safety, health and safety in the construction industry
	SafetyMap: Auditing health and safety management systems
Worksafe WA	Workplace change project report
	Mix of measures for industry OHS performance

Sectors of the construction industry

The diverse nature of the construction industry, the different types of hazards experienced in different construction projects and the numerous work practices adopted to perform a variety of tasks in different sectors of the construction industry were acknowledged. As a result, the construction industry, for the purposes of this project, was divided into four sectors, which would be considered for the development of OHS performance indicators. These four sectors were:

- commercial construction (for example, factories; high rise apartments);
- civil construction (for example, roads; bridges);
- heavy engineering construction (for example, petro-chemical sites); and
- domestic housing.

Factors that can influence injury experience

A review of the factors that have been reported to be associated with the injury experience of an enterprise was conducted to provide an indication of the type of areas where OHS performance indicators should be developed (Appendix 2). Specific factors in the construction industry which past research has shown can influence injury experience were also identified (Appendix 3).

An overview of the non-fatal and fatal injury experience of the Australian construction industry, together with a snapshot of the injury experience of the construction industry internationally, was conducted (NOHSC, 1999). This overview sought to determine the common mechanisms of injury and agents involved in the injurious incidents and also to try to establish possible patterns of injury causation.

Selection of performance indicators

A framework was adopted for the selection of performance indicators for OHS. This framework proposed that:

(1) the indicators to be developed

  (a) should reflect all areas of OHS, such as the OHS management system, site safety and the workers' compensation and/or incident experience of the industry;
  (b) should be perceived as useful and also cost-effective for data collection; and

(2) any factors or conditions that could affect the collection of OHS performance indicators should be identified and considered when developing the indicators.

OHS in the construction industry

From the information and data available, six main areas that were considered to have an impact on OHS performance in the construction industry were identified. These six main areas were:

- commitment by management to safety;
- an effective OHS management system;
- risk management and control of hazards;
- auditing of both management systems and physical hazards;
- training and education; and
- communication and consultation.

Further investigation of these six areas and their impact on OHS across industries was conducted through a brief survey of the research literature.

Commitment by management to safety

Enterprises where management are interested, show commitment to and are involved in their enterprise's OHS performance have been demonstrated to have better safety performance records than firms where senior management is not interested in OHS performance (Cohen, 1977; Simonds & Saafai-Sahrai, 1977; Smith et al, 1978; Shannon et al, 1997; Shannon, 1998).

Specifically, Simonds and Saafai-Sahrai (1977) argued that senior management produce enterprises with better safety records than their competitors when these managers are involved in safety in terms of:

- attendance at safety meetings;
- chairing safety meetings;
- regularly receiving safety reports;
- being members of a safety organisation;
- regularly attending safety meetings or conferences outside the company;
- emphasising plans for achieving certain safety objectives;
- actively participating in the execution of safety plans;
- encouraging reviews of safety plans against objectives; and
- including safety figures, reports and achievements on the agenda of company board meetings.

Active support by management for safety programs and the attitude and commitment of senior management towards safety were cited by Cohen (1977) as being some of the dominant factors in the success of occupational safety programs. The commitment and support of management for health and safety were also characteristics of enterprises with good safety performance records (Cohen, 1977). Cohen (1977) measured management commitment in terms of whether:

- the safety officer holds a high staff rank;
- top officials are personally involved in safety activities. For example, top officials make safety tours and give personal attention to accidental injury reports;
- a high priority is given to safety in company meetings and in decisions on work operations; and
- management sets clear safety policy and goals.

Cohen (1977) reported that senior management in enterprises with good safety performance records placed the same emphasis on safety as on the quality and quantity of the enterprise's production and profits.

In a review of the literature, Shannon et al (1997) concluded that enterprises where senior management played an active role in health and safety consistently had lower injury rates than enterprises whose managers were not actively involved in safety.

Shannon (1998) found in several enterprises that management factors that were associated with lower injury rates in the manufacturing industry included:

- defining health and safety in every manager's job description;
- the inclusion of information regarding health and safety performance in annual appraisals of managers; and
- the attendance of senior managers at health and safety meetings.

An effective OHS management system, risk management and control of hazards

A number of research studies have argued that an established system to manage OHS and a system to control hazards at the workplace were associated with good safety records (Simonds & Saafai-Sahrai, 1977; Boden et al, 1984; Gun & Ryan, 1994; WorkSafe WA, 1998).

Enterprises with good safety performance records had cleaner, better designed and better environmental qualities (for example, noise, dust, heat, fumes, lighting) at their work sites than enterprises with poor safety records (Smith et al, 1978).

Enterprises with highly developed safety structures (WorkSafe WA, 1998), comprehensive, written standard operating procedures (Gun & Ryan, 1994; WorkSafe WA, 1998) and clearly identified areas regarding the responsibility of safety (WorkSafe WA, 1998) were found to have good safety performance records compared with enterprises who did not have these items in place.

Gallagher (1997) found that enterprises with more highly developed health and safety management systems were more likely to:

- ensure health and safety responsibilities are identified and known;
- have senior mangers taking an active role in health and safety;
- encourage supervisor involvement in health and safety;
- have health and safety representatives who are actively and broadly involved in health and safety management system activity;
- have effective health and safety committees;
- have a planned approach to hazard identification and risk assessment;
- give high priority and consistent attention to control of hazards at the source;
- have a comprehensive approach to workplace inspections and incident investigations; and
- have developed purchasing systems.

The presence of a trained, effective health and safety committee was associated with fewer serious hazards at the workplace (Boden et al, 1984; Gallagher, 1997; Hale & Hovden, 1998). Reilly et al (1995) found that enterprises in the UK who had a joint consultative committee set up exclusively for health and safety (where all employee representatives were chosen by unions) had, on average, fewer employee injuries compared with enterprises where management deals with health and safety matters, without consulting with workers. However, there is no clear evidence to suggest that just the presence of a health and safety committee was associated with good safety performance in an enterprise (Hale & Hovden, 1998).

Good injury recording systems, one of the components of an effective OHS management system, were associated with lower work-related injury rates in enterprises (Simonds & Saafai-Sahrai, 1977; Hale & Hovden, 1998).

Enterprises where good housekeeping procedures were employed were found to have better safety performance records than those enterprises with poor general housekeeping (Simonds & Saafai-Sahrai, 1977; Cohen, 1977; Smith, 1978; Shannon et al, 1997; Harper & Koehn, 1998).

The provision of safety devices and controls on machinery and equipment was consistently related to lower injury rates in enterprises (Simonds & Saafai-Sahrai, 1977; Shannon et al, 1997).

Auditing of both management systems and physical hazards

The completion of regular safety audits has generally been associated with enterprises that have lower injury rates and/or successful approaches to health and safety (Smith et al, 1978; Shannon et al, 1997; WorkSafe WA, 1998). However, Eisner (1993), in a study of safety rating systems in South African gold mines, found a poor correlation between the presence of a safety audit system and accident performance.

Training and education

Several research studies indicate that safety training is associated with good safety performance in enterprises (Cohen, 1977; Gun & Ryan, 1994; Shannon et al, 1997; Harper & Koehn, 1998; WorkSafe WA, 1998). The provision of regular safety training was found to be a common feature of good safety performers (Shannon et al, 1997; WorkSafe WA, 1998). In enterprises that were not performing as well as their counterparts, training and induction procedures were found to be haphazardly arranged and poorly organised (WorkSafe WA, 1998).

The induction of new workers at the workplace and induction in safe working procedures was also commonly associated with successful safety performance (Cohen, 1977; Harper & Koehn, 1998).

Communication and consultation

Good communication and good relations between management and workers, enabling open communication on safety as well as other work-related matters, have been associated with good safety performance records in enterprises (Cohen, 1977; Smith et al, 1978; Shannon et al, 1997; WorkSafe WA, 1998). Further, Smith et al (1978) found that enterprises who had good safety performance records had more frequent and more positive contacts between management and employees, while management from enterprises with poor safety records had tended to use the health and safety committee meetings as their only means of interacting with employees.

Enterprises where there were opportunities for workers to participate, to be involved in the consultation process and who were able to be involved in negotiations on health and safety issues were more likely to have good safety performance records (Shannon et al, 1996; Shannon et al, 1997; Harper & Koehn, 1998; WorkSafe WA, 1998; Shannon, 1998).

Design and planning

Although not initially indicated as an area that has an impact on OHS performance in the construction industry, design and planning was found to be an important area during the case study process.

Limitations in the design of machinery, equipment and other devices have been demonstrated to contribute in some way to several types of incidents, involving both near misses and fatalities (Casey, 1993). Many of these incidents occur "because of incompatibilities between the way things are designed and the way people perceive, think, and act" (p9, Casey, 1993).

The design of a building or structure is an area that has not generally been considered in detail in Australia as a risk factor for injury in the construction industry. Bamber (1994) argues that it is vitally important to "ensure that health and safety [is] built in, rather than bolted on" (p192) in the design and planning of new construction projects. In Europe, research has indicated that injurious incidents are occurring in the construction industry due to shortcomings in design (such as architectural choices and decisions on materials and equipment) (European Foundation for the Improvement of Living and Working Conditions, 1991; MacKenzie et al, 1999).

Churcher and Alwani-Starr (1996) considered the design process when determining the causes of construction injuries and fatalities in the UK. They identified that 36% of incidents were traceable to the nature of the design of the structure and that 27% of incidents were traceable to the lack of planning of the construction process.

From the European research, it appears that many injurious incidents are preventable and consideration should be given to highlighting awareness of the risks involved in construction work to architects, engineers and designers who may be in a position to 'design out' some of the risks in the construction process to aid both the initial construction and later maintenance of the structure.

An example of the ability to design out hazards or potential injury risks may be through prefabricating large elements of the project off site (Neale, 1995; Hinze et al, 1999) or through completing permanent stairways early in the construction of structures to minimise the risk of falls (Hinze et al, 1999). Ensuring that items such as anchorage sockets for brackets and safety harnesses are included in the design of structures will aid in later maintenance of the structure (European Foundation for the Improvement of Living and Working Conditions, 1991).

Preliminary performance indicators

On the basis of linkages demonstrated within the research literature between positive and outcome indicators of OHS performance, preliminary positive performance indicators for the six areas thought to have an impact on OHS in the construction industry were developed. These indicators were:

1. Commitment by management to safety

- Do management duty statements include OHS? and do management performance reviews include OHS?
- Is the OHS policy and/or information regarding OHS performance included in public company reports?
- Is there a budget allowance for OHS? (contextual information would be needed for this indicator. For example, if OHS was taken into account early in the construction process, an OHS budget would be low. Similarly, if an enterprise was not adequately budgeting for OHS, their OHS budget would also be low).
- Worker rating of supervisor/ project manager commitment to OHS.
- What percentage of OHS committee meetings are attended by senior managers?
- Are sub-contractors periodic payments reliant on outcomes of OHS audits?

2. An effective OHS management system

- Does the purchasing policy include OHS requirements? or is OHS taken into account when purchasing new equipment?
- Do sub-contractors contracts and/or tenders include adherence to OHS practices?
- Does the enterprise have an effective OHS management system in place or can the organisation demonstrate systematic management of OHS?
- Number, regularity and effectiveness of OHS committee meetings.
- What percentage of safe operating procedures are developed for work tasks?
- Is there a preventative maintenance program in place for equipment and/or machinery?

3. Risk management and control of hazards

- What percentage of major hazards are controlled and is there demonstrated use of risk assessment methods (i.e. elimination; substitution; engineering controls; administrative controls; personal protective equipment)?
- What percentage of injuries are incurred for identified major hazards?
- Does the employer have any input regarding OHS in the design of the structure?
- Observation of general housekeeping on site.
- Is there a process in place for workers to report hazards in the workplace?
- What percentage of hazards identified through OHS committee meetings have been rectified?

4. Auditing of both management systems and physical hazards

- Number, regularity, quality and outcomes of self assessments conducted (i.e. self audits).
- Number of sub-standard conditions identified and corrected as a result of safety audits.
- Number, regularity, quality and outcomes of independent assessments conducted (i.e. independent audits).

5. Training and education

- What percentage of workers have completed induction training (i.e. general, work activity and site specific)?
- What percentage of supervisors/ forepersons have received OHS training?

6. Communication and consultation

- Do training and operating instructions take into account non-literate workers (i.e. does training include videos, workshops, demonstrations, audio tapes, interpreters, if necessary)?
- How does the organisation communicate to the workforce (eg. toolbox meetings)?

Preliminary outcome performance indicators identified were:

- Number of injuries involving employees (especially, new employees), sub-contractors or others on site, including:
  - minor work-related injuries. For example, visits to first aid or medical facility;
  - other work-related injuries which resulted in the worker taking time off work;
  - any work-related injuries that required a worker to undertake alternative work duties; and
  - compensable work-related injuries.
- Number of occurrences where there was damage to property (i.e. machinery, equipment, structures) or potential injury to employees, sub-contractors or others (i.e. near misses).

On advice from industry, these performance indicators were categorised by the 'OHS phases' of a construction project. These stages included:

(1) establishment of a charter regarding OHS;
(2) establishment of a site specific OHS management system;
(3) identification of major hazards at the site;
(4) self assessment of the OHS management system;
(5) self assessment of major hazards; and
(6) completion of an independent audit.

Consultation with industry groups

Further consultation with relevant industry groups regarding the preliminary performance indicators was undertaken and feedback regarding these indicators was sought. Consultation was undertaken with the Housing Industry in Victoria and Western Australia; Master Builders' Association in New South Wales, Victoria and Western Australia; Civil Construction and Building Committees in South Australia.

Case studies

Industry case studies were selected as the optimal method of assessing the feasibility of collecting information regarding the preliminary performance indicators within the construction industry.

The case study approach has been used in other research studies as a means of collecting information regarding OHS and assessing the impact of organisational, workplace and workforce characteristics on injury experience (Simonds & Saafai-Sahrai, 1977; Smith et al, 1978; Gun & Ryan, 1994; Bentil & Rivara, 1996; Shannon et al, 1996).

Industry Case Studies

This section provides a summary of the case studies by industry sector. Sixteen case studies were conducted in four states in Australia and, where possible, across the four construction sectors by four independent consultants (Table 3):

Table 3.
Case Study Matrix

Industry Sector	New South Wales	Victoria	South Australia	Western Australia
Commercial	✔✔	✔✔	✔	✘
Civil	✘	✔	✔	✔✔
Heavy engineering	✔	✘	✔	✔
Domestic housing	✔	✔	✔	✔

The industry case studies involved:

- an assessment of the feasibility of collecting the identified OHS performance indicators in the case study enterprises;
- identification of any indicators that were currently being used to assess OHS performance in the case study enterprises;
- identification of alternative, existing OHS performance indicators in the case study enterprises that could be used to assess any of the six identified areas that have an impact on OHS in the construction industry; and
- determination of whether the performance indicators are true measures of the 'drivers' of OHS in the case study enterprises.

Data collection took place over a three month period, using a combination of data collection tools to obtain reliable and valid information. The tools were:

- structured interviews using a long form questionnaire to obtain detailed and specific responses;
- semi structured interviews using open ended questions;
- a short workshop with relevant groups from the case study enterprises to elicit potential OHS indicators and measures of relevance to the case study enterprises; and
- review and analysis of secondary data sources such as OHS documentation maintained by the case study enterprises.

Where possible, one or more construction projects were selected as the focus for data collection in each case study. Representatives from corporate OHS personnel, site-based OHS personnel, project and line management, union representatives, sub-contractors and the workforce were selected from each case study enterprise to take part in the research.

Findings reported in the summary have been checked for accuracy and cleared with the case study enterprises.

The summary for each construction sector provides:

- a brief profile of the case study enterprises in the sector;
- a description of the drivers of good OHS performance which were identified in the case study enterprises;
- a description of the strategies the case study enterprises use to manage OHS;
- a list of the OHS performance indicators in use by the case study enterprises;
- a list of the OHS performance indicators the case study enterprises would like or plan to use; and
- a description of the issues of significance revealed by the case studies which may have significant impact on OHS performance and the capacity for performance improvement in the sector.

Profile of case study enterprises

Five case studies were conducted of companies operating in the commercial sector of the industry:

- the NSW division of Walter Construction Group, a large multinational construction company which directly employs 1000 workers in Australia;
- the NSW division of Abigroup Limited, which directly employs 900 workers across Australia;
- the SA division of Baulderstone Hornibrook, a medium sized national building company;
- the Victorian division of Hansen Yuncken, with 75 direct employees in the division; and
- the Victorian division of Multiplex, a large national construction company with 170 direct employees in Victoria.

Key drivers identified by case study enterprises

The following drivers of good OHS performance were identified in the case study enterprises:

Senior management commitment

This was identified as a critical issue in each case study enterprise. It was created by a range of other drivers, listed below, as well as a sincere concern for employees. At one case study enterprise, it was considered easier to gain support for some OHS initiatives, particularly those that were resource-intensive, because of this commitment. In turn, management commitment was a driver of employee commitment to OHS. For example, at another enterprise, one informant commented that "workers' attitudes are good when the boss does the right thing".

Use of OHS as a competitive advantage, enhancing market position and public image

For each case study enterprise, OHS was identified as a key aspect of how they market their business. Good performance in OHS was seen as a competitive advantage. In the NSW case studies, being a signatory to the Memorandum of Understanding provided an important marketing advantage as well as driving specific actions required under the Memorandum. In addition, public image was important. For example, the project investigated in one case study was a high profile site at a time when construction industry OHS was receiving significant media attention in the state as a result of recent fatalities in the construction industry. This was reported to contribute to the high priority that OHS was given.

Project personnel

In each of the case study enterprises, the competence, knowledge and commitment of site personnel made a significant difference to how seriously OHS was treated on the site. One enterprise's OHS manager reported that he was able to provide a more effective resource to sites with committed and aware project personnel. This was particularly important with respect to sub-contractor management. In each case study, tendering documentation included OHS requirements. However, ensuring that these were achieved in practice depended very much on the attention given at a site level. The project manager of one case study project took great care when selecting sub-contractors to choose ones which he believed had the ability and commitment to meet the OHS requirements of the job, not just those which offered the best price. The site supervisor provided clear advice, based on his experience and knowledge of other projects, regarding which potential sub-contractors were more likely to comply in practice with the enterprise's OHS requirements.

Enforcement, both internal and external

Enforcement by OHS agencies was identified as an important influence on management commitment and OHS performance. For example, access to common law action by sub-contractors was cited by one enterprise as a driver of OHS. Another case study enterprise used the number of notices and fines issued by the OHS agency as a measure of their OHS performance. Equally, internal surveillance of sub-contractors through activities such as auditing and monitoring was identified as a key driver of sub-contractor OHS performance. This may have negative consequences if OHS is treated as something that is done as a result of external threats, rather than internal need.

Independent audits

In four of the case study enterprises, independent audits provided a critical incentive to improve OHS management on site. In particular, participation in the Safety Achiever Bonus Scheme (SABS) drove OHS performance and provided important feedback on possible improvement strategies. Independent audits not only provided an incentive to meet required standards, but also revealed opportunities for improvement. One enterprise reported particular value in inviting independent audit of its operations because it meant that the organisation was scrutinised by people with 'fresh eyes'.

Strategies

The following strategies describe the actions to manage OHS taken by the case study enterprises as a result of the drivers.

Consultation and communication

Consultation and communication was identified by the case study enterprises as critical to ensuring effective OHS management. Formal processes such as site safety committees were nominated as significant, but ensuring that consultation and communication was part of everyday management processes, such as development of work procedures, was even more important. For example, one OHS manager believed that workforce participation in OHS management is critical to success. He was working to encourage management to change the current more top down approach to one which recognises that "participation is the key".

OHS management systems

In each of the case study enterprises, formal OHS management systems were in place. Each enterprise emphasised, however, that the systems were only of value to the extent of their implementation on site. For example, workshop participants at one enterprise recognised limitations of systems which were very reliant on documentation. They suggested that the mere presence of written procedures constituting an OHS system was less useful as a measure of performance than the effectiveness of the system.

Risk management and hazard control

Activities in the hazard control area were a primary focus in all case studies. Activities of particular importance were inspections of varying frequency and focuses, use of Job Safety Analyses and Standard Work Procedures and reporting of hazards and incidents. For example, the site manager of one case study site used the recurrence of identified hazards as a personal measure of how well OHS is being managed on site by sub-contractors: "If we keep getting items coming up all the time, that would tell us that things are not working and that we need to monitor and go back to the subbies".

Sub-contractor management

Sub-contractor management was cited as the most important strategy for managing OHS on the case study sites. One enterprise identified that their biggest problem was "getting sub-contractors to take safety seriously. Attitudes can be improved if the main contractor leads by example, e.g. run toolbox meetings for sub-contractors". Another enterprise did not believe their sub-contractors were as committed to OHS as necessary. This was explained as the result of lower levels of OHS knowledge, budget pressure and communication difficulties, particularly language barriers. They also reported that sub-contractors generally perceived that OHS was the responsibility of the main contractor. Each case study enterprise had implemented a number of strategies to address this. In particular, addressing OHS from the beginning of the selection process, providing support in developing effective OHS management and ongoing surveillance were cited as being of critical importance across the case studies.

Training

Training was cited as an important strategy for effective OHS management. As well as specific OHS training, case study enterprises stated that vocational training makes a considerable difference to OHS standards. In this context, the general dissatisfaction with the quality of vocational education and training in the industry is concerning. Site personnel interviewed at the one case study site were all critical of the standard of vocational training currently available in the industry. This was related to concerns about changing levels of regulation regarding training. For example, one health and safety representative at one of the case study enterprises was particularly critical of the standard of training provided to equipment operators. Many types of equipment do not require certificates of competence to operate and operators have not received the level of training he believes is required to operate high hazard equipment.

Auditing

Each case study enterprise undertook auditing, both internal and independent, to review OHS management on sites. The scrutiny created by auditing, particularly for sub-contractors, supported accountability and helped to identify improvement opportunities.

Design

In each case study project, improving the design of the project was identified as an important potential strategy for improving OHS. The site safety committee at one case study site argued that most of those with control or influence over design had little knowledge of how to build, much less knowledge about OHS in the construction process. To improve this, they argued that the design process should involve those who will build a structure, even if this is just to review drawings before finalisation. More importantly, they argued that architects and engineers should have more knowledge and competence in how to build safely and be held accountable for this. However, only one enterprise specifically addressed OHS issues in the design process, modified designs to control identified OHS risks.

Indicators currently in use

Each case study enterprise recognised the limitations of outcome data in measuring OHS performance. Most of the case study enterprises consequently used a combination of outcome and positive performance indicators to monitor OHS performance.

The following outcome data was commonly collected at enterprise and project level:

- lost time injury frequency rate (LTIFR);
- first aid injury rate and number;
- notifiable dangerous occurrence rate;
- fatality;
- non injury incident; and
- days lost.

The following positive performance indicators were collected at different case study enterprises:

- number of internal safety improvement notices;
- percentage of people inducted;
- number of inductions to industry standard;
- number of inductions to site;
- number of tool box meetings held;
- number of method statements signed off;
- number of accidents/near misses investigated;
- internal safety audit score;
- external safety audit score (if applicable);
- frequency of site safety meetings;
- number of OHS plans submitted;
- number of OHS plans accepted;
- number of OHS audits scheduled (internal and for sub-contractors);
- number of OHS audits completed (internal and for sub-contractors);
- number of nonconformance reports raised on site;
- number of nonconformance reports outstanding to date;
- number of OHS authority rectification notices; and
- number of OHS authority fines.

Indicators they would like or plan to use

Each of the enterprises was in the process of reviewing their OHS performance measurement system, some with specific changes which were being implemented. The workshop conducted with some case study enterprises as part of the data collection process also identified areas where participants believed additional OHS positive performance indicators might be useful.

The following positive performance indicators were planned to be used or suggested in the workshops in the different case study enterprises:

- number of project safety plans in place;
- number of system audits undertaken;
- average branch audit score or individual project scores;
- number of sub-contractor audits undertaken;
- average sub-contractor score per project;
- number of task observations undertaken;
- percentage of project personnel observed performing a task correctly;
- number of project initiatives entered into the system;
- percentage of movement in attitude surveys;
- number attending training;
- number of reported plant incidents;
- number of reported property incidents;
- number of sub-contractor companies on site;
- number of sub-contractor safety plans;
- number sub-contractor plans audited;
- average audit score;
- number of sub-contractor plans appraised;
- number of project safety committee meetings held;
- number of management workplace inspections;
- percentage of actions closed out;
- number of safety committee inspections;
- percentage of actions closed out;
- number of attendees at specific OHS training courses;
- number of weekly toolbox meetings held;
- risk assessments revised, accepted and recorded;
- number of clean up notices issued;
- number of departures from safe work method statements;
- number of issues identified on safety walks;
- percentage of supervisor checklists not completed for week;
- results of safety inspections, particularly continuing or repeated problems;
- safety committee effectiveness;

- number of management or OHS committee communication tours;
- audit of minutes of meetings;
- annual culture survey;
- annual performance reviews;
- monthly audit of participation in the development of job safety analyses (JSA) as recorded on each JSA;
- awareness of safe systems of work by employees and sub-contractors at toolbox meetings;
- monitoring the involvement of the safety committee and site safety committee in the review of JSAs;
- audit of inspection reports to check participants;
- checking actual work performance against referees' reports, interview results, tender evaluation;
- audit of accident investigation reports against hazard control reports;
- audit of OHS meetings to determine that problems are dealt with;
- audit of actual state of plant and equipment against statutory requirements - monthly audits and random checks; and
- OHS performance of sub-contractors at tender evaluation stage and at completion of work.

As well as the issues included in the above list, other areas suggested by the case study enterprises for the development of positive performance indicators were:

- planning and design;
- reporting and monitoring;
- education and training;
- communication; and
- attitudes to OHS.

Issues of significance

The case studies in this industry sector revealed a number of issues which may have significant impact on OHS performance and the capacity for performance improvement in the sector.

Dissatisfaction with aspects of vocational education and training in the industry

Each of the case study enterprises expressed dissatisfaction with the standard of vocational training in the industry. For example, concern was common about the standard of training provided to equipment operators, which was reported to be inadequate for operating high hazard equipment on a construction site.

Importance of sub-contractor management approaches

Each case study enterprise stressed that the effectiveness of sub-contractor management was the main determinant of OHS performance. Some site personnel reported that they went to considerable lengths to reduce the likelihood that sub-contractors with inadequate OHS management would be engaged on their project.

Fatalism about accidents

While personnel in each case study enterprise expressed personal commitment to improving OHS performance, most of those interviewed expressed varying degrees of fatalism. They reported a belief that it would be impossible to prevent all accidents in the industry. For example, one interview participant stated that "you can't get all injuries to go". The aim for health and safety management developed at one workshop cited "no accidents" as a target with the qualification that this referred to serious accidents, because minor accidents are "always expected".

Concern about use of OHS as an industrial lever

To greater or lesser extent, personnel in most of the case study enterprises expressed concern about the use of OHS as an industrial tool.

Universal recognition of the lack of reliability of outcome data

Each case study enterprise had previously identified that outcome data was of limited validity and was actively using or seeking positive performance indicators to help them improve their OHS management. For example, one enterprise's OHS manager reported that accident data is of limited usefulness in managing OHS, because it is negative and also does not reveal the potential severity of accidents. At a site level, accident data is difficult to collect because many site workers are only on site for a short period and therefore it is difficult to collect accurate data. In another case study enterprise, neither the project manager nor the state OHS manager believed that the accident data they collected was either statistically meaningful nor reflective of OHS performance of the site. This means that the current study will be able to provide timely support to the industry, encouraging other companies to also improve their data collection and analysis.

Design

Each case study enterprise identified that the design of the building has considerable influence on OHS performance. At several case study sites, personnel identified that improving the education of design professionals (i.e. architects and engineers) to include OHS would have major benefits for OHS in the industry. In this context, it is revealing that only one case study enterprise explicitly reviewed the project's design for OHS consequences.

Conclusion

Each of the commercial case study enterprises had identified limitations with traditional OHS performance measurement and was seeking to improve their approach. The enterprises were using a variety of indicators which focused on areas of importance for their OHS management systems. This project will add value to their work by providing useful guidance to other areas in which positive performance indicators may be useful and by supporting greater industry coordination in positive performance measurement.

Profile of case study enterprises

Four case studies were conducted of companies operating in the civil construction sector of the industry:

- three construction sites of Adelaide Civil Pty Ltd [ADCIV], a locally owned, South Australian construction company directly employing about 120 people;
- the Western Australian division of Theiss Contractors Pty Limited directly employing 250 workers;
- the Western Australian division of Consolidated Constructions directly employing 115 workers; and
- a case study of one site where Vicroads, the Victorian government civil construction authority, was the principal and the Victorian division of John Holland was the contractor with 40 employees on site.

Key drivers identified by case study enterprises

The following key drivers were identified in the case study enterprises:

The commitment of senior management and other key personnel

Strong personal commitment to OHS by senior management and other key personnel was identified as a key driver for OHS in each of the case study enterprises. The competence, experience, personal commitment and preparedness to follow through when displayed by the project managers and other senior managers played a critical role in the effectiveness of on-site OHS management. As one person commented, “It starts at the top - management setting out proper rules and so on at the start of the job”.

Use of OHS as a competitive advantage, enhancing market position and public image, and contributing to company viability

For some enterprises the OHS record was regarded as an important aspect of their competitive position. A good record in safety management was known to support tenders, particularly for government-funded work.

All enterprises reported that being seen as a safe employer, concerned for those who work on their sites, and being seen as a socially responsible employer, was important for their public image and was therefore a key driver for attention being paid to OHS.

Enforcement, both internal and external

Enforcement by OHS agencies was regarded as an important driver for some enterprises. This ranged from seeking to comply with legislation ("we want to avoid litigation and costs associated with incidents") being considered to have played a role in OHS improvement programs in others ("we have used our inspector to help us improve our OHS processes").

The case study enterprises asserted that a key driver for OHS in many small sub-contracting companies was the surveillance of the contractor and the associated likelihood of detection. In addition, contact with and support from the contractor's often more experienced and competent supervisors provided some smaller sub-contractors with a form of on-the-job training in OHS management. This one-on-one approach was considered an effective way to spread the message about the importance of OHS and how to incorporate it into daily activities.

The unpleasant experience of past incidents and a desire to prevent potential incidents

Site supervisors and the OHS coordinator at one enterprise cited a serious incident in the early days of the enterprise that had a significant impact on the way members of the enterprise at all levels viewed health and safety and the incident was perceived as a driver of the health and safety program.

Respect for others, both as people and as skilled individuals

In one enterprise, workers identified self-protection, respect for others and the desire to work in a happy crew as a key driver of OHS from their perspective. They indicated that open communication at all levels in the enterprise showed that they were respected and they felt they were provided with opportunities to participate in decision-making about OHS, which they appreciated.

Strategies

The following strategies describe the actions to manage OHS taken by the case study enterprises as a result of the drivers.

Consultation, communication and participation

Developing genuinely interactive and participatory means of communicating and engaging everyone in managing OHS was regarded as a key strategy in each of the case study enterprises. “Health and safety has got to be part of everyone’s work. It’s not just the bosses or just the workers”, as one site supervisor said. In some enterprises, effective participation and consultation were encouraged through the OHS committee and through formal toolbox meetings and team briefings which provide opportunity for problem solving. Informal, daily communication on site was regarded as critical to supporting OHS and as the most effective way to communicate with the workforce about OHS because it was frequent and low key - just part of normal daily conversation. As one site supervisor said, “just about every time I meet with the guys on site we talk about some health and safety matter or other, it’s always up front”. Other forms of communication might be written, such as the OHS bulletins (‘Safety Alerts’ in one enterprise) or regular information sheets on pertinent OHS issues that are distributed to the people on work sites.

In most enterprises a collaborative approach was used to develop detailed OHS policies and procedures. This was done by the management and workforce working together on the OHS committee. This type of collaboration works when employee members of the committee are given the opportunity to talk through the issues with the people they represent outside of the meetings.

Some enterprises used a system of site-based OHS committees to guide the application of their policies and procedures at site level by the OHS committee monitoring and reviewing the use of the site safety plan and monitoring hazard control actions. This was considered very effective, particularly when the project manager attends site OHS committee meetings as well as company level OHS meetings. This way site-based problems could be brought to the attention of senior management, and company level issues could be brought back to the site. OHS committee meetings in most case study enterprises were held regularly (monthly/bi-monthly) and received feedback about current issues from the sites.

OHS management systems

The translation of systems and infrastructure provided by the enterprise into safe work practices and safe working environments was a theme at each of the civil case studies, and they each demonstrated different activities aimed at achieving this. These ranged from site-based to enterprise level activities. At all case study enterprises, OHS was a regular agenda item for executive meetings and was a standard item in Board reports, although the nature and complexity of reports varied considerably. OHS responsibilities and accountabilities were included in duty statements and OHS was included in management and supervisor performance reviews. None of the case study enterprises dealt with OHS costs through a specific budget allocation for OHS, rather they said, "If it needs doing for health and safety reasons, then we just do it".

Using planning processes to ensure that risks and hazards were understood and eliminated or controlled before work on that stage, area or task begins was a strategy employed by each case study enterprise. In one enterprise, the principal's OHS coordinator reviewed the specific OHS management plan for each project which was drawn up by the contractor. The plan may have been generic, but specific procedures have been developed to meet particular requirements of the project. The relevance of this documentation and the extent to which people on site were able to implement it was regarded as a key marker of good OHS performance. At another enterprise, a template was used for a project safety management plan and project safety procedures which could be adapted to meet the needs of different projects, forming a project safety management plan. The template could include a number of specific procedures, e.g. working at heights, toolbox meetings, and workplace hazard inspections. Systematic preventive maintenance of plant and equipment was regarded as a critical component of planning at each case study enterprise.

At one case study enterprise, site supervisors were supplied with laptop computers to enhance reporting of meetings and hazards. With this action, the natural reluctance to handwrite notes was overcome and poor handwriting and spelling were not revealed.

Each case study enterprise expressed the view that industry benchmarking was effective as a learning activity to help identify better ways to identify and control hazards, manage OHS and assess their own performance.

Risk management and hazard control

Collaboration between management and the workforce was regarded as critical in identifying major hazards at all of the case study enterprises. This was manifest in most enterprises principally as a very clear focus on seeking to control hazards at

their source. Informal approaches to identifying hazards were encouraged on a 'see and fix' basis, with hazards which could not be rectified immediately being reported to the site supervisor for rectification. This was coupled with a structured inspection regime. Weekly safety walks were undertaken by project personnel on a roster basis, although with particularly risky work processes, safety walks occurred daily.

In one enterprise there was a formally planned and collaborative approach to identifying hazards (including specific checklists for major hazards, e.g. traffic management), assessment of risk and control measures. In another enterprise, although the hazard management was very collaborative, there was little formal system imposed on it. Instead there was reliance on supervisors and workers to reassess site conditions each day and throughout the day based on changes in soil types or the weather as they occurred. The whole crew operated with vigilance, using their combined skills, knowledge and experience in order to keep the worksite safe. As one site supervisor said, "We respect each other's skills and knowledge and that lets us have confidence in each other. We know we all have each other's safety in mind so we can work well together as a crew". No checklists were used, although supervisors kept a record of the meetings in order that changes to the job could be justified.

The work activity briefing was a primary tool for collaborative hazard assessment in two enterprises. Held on a weekly basis or whenever there was a change in work activity, the briefing required the supervisor and workers involved in doing the work, to identify potential hazards and how they would control them.

While personal protective equipment (PPE) was regarded as an important part of risk control in each of the case study enterprises, it was clearly seen as a measure of last resort and the comprehensive hazard identification, risk assessment and control procedures contained in the site safety plans of the enterprises were explicitly based on the hierarchy of control.

Job safety analyses (JSAs) were an important part of hazard management and these were developed collaboratively, including with contractors in some instances. Mostly JSAs were formally prepared and written down. One case study enterprise kept such paperwork to a bare minimum in recognition of the fact that it was not possible to have JSAs to cover every conceivable contingency. They also recognised that in reality few people on site would refer to them.

Some case study enterprises were overt in maintaining an active and friendly relationship with inspectors and other staff of the OHS agencies. These organisations were regarded as important sources of reliable information that could help to improve OHS performance.

Sub-contractor management

Sub-contractors were not always highly regarded on site. In one enterprise, sub-contractors were described as "mongrels" by some of the plant operators. In most case study enterprises, contractors who behaved badly on site, or who demonstrated repeated OHS or quality non-conformances, were removed from site.

One enterprise avoided problems with sub-contractors by adopting a policy of direct employment rather than contracting out work. This was regarded as a sure way of maintaining more effective control over OHS. Another enterprise employed an on-site works manager whose specific role was to monitor the work undertaken by contractors, in an open and supportive way.

Some of the case study enterprises specified formal requirements for contractors with respect to OHS management, and then audited their performance over the course of projects. One enterprise made sub-contractors' periodic payments reliant on the outcomes of OHS audits. Payments could be withheld, especially in relation to supply and install contracts, dependent on the nature of the non-compliance. Other enterprises considered that such a move might have industrial relations implications and, although they liked the idea in theory, could not see it being put into practice. There was a view that using money as a control mechanism was not the best way of managing sub-contractors - "It's more important to have subbies involved in the system - on the OHS Committee, in toolbox meetings."

Training

Having competent, trained and experienced people on the job and in management roles was seen as the first demand that needed to be met if health and safety were to be accorded proper priority in each of the case study enterprises.

Effective briefing and training of supervisors, leading hands and team leaders (including contractors and sub-contractors) before the start of a project was regarded as critical to good OHS performance. This could be very difficult when the

project lead-time was short. However, it was regarded as imperative in each of the case study enterprises that supervisors were trained and their role development managed so they were able to take an active role in promoting and managing OHS.

Induction training of workers (including contractors and sub-contractors) for the site and for their work activity was regarded as very important, but in most case study enterprises induction training was not always completed before a project commenced. In some enterprises, training was entirely provided on-the-job and this was the preferred mode of delivery.

Auditing and inspection

Most case study enterprises audited their OHS systems in one way or another. Sometimes this was formal, at other times informal. Independent audit (cross-auditing by project managers in the same company but from different sites) and external audits (by OHS agencies or consultants) were used to help identify deficiencies. Whether formal or informal, each case study enterprise reported a systematic approach to auditing and inspections, both external and self-assessment. Self-assessment audits were invariably conducted by management in collaboration with the workforce.

It was common to have documented, detailed self-audits conducted on a weekly or fortnightly basis with results and corrective actions being reported to the project manager, OHS coordinator or other senior person, who signs off on the audit. One enterprise used the audit process, which was part of the OHS management system, to feed information back into the system and correct or improve the system. The important thing was that deficiencies identified through the audit process were actioned. In another enterprise, outcomes from audits could be challenged. A follow-up procedure was in place to check the rigour of audit findings as well as control actions.

Documented self-audits were a feature of the requirement of sub-contractors in some of the case study enterprises.

One case study enterprise did not use formal audit systems that relied on checklists, but conducted intensive, informal audits of site activities. These were regarded as more efficient and flexible as they were adapted to each site and changing site conditions. They were conducted by the OHS coordinator as an in-house 'expert' but were also a feature of the daily activity of site supervisors and plant operators. Visual inspections were carried out on a daily and weekly basis and during the day when conditions changed.

Indicators currently in use

Each case study enterprise acknowledged that there were limitations in using outcome measures to assess OHS performance. Consequently, most enterprises used a combination of outcome measures and positive performance indicators to monitor their OHS performance, although one company used only outcome measures.

The following outcome data was commonly collected at enterprise and project level:

- lost time injury frequency rate (LTIFR);
- first aid injury rate;
- medical treatment injury rate;
- cost of compensable injuries;
- recurrence of incidents;
- lost time injuries to contractor employees/sub-contractors;
- medical time injuries to contractor employees/sub-contractors; and
- non-injury incidents (near-misses) investigated for both contractor employees and sub-contractors.

The following positive performance indicators were collected at different case study enterprises:

- number of JSAs conducted;
- number of hazard inspections conducted;
- number of tool box talks conducted;
- number of OHS inductions conducted;
- number of OHS meetings completed;
- number of OHS training exercises held;
- number of OHS audits conducted;
- number of OHS bulletins issued;
- number of OHS non-compliance reports issued;
- whether OHS procedures for critical works have been submitted by sub-contractors (rated either yes or no);
- whether there is evidence that surveillance of sub-contractors is carried out (rated either yes or no);
- the frequency of on-site inspections;
- the time taken to fix problems in accordance with the allocated timeframe;
- general attitude to safety on site (subjectively assessed by the OHS coordinator);
- quality of records and documents related to OHS (subjectively assessed by the OHS coordinator);
- commitment to safety overall (subjectively assessed by the OHS coordinator);

- the consistency of project managers in relation to OHS as a measure of the quality of OHS management in contractors (used informally and subjectively assessed by the OHS coordinator);
- workers' rating of supervisors/project management's commitment to OHS
- percentage of injuries incurred for major hazards;
- percentage of sub-standard conditions identified and corrected as a result of safety audits;
- results of independent (by people in the same company but from different sites) and external audits. Measured as number, regularity, quality, outcomes and action taken to resolve non-conformances;
- time taken to get hazards under control once they have been identified;
- assessment of the availability and standard of PPE; and
- number of hazard reports and feedback from toolbox meetings.

Indicators they would like or plan to use

The workshop conducted with some case study enterprises as part of the data collection process identified areas where participants believed positive performance indicators might help them to improve their performance. Other potential positive performance indicators were identified in the data collection process.

The following positive performance indicators are planned to be used or were suggested in the different case study enterprises:

- return to work performance - to assess the effectiveness of rehabilitation;
- content and, method of holding, chairing or presenting tool box meetings;
- frequency and duration of tool box meetings;
- participation level in tool box meetings;
- worker assessment of supervisor/project management commitment to OHS (but needs to be designed so as to be confident that responses are honest);
- commitment to safety - assessed subjectively by the project manager or the safety manager;
- assessment of the effectiveness of JSAs on site through audit of diary entries and discussions with site supervisors and workers;
- assessment of effectiveness of on-site induction training (on basis of time taken to become a safe, independent worker);
- availability of equipment necessary to perform the job safely (assessed by audit/worker feedback);
- maintenance of equipment (audit of maintenance records);
- an attitude shift amongst workers and clients measured by questionnaires or interviews. (Could be used at an enterprise and industry level.);

- workplace survey to determine levels of respect and a happy working environment. The survey would cover communication, consultation, participation in decision-making, and good human relations. (Could be used at an enterprise and industry level.);
- adherence to site rules - the number of punitive measures instigated on the job such as verbal alerts/warnings, infringement notices through to removal from site;
- number of job safety analyses completed and documented;
- standard of housekeeping;
- standard and availability of facilities and equipment;
- amount of feedback from the ground up on OHS matters;
- reaction time to deal with issues that are raised;
- independent feedback e.g. from OHS agencies;
- reduction in the number of corrective actions required per inspection; and
- number of repeat problems occurring.

Issues of significance

The case studies in this industry sector revealed a number of issues which may have significant impact on OHS performance and the capacity for performance improvement in the sector.

Industry cohesion

Over recent years, as increasing quantities of work have been contracted out, work with OHS risks have tended to be shifted to contractors. Not all contractors have included the costs of covering these risks in contract bids. This supports price undercutting in an attempt to win tenders, which can increase the pressure to take short-cuts with safety. Stronger industry cohesion around improving OHS could be an important driver of further improvement throughout the industry by reducing the temptation to cut safety as a way to increase margins.

A good OHS management record was regarded as an important competitive advantage for government-funded work but of less importance in privately-funded work. Stronger industry cohesion around the uptake and improvement of OHS would help the industry as a whole by reducing the temptation to cut safety as a way to increase margins. Industry networks and benchmarking could assist this to happen. The adoption of appropriate positive performance indicators throughout the industry would support increased industry cohesion by redefining 'good OHS performance' through process rather than through traditional outcome indicators.

Importance of managing contractor OHS

Each of the case study enterprises emphasised the importance of managing sub-contractors' OHS performance. This was considered to be particularly true for smaller contractors where the OHS was more likely to be poorly managed and less well understood. Some enterprises had official or unofficial 'blacklists' of contractors who are known to be 'cowboys'. Such lists were operated at site level and/or at company level, and were an effective way of controlling unsatisfactory contractors. The fact that the industry needs to compete on cost was identified as a major contributor to such contractors remaining in the industry. Balancing the need to meet safety requirements with budgetary constraints and short timelines could at times compromise the attention which was paid to the safety performance of contractors.

Recognition of the lack of reliability of outcome data

Each of the case study enterprises acknowledged that reliance on basic accident data was of limited value to the management of OHS. One OHS coordinator described it as "a barrier to focussing on the root causes of accidents". (However, it should be noted that detailed analysis of injury data, looking at the factors that contributed to the incident occurring, can indicate possible causes of the incident.)

Formal systems vs informal systems

Although in this sector there was strong reliance on written systems for managing OHS, there was a clear need for these systems to be dynamic enough to maintain relevance in actually getting the work done, than might be the case in a static workplace such as a manufacturing facility. Systems need to be able to cope with frequently changing conditions on sites and, rather than take the view that 'accidents will happen anyway', there should be recognition of the need for people to have the skills to cope with the ambiguities they face in the workplace.

Concerns about vocational education and training in the industry

Training was regarded as an important strategy. However, there were serious criticisms of the quality of industry training with respect to OHS. The issues included the content of courses and concerns that people were not trained to cope with real life environments. For example, as one site supervisor put it, "Some guys I've hired come along with a certificate of competence but they've never worked on site before. They might know how to operate the equipment, but they don't understand about working around pedestrians and near other working equipment. They are a danger to themselves and others because they think they know what they're doing, but they don't really".

Design

The design of the project makes a significant difference to the safety of the construction process for the contractor. A safer design would create a safer construction process. To help support this, it would be far better to have those who will actually build the project involved in the design process early enough to influence the design. However, time pressures mean that the opportunity to change things is not always available. Changing this approach, by building the opportunity to make changes into the project time lines, would have significant positive impact on the contractor's ability to manage OHS.

Consistent application of legislation

The case study enterprises argued that all contractors should face the same risk of detection and enforcement of breaches of OHS law. Otherwise, some enterprises might be penalised for taking OHS seriously in comparison to their competitors.

OHS in board reports and company reports

Some companies routinely report OHS performance to their Board. Reports using positive performance indicators would provide a new focus for OHS management at this senior level. Including positive performance indicators in public company annual reports would also be a powerful way to refocus the type of attention that OHS gets in the industry more generally.

Working hours and OHS

Workers were consistent in their belief that fair and appropriate pay rates and reasonable working hours (that is, no excessive overtime) were fundamental to site health and safety. It is important to recognise that issues that sometimes appear to be in the realm of 'industrial relations' impact on health and safety and should be considered at enterprise and industry level during wage negotiations.

Conclusion

The enterprises in the civil sector were very different to the other sectors in the maturity of their programs. Statistical reports on outcome measures were still regarded as important and useful. There was concern that at this stage the industry as a whole relies on outcome measures. However, some people in the enterprises had difficulty seeing the limitations of outcome measures of performance as their clients demand them as do OHS agencies and insurers. Some civil enterprises could see value in positive performance indicators. The positive performance indicators chosen for the industry need to reflect the needs of 'new starters in OHS' so that they are encouraged to continue along the path and are led by their indicators of performance. This means that there will need to be a range of indicators available that will suit the needs of construction enterprises at different stages of OHS development.

Profile of case study enterprises

Three cases were studied of companies operating in the heavy engineering sector of the construction industry. These companies were:

- Clough Engineering Limited (WA Division) - the case study was conducted at a site where large scale expansion of processing and refining capacity was under construction. The company has diverse international engineering and construction interests. It employs 5000 people in total. The average number of workers on the case study site was 125. The company directly employs the workforce;
- Transfield Construction - NSW - the case study was conducted on a joint venture project to design and operate a wastewater treatment works in New South Wales. Transfield is a large company with projects within Australia and overseas. Thirty-five workers were employed on the project at the time the study was undertaken; and
- Baulderstone Hornibrook Engineering Pty Ltd, based in South Australia, specialises in heavy engineering projects such as petro-chemical plants. The case study involved the end stages of construction of a series of filtration plants. When the study was undertaken, employee numbers had fallen from around 150 to 20. The company prefers in the main to directly employ project workers.

Key drivers identified by case study enterprises

The following drivers of good OHS performance were identified in the case study enterprises:

Competitive advantage

In the heavy engineering case study enterprises, respondents at all levels acknowledged that OHS is increasingly becoming part of the business of winning contracts - a demonstrable record of good OHS performance is necessary for successful marketing and securing new contracts.

Managerial capabilities and commitment

Attitude, approach and capabilities of management were key drivers of OHS in the case study enterprises - "[It] all starts with the management - managers have to be proactive, walk the talk". The features that were identified in the case study enterprises as indicators of management commitment were: a management team

dedicated to the cause - a team willing to remedy identified hazards, allocate resources for OHS, provide the time needed to resource OHS and be accessible to the workforce - ("you get heard and can sort out problems"). A team able to absorb criticism and learn from examples set by others was a clear driver of OHS.

Along with the active demonstration of a proactive approach to OHS, the habits of the enterprise - "Even at induction we are given a hazard checklist and report sheet. The trouble that's been taken shows they care" - provide evidence of a commitment to good health and safety practices.

To demonstrate management commitment to OHS and to also raise knowledge and awareness of OHS at executive management levels, senior executives in one case study enterprise were required to attend part of a site OHS system audit.

Another important aspect of commitment was the active involvement of front line managers in OHS systems implementation and communication. Active safety advisors - demonstrating the process on site, picking up on poor behaviour, communicating effectively - were also found to impact positively on safety performance in the case study enterprises.

OHS obligations

Recognition of obligations to employees, i.e. the right of people "to go home in one piece", was identified as a driving force for OHS in the heavy engineering case study enterprises. This driver, along with good OHS practices seen as a competitive advantage, are consistent with acknowledged broader societal expectations that people will not be harmed through going to work. Interestingly, respondents in the case study enterprises also reported similar motivating factors amongst the workforce, with the desire to secure continuity of work along with a desire for self preservation both being important factors.

Auditing

Auditing was undertaken in each of the case study enterprises, both internally and independently. In one case study enterprise, auditing was seen as an opportunity to evaluate OHS activity in detail, as well as to assess the overall performance of a division. Performing well on an audit was seen as a driver of continuing good OHS performance. For example, consistently good internal and independent audit results and achieving targets acted as positive reinforcement and motivation. One case study enterprise regarded independent audits as useful, as they found them an important way to assess their OHS performance and also as an opportunity to learn new ways of approaching OHS problems.

Cost savings

Reducing costs associated with poor safety, such as lost time, insurance premiums and rehabilitation - 'the hidden costs associated with workplace injury and illness' - was also reported as a driving factor for effort spent on OHS in the heavy engineering case study enterprises.

Compliance with legislation

Compliance with legislative and regulatory requirements was identified by case study enterprises as a driver of OHS. In one enterprise, the threat of industrial action over health and safety issues was also a driver.

Site drivers

Key drivers at site level can be summarised as the desire to get the job done on time, on budget, without problems. The OHS contribution to this was further driven by:

- creating a high OHS profile right the way through, as typified by the comment "...there's no point in paying lip service, it's here to stay and we must be prepared to work this way.";
- the presence of full time safety personnel on site;
- induction, which set OHS as a priority; and
- on one project, a cross-site OHS observation program focused additional external attention on OHS.

Strategies

Enterprises relied on a range of strategies to help manage OHS. The following strategies describe the actions to manage OHS taken by the case study enterprises as a result of the drivers.

Design and planning

In the heavy engineering case study enterprises, input into construction design, all planning stages (from overall construction to work activities) and scheduling was seen as critical to ensuring that OHS is actively managed from the outset. This went beyond hazard and risk identification to ensuring that problems were designed out of construction, operation and maintenance stages in so far as was possible or otherwise controlled. It also encompassed site set up and scheduling of activities to facilitate safety in construction, operation and maintenance. In addition, having specific safety management plans in place and adhered to from the outset of construction was viewed as an important means of achieving effective OHS performance.

Including OHS specifications in calls for tender and in the contractor and sub-contractor (and employee) selection process was also rated as a useful strategy by the case study enterprises to assist with the management of OHS on site. One case study enterprise felt that industry-wide changes were needed regarding the way work was initiated and designed and that changes in the education and skill of architects, engineers and other designers of built environments would also need to take place regarding safe design.

OHS management system

All of the case study enterprises had an OHS management system in place. In one case study enterprise the OHS management system was in a continuous process of review and was updated as required. All enterprises emphasised the importance of the practical application of the OHS management system rather than just the presence of written procedures. This was demonstrated in one enterprise, which placed a high value on workers who had problem solving skills.

Hazard management

Hazards at each project were identified via collaboration between management and workers through conducting risk assessments, completing job safety analyses (JSAs) and safe operating procedures (SOPs), incident reports and, in some instances, through pre-start planning meetings. One case study enterprise reported conducting inspections (including of equipment and machinery) regularly during the project, especially at critical stages of construction. Another case study enterprise, although they had SOPs in place, questioned the value of written SOPs, stating that instead they placed a high value on people who could use their experience and knowledge to solve problems.

Sub-contractor management

Management of sub-contractors was an integral aspect of effective management of OHS in the case study enterprises that employed sub-contractors. In one case study enterprise, sub-contractor management was initially considered at the tender evaluation stage (through evaluating OHS capabilities and management systems) and then throughout the life of the project by monitoring and supervising the sub-contractors' OHS performance. Sub-contractors in this enterprise were treated as if they were company employees and were also included in all OHS management activities. In another case study enterprise, if particular sub-contractors could not demonstrate adherence to the required OHS practices, they were not used.

Workforce capability, training and education

Attitude, approach and capabilities of the workforce, i.e. a workforce that is, "competent, capable, will help identify problems, [and] work safely", ensuring that the right people are in place was identified by the case study enterprises as a critical strategy for effective OHS management.

Hand in hand with management and workforce capabilities went a sound selection process "so you're getting capable people to work with". Also identified as important factors in building a safe working environment were supporting training and continuing education processes, which needed to be practical and fit for purpose.

Case study enterprises regarded induction training of workers to the site as a fundamental requirement and all enterprises provided induction training to their workers.

Communication and participation

Effective communication, especially where activities interfaced, was another key strategy in successfully managing OHS identified by the case study enterprises. This facilitated teamwork and involved communications at individual and group levels throughout the project. It enabled the uptake of workforce suggestions by management and the reciprocal uptake of management systems by the workforce with no "resentment factors" present: "we're all working to the same end, all there to be spoken to - we're a team".

A key aspect of participation was the development a 'culture' of safety and of reporting incidents or potential incidents, with everyone understanding that OHS was needed and had to be fundamental to the way work was done: "no shonkies - if the job's unsafe no-one will do it".

Other strategies

Other key strategies used to achieve workplace health and safety included:

- the provision and maintenance of an appropriate standard and availability of equipment and facilities for the workforce to use;
- consistent, practical systems and procedures that acted as vehicles for improving OHS - for example, providing coaching through the disciplinary procedure;
- good housekeeping standards; and
- appropriate auditing, feedback and follow up of site issues, behaviours, plans and systems.

One enterprise, with excellent outcomes from its deployment of the OHS management system at site level, commented on the cultural shift that had taken place within the last decade. Previously, OHS consciousness was not part of the industry. Management viewed OHS as a cost. The workforce viewed people who were safety conscious as "soft". Respondents reported this shift as being in part due to the enterprise's efforts - one respondent, who has spent some years working for other enterprises, stated "this is as good as I've seen it". Workforce respondents commented that systematised and enforced OHS requirements had removed negative peer pressure.

The shift is also attributed to increasing industry awareness, with employees at all levels bringing increased safety consciousness with them from previous experiences.

Indicators currently in use

The enterprises all had systems that incorporated the majority of the preliminary positive performance indicators that were the subject of the case study research. These indicators were in the main assessed through detailed audit procedures or were present in the enterprises' systems as strategies for managing OHS performance.

The following outcome data was commonly collected at enterprise and project level:

- number of first aid treatments
- medical treatment frequency rate;
- lost time injury frequency rate (LTIFR);
- average lost time rate;
- compensable injury rate;
- cost of compensable injuries;
- number of improvement/prohibition notices;
- number of injuries per body part; and
- number of injured persons, including contractors.

Each of the case study enterprises was actively using a range of positive indicators. Some were numerical indicators, others non-numerical. The following positive performance indicators were collected at different case study enterprises:

- number of structured visits to site by corporate directors;
- individual performance assessment and ratings;
- number of workers who have completed induction training;
- number of supervisors who have received OHS training;
- number of OHS committee/toolbox/team meetings attended by management;
- number of employees wanting to be part of committees and other participatory

forums - taken as an indication of the effectiveness of the OHS program;
- benchmarking - internal and external;
- inclusion of OHS in tender specifications;
- sites develop and implement an OHS improvement plan - this indicator is being tracked to ensure that plans are developed and implemented on all sites/ projects;
- number of hazards controlled ("Construction is constantly changing so we need to constantly measure this");
- data from structured daily site observations;
- planned observations of high risk activities - percentage of compliance;
- monitoring local hazards e.g. noise and dust levels;
- ratings from regular monitoring, assessment and internal auditing of safety systems (conducted fortnightly and inclusive of sub-contractors) and independent auditing were seen as most useful. They provide a "different perspective, different ways of looking at things";
- level of improvement over time in audit ratings;
- number of corrective actions;
- incident reporting frequency rate used as a positive indicator - where the potential for accident or injury is reported, opportunities to improve physical or behavioural safety increase;
- attitude surveys;
- number of equipment failures; and
- level of industrial disputation related to OHS issues.

Indicators they would like or plan to use

Case study enterprises identified a range of alternative indicators they believed could track relevant areas of OHS. These indicators also reflect a mixture of qualitative and quantitative assessment. The following positive performance indicators were planned to be used or were suggested in the workshops in the different case study enterprises:

- assessment of OHS content of management meetings with a report going to executive management to maintain a enterprise focus on OHS;
- annual workforce (employees and sub-contractors) culture survey which includes OHS;
- pre-placement health assessments;

- level of communication by employees of their needs;
- active participation and feedback from employees in toolbox/pre-start meetings etc;
- comparison of training provided against a benchmark or percentage e.g. 70% trained in welding;
- demonstrated use of appropriate work practices and preventative procedures;
- documented observations of compliance with housekeeping standards;
- number of repetitive or re-occurring complaints/problems;
- number of notices, actions and non-conformances closed out against number open;
- time taken to fix problems in accordance with allocated timeframes;
- assessment of the time taken to remedy issues raised;
- using feedback from "weekly look ahead" meetings to identify risks and hazards; and
- daily hazard reports.

Issues of significance

The case studies in this industry sector revealed a number of issues which may have a significant impact on OHS performance improvement in the sector.

Applying corporate systems effectively at site level

A key issue was ensuring that systems and strategies emanating from the corporate level were effective in their implementation at project and site level, thus ensuring that site OHS needs were appropriately addressed and managed.

Design and constructability

Similarly, a major concern was the need for design to include constructability, operability and maintainability as a means of reducing injury and illness. One case study enterprise perceived this as a job that is "bigger than us" - in other words, industry-wide changes in the way work is initiated and designed are required.

Education and training

A related requirement is for change in the education and development of architects and design engineers to ensure that OHS considerations form part of the design task and solutions. Concern with the effects of changes to industry standards and the nature of industry training extended to training provided to the workforce.

Case study enterprises expressed the view that changes in competency requirements as well as changes to the practical hands-on nature of former training schemes have left individuals and their work mates exposed to unnecessary risk. For example, it was possible to obtain an advanced rigging certificate in ten days. Previously, people underwent a staged and mentored on-the-job program that provided practical skills along with the knowledge to do the job competently and safely. The current training program required significant catch up once people had the qualification, to equip them with a similar level of capability to those who qualified under the previous system. Increased flexibility had been obtained at the expense of safety.

Conclusion

Notwithstanding the identified limitations, the elements reflected in the preliminary positive performance indicators were accepted as contributing to the effective management of OHS. Each of the case study enterprises recognised shortcomings in a reliance on outcome measures and had moved to varying degrees to initiate and monitor OHS processes or positive performance. The development of this project should continue to be informed by, and contribute to, that effort.

Profile of case study enterprises

Four case studies were conducted of companies operating in the domestic housing sector of the industry:

- Atrium Homes, a Western Australian private company that employs around 30 people and 200 sub-contractors;
- the South Australian division of AV Jennings Homes Limited, a national company that employs around 80 staff and 100 sub-contractors;
- Clarendon Homes, a private company operating primarily in New South Wales that employs around 300 people and has a network of sub-contractors and suppliers; and
- Stonehenge Homes, a Victorian private company that employs around 30 people. All labour and tradespeople on sites are sub-contractors and their employees.

Key drivers identified by case study enterprises

The following drivers of good OHS performance were identified in the case study enterprises:

External enforcement

Enforcement by OHS agencies was identified as an important influence on management of OHS in all case study enterprises. For enforcement to be effective, it was felt that all builders and sub-contractors should face equal likelihood of action and that it must relate to the specific circumstances of housing with advice on how to improve. It was also considered that enforcement should be directed where responsibility lies, including the owners of the houses.

Public image

All case study enterprises were concerned with public image in relationship to OHS. It was perceived as important to be seen to be "doing the right thing", as well as being reputable and completing business on time without OHS problems. One enterprise found that 'cowboy' sub-contractors who take shortcuts on safety were also usually not professional in terms of quality of work. Good OHS was considered useful as a marketing tool.

Management commitment and employee understanding of responsibilities

This was identified as a critical issue in all the case study enterprises. Management commitment was driven by the different drivers operating in each enterprise and had an impact on sub-contractor behaviour. In one case study enterprise, a sub-

contractor reported that he chose to work for the company because “of the emphasis the company places on safety”. Further, he chose not to work with some other companies “because of their cavalier approach to OHS”.

Training and education

Training was cited as central to improvements in OHS in all the case study enterprises. In particular, it was reported that it was important that supervisors were competent and both understood and used safe building practice. One supervisor reported that OHS training “made me more aware and observant. Now I’ll look for things - situations which could be hazardous before things go wrong.” Also considered important was industry-specific induction training followed up by site-specific induction training.

OHS management system

Although it was emphasised that OHS management systems should encourage problem solving in the variety of situations that occur on building sites, there was a general consensus that an appropriate systematic approach was required. This should have been tailored to the specific needs of the domestic sector and included, but not be limited to, sub-contractor management, hazard management and auditing. There was considerable discussion in one case study enterprise concerning whether these initiatives required trade-based rather than enterprise-based approach.

Design

It was reported that the design of the residence made a significant difference to the safety of the construction or renovation process. Renovations and additions could provide a problem, because control over the design was much lower. It was reported by one case study enterprise that they had often “got a situation which is difficult to change and very expensive to achieve in a safe way.” At the time, control over design was usually used to contain costs rather than improve safety. Improving design in the domestic sector could have a significant impact on this sector’s ability to manage OHS.

Strategies

The following strategies describe actions to manage OHS taken by the case study enterprises as a result of the drivers.

Leadership in OHS

The majority of the case study enterprises had created, or planned to create, leadership roles in OHS. In general, the person designated as OHS manager or coordinator also had another management role in the organisation. The allocation of the responsibility for OHS was aimed at facilitating improvement in OHS performance. It was complemented by an OHS committee or through including OHS as an agenda item of all management and construction meetings, which provided a forum for the debate and resolution of OHS issues.

Training and education

In one case study enterprise, training and education was fundamental to improvements in OHS enterprise-wide. As a result of the concerns of one site supervisor, two supervisors attended the Housing Industry Association (HIA) OHS course for supervisors. This in turn led to further training enterprise-wide as well as the establishment of the enterprise OHS committee and OHS policy and manual.

Sub-contractor safety

All of the case study enterprises considered the quality of their relationship with their sub-contractors important to smooth functioning of their business. They expressed the fear that by putting too many demands on their sub-contractors, the sub-contractors may choose to work for enterprises that did not have such stringent requirements. One company case study enterprise stated that in boom time “it’s easier for sub-contractors to go and work for someone else” than comply with the OHS demands of a particular enterprise. However, most of the case study enterprises expected sub-contractors to sign an agreement covering the OHS requirements of working on their sites and provided them with information on unusual hazards on site, prior to commencement of work. Most of the case study enterprises also considered previous OHS performance of the sub-contractor prior to awarding work. One enterprise made it clear that they let sub-contractors go if they did not meet OHS standards. On site, sub-contractors were managed by a supervisor who usually had responsibility for a number of sites. One case study enterprise had scheduled their sub-contractors to attend OHS programs run by the HIA and the Master Builders’ Association (MBA).

Hazard management

In general, hazard management was reported to be undertaken informally. Hazards tended to be dealt with immediately or conveyed to the supervisor if this was not possible. However, one of the case study enterprises reported that supervisors completed daily visual inspections and also formal inspections quarterly. This enterprise also planned to make random formal inspections fortnightly in the future. Another enterprise had introduced both job safety analysis and a preventative maintenance program for electrical equipment of subcontractors. However, the enterprise reported difficulty involving sub-contractors in these processes.

Indicators currently in use

None of the case study enterprises were assessing positive performance indicators formally to monitor and improve their OHS programs. They did not believe that it would be feasible or indeed useful to collect data regarding most of the NOHSC identified preliminary performance indicators. However, all were recording workers' compensation claims and reported that they have had very few of these.

The following outcome data was collected by one of the case study enterprises on its employees only:

- lost time injury frequency rate (LTIFR);
- number of medical treatments;
- cost of medical treatments;
- cost of workers' compensation claims; and
- number of first aid attendances.

Two of the companies informally used the standard of housekeeping on site as a key visual indicator of the effectiveness of hazard control on site.

Indicators they would like or plan to use

Each of the enterprises were in early stages of developing and implementing an OHS management system suitable for their needs and the majority of enterprises had not begun to collect outcome data. None of the enterprises had formally begun to collect data on positive performance indicators, nor did they intend to. However, the workshops, interviews and focus groups conducted with the case study enterprises identified areas where participants believed positive performance indicators might be useful.

The following positive performance indicators were suggested by the different case study enterprises:

- monthly feedback from site supervisors on the success of OHS management strategies;
- number of employees and subcontractors attending specified training courses;
- audit of building schedules against building practice (to assess effectiveness of trades allocation);
- feedback from sub-contractors via periodic survey or interviews (to assess effectiveness of trades allocation);
- number of spot checks on worksites;
- audit of worksite conducted by safety manager and site supervisors;
- results of questionnaire to assess improving OHS awareness;
- results of culture survey;
- results of periodic focus group discussions on the topic of OHS;
- feedback from tool box meetings;
- internal assessment of competence following training;
- results of testing after induction/OHS training program;
- audit of minutes of OHS committee and management meetings;
- internal/external audit of plant and equipment against legislative requirements;
- monitor time taken to fix deficiencies identified at audit;
- audit use and maintenance of PPE;
- audit use and understanding of policies;
- number of people actively involved in the development of policies;
- number of people standing for election as employee representatives on OHS committee;
- internal/external audit of OHS management system;
- monitor audit outcomes (by site and trade) against previous audit;
- percentage of hazard reports remedied;
- constructability checklist completed;
- audit sub-contractor self-assessment; and
- regular review of inspection and audit checklists.

As well as the indicators included in the above list, enterprises involved in the cases studies reported that they informally assessed site safety by observing and considering the following:

- cleanliness or housekeeping standards on site;
- standard of scaffolding;
- role model provided by the site supervisor;
- back-up provided by head office;

- awareness and level of co-operation amongst sub-contractors and between sub-contractors and the builder - this is assessed by such things as:
  - sub-contractor willingness to draw the relevant person's attention to the problem and the time taken to rectify the cause;
  - sub-contractor input into the development of safe work procedures etc;
  - level of equipment damage;
  - level of compliance from each trade with designated safe practices; and
- number of OHS authority infringement notices.

Issues of significance

The case studies in this industry sector revealed a number of issues, which may have significant impact on OHS performance and the capacity for performance improvement in the sector.

OHS is seen as a low priority

All of the case study enterprises identified that the domestic sector, in general, did not consider OHS a priority, although awareness seemed to be increasing. There was also a lack of sector cohesion around OHS and this acted as a barrier to improvement. Cost-benefit of OHS issues was a major consideration when determining the implementation of OHS strategies. To some extent, OHS was considered the next step forward - cost, productivity and quality workmanship being the dominant considerations at present. It was reported that many small operators were prepared to cut costs by taking risks in order to obtain work and that the creation of a 'level playing field' was seen as imperative to raising the priority of OHS across the board. Stronger industry networks around OHS would be a useful strategy for improving OHS performance of the sector as a whole.

Improvement of enforcement strategies

Effective enforcement was seen as critical to improving OHS performance in the housing sector. Enterprises believed that the most effective results from enforcement would occur if enforcement was universal, with all builders and sub-contractors facing equal likelihood of action and if enforcement was tailored to the needs of the sector, with an education first approach. Enforcement should also be directed to where the responsibilities and control lie. For example, it was argued that legal responsibility should also be placed where the finances were - with the owner.

Formal OHS systems vs informal systems

There are specific needs for the housing sector regarding OHS management systems because of the sector's less developed infrastructure. Effective management systems, not bureaucratic structures, are required. One sub-contractor summarised that in his opinion, it was more important for people to have sufficient knowledge and experience to be able to solve problems when they were faced with new situations that were a threat to OHS, rather than be reliant on the requirements of a procedure manual. Assistance is required in this sector of the industry to develop appropriate OHS management and auditing systems. Particular emphasis is required on sub-contractor safety and hazard management.

Training and education

The case study enterprises indicated that OHS needed to be addressed in the training and registration requirements of housing personnel so that it became an industry-wide issue rather than a enterprise-driven issue. This was seen as critical by the case study enterprises because there are many small operators who are prepared to cut costs by taking risks in order to obtain work. In this environment good OHS could be a competitive disadvantage, unless an industry-wide stance was taken to improve OHS practices. It was also suggested by one case study enterprise that incentives for OHS training in the housing sector could be linked to a tangible benefit such as a reduction in workers' compensation premiums and that the different associations should tailor courses to meet the needs of their members.

It was also reported that generic OHS induction should be available through TAFE or the HIA so that only site-specific material was required to be provided by the enterprise. This would limit the time taken for induction purposes with contractors who are used frequently, minimise the length of the enterprise induction, and reduce the cost of the program.

Communication and participation

Only one of the case study enterprises had a formal OHS committee and this committee did not have sub-contractor representation. In another case study enterprise, it was reported that due to the fluctuating nature of the workforce, it was not considered feasible to have a formal OHS committee but also that "the basis of good performance in any aspect of the enterprise, including OHS, is good two-way communication". However, in all case study enterprises, general communication depended on the presence of supervisors and management passing on or receiving information on site. It seems that evaluation of the effectiveness of communication in the domestic sector requires further investigation and improvement in the future.

Working in isolation

Unlike other sectors in the construction industry, domestic housing tends to be isolated work conducted by a series of essentially transient sub-contractors with minimal active supervision by the principal. Supervisors may have responsibility for many sites and their visits to sites may not coincide with the times the sub-contractors are present. As direct supervision is unlikely to occur it is imperative that there is a joint understanding of OHS requirements. To attain this understanding there needs to be a strong participative approach to OHS at industry level, not just enterprise level.

Design

Control over design is generally directed at keeping costs down rather than at construction safety. In the additions and renovations segment of the market, control over design was much lower. Integration of OHS considerations into the design process in education of engineers and architects on an industry basis as well as consideration of constructability during the design of residences requires focus in the future.

Conclusion

All enterprises involved in the domestic housing case studies were in the process of implementing OHS systems to varying degrees. In general, the work they were doing was not as sophisticated as that done in the other sectors of the construction industry. This was a result of many factors, including the smaller size of the enterprises, lower levels of risk, knowledge levels in the sector, perceived need and the drivers acting in the industry.

At present, the domestic sector requires practical, easy to digest, purpose specific tools for OHS. It should not be assumed that what is suitable in the other sectors is appropriate in the domestic sector. Any measures of OHS performance at present should encourage implementation of appropriate OHS improvement strategies, which take account of both costs and benefits to enterprises and sub-contractors.

Industry Case Study Conclusion

The key high level drivers of good OHS performance were identified through the case studies as:

- senior management commitment;
- competitive advantage obtained through demonstrating and marketing successful OHS;
- OHS obligations to employees and the public;
- external enforcement; and
- reducing costs associated with poor OHS (e.g. insurance premiums, lost time, rehabilitation).

Strategies that were taken by enterprises as a result of the drivers were:

- leadership in OHS;
- design and planning initiatives;
- methods for consultation, communication and participation;
- management of sub-contractors;
- systems and processes to manage OHS;
- training and education initiatives;
- risk management and control of hazards; and
- auditing procedures.

Issues that may have a significant impact on OHS performance identified in the case study enterprises were:

- the standard of vocational education and training in the industry;
- the management of sub-contractors;
- the type of system (formal versus informal) for managing OHS; and
- design and constructability of the structure.

Each of the industry sectors identified limitations with traditional OHS performance measurement and were seeking to improve their approach to the measurement of health and safety performance.

The enterprises involved in the case studies were supportive of the development of positive performance indicators for OHS and recognised that indicators would need to be suitable for construction enterprises at different stages of OHS development.

The case study enterprises recognised the limitations of outcome measures that indicate levels of failure in health and safety performance. It is thus concluded that the commercial, civil and heavy engineering construction sectors are ready for the introduction of positive performance indicators and measures such as those offered in this report.

However, a distinction needs to be drawn between these industry sectors and domestic construction. The current uptake of positive performance indicators across the domestic case study enterprises is lower than in the other sectors. The domestic sector needs practical, easy to digest, purpose specific information and tools to help identify and meet OHS requirements. Therefore, additional assistance may be required to assist the domestic sector to apply and make good use of positive performance indicators.

Positive Performance Indicators

This section presents information on:

- why positive performance indicators might be useful;
- various types of positive performance indicators;
- how positive performance indicators can be used;
- factors that may affect the collection of information on OHS; and
- selecting positive performance indicators for your enterprise.

Use of positive performance indicators

Measuring OHS performance will help enterprises identify and evaluate OHS improvement strategies. To achieve this, indicators which give information about the effectiveness of OHS management in the enterprise are needed. However, positive performance indicators are only indicators - they give an indication of how the enterprise is performing, they will not necessarily tell the whole story. Positive performance indicators are like pieces of a jigsaw puzzle. Enough of them are needed to make up a reasonable picture of the enterprise's OHS performance. That is, to improve the understanding of the enterprise's OHS performance, a range of indicators needs to be measured, preferably at least one under each of the main headings below. These headings represent the critical areas that were identified in the research for this report.

The following are the best way to use positive performance indicators:

- Firstly, the management and the workforce should collaborate and discuss the results of the indicators to help determine what needs to be done to improve health and safety in the enterprise.
- Secondly, the indicators should be used to identify areas where improvements can be made regarding health and safety.
- Thirdly, collecting positive performance data will not in itself improve the enterprise's performance - there is no substitute for just doing a good job.
- Lastly, there is flexibility in the use of positive performance indicators. The use depends on the needs of the enterprise. For example, the selection of positive performance indicators can be targeted to the enterprise's overall priorities or needs, or they can be used to help improve the performance on particular projects.

Types of performance indicators

Performance indicators tend to fulfil three different functions; dials, alarm bells and can openers (Carter et al, 1992). The worksheet at the end of this section also refers to these types of indicators.

Dials are indicators that can be 'read off'. They are quantitative. An example of a dial indicator is - "the percentage of planned management visits to site conducted over a specified time frame".

Alarm bells are indicators of events that should never happen. They give an alert that something is very wrong. These tend to be outcome measures such as the number of injuries that occur.

Can openers are indicators that lead to the right questions or further investigation in the right direction. An example is "average time taken to rectify high risk hazards". This information would need to be analysed to determine the reasons for any delays. Alternatively, analysis might determine why there is a reduction in the time taken, so that the process can be done right all of the time.

Some indicators only give information about how busy the enterprise has been rather than how effective the strategies have been. An example of a busy-ness indicator is 'the number of people attending a training course'; this tells nothing about the effectiveness of the training program. Busy-ness indicators might be important at some stages, particularly if the enterprise's OHS program is not yet mature, in order to ensure that basic activities are happening at the planned pace. They can also make accountability more transparent - in some of the case studies, busy-ness indicators made the actions expected of people in the workplace very clear. However, busy-ness indicators need to be balanced with other types of indicators to get the best assessment of the enterprise's OHS performance.

Using positive performance indicators

The suggested indicators for the construction industry can be used in different ways, depending on the needs of the enterprise. Consider the following indicator:

- The extent to which the design of the structure enables safe construction, rated on a scale of one to six:

This might be used to compare how different design companies perform in designing for constructability. Alternatively, it could be used to see how the same design company performs over time or over a number of projects. This information might help in making decisions about which projects to tender for, which design company to use, or how a given design company might be approached, based on the performance of the design companies.

Factors that may affect the collection of information on OHS

There are some factors which may affect the way in which information about the enterprise's or contractors' OHS performance is collected. Some small enterprises may not keep records and they might need to be given good reasons to encourage them to participate in collecting information relating to OHS. They may not perceive any cost-benefit in collecting data and they would want to be convinced that on-going data collection was useful to both the enterprise and the industry. They might also need guidance on how to collect information and what to collect.

Short-term contracts may not be suitable for data collection purposes, especially if statistically meaningful information is being sought. For similar reasons, it may be difficult to compare safety performance between projects due to their diverse nature. For example, the number and type of the on-site workforce may vary depending on the stage of the construction process. It might be like comparing apples and pears. However, for some performance measures, this will not be a problem.

Selecting a range of performance indicators

The chosen range of indicators should include a selection of 'dials', 'alarm bells' and 'can openers' to help balance the understanding of the OHS performance of the enterprise. A selection of suggested positive performance indicators is listed below. Some of these may be directly applicable to the enterprise, or it may be desirable to work out specific indicators for the enterprise using the worksheet at the end of this section.

Different positive performance indicators are relevant at different times. For example, this might vary according to the stage of the construction process or the complexity of the project. As the enterprise's OHS program matures, different positive performance indicators will be needed to help identify the next stage in the development of the enterprise.

Outcome indicators are also a necessary part of the range of indicators to give a more complete picture. Some examples of outcome indicators are:

- lost time injury frequency rate (LTIFR);
- medical treatment injury rate;

- compensable injury rate;
- minor injury (first aid) injury rate;
- average lost time rate;
- all incident case rate;
- cost of claims per project;
- rehabilitation case rate; and
- near-miss frequency rate.

The choice of performance indicators will vary depending on the maturity of the OHS program in the enterprise. For example, during the early stages, a higher number of 'busy-ness' indicators might be needed to show that certain basic things are being done. As the program matures and OHS becomes part of the organisational culture, these activities can be expected to become more reliable, so the focus can shift to their effectiveness and how to refine them. Positive performance indicators can help in this process.

The following list of positive performance indicators has been developed specifically for use within the construction industry. These positive performance indicators should be used to assist the industry and to assess the effectiveness of OHS improvement strategies and could be used either within an enterprise or across enterprises.

The list is based on a distillation of the results of the sixteen case studies across all sectors of the construction industry - commercial, civil, heavy engineering and domestic construction. From the case studies, the indicators that were currently in use by enterprises and the indicators that enterprises would like or plan to use were grouped under five main headings:

1. planning and design;
2. management processes;
3. risk management;
4. psycho-social working environment; and
5. monitoring.

The list of indicators was then refined using the approach described in the worksheet at the end of this section and the number of indicators was reduced. The list is not exhaustive. Other indicators which are in use or were perceived to be relevant measures in the case study enterprises are found in the industry case study summaries.

The best approach to developing performance indicators in the construction industry is to choose from the list below and use the worksheet to develop indicators of OHS performance specific for the enterprise or project.

Positive performance indicators for the construction industry

1. Planning and Design

Occupational health and safety is integrated into the design and planning phases and activities of the project.

Indicators:

- The extent to which the design of the structure enables safe construction, rated on a scale of one to six:

- The extent to which site set-up contributes to safe construction, rated on a scale of one to six:

- The extent to which planning and scheduling contributes to safe construction, rated on a scale of one to six:

- Percentage of design changes required as a result of OHS problems, calculated over a specified time frame.
- Percentage of incidents where poor design was a root cause, calculated over a specified time frame.

2. Management Processes

Management at all levels demonstrates genuine commitment to and provides appropriate leadership in OHS.

Indicators:

- The effectiveness of implementation of site specific OHS plans, rated on a scale of one to six:

- Percentage of planned formal management reviews of OHS that are conducted, over a specified time frame.
- Rating of management commitment via workforce survey.

- Percentage change in the assessment score for sub-contractors' OHS plans, ranked against specified criteria, during the life of a project or across a number of projects.
- Percentage change in number of internal OHS non-compliance warnings issued to each sub-contractor on site, over a specified time frame.
- Percentage of planned management visits to site conducted, over a specified time frame.

3. Risk Management

Risks/hazards on site are eliminated or controlled.

Indicators:

- The proportion of items identified through safety walks, inspections etc that are repeat items, measured over a specified time frame.
- Proportion of identified hazards that are medium to high risk, over a specified time frame.
- Percentage of unplanned down time for plant and equipment.
- The effectiveness of job safety analyses or other risk management methods in controlling high risk activities as rated on a scale of one to six:

- The proportion of reported incidents that do not result in injury, compared with those that do, over a specified time frame.
- Average time taken to rectify high risk hazards. (This information needs to be analysed to determine the reasons for any delays.)
- Percentage of high risk hazards rectified within the planned time frame.

4. Psycho-Social Working Environment

The working environment provides people with the capabilities and opportunities to effectively contribute to OHS management: they are actively engaged in problem-solving and decision-making, and receive education and training that is practical and fit for purpose.

Indicators:

- Percentage of employees assessed as competent in OHS following:
  - inductions;
  - training program(s);
  - professional education (e.g. architectural design, engineering).
- Rating of the effectiveness of communication (e.g. through toolbox, pre-start meetings) via workforce survey on a scale of one to six:

1	2	3	4	5	6
Very poor					Excellent

- Ratings of the effectiveness of employee participation in OHS management (including the OHS committee) via workforce survey on a scale of one to six:

1	2	3	4	5	6
Very poor					Excellent

5. Monitoring

OHS is self-assessed and/or independently audited for effectiveness of systems and practices.

Indicators:

- Percentage change in internal or independent audit score, over a specified time frame.
- Percentage changes in number of corrective actions required, over a specified time frame.

NOTE: It should be noted that the workshop worksheet presented in this report was not developed as part of this project. It provides an example of an approach to developing positive performance indicators and should not be considered as the only means for the development of positive performance indicators.

WORKSHOP WORKSHEET

Developing key performance indicators for OHS

Acknowledgement

How to use this workshop

You will get the best results from this workshop if management and employees work collaboratively to determine your OHS performance indicators. The OHS committee for your enterprise or project is usually a good group to use. Consider involving other key personnel, too, such as representatives of major contractors. Simply work through the steps on the worksheet described below.

Step 1 - Establish your goal for OHS

What is your goal for OHS management on this site?

(Steer away from measures masquerading as goals. For example, zero injuries is not a goal, it's a measure. Ask "what have you achieved when you've achieved zero injuries?". You'll get something like, "a safe and healthy work environment".)

_____

_____

_____

_____

Step 2 - Determine the objectives that will let you fulfil the goal

What will you have to do to achieve this goal - ie what are your objectives?

(These might be things like, "provide everyone with the competencies they need to perform their job effectively" or "establish more effective consultation".)

Choose one of your objectives to work on:

Step 3 - Develop a list of KPIs

Brainstorm your answers to the following questions about the chosen objective:

- How would we know if we have achieved that objective?

- What tells us that we are performing well or badly in getting there?

Step 4 - Refine your KPIs

Next, refine that list:

- Cross off any silly or irrelevant items.
- Compare the list to the ACCURATE checklist for good performance indicators and cross off any which don't have the necessary features.

ACCURATE:

Assessable or measurable;
Controllable - able to be changed by what you do in health and safety management;
Central and relevant to what you are trying to achieve;
Understandable and clear;
Reliable - providing the same measures when assessed by different people;
Acceptable to the users as true indicators of performance;
Timely; and
Efficient to monitor.

- Do you have the right balance of dials, alarm bells and can openers?

Dials - are indicators that you can 'read off'. They are quantitative. An example of a dial indicator is "the percentage of planned management visits to site conducted, over a specified time frame".

Alarm bells - are indicators of events that should never happen. They alert you that something is very wrong. These tend to be outcome measures such as the number of injuries that occur.

Can openers - are indicators that lead you to ask the right questions or investigate further in the right direction. An example is "average time taken to rectify high risk hazards". This information would need to be analysed to determine the reasons for any delays. Alternatively you might want to work out why there is a reduction in the time taken so that you can do it right all of the time.

- Is the item only telling you how **busy** you are, not how effective you are?
- Will the performance indicators you have left help you to improve your performance?
- Do you have too many performance indicators?
- Do you have enough performance indicators?

Step 5 - List your KPIs

Write down the performance indicators you have left. These become your Key Performance Indicators, or KPIs.

Step 6 - Determine how to measure your KPIs

Use the following table to summarise your answers to the following questions:

- How can our KPIs be measured?
- What do we need to set up a measurement system?
- What is our current measurement against each KPI?

KPIs	How measured?	What do we need to do?	Current Measure

Appendixes

Appendix 1

Performance Measurement Construction Working Group Members

Organisation	Representative	Contact details
Chairperson	Mr Tony Cooke	
	Trades and Labour Council of WA	Tel: (08) 9328 7877
	27 Brewer Street	Fax: (08) 9328 8132
	Perth WA 6000	Email: unionsyes@tlcwa.org.au
ACTU	Mr Lindsay Fraser	
	CFMEU	Tel: (02) 9267 3929
	2nd Floor, 361 Kent St	Fax: (02) 9262 1465
	Sydney NSW 2000	Email: cfmeu@tpgi.com.au
ACCI	Mr George Gay	
	Housing Industry Association	Tel: (03) 9280 8260
	3/70 Jolimont St	Fax: (03) 9654 7332
	Jolimont VIC 3002	Email: g.gay@hia.asn.au
NSW	Mr Daren McDonald	
	NSW WorkCover Authority	Tel: (02) 9370 5379
	400 Kent Street	Fax: (02) 9370 6100
	Sydney NSW 2000	Email: daren.mcdonald@workcover.nsw.gov.au
SA	Ms Rose Mitchell	
	SA WorkCover Corporation	Tel: (08) 8233 2506
	100 Waymouth Street	Fax: (08) 8233 2223
	Adelaide SA 5001	Email: RMitchell@workcover.sa.gov.au
ACTU	Peter Moylan	
	ACTU	Tel: (03) 9664 7310
	Trades Hall, 54 Victoria Street	Fax: (03) 9663 8220
	Carlton South VIC 3053	Email: ohs@actu.asn.au
ACCI	Mr Dino Ramondetta	
	MBA Victoria	Tel: (03) 9411 4555
	332 Albert St	Fax: (03) 9411 4592
	East Melbourne VIC 3002	Email: dramondetta@mbav.com.au
ACCI	David Shaw	
	ACCI	Tel: (03) 9289 5286
	55 Exhibition Street	Fax: (03) 9289 5250
	Melbourne VIC 3000	Email: dfshaw@acci.asn.au

Organisation	Representative	Contact details
ACTU	Mr Peter Tighe Communication, Electrical and Plumbing Union (Engineering and Electrical) 52 Bay Street Rockdale NSW 2216	 Tel : (02) 9597 4499 Fax: (02) 9597 6354 Email: Edno@cepu.mpx.com.au
NOHSC	Project Officer Ms Rebecca Mitchell Senior Officer Epidemiology Unit NOHSC 92 Parramatta Rd Camperdown NSW 2050	 Tel: (02) 9577 9302 Fax: (02) 9577 9300 Email: mitchelr@nohsc.gov.au
NOHSC	Dr Tim Driscoll Head Epidemiology Unit NOHSC 92 Parramatta Rd Camperdown NSW 2050	 Tel: (02) 9577 9295 Fax: (02) 9577 9300 Email: driscolt@nohsc.gov.au
NOHSC	Ms Lyn Maddock Executive Director Performance Measurement and Planning NOHSC 92 Parramatta Rd Camperdown NSW 2050	 Tel: (02) 9577 9367 Fax: (02) 9577 9206 Email: maddockl@nohsc.gov.au
OBSERVER	Anne-Louise Slack Housing Industry Association 10 Pitt Street Parramatta NSW 2150	 Tel: (02) 9633 4488 Fax: (02) 9689 3090 Email: al.slack@hia.asn.au
OBSERVER	Peter Southwood-Jones DEWRSB Garema Court 148 - 180 City Walk Canberra ACT 2600	 Tel: (02) 6243 7303 Fax: (02) 6243 7907 Email: peter.southwood-jones @dewrsb.gov.au

Appendix 2

Organisational, workplace and workforce characteristics reported to be associated with injury experience

There are several factors that have been associated with either a decrease or increase in the injury experience of an enterprise. This appendix briefly outlines several factors that have been reported in prior research that may influence the injury experience of an enterprise. For a comprehensive review of factors that have been associated with both successful and unsuccessful safety, health and environment management (see Hale & Hovden, in Feyer & Williamson (1998)).

Thorough investigations are usually conducted following breaches of safety in the workplace. These safety breaches may or may not result in work-related fatalities. Some of the well known incidents that involved breaches of safety include the Three Mile Island and Chenobyl nuclear power plant incidents, the leak of methyl isocyanate in Bhopal, the Piper Alpha oil and gas rig explosion and fire, the Challenger space shuttle explosion, and the Moura mine No. 4 and No. 2 explosions and the Longford gas explosion in Australia. The investigations conducted following incidents such as these often provide an analysis of the factors that contributed to the occurrence of the particular incident.

Similarly, a number of research studies have identified factors, including organisational, workplace and workforce characteristics, that have been found to be associated with either good or poor safety performance at the workplace or organisational level.

It is apparent from the literature that there are some contradictory findings regarding what factors contribute to the successful management of health and safety in an enterprise (Hale & Hovden, 1998). Findings from research studies indicate that the type of enterprise studied and/or the state of development of the enterprise's practical application of OHS initiatives can have an influence on the outcomes for an enterprise (Hale & Hovden, 1998).

It should also be acknowledged that there may also be a number of external influences impacting on an enterprise that could influence the relationship between particular organisational factors and OHS performance. In some cases, it may not be possible to establish clear links between organisational characteristics and safety performance (Hale & Hovden, 1998).

However, many of the investigations that were conducted involving major breaches of safety found that organisational and management factors played a predominant role as the precursor to the failure of systems that resulted in the incidents occurring (Nichols & Marcus, 1990).

Also, research studies found several organisational factors that were found to either be associated with good (Table 4) or poor (Table 5) performance regarding injury experience.

Table 4. Organisational factors reported to be associated with lower injury experience

Organisational factors	Research studies
Larger firm size	Salminen et al, 1993; Wooden & Roberston, 1997
Regular safety audits conducted	Smith et al, 1978; Shannon et al, 1997; WorkSafe WA, 1998
Top management actively involved in safety and strong commitment to safety	Simonds & Saafai-Sahrai, 1977; Cohen, 1977; Smith et al, 1978; Osborn & Jackson, 1988; Shannon et al, 1996; Shannon et al, 1997
Good injury record keeping	Simonds & Saafai-Sahrai, 1977
Use of accident cost analysis	Simonds & Saafai-Sahrai, 1977
Use of standard operating procedures	Gun & Ryan, 1994
Information regarding safety is highly organised and readily accessible	WorkSafe WA, 1998
Presence of effective health and safety committees and fewer complaints and serious citations by a health and safety body	Boden et al, 1984; Gallagher, 1997; Hale & Hovden, 1998
Good communication and good relations between management and workers	Cohen, 1977; Smith et al, 1978; Shannon et al, 1997; WorkSafe WA, 1998
Defining health and safety in every manager's job description	Shannon, 1998
Importance of health and safety in manager's annual appraisals	Shannon, 1998
Attendance of senior managers at health and safety meetings	Shannon, 1998
Involvement of supervisor in accident prevention	Smith et al, 1978; Simard & Marchand, 1994
Highly developed safety structures, comprehensive written procedures and clearly identified areas of responsibility for safety	WorkSafe WA, 1998
Attitudes or perception of safety can be useful in identifying characteristics of the workforce's safety climate	Zohar, 1980; Dedobbeleer & Beland, 1991 and 1998; Coyle et al, 1995; Shaw & Blewett, 1996; Williamson, et al, 1997; Hayes et al, 1998; WorkSafe WA, 1998
Good management in the utilisation of resources and production planning and monitoring	Smith et al, 1978
Some association found between safety training of management and reduced risk of injury	Gun & Ryan, 1994

Table 5. Organisational factors reported to be associated with a poor record regarding injury experience

Organisational factors	Research studies
Hurried complete of job associated with greater injury/ incident rates	Salminen et al, 1993
Accident risk greater for sub-contractors than main contractors	Salminen et al, 1993; WorkSafe WA, 1998
Poor correlation found between presence of a safety audit system and accident performance in South African mines	Eisner, 1993
Use of safety bonuses and increased risk of injury	Gun & Ryan, 1994
Existence of a health and safety policy not related to lower LTIFR	Smith et al, 1978; Shannon, 1998
Status of health and safety officer not related to lower LTIFR	Shannon, 1998

Two factors in the workplace (good housekeeping and provision of safety devices on machinery) were found to consistently be associated with reduced injury experience in an enterprise (Table 6).

Table 6. Workplace factors reported to be associated with lower injury experience

Workplace factors	Research studies
Good housekeeping	Simonds & Saafai-Sahrai, 1977; Cohen, 1977; Smith et al, 1978; Shannon et al, 1997; Harper & Koehn, 1998
Safety devices on machinery	Simonds & Saafai-Sahrai, 1977; Shannon et al, 1997

The workforces of enterprises with good safety records were shown to have a number of characteristics, such as experience and workers who had received training, which distinguished them from enterprises with poor safety records (Table 7).

Table 7. Workforce characteristics reported to be associated with lower injury experience

Workforce characteristics	Research studies
More experienced workforce less likely to have an incident	Simonds & Saafai-Sahrai, 1977; Shannon et al, 1996; Wooden & Roberston, 1997; Harper & Koehn, 1998; Shannon, 1998
Lower employee turnover and absenteeism	Smith et al, 1978; Shannon et al, 1997; Harper & Koehn, 1998; Shannon, 1998
Trained workforce	Cohen, 1977; Gun & Ryan, 1994; Shannon et al, 1997; Harper & Koehn, 1998; WorkSafe WA, 1998
Involvement of workers in decision making processes	Shannon et al, 1996; Shannon et al, 1997; Harper & Koehn, 1998; WorkSafe WA, 1998; Shannon, 1998

Appendix 3

Risk factors associated with injury in the construction industry

Risk factors for work-related injury in the construction industry have been identified in several investigative studies (Bentil & Rivara, 1996; Churcher & Alwani-Starr, 1996; Holmes et al, 1997; BCITO, 1997; NOHSC, 1999). These research studies involved obtaining information regarding injury experience either through case studies in the construction industry, focus group discussions with construction workers and/or through the analysis of injuries and fatalities in the construction industry.

Work-related traumatic fatalities in Australia 1989-1992

Information regarding work-related traumatic fatalities of workers employed in the construction industry during 1989 to 1992 was obtained from an investigation of coronial files.

Many of the fatal incidents in the construction industry had similar circumstances and common associated factors (NOHSC, 1999). Factors that were identified from the coronial file as being a contributing factor to a particular type of fatal incident are described below.

Fatal incidents where a worker fell from a ladder were found to involve several contributing factors, including:

- ladders not securely anchored;
- fall protection devices not used, such as a safety harness;
- lack of a safe system of work;
- the worker losing their balance; and
- the worker receiving an electric shock, then falling from the ladder.

Incidents where a worker fell from the roof of a structure involved factors such as:

- environmental agents, such as strong wind or wet and slippery roofs;
- fall protection devices not used, such as guard rails, safety mesh or safety harnesses;
- falls through insufficient roof support either during construction, demolition or renovation work;
- holes in the roof or unreinforced skylights not taped or sectioned off;
- the worker losing their balance;
- inexperience of the worker;
- lack of a safe system of work; and
- inadequate training of the worker regarding working at heights.

Incidents where a worker fell from scaffolding involved factors such as:

- fall protection devices not used, such as guard rails or safety harnesses;
- wheels on mobile scaffolding not locked and sloped terrain, causing the scaffold to roll and overturn, or the worker to fall; and
- other equipment or objects falling and striking the scaffolding, causing the worker to fall.

Incidents where a worker was hit by a falling object involved factors such as:

- lack of a safe system of work;
- lack of or inadequate support for structures which collapsed;
- environmental agents, such as strong winds; and
- the lack of identification of a safe distance to segregate workers from demolition work.

Incidents where a worker was hit by a moving object involved factors such as:

- high visibility, reflective clothing or vests not worn;
- lack of a safe system of work;
- audible and/or visual reversing warning devices not fitted to vehicles or mobile machinery;
- no segregation of vehicle access roads from pedestrian activity; and
- obscured vision due to objects or glare from the sun.

Factors that contributed to incidents where mobile machinery (such as forklifts, rollers or excavators) overturned were:

- environmental agents, such as unstable, uneven, or sloped terrain;
- no rollover protection structure fitted to the mobile machinery;
- lack of a safe system of work;
- inexperience of the operator;
- operator not wearing a seat belt; and
- no use of marker pegs or barriers to indicate the edge of an embankment.

Incidents that involved a worker contacting electricity involved factors such as:

- electrical supply not disconnected or isolated before start of work;
- earth leakage devices, such as residual current devices or circuit breakers, not fitted;
- defective electrical wiring;
- environmental agents, such as damp ground;
- lack of a safe system of work;
- inadequate clothing of worker (e.g. not wearing footwear, gloves);
- use of aluminium ladders while performing electrical work;
- energised equipment;
- incorrectly wired equipment;
- lack of safety cut off switches on equipment;

- equipment (such as cranes) contacting overhead electrical distribution wires;
- inexperience and inadequate training of the worker; and
- lack of supervision of apprentices.

Victorian construction industry

Holmes et al (1998) conducted interviews with 13 workers employed in small business in the Victorian construction industry, specifically in the concreting, plumbing, electrical and carpentry trades.

Risk factors associated with falls from a height

As part of this study, risk factors regarding falls from a height were identified by workers. These risk factors and comments by workers included:

- working at height is a risk, but "it's just a part of the job";
- poor work practices (such as failure to secure ladders or working without rails or harnesses), being careless, and adopting bad work habits;
- lack of awareness or experience;
- pressures imposed by tight budgets and schedules; and
- principal contractors' failure to provide appropriate height access equipment, such as general access scaffolding.

Control of the risk of falling from a height

In the opinion of the 13 construction workers, control of the risk of falling from a height should be conducted through:

- the use of engineering controls, such as the installation of guard rails, handrails or safety mesh (site manager or employer seen as responsible for providing these measures);
- improved education and training of workers;
- employees taking greater care when working at height;
- appropriate selection and use of ladders;
- appropriate use of personal protective equipment (PPE), such as appropriate safety footwear to avoid slipping and use of fall arrest devices;
- employers following regulations;
- more OHS officers on site;
- greater enforcement of work procedures; and
- more frequent inspections of work sites.

Barriers to the control of risks

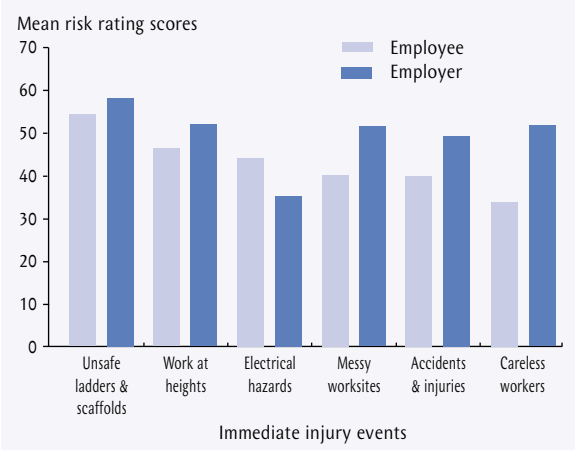
The two main barriers seen by construction workers to controlling the risk of falls from a height were stated to be monetary incentives and time constraints.

Perception of risk of employees and employers

Prior research by Holmes et al (1997) examined the perception of risk of both employees (81 employees) and employers (87 employers) in the painting industry. Both groups were asked to rate the order of 'riskiness' of a number of known occupational risks for painters on a scale from 0 to 100.

Risk ratings for 'immediate injury' events rated by employers and employees are shown in Figure 8. The findings of this study demonstrate that, to some extent, employees and employers have differing views regarding occupational risks in the workplace in the painting industry in Victoria. Employers were found to rate both 'messy worksites' and 'careless workers' significantly higher risks than did the employees. It is also interesting to note that employers rated all activities, other than electrical hazards, as more risky than did employees.

Figure 8.
Employees and employer ratings of risk for immediate injury events in the painting industry



Source: Holmes et al (1997)

New Zealand construction industry

In 1997, the Building and Construction Industry Training Organisation (BCITO) in New Zealand conducted interviews with 64 workers from different sized firms in the construction industry regarding their perceptions of risk factors associated with non-fatal injuries.

Risk factors for injury

The risk factors for injury identified by New Zealand construction industry workers included:

- pressure from the head contractor to complete the job;
- working on a difficult job by oneself;
- working with machinery, cranes and scaffolds;

- not enough time allowed for the job;
- insufficient training and experience;
- lack of planning; and
- cost of safety measures.

Work and organisational risk factors

Work and organisational factors identified by BCITO that could increase the risk of injury in the construction industry in New Zealand included:

- time pressure to complete the job;
- supervisor attitude and skill - need for good planning, supervision and communication;
- sub-contractor management and co-ordination - possible increased risk of hazards when several contractors are working on the same site; and
- teamwork and turnover - firms with high turnover of staff were more likely to have higher injury rates.

Firm commitment to good OHS practices

BCITO identified that in construction firms committed to good OHS practices (unlike those who were not) there was:

- involvement of senior managers in safety issues;
- integration of safety issues in day-to-day decisions and management systems;
- a sub-contractor selection process that addressed safety issues;
- workers actively involved in training and safety issues; and
- a long-term strategic review adopted by OHS management.

Washington construction industry

Through the use of case studies, a predictive model of the occurrence of non-fatal injuries to workers in the construction industry was developed by Bentil and Rivara (1996) in the United States. For this research, information regarding non-fatal injuries in the construction industry was obtained from persons working on 730 commercial construction projects in Washington between 1991 and 1993.

Risk factors for injury

Risk factors for injury identified from the case studies included:

- workers involved in new construction had a higher rate of injury than workers involved in renovations; and
- the rate of injuries increased with the financial size of the project, but the rate decreased with the presence of supervisory workers.

References

ABS. (1999a) *Year Book Australia*. Catalogue No. 1301.0. Commonwealth of Australia: Canberra

ABS. (1999b) *Labour Force, Australia*. Catalogue No. 6203.0. Commonwealth of Australia: Canberra

Amis, R. and Booth, R. (1992) Monitoring health and safety management. *The Safety and Health Practitioner*, Feb, 43-46.

BCITO. (1997) *Injury prevention in the construction sector*. BCITO and ACC: New Zealand.

Bentil, K. and Rivara, F. (1996) *Development of a construction injury predictive model*. NIOSH: Atlanta, Georgia.

Boden, L., Hall, J., Levenstein, C. and Punnett, L. (1984) The impact of health and safety committees. *Journal of Occupational Medicine*, vol 26, no 11, 829-834.

Bramber, L. (1994) Risk management: techniques and practices. In Ridley, J. *Safety at Work* 4 th edition. Butterworth Heinemann: Oxford, p174-207.

Carter, N., Klein, R. and Day, P. (1992) *How organisations measure success: The use of performance indicators in government*. Routledge: London, p49.

Casey, S. (1993) *Set phases on stun and other true tales of design, technology and human error*. Aegean Publishing Company: Santa Barbara.

Churcher, D. and Alwani-Starr, G. (1996) Incorporating construction health and safety into the design process. In Alves Dias, L. and Coble, R. (eds) (1996) *Implementation of Safety and Health on Construction Sites*. Balkema: Netherlands, p29-39.

Cohen, A. (1977) Factors in successful occupational safety programs. *Journal of Safety Research*, vol 9, no 4, 168-178.

Coyle, I., Sleeman, S. and Adams, N. (1995) Safety Climate. *Journal of Safety Research*, vol 26, no 4, 247-245.

Davis, B. (1998) Avoiding accidents by design. *The Engineer*, 5 June, 30-31.

Dedobbeleer, N. and Beland, F. (1991) A safety climate measure for construction sites. *Journal of Safety Research*, vol 22, 97-103.

Dedobbeleer, N. and Beland, F. (1998) Is risk perception one of the dimensions of safety climate? In Feyer, A-M., and Williamson, A (eds) (1998) *Occupational Injury: Risk, Prevention and Intervention*. Taylor and Francis: UK, p73-81.

Eisner, H. (1993) Safety rating systems in South African mines. *Journal of Health and Safety*, 9, 25-30.

European Foundation for the Improvement of Living and Working Conditions. (1991) *From Drawing Board to Building Site*. HMSO: London.

European Process Safety Centre. (1996) *Safety Performance Measurement*. Bookcraft Ltd: UK.

Gallagher, C. (1997) *Health and Safety Management Systems: An Analysis of Systems Types and Effectiveness*. Worksafe Australia Grant. National Key Centre in Industrial Relations: Monash University.

Glendon, I. and Booth, R. (1995) Risk management for the 1990s: Measuring management performance in occupational health and safety. *Journal of Occupational Health and Safety - Australia and New Zealand*, 11 (6), 559-565.

Gun, R. and Ryan, C. (1994) A case-control study of possible risk factors in the causation of occupational injury. *Safety Science*, 18, 1-13.

Hale, A. and Hovden, J. (1998) Management and culture: the third age of safety. A review of approaches to organisational aspects of safety, health and environment. In Feyer, A-M., and Williamson, A (eds) (1998) *Occupational Injury: Risk, Prevention and Intervention*. Taylor and Francis: UK, p129-165.

Harper, R. and Koehn, E. (1998) Managing industrial construction safety in Southeast Texas. *Journal of Construction Engineering and Management*, Nov/Dec, 452-457.

Harrison, J., Frommer, M., Ruck. E. and Blyth, F. (1989) Deaths as a result of work-related injury in Australia. *Medical Journal of Australia*, 150, 118-125.

Hayes, B., Perander, J., Smecko, T. and Trask, J. (1998) Measuring perceptions of workplace safety: development and validation of the work safety scale. *Journal of Safety Research*, vol 29, no 3, 145-161.

Hinze, J., Coble, R., Elliott, B. (1999) Intergrating construction worker protection into project design. In Singh, A., Hinze, J. and Coble, R. (eds) (1999) *Implementation of Safety and Health on Construction Sites*. Balkema: Netherlands, p395-401.

Holmes, N., Triggs, T., Gifford, S. and Dawkins, A. (1997) Occupational injury risk in a blue collar, small business industry: implications for prevention. *Safety Science*, vol 25, no 1-3, 67-78.

Holmes, N., Lingard, H., Yesilyurt, Z. and DeMunk, F. (1998) *Meanings of risk control in small business construction firms*. RMIT: Victoria.

Hopkins, A. (1995) *Making Safety Work: Getting Management Commitment to Occupational Health and Safety*. Allen & Unwin Pty Ltd: NSW.

Hopkins, A. (1999) *Managing Major Hazards: The Lessons of the Moura Mine Disaster*. Allen & Unwin Pty Ltd: NSW.

Kletz, T. (1993) Accident data - the need for a new look at the sort of data that are collected and analysed. *Safety Science*, 16, 407-415.

Labour Ministers Council. (1998) *Comparative Performance Monitoring: Occupational Health and Safety and Workers' Compensation*. Commonwealth of Australia: Canberra.

MacKenzie, J., Gibb, A., Bouchlaghem. N. (1999) Communication of health and safety in the design phase. In Singh, A., Hinze, J. and Coble, R. (eds) (1999) *Implementation of Safety and Health on Construction Sites*. Balkema: Netherlands, p419-426.

Neale, R. (1995) *Managing International Construction Projects: An Overview*. International Labour Officer: Geneva.

Nichols, M and Marcus, A. (1990) Empirical studies of candidate leading indicators of safety in nuclear power plants: an expanded view of human factors research. *Proceedings of the Human Factors Society 34 th Annual Meeting*, 876-880.

NOHSC. (1994) *Positive Performance Indicators: Beyond Lost Time Injuries*. Part 1 - Issues. AGPS: Canberra.

NOHSC. (1995) *Occupational Health and Safety Performance Overviews, Selected Industries. Issue No. 8 Construction industry*. Commonwealth of Australia: Canberra.

NOHSC. (1998a) *Compendium of workers' compensation statistics, Australia, 1996-97*. NOHSC: Sydney.

NOHSC. (1998b) *Work-related traumatic fatalities in Australia, 1989 to 1992*. NOHSC: Sydney.

NOHSC. (1999) *Work-related traumatic fatalities involving construction activities in Australia, 1989 to 1992*. NOHSC: Sydney.

NSW Health Department. (1998) *Health Outcome Performance Indicators: Monitoring Health Improvement*. NSW Health Department: NSW.

Ojanen, K., Seppala, A. and Aaltonen, M. (1988) Measurement methodology for the effects of accident prevention programs. *Scandinavian Journal of Work Environmental Health*, 14, suppl 1, 95-96.

Osborne, R. and Jackson, D. (1988) Leaders, riverboat gamblers, or purposeful unintended consequences in the management of complex, dangerous technologies. *Academy of Management Journal*, vol 31, no 4, 924-947.

Reilly, B., Paci, P., Holl, P. (1995) Unions, safety committees and workplace injuries. *British Journal of Industrial Relations*, 33, 2, 275-288.

Salminen, S., Saari, J., Saarela, K. and Rasanen, T. (1993) Organisational factors influencing serious occupational accidents. *Scandinavian Journal of Work and Environmental Health*, 19, 352-357.

Shannon, H., Walters, V., Lewchuk, W., Richardson, J., Moran, L., Haines, T. and Verma, D. (1996) Workplace organisational correlates of lost-time accident rates in manufacturing. *American Journal of Industrial Medicine*, 29, 258-268.

Shannon, H., Mayr, J. and Haines, T. (1997) Overview of the relationship between organisational and workplace factors and injury rates. *Safety Science*, vol 26, no 3, 201-217.

Shannon, H. (1998) Workplace organisational factors and occupational accidents. In Feyer, A-M., and Williamson, A (eds) (1998) *Occupational Injury: Risk, Prevention and Intervention*. Taylor and Francis: UK, p73-81.

Shaw, A. and Blewett, V. (1994) Performance indicators for benchmarking. In NOHSC. (1994) *Positive Performance Indicators: Beyond Lost Time Injuries. Part 1 - Issues*. AGPS: Canberra.

Shaw, A. and Blewett, V. (1995) Measuring performance in OHS: using positive performance indicators. *Journal of Occupational Health and Safety - Australia and New Zealand*, 11, (4), 353-358.

Shaw, A. and Blewett, V. (1996) Telling tales: OHS and organisational culture. *Journal of Occupational Health and Safety - Australia and New Zealand*, 12, (2), 185-191.

Simard, M. and Marchand, A. (1994) The behaviour of first-line supervisors in accident prevention and effectiveness in occupational safety. *Safety Science*, 17, 169-185.

Simonds, R. and Saafai-Sahrai, Y. (1977) Factors apparently affecting injury frequency in eleven matched pairs of companies. *Journal of Safety Research*, vol 9, no 3, 120-127.

Smith, M., Cohen, H., Cohen, A. and Cleveland, R. (1978) Characteristics of successful safety programs. *Journal of Safety Research*, vol 10, no 1, 5-15.

Williamson, A., Feyer, A-M., Cairns, D. and Biancotti, D. (1997) The development of a measure of safety climate: the role of safety perceptions and attitudes. *Safety Science*, vol 25, no 1-3, 15-27.

Wooden, M. and Robertson, F. (1997) *Determinants of work-related injuries: an inter-industry analysis*. National Institute of Labour Studies: South Australia.

WorkSafe WA (1998) *The WorkSafe Western Australia Commission Workplace Change Project Report: Volumes 1 and 2*. WorkSafe Western Australia Commission: Western Australia.

Zohar, D. (1980) Safety climate in industrial organisations: theoretical and applied implications. *Journal of Applied Psychology*, vol 65, no 1, 96-102.