

Guide to Best Practice for Safer Construction: Case studies



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The best practices outlined in this guide are proposed to improve safety outcomes, but the value of the suggested methodologies, including the examples provided, is not proven. Therefore, support by these associations is not an endorsement of any part of this guide as an accepted standard by which the professional behaviour of individual practitioners may be judged.

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PREFACE

Safety practices are mandated by legislation. However, some companies and projects do more than satisfy legislated requirements; they strive for best practice in their approach to safety. These best practice frameworks and approaches are not necessarily well documented in a systematic way within the construction industry. In response, this report documents and analyses safety practices drawn from forward-thinking and award-winning construction projects located across Australia.

This study begins the process of identifying and systematically codifying safety best practices in construction projects. It examines best practice in construction projects, researching the types of innovative practices implemented to promote safety in construction. The safety practices cover all phases from project conception to completion.

The projects identified in this research encompass a broad range of construction industry sub-sectors: infrastructure, commercial, large-scale residential, rail and airports. Case studies were drawn from those projects that had been chosen for safety awards or for building awards that contained safety elements and, to ensure broad coverage of the construction industry sectors, were sourced from the recommendations of the Safer Construction Taskforce, an expert panel of construction professionals. In each project, the designer, client and constructor were interviewed to determine their perspectives on the best practice safety aspects.

Best Practice Case Studies in Construction Projects systematically analyses the range of safety practices and extends understanding of ways to achieve an outstanding safety record.

1 EXECUTIVE SUMMARY

1.1 Best Practice Key Findings

Requirements of Occupational Health and Safety legislation mandate standards for construction activity both on-site and off-site e.g. construction safety plans, work method statements and Job Safety Analysis forms that are completed before work can start. A best practice framework, however, emphasises those construction practices that go beyond the required level of safety in construction projects. The practices and principles highlighted in the best practice case studies indicate the activities and processes in construction projects that consistently strive to set industry benchmarks for best practice. Specific elements of those projects identified as promoting a best practice approach to safety are summarised in this Executive Summary.

The following points summarise the best practice safety strategies implemented across the pre-construction to post-construction phases of the high performing construction projects examined in this research:

- Make safety part of the strategic planning, related to Occupational Health and Safety (OHS) management systems as required by some accreditation schemes and OHS legislation
- Continually monitor site development
- Supervise and maintain coordination between designers and constructors
- Involve clients in all the project phases, including clients personally monitoring on-site activities
- Change culture, e.g. develop close relationships with workers through socialising and 'buddy systems'
- Go beyond the regulations at all levels, especially in design and construction
- Go beyond the contractual obligations to develop, for example, a safety charter
- Communicate through all levels, both formally and informally, e.g. include safety as part of the agenda in meetings
- Offer incentives for workers, e.g. systems of involvement and identification such as barbecues, prizes, monetary incentives, or simple recognition
- Eliminate the concept of 'having to finish on time'
- Delegate responsibilities about safety (everybody is responsible and '600 eyes')
- Actively involve designers in safety: design criteria and reviews
- Undertake design consultation and review across stakeholder groups.

1.2 People

1.2.1 Designer

Considering safety in design was highlighted in most of the best practice case studies. Inclusion of safety considerations in design ensured that safe construction practices and safe post-construction operation of the building or constructed physical asset were thought through along with buildability.

Designers integrating safety considerations into design aspects consistently featured in these case studies. These aspects included identifying risks at the design stage, developing mitigation strategies and continuously reviewing designs as issues related to safety or buildability arose. An effective strategy to integrate safety considerations into design that was

commonly mentioned was for designers to work directly with constructors and clients to develop strategies to design for safety, risk mitigation and reviews. An example is the case of the Eastern Freeway.

Outstanding design initiatives included the development of six design options and the identification of potential hazards associated with each of these alternatives for the Orange Aerodrome Reconstruction project. This breakdown assisted the design team to select the best rehabilitation method.

Close client consultation with the design group was an effective initiative of the Cobram Barooga Bridge project.

A number of projects constructed and in some cases, designed, by Lend Lease implemented a design review process known as ROAD (Risk, Opportunity and Design). This company-specific systematic design review process was applied progressively through project stages. Projects that implemented ROAD were: Hyatt Regency Coolum, Coles Myer Somerton, Millennium Arts Project, Rouse Hill Town Centre and University of NSW. In addition, ROAD promoted effective communication between the designer and the client.

Design reviews and pre-established design criteria were developed for Rouse Hill Town Centre and Geraldton Southern Transport Corridor. These reviews involved all stakeholders, working together in an open consultation process.

In the case of Geraldton Southern Transport Corridor, design criteria were developed by the design team. Design reviews were undertaken consistently by the design team along with the constructor. These reviews were supported by effective and thorough documentation, which helped with risk identification and the subsequent mitigation strategies.

Melbourne Airport also incorporated safety in design initiatives. Designer-driven health and safety sessions for the design team were held and the design team moved on-site when construction began.

1.2.2 Constructor

❖ Pre-qualification and Tender Requirements

Most consistently, safety pre-qualification and tender specifications that included safety criteria were mentioned as a valuable contribution to safety best practices. The pre-construction or tender phase proved to be a critical stage for setting the foundations for safety practices.

In some cases, only pre-qualified constructors with a proven safety record were invited to tender by the client. This approach was adopted in the Cobram Barooga Bridge project, where all potential principal contractors had to be pre-registered and meet certain safety criteria. Procurement was only open to a limited number of pre-qualified constructors for Auburn Intersection Upgrade and Rail Bridge Renewal, Eastern Freeway and Helensvale to Nerang Duplication. Pre-qualified constructors also were required to comply with a concept design or agree to prescriptive safety guidelines that were set out in contracts or method statements provided by the client. For the Auburn Intersection Upgrade and Rail Bridge Renewal the client defined the outcomes for the project at the concept stage.

In the case of the Eastern Freeway, safety requirements for the constructor were set out by the client. The requirements included safety audits, which needed to be undertaken by the clients' own surveillance managers and junior engineers every three months.

Assessment criteria and safety specifications were established at the tender stage for Millennium Arts Project and Morwell River Diversion. The client for Morwell River Diversion undertook interviews with key people to assess their safety priorities and plans for the project.

In other cases, such as Coles Myer Somerton and 1010 Latrobe Street, criteria were established for sub-contractors to ensure they had a history of safe working and were aware of safety policies and practices on-site.

Any workers on-site for Helensvale to Nerang Duplication were required to meet specific challenge assessments or be assessed through safety familiarisation processes.

Safety goals were determined at the tender stage for Hyatt Regency Coolum. These goals were included in the final contract and discussed at regular weekly meetings.

❖ **Safety Planning and Risk Management**

Once a pre-qualified contractor was selected, in most cases, they were required to submit a safety plan, such as in the case of Basslink and Cobram Barooga Bridge.

Some projects, like Sydney Airport Gate 24, required that each contractor produce a site-specific safety plan, which was reviewed by an independent consultant on behalf of the client and then by the construction manager.

Risk management and mitigation strategies developed by the constructor were implemented in several case studies, including Coles Myer Somerton. Comprehensive pre-construction and construction safety planning, meetings and documentation were established to ensure safety in both design and construction.

FPE Seawall Alliance developed a safety charter at the pre-construction stage. This charter was supported with monitoring to ensure safety compliance.

1.2.3 Client

Communication was a key feature in achieving client-led safety initiatives and for driving a top-down approach to safety. This more intensive approach to communication meant communicating safety messages for the overall project direction or directly communicating with personnel on-site. Further, the client's involvement (or that of a client representative) with on-site activities including inductions, safety meetings, inspections and safety walks was perceived as contributing to safety best practice.

In the case of Sydney Airport Gate 24, client representatives were involved with activities on-site – maintaining frequent communication with the contractor and closely monitoring safety. The client was closely involved with on-site activities for Millennium Arts Project as they were based on-site and maintained direct interactions and communication with other stakeholders.

An effective client initiative, where all personnel were issued with direct contact numbers for client representatives to discuss safety, was initiated in Basslink.

In some cases, client-appointed external facilitators reported directly to the client. In the Wivenhoe Alliance the facilitator worked through safety goals and objectives and communicated effectively and openly with other stakeholders.

❖ **Community Engagement**

Positive external relations developed by the client were mentioned in several case studies as best practice. This initiative was exemplified in the cases of Eastlink, Hallam Bypass, Flinders Street Overpass and Geraldton Southern Transport Corridor.

These positive relations contributed to safety best practice by informing parties, generally in the community, of the works being undertaken, and managed the flow of information about the project. In the case of Eastlink, the Internet was the main communication tool.

1.3 Overarching Best Practices

1.3.1 Planning

Multi-level planning and integration of stakeholders in the planning stage were both considered fundamental to determining safety expectations, and to setting safety standards and goals.

Planning safety from the outset was specifically mentioned by stakeholders from Basslink, Alice Springs to Darwin Rail Link, Morwell Rail Division, Lucas Heights Nuclear Facility, Hallam Bypass and Geraldton Southern Transport Corridor.

Multi-level planning contributed to coordinating safety plans and developing the safety goals for each project. In the case of Alice Springs to Darwin Rail Link these safety goals were supported by a reporting structure so that, if anything went wrong, it would be determined how to correct the problem. Scenario planning determined risk management and mitigation strategies. For Hallam Bypass, preparation was extensive, with design meetings beginning months before construction.

❖ **Communication**

Across the board, communication was considered fundamental to engendering a safety culture. Communication encouraged positive relationships between stakeholders and ensured that the transfer of information was delivered effectively along the supply chain, from clients through to sub-contractors. In some cases, direct client involvement in project activities was highlighted as best practice. The client was involved by personally monitoring on-site activities and communicating with all stakeholders directly. In some cases, such as Eastern Freeway and Melbourne Airport the client personally inspected the site on a near-daily basis.

An overarching culture of safety, supported by relaying safety messages along the supply chain set the foundations for safety best practice. Stakeholders for FPE Seawall Alliance, Geraldton Southern Transport Corridor and Melbourne Airport specifically mentioned communicating safety messages across the supply chain, to support a safe workplace. The high-risk nature of the Melbourne Airport project, along with tight timeframes, made effective and reliable communication along the supply chain absolutely imperative.

For Tullamarine Calder Interchange (TCI), communication along the supply chain was supported by cross-overs of different groups, such as field workers meeting with office staff and then taking information to workers in the field.

For larger projects such as Eastlink, communication tools were used to convey messages to all stakeholders. The Thiess John Holland computer-based project management tool, inCITE was used to track the progress of the project and update personnel. This approach included a risk section that showed the outcomes from safety and design workshops. The project's *Crew Connect* magazine, which included safety notices and reminders, was another effective communication channel.

For smaller-sized projects like Helensvale to Nerang Duplication, safety messages were personalised and communicated directly from management to sub-contractors.

❖ **Information Sharing**

Open management systems and information sharing amongst stakeholders facilitated a team approach to a number of projects, such as the Lucas Heights Reactor project. Information sharing was practised for the Melbourne Airport Runway, where each stakeholder had a different OHS monitoring system; however, the sharing of information meant that the project was treated as more of an alliance.

A custom-developed internet 'project web' acted as a communication tool for project works through different stages to be reviewed and modified between stakeholders for the Millennium Arts Project and Rouse Hill Town Centre. This is a standard feature for all Lend Lease projects.

Reporting structures for safety and notification systems contributed to monitoring and effective information sharing. A reporting structure was implemented for Alice Springs to Darwin Rail Link.

Information was conveyed along the supply chain for Basslink. Monthly meetings on safety were attended by site supervisors but not sub-contractors. It was therefore imperative that project managers communicated with different OHS representatives.

The company-specific 'incident and injury free' (IIF) plan developed by Lend Lease provided a flexible orientation training program that could be adapted to specific projects. This program was implemented at Hyatt Regency Coolum, Coles Myer Somerton, Rouse Hill Town Centre and Forest Gardens.

❖ **Monitoring**

Some construction companies developed their own specific monitoring safety programs, like the '600 eyes' program developed by Orange City Council. This program aims to encourage personnel to monitor, record and report any hazards. An innovative aspect of a safety program was the distribution of disposable cameras in training sessions for the Orange Aerodrome Reconstruction project. These were kept in Council vehicles for easy access and were used to monitor safety.

For all case studies, project managers and safety officers were on-site to monitor work, get to know personnel and support monitoring programs. For example, a surveillance manager was appointed for Eastern Freeway. Project managers were engaged for Sydney Airport Gate 24 and Forest Gardens to monitor safety. Specifically, the Project Manager for Forest Gardens made a conscious effort to spend time with workers during their breaks to develop positive interactions between the construction representative and sub-contractors.

Sydney Airport Gate 24 had a project manager and an external consultant who undertook spot checks for safety and checked that personnel complied with their work methods statement. In addition, the construction company appointed an OHS administrator, who attended the site on a weekly basis.

❖ **Shared Stakeholder Responsibility for Safety**

Equal or shared responsibility for safety across stakeholder groups was mentioned in a number of projects as a best practice approach. In the cases of Alice Springs to Darwin Rail Link and Hallam Bypass, consultation occurred in a 'round table' structure, not as a trickle-down effect.

Ownership of safety was another consistent theme. Safety ownership was a feature of the Morwell River Diversion where stakeholders were encouraged to share responsibility for safety equally. Stakeholders facilitated this process through effective communication and designation of responsibilities for different aspects of a project. This division of responsibilities for aspects such as management, administration and communication was particularly mentioned by stakeholders from Tullamarine Calder Interchange.

❖ **Team Building and Mentoring**

Team building was an important aspect in preparing for works in the pre-construction phase. Most of the projects included in the study implemented preparatory measures to determine a risk management strategy. Furthermore, safety education and training development were supported by intensive training, safety certification and comprehensive inductions.

Team building gave personnel the opportunity to get to know each other at Wivenhoe Alliance. At Lucas Heights the philosophy of 'look after yourself and look after your buddy' was adapted to encourage team building and to develop a safety culture in a high-risk environment.

Wivenhoe Alliance and Rouse Hill Town Centre adapted an informal mentoring arrangement. Specifically for Rouse Hill Town Centre, mentoring was established as a 'buddy system' to support younger apprentices.

❖ Incentives

A popular method to drive safety performance was incentives such as awards, dinners, BBQs or simple acknowledgements. Basslink and TCI gave awards for good safety practices in an initiative that was driven by the constructor and sponsored by the client.

Internal awards for safety and innovation (both small-scale and for the overall organisation) were given for Wivenhoe Alliance and were embraced by personnel. An incentive program for Millennium Arts Project was integrated into team-building exercises. BBQs were a reward for good safety practices and provided opportunities to build communications and affirm relationships.

❖ Work-life Balance

Two separate projects implemented work-life balance programs. These programs were perceived as contributing to OHS by encouraging personnel to maintain healthy lifestyles and have a balanced work schedule that was not too intensive. The projects that implemented such programs included: FPE Seawall Alliance which established a 'quality of life' program including free medical examinations and a 'sun cancer day'; and Wivenhoe Alliance, which included a 5-day working week and 'energy for life' program promoting good health and lifestyle.

❖ Training and Inductions

Training and induction sessions were mentioned in all case studies as effective forums to communicate safety information. All projects had compulsory training and inductions that were legally enforced. However, some projects established their own company-specific training and induction programs and, for some projects, additional training was compulsory for personnel.

Additional safety training was used at FPE Seawall Alliance, where some personnel completed a full WHSO accreditation (Workplace Health and Safety Officers) training program and all personnel undertook training for a motor-vessel licence, due to the nature of the work. For the Helensvale to Nerang Duplication project, the management company's inductions were followed by a multiple-choice questionnaire and discussion. Safety officers were asked to do extra training on top of the standard Certificate IV.

A 'passport to safety' training program was implemented by John Holland for their construction projects. This initiative was perceived as raising the overall awareness of safety.

Training responsibilities were determined with a training matrix for 1010 Latrobe Street. Training and inductions were updated as project stages progressed and personnel going on-site had to re-take these activities for Morwell River Division.

❖ Measuring Safety

Safety is measured on all project case studies through regulatory enforcement and other initiatives. The national injury average for over 5 million man hours worked is 7.04 for major construction projects, with most case studies examined in this report having well under this number. Most common was the use of Lost Time Injuries (LTIs) to measure injury rates, which were then reported to the relevant stakeholders. Safety performance was measured with a combination of lagging and leading indicators.

Safety was measured by setting out safety goals in the initial Environmental Health and Safety (EHS) plan and meeting these targets on some projects, including Rouse Hill Town Centre. Key Performance Indicators (KPIs) were established to drive safety performance at the Wivenhoe Alliance project.

Performance targets or benchmarks were set at the Millennium Arts Project and Orange Aerodrome Reconstruction.

Incident and injury registers provided an accessible reporting system to record safety data, which was implemented at Rouse Hill Town Centre. This WET computer-based system stores data on LTIs. A data management system was used to record safety information at

Wivenhoe Alliance and 1010 Latrobe Street. The Intranet recorded safety information at 1010 Latrobe Street, included information as to where the contractors were located, along with injury rates.

At Cobram Barooga Bridge, a SuMS (Surveillance Management System) computer program, similar to a register, supervised the project, which was monitored by client-appointed external audit and surveillance managers.

2 INTRODUCTION

The Australian construction industry's occupational health and safety (OHS) record has long been regarded as unacceptable (Cole, 2003; Lingard & Rowlinson, 2005; Wild, 2005). Studies in other nations have established similar findings (e.g. Alves Dias, 1995; Suraji *et al.*, 2001). As a result, improving safety on-site has emerged as a matter of great concern, not only for government agencies and regulatory authorities, but also for organisations within the construction industry.

Under Australian law, employers have a duty of care to provide their workers with a safe workplace. Indeed, the Supreme Court of Victoria (1992) has determined that "one of the chief responsibilities of all employers is the safety of those who work for them." Such a duty has been held by Australian courts to apply not only to direct employees of a firm, but also to a firm's sub-contractors (Rozen, 2004). The legislative framework prescribes basic rules and behaviours for OHS in the workplace. However, many firms and projects within the construction industry are looking to improve the safety record of the sector through adopting leading edge and innovative safety programs and practices.

The developing trend of high-profile or large-scale projects ensuring not just the safety of workers as required by legislation on construction sites, but also developing systems of best practice is recognised as having an important part to play in changing attitudes *throughout* the industry. Construction projects operating according to best practice principles have the ability to set standards that take the industry to a new level of safety and safety competency. These best practices provide a set of measures that have been tested for success. The rest of industry may therefore follow these safety practices with confidence that they have the potential to lead to improved safety outcomes.

While the focus has been on the constructor as the pivotal party for promoting safety, other locations and parties in construction need to be included in the safety agenda. Clients and designers have a responsibility to participate as well. This affects the way in which clients should behave, especially the extent to which they factor important public values into the decision-making process during the procurement of infrastructure. As one public sector client put it: "It is about leading by best practice, but it is more than that. It is leading almost by *de facto* requirement. It is effectively saying, that best practice is the best way to behave, so there is an expectation [that other] clients will behave that way."

Clients thus have the opportunity to drive safety as a priority: first by establishing it as primary selection criteria in the contractual process; and then by encouraging contractors and designers to follow their example. Designers are also important in safety management and practice, since the built environment needs to be designed to ensure the safety of construction workers, as well as the end-users and/or occupants.

3 METHODOLOGY

This section outlines the frameworks for case selection and analysis.

3.1 Best Practice Case Studies

3.1.1 Awards

Industry awards were used as the main way of sourcing best practice construction projects. Recipients of construction industry awards were contacted to discuss the safety practices that they had implemented on their projects. This process developed a series of case studies of best practice in construction safety. The designer, constructor and client from each project were interviewed to establish the range of practices instigated by the various stakeholders from conception to completion of the project.

3.1.2 Best Practice Framework

Most projects were selected according to a best practice framework determined by industry awards. Some Australian states and some industry sub-sectors, however, were not well-represented in the initial investigation.

Therefore, an expert panel model was adopted to gather advice regarding other 'best practice' projects. A panel of industry experts from different professional groups within the construction industry known as the Engineers Australia Taskforce for Construction Safety undertook a gap analysis of the construction industry case studies, identified industry sub-sectors and states that were not well represented, and provided the names of projects that were considered best practice in these areas. The selected projects were then added to the award case studies. A total of 27 case study projects were sourced from this combined process.

3.2 Case Study Methodology

A case-study method was adopted to investigate best practices in safety at a construction project level and to determine the safety impact of decisions made upstream in on-site processes. Each project was considered a defined case and was generally included in the research only if a representative of the designer, client and constructor agreed to be available for interview. In some instances, one stakeholder was not able to be interviewed however, due to the significance and profile of the project, the case study was included.

3.2.1 Interviews

Semi-structured interviews were conducted with the client, designer and constructor. Most interviews were conducted via telephone, with a few face-to-face, since interviewees were based in remote locations and due to time constraints. Interviews were taped and transcribed and were generally of one hour's duration. The summaries were returned to the stakeholders for checking and amendment.

4 BEST PRACTICE CASE STUDIES

This section summarises each of the 27 best practice case studies. The result is a comprehensive study of industry-implemented best-practice safety characteristics and elements within construction projects.

Each section includes:

- The project summary
- Summary of unique safety aspects identified
- Best practice approaches
- Stakeholder perspectives from the client, designer and constructor.

4.1 1010 Latrobe Street, VIC – Commercial Office Building

Key information	Summary	Award
Client: Digital Harbour	The Digital Harbour Vision is a fully-integrated digital community. The client and designer were involved in safety during the pre-construction stage. In this case, the safety award was primarily aimed at the constructor. The project focuses on identifying safety in practice for all the construction team and included a 'safety index' and 'behavioural observation program'. Both required supervisors to monitor safe implementation of various work activities on-site.	Winner: MBAV Professional Excellence in Construction Award 'Excellence in Health and Safety General Contractor' category. Winner: Commercial Architecture Award. RAIA 2007 Victorian Architecture Awards <i>Five-star:</i> GreenStar environmental rating from the Green Building Council of Australia. This award evaluated the impact of the building, against eight environmental criteria including energy consumption, water use, indoor environment and quality materials. (Awarded to Digital Harbour)
Designer: ARM Architecture		
Constructor: Baulderstone Hornibrook		
Cost: \$40 million		
Injuries: LTIFR: Target 4 Actual 0 FAIFR: Target 154.0 Actual 157.49		

4.1.1 Summary

- Recorded safety information on the intranet, including where the contractors are located, injury rates and incident data.
- Targeted specific prevention methods for particular types of common injuries.
- Developed a training matrix to determine safety training and delegate responsibilities.
- Contractor's selection process for recruiting sub-contractors ensured that safety was an integral part of their work planning.
- Project and processes were well organised, transparent and well-maintained as a means to eradicate the possibility of anything going wrong.
- Communication occurred at and between all levels: client, designers, staff, health and safety representatives and workers.

4.1.2 Best Practice

The constructor's company used an intranet to record safety information for up to 600 different contractors. This system included LTI rates with a breakdown of the types of injuries and where they occurred. The system records every sub-contractor that has worked for the company over a period of about 10 years. This procedure is not standard across the Australian construction industry – in fact it is unique.

By means of site safety supervisors, the constructor ensured that the personnel recruited had adequate experience. A project engineer with around 4–5 years experience was put in a dedicated safety role to give the new project personnel the opportunity to learn about a range of safety mechanisms such as MSD sheets, relationships with contractors, rules and regulations regarding scaffolds, and plant and induction checklists.

❖ Meetings and Communication

Initially, design meetings were held weekly. Afterwards, they were held when deemed appropriate. During the design process, team meetings were held frequently, though less frequently during the construction phase.

Site Safety Committee meetings were held every week, with guests invited on a rotating basis to ensure appropriate communication was taking place and then being passed on to the work force.

❖ Training and Inductions

All sub-contractors were subject to similar training systems as employees of the construction company – although the employees were given more safety training.

Safety initiatives on the project included training and awareness, materials handling initiatives and employee recognition for safety performance.

[The construction process] has been very organised, very obvious and well-maintained and consistent, so that the chances of somebody doing something that they weren't aware of a reason not to do it, would be remote, and that has been very positive (Client).

A general induction covered a broad range of safety requirements needed on any construction site. A training matrix existed where around 60 percent of personnel had completed health and safety courses. Some were targeted to undertake further training courses in line with their level, and nature of their supervisory role. Nearly all workers had undertaken a first aid level 2 and, in some cases, advanced first aid training.

Planned inductions were structured so no piece of plant equipment was used until it had been inspected and deemed safe for use.

❖ Safety Development across Project Stages

An engagement process was undertaken when sub-contractors were being recruited. The contractor spoke on safety responsibilities during the tender interview before they began work on-site.

The representative of each of the sub-contracting companies met with the managing contractor to explain their scope and the way in which they would execute the work. These sub-contracting companies produced completed JSAs and work methods statements. This was described as a 'stepped procedure' and ensured that the sub-contracting companies clearly understood what was expected of them before starting work on-site.

If we could remove risks for the contractor, the client was able to reap a portion of the benefit from doing so because the price would come down at tender time. It was an incentive for them to be involved in and help us design a safe building. It was an effective way of communicating and minimising risk (Constructor).

4.1.3 Stakeholder Perspectives

❖ Client
<ul style="list-style-type: none">• Responsible for communicating to the external public and extended safety practices by engaging with sub-contractors to raise safety awareness.• Training, awareness and management of personnel inside the construction area, were extremely organised, well maintained and consistent.• Focused on managing the interface between the construction site and the public and environment outside the construction site• Displays to raise safety awareness were a feature. The site was well signed.• Procedures were put in place to demonstrate to all stakeholders and personnel safe work methods and procedures.• Traffic management and protocol for deliveries was clearly set out in method statements and effectively carried out in a safe manner.• In the common meeting room, posters and reminders of regular training sessions were evident.• Worked hard to ensure that materials were chosen and placed in a way that was conventional and well understood.
❖ Designer
<ul style="list-style-type: none">• Promoted safe design, especially with respect to the façade.• The constructor was involved in the later design stage, which meant there was a smooth transition from the design phase to the construction.• Intranet was the main communication tool used by the designers.• Primary focus for designers was the end-user, but safety in construction was still a consideration.• Assessed quality and compliance through design documentation which sometimes involved co-ordinating with the primary contractor.• Worked with the constructor on issues of safety during construction.• In general, the designer can assist the constructor by ensuring that the choice of materials and finishes on-site are not hazardous, and ensuring that construction and assembly methodologies are achievable in a safe way.
❖ Constructor
<ul style="list-style-type: none">• Recruited personnel who had safety experience.• Worked with the designer to manage risk by understanding local conditions on-site.• Extended safety performance through extensive database records of site safety in projects over past 10 years.• Main contractor demonstrated effective safety leadership to sub-contractors.• Key relationships developed and maintained throughout project life.

4.2 Auburn Intersection Upgrade and Rail Bridge Renewal, NSW – Infrastructure

Key information	Summary	Award
Client: RailCorp, Local Council	This project involved demolition of an existing bridge and installation of a new one. The bridge to be constructed was part of a 'T' intersection with Rawson Street, which was also upgraded.	Winner: Earth CASE Award <i>Criteria for this award included:</i> <ul style="list-style-type: none"> • Industry best practice and use of new technology • Overcoming construction constraints and client satisfaction • Interface with other project parties and/or components • Quality, OHS and environmental management • Completion within timing deadlines and cost budgets • Technical complexity
Principle Manager/Supintendent: Tiel		
Designer: Connell Wagner		
Constructor: Reed Constructions Pty Ltd		
Value: \$15 million		
Injuries: LTIFR: 14.33 TRIFR: 35.82		

4.2.1 Summary

- Principle manager was appointed to oversee project.
- Client defined the outcomes for the project at concept stage.
- Principal manager hired a consultant to develop concept design before the project was tendered.
- Procurement was only open to three constructors, who were selected if they agreed to comply with the concept design and had a proven pre-qualification.
- Contractor developed a methodology that included working behind security screens and safety divisions for high-risk operations carried out close to existing railway.

4.2.2 Best Practice

The client said that best practice is about having clear, desired goals and developing strategy focusing on the key elements of a particular deliverable. The underlying issues such as OHS were established. Despite this, the client said that success was fundamentally dependent on selecting the 'right people' for the different phases of the project.

The principle manager supervising the project said that much time was spent with RailCorp and the Council in order to understand both clients' needs, and the constraints of the work.

If they can handle the scope of works, the issue of occupational health and safety is more easily managed. It is not easy, but it becomes more easily managed (Client).

The client defined the project outcomes at the concept design stage. The concept design defined the clearances for the railway line that would pass underneath the road. It indicated

to the contractor that the project was designable and buildable. Two imperative criteria were providing clearance for the railway and retaining the elevation view of the street. The constructors who put in a tender bid had to prove their design and construct capabilities and the integration of safety in their design and construction proposal.

The contractor developed a methodology that included working behind security screens and safety divisions for the highest risk operations carried out close to the existing railway. These screens and dividers were built into the overall design of the bridge structure, although the client acknowledged that many of these features, such as anti-throwing devices, are standard in projects of this nature. Designs had to consider the separation of works caused by the screens and dividers that sectioned off the rail area.

Effective outcomes ... are generally driven by the attitude of the people, more than the tools or mechanisms that they use. I look at written, verbal, any other form of correspondence, body language, as all tools to aid the outcome, but in the end it is more about creating a right environment, having people with the right attitude, and the focus to deliver (Client).

❖ **Meetings and Communication**

Aside from meeting the contractual obligations, partnering between parties was developed to achieve outcomes. Communication between the three parties was face-to-face at formal meetings.

When works would involve infrastructure owned by RailCorp, the project management team convened a separate meeting to manage and co-ordinate activities with RailCorp. As the official owner of the bridge, RailCorp had to officially accept the design before they approved it. Three-way meetings were undertaken between the client, constructor and designer during this process. Both the client representative, who acted as the superintendent of works, and RailCorp were present and helped to facilitate the process.

Informal communication consisted of emails and phone conversations. The principal manager said emails were effective since they provided a “trail [of] correspondence”.

The project supervisor noted that the group of workers and sub-contractors on-site had worked together for years. This resulted in good rapport and a high level of expectation. This attitude, it was reported, “pretty well permeated through the whole exercise”.

❖ **Safety Development across Project Stages**

The principal manager used a pre-selection process aimed at recruiting a constructor with the appropriate skills in communication and management. The principle manager employed a consultant to develop a concept design, to send to potential contractors applying for tender.

The client went through a pre-selection process to choose three contractors who could bid for the project. These contractors were selected based on their proven experience to deliver jobs within a tight timeframe. These contractors needed a significant amount of skill and capacity in order to deliver the project. One of the criteria for selecting potential contractors was a proven track record of excellent occupational health and safety.

This method of pre-qualification was coupled with development of a concept design and prescriptive statement objectives that the contractor had to be able to deliver. The procurement process was described by the principle manager as an essential tool for recruiting constructors with the requisite safety experience.

During the design phase, all stakeholders met about once or twice each week, or as the need arose. According to the client, meetings during the design phase were not scheduled to follow a strict timetable pattern within the project, but instead were focused on the deliverables.

The client and constructor also met regularly during the construction phase, with third parties invited to attend meetings when necessary.

Our philosophy is that safety is number one, We don't want to see any accidents. It started in the design, because the design had a lot to do with safety regarding working around the rail corridor, so from the start, it was known that it was a safety driven project. In the concept design it was outlined in that, so before the project started the client already had that in his mind, that was what was needed (Constructor)

❖ **Preparation**

The constructor reviewed the sub-contractors' safe work method statements before the sub-contractors were allowed on-site, to ensure that they were correctly filled out. Furthermore, the contractor ensured that these workers were wearing hard hats, the right coloured vest for working in a rail corridor, and that they had the correct Personal Protective Equipment (PPE). When sub-contractors signed-in daily, the constructor made sure they had what was necessary, usually at the toolbox meetings.

4.2.3 Stakeholder Perspectives

❖ Client
<ul style="list-style-type: none">• Promoted safety in design through the role of 'principal manager', looking after concept development into design, procurement and construction phase.• Managed safety risks by ensuring development of a design concept which met the criteria of multiple stakeholders, the Local Council and Rail Corp, and then procured the services of a contractor with the skill and capability to deliver the project safely in a very short timeframe• Continuously improved safety performance as the client was responsible for acting as a superintendent for the works, and visited the site "as needed".• Demonstrated safety leadership by deciding to physically deliver the works under a detailed design- and-construct contract package.• Communicated safety information at every opportunity including continual meetings and site visits.
❖ Designer
<ul style="list-style-type: none">• Extended safety practices by going beyond the contract requirements and developing designs that considered a separation of the road and rail works.• Communicated safety information effectively in design meetings and regular meetings with all stakeholders.• Designs were a collaborative effort and needed approval from the client.• Promoted design for safety by integrating safety and constructability in design and through dividing rail and road works.
❖ Constructor
<ul style="list-style-type: none">• Constructor advertised their focus on safety (prioritisation of safety as company policy).• Ensured a safety-driven project.• As all stakeholders were based at various, spread-out locations, face-to-face meetings were arranged. During the construction phase, regular site visits together with weekly meetings assisted communication.• Managed safety risk by developing a methodology that included specifications for highest risk operations.• Extended safety practices with an external audit. The audit was undertaken every fortnight, with a major audit every month. Specific to communication, that is what really helped the project.• Entrenched safety practices and principles through building a 'philosophy of safety' within the construction team that started from the design. The safety culture came from the construction team, and then from the client.• A register book was signed in and out by all personnel each day. The safety register uses a numbering system, identifies the issue, corrective action needed and what has been done about to address these issues.

4.3 Basslink, TAS – Infrastructure

Key information	Summary	Award
<p>Client: National Grid Australia and Basslink Pty Ltd</p>	<p>This joint venture between National Grid Transco and Basslink interconnected Bells Bay in Tasmania and Gippsland in Victoria. It included 295 km of undersea cable. The project has the capacity to deliver 600 megawatts of energy and includes a telecommunication cable link between Tasmania and the mainland. The main objective is to deliver energy with a strong green focus.</p> <p>Basslink was constructed by a consortium, with Siemens and Pirelli as the main constructors. Siemens was responsible for the entire HVDC transmission technology, including the key components of power converter valves, converter transformers, smoothing communication and control technology. It was also responsible for the constructor work, including the valve halls and the operational building, as well as the erection of the overhead power lines over a distance of about 70 km.</p> <p>The project also included the expansion of existing switching stations that were linked to the HVDCT (high-voltage direct current transmission route) system. Prysmian Energy Cables & Systems delivered and installed the 290-km long submarine cable, currently the longest in the world used for power transmission.</p>	<p>Highly Commended: National Safety Council of Australia (NSCA)/Telstra National Safety Awards of Excellence (2003) for Best Implementation of an OHS Management System. (Awarded to Siemens)</p>
<p>Designer: Siemens</p>		
<p>Constructor: Siemens and Pirelli (main contractor was Siemens)</p>		
<p>Value: \$850 million</p>		
<p>Injuries: LTIFR: 0 (Loy Yang) LTIFR: 2.9 ASF18.85 (LTIs where a worker misses a complete shift) First aid injuries frequency rate: 70 Near misses: 44 Overall project: 679,000 hours Between 900 and 1000 days were worked without a lost time injury (LTI).</p>		

4.3.1 Summary

- Contractor was required to develop a safety plan that could be integrated into client's pre-established safety plan – this resulted in a Global Safety Management Plan.
- Multi-level planning was fundamental to coordinate safety plans of different stakeholders.
- Monthly meetings on safety were attended by site supervisors but not sub-contractors – it was therefore vital for project managers to communicate with different OHS representatives in order to ensure that the message was relayed down the supply chain.
- Incentives program driven by the constructor and sponsored by the client awarded good safety practices.
- Media approach to communication – all those involved in the project were issued with direct contact numbers for client representatives to discuss safety issues.
- All stakeholders were inducted and provided with a sticker to demonstrate this – client also had to wear sticker to enter site.

4.3.2 Best Practice

Siemens, the main constructor, had its own safety plan. This project required multi-level planning since several sub-contractors, most of who had their own safety plan and quality control systems, were involved. Communication between senior project managers and the health and safety representatives of the different sub-contractors was crucial to ensure that the client was kept informed about the safety and environmental standards implemented throughout the project.

The whole project was carried out under a pre-determined management safety system developed specifically by Siemens. The contractor developed its own safety management plans as required and combined its standard requirements with Siemens' project-specific requirements. These safety plans were adopted as a 'global safety management plan'. This plan aimed to maintain the management systems, procedures, standards and HS targets. On-site, the plan was audited, regulated and complied with, which resulted in few incidents and minimal lost time injuries (LTIs) on-site.

The global plan was then passed on to the contractors' personnel and sub-contractors by means of site inductions. The contractors had their own site inductions, which everybody entering the site had to undertake. They were also required to sign off under the contracting company's own safety standard requirements. All personnel entering the site had to comply with requirements of the site's global safety management plan.

A full-time safety manager was employed on-site and site inspections were conducted regularly. Senior project managers and health and safety representatives regularly liaised in order to discuss safety.

It is the first time that we had really engaged in the whole of project safety communication program right from the beginning and that is something that was certainly new to me ... very often the client has very little to do with what goes on, on-site and they delegate the whole responsibility to the contractor and ... when an accident happens and if it does, it's the contractors problem, which it is legally, but we thought it was so important, we wanted to be involved (Client).

❖ Meetings and Communication

The monthly management team meetings placed safety as the first item on the agenda. The site supervisor was included in these meetings, but sub-contractors were not involved. Weekly pre-start and toolbox meetings ran for 10 to 15 minutes and usually took place just before work started. Safety messages were emphasised daily, and posters displayed on-site.

The client took a 'media approach' to reinforce safety messages. The client also issued cards with the phone numbers of client representatives and the Siemens project manager so that everyone could talk directly to a senior management representative about safety.

❖ **Training and Inductions**

Inductions ran for 1 to 1.5 hours, with a maximum of 6 people attending each session. A rotating system was used so that different people held the inductions, including one of Siemens' representatives. These inductions were interactive, with the support of a computer program that included a question-and-answer section. Everyone on-site was required to attend the inductions and wear stickers to show that they had attended.

The client participated in the inductions at each stage of the project.

❖ **Incentives**

An incentive program was organised by the constructor and sponsored by the client. Achievement was openly recognised, and prizes such as tool sets and first aid kits were awarded.

4.3.3 Stakeholder Perspectives

❖ Client
<ul style="list-style-type: none">• Demonstrated safety leadership by establishing several consultative committees whose main objective was to establish good relationships between stakeholders in the project, such as the Victorian Department of Infrastructure and the Department of Natural Resources.• Engaged in project safety communication program through safety culture and statements.• Continuously improved safety performance by maintaining a close relationship with the main contractor.• Safety risks were managed through closely monitoring all activities, with a particular focus on safety and environmental issues.
❖ Designer
<ul style="list-style-type: none">• Promoted safe design through planning and reviewing, and supporting this by learning from these processes.• Emphasised having an effective safety and environmental plan with defined procedures.• Communication of issues, events or upcoming issues before becoming a safety issue. Used a site safety committee as a vehicle for discussion of concerns and to generate solutions to those problems.• The main constructor continually revised designs.• Entrenched safety practices by ensuring that design was about quality and appointing workers who can specialise (through experience) on different design aspects. For example, investments were made in providing the best and most effective equipment, which cost more but were quality assured.
❖ Constructor
<ul style="list-style-type: none">• Improved safety performance by assisting with creating a safety culture through a 'global safety management plan'.• Demonstrated safety leadership through multi-level planning: integrating safety plans and quality control systems.• Communicated safety information through regular site meetings and the Tasmanian teams spent time in Victoria, and the Victorian team spent some time in Tasmania.• Entrenched safety practices by building close relationships with sub-contractors and/or their safety representatives.• Managed safety risks by conducting internal and external safety audits and the requirement for site supervisors to do a daily checklist as well.

4.4 Cobram Barooga Bridge, NSW – Infrastructure

Key information	Summary	Award
Client: VicRoads	<p>The Cobram Barooga Bridge runs over the Murray River and connects Cobram and Barooga in New South Wales. VicRoads arranged for it to be built on behalf of the Road Traffic Authority in New South Wales.</p> <p>The project was unusual since it was constructed by Victorians, in New South Wales, under New South Wales' legislation. The RTA requested VicRoads to build the bridge because of the RTA's excess of work.</p>	<p>Winner: Major Projects Safety Excellence Award, awarded by VicRoads</p> <p>The Excellence Award recognised a constructor who consistently demonstrated a high standard of safety throughout the duration of a project.</p>
Designer: KBR		
Constructor: FRH Group Pty Ltd		
Cost: \$9.6 million		
Injuries: 0 LTIs Some minor cuts and abrasions		

4.4.1 Summary

- Used SuMS (Surveillance Management System) computer program to supervise the project, which was monitored by client-appointed external audit and surveillance managers.
- Client consulted closely with design group to manage safety during construction phase.
- Construction site was kept neat and orderly through direction of the foreman.
- Project manager was “meticulous” in the procedures (including safety) that were implemented.
- WorkSafe officer visited the site regularly and worked effectively with project personnel. The officer completed a formal safety certificate and diary entry.
- Safety was an important criterion for pre-qualification; all potential principal contractors had to be pre-registered and meet certain criteria, including safety. Furthermore, the successful tenderer had to submit a safety plan.

4.4.2 Best Practice

The client provided external audit and surveillance managers responsible for supervising the project in its entirety. This was known as SuMS (Surveillance Management System). The system was based on a computer program that created continual reports on on-site progress and included graphical representations and pictures of the site. This surveillance system not only supervised safety performance but also monitored environmental aspects of the construction phase.

The principal constructor was in charge of driving safety. Potential principal constructors had to be pre-registered with VicRoads by meeting certain criteria. The successful tenderer was then required to submit a site safety plan.

The client also consulted closely with the design group to manage safety and environmental aspects of the construction phase. The client provided documentation covering safety in design. There was a clear communication process between the constructor, the client, and the designer.

The constructor said that they implemented initiatives such as safety awards. An important initiative promoted by the client was maintenance of a clean and uncluttered site as a means

of reducing the likelihood of injury. This was reinforced by appropriate communication at toolbox meetings.

According to the constructor, the project was “one of the neatest construction sites” that they had seen. The constructor attributed this to the project supervisor’s high level of experience relating to worker safety. The importance of a safety focus and clean site was reinforced to the workers. The project supervisor was described as “meticulous” by the constructor.

❖ **Meetings and Communication**

The constructor was located on-site, and normally inspected the site twice a day. The constructor noticed that the safety messages were mainly coming from the site supervisor, who was persistent with regard to their messages to keep the site clean and tidy.

The client was responsible for other external communication, such as newsletters. Newsletters were distributed to all contractors monthly and contained all the safety outcomes and news about the project. Meetings were also held monthly to ensure regular internal communication.

❖ **Training and Inductions**

Prioritising and driving safety was discussed during induction processes, which were described by the constructor as a “method of being able to promote safety”.

The constructor said that they tried to instil safety in their sub-contractors during inductions. In addition, safety messages and the construction company’s safety policies were also displayed on noticeboards to keep personnel informed of the company’s policies and safety standards.

❖ **Monitoring**

An officer from WorkSafe Victoria visited the site informally on a monthly basis. The officer completed a formal safety certificate and diary entry. The constructor usually conducted a brief discussion with the WorkSafe officer. Although a site walk was necessary on account of legislative requirements, the constructor worked more closely with the WorkSafe officer than would normally be the case.

❖ **Pre-qualification**

The client maintained a list of pre-qualified contractors that met certain levels with which they were comfortable. The constructor met with the prospective sub-contractors to determine their experience and history. This analysis was based on the projects with which the sub-contractors had been involved, with attention also paid to the size and complexity of those projects.

4.4.3 Stakeholder Perspectives

❖ Client
<ul style="list-style-type: none"> • Demonstrated safety leadership by introducing an electronic safety and environmental monitoring system that included taking photographs of the site during the project. • Promoted design for safety by consulting regularly with the design team and providing documentation of safety in design. • Communicated safety information, managed risk, and improved safety performance. • Advocated for a positive recognition of safety, as the negative messages have always had publicity. • Included in the criteria for selection of a constructor, was fitting in with corporate management’s work safety culture. The constructor that was appointed was described by the client as “excellent” in terms of safety. When visiting the site, the client noticed the conscientious efforts made by the constructor. For example, the ways in which materials were stored. • Only constructors who were pre-registered with Vic Roads for suitability in safety could bid on the project. Specifically, criteria were provided to potential constructors to determine if they met pre-qualification standards. One of the criteria included an accredited Safety Management system which complies with the Australian Standard Australian Standard 4801-2000. • Regulations set by Workcover or regulatory authorities were complied with and also exceeded in some instances. For example personnel had to cross the bridge piers a proper little bridge was set-up with hand rails instead of simple plank structure to ensure personnel could cross safely. In addition to life rings provided for safety, a small boat was provided for recovery. • Unsafe practices were very rarely identified and any that were identified were only minor safety issues. • Communication was a highly important part to supporting safe practices. • Safety culture was important. Key stakeholders needed to prioritise safety over getting the job done as fast as possible • Visited the site about once a month. The client-appointed surveillance manager was on-site on a daily basis. • Safety goals were communicated to the designer. • All safety matters were communicated by the client to the Surveillance Manager, who would communicate with the constructor. • Communicating positive messages and giving a ‘pat on the back’ to personnel was the most effective way to recognised good safety performance. • Site safety newsletters with safety alerts were distributed. These newsletters intended to highlight particular safety incidents and prevent reoccurrences. • To manage traffic safety, on-site speed bumps were trialled.
❖ Designer
<ul style="list-style-type: none"> • Liaised with the client at the design phase to better understand the client’s expectations, working constraints and the client’s preferred method of work. • Open communication was effective. This meant that all parties communicated clearly and frankly. This meant that if an incident occurred, each party understood what had happened, the cause of the incident and prevention strategies to prevent it happening again, including design details where applicable. • Safety goals were specified from the off-set. Safe design specifications were communicated and well-understood by all parties.

- At the review stage, once the design was completed, it was passed it onto the contractor to review. If there was a safety issue of concern, the constructor would raise this with the designer. This issue would then be resolved by the two parties. The designs were also reviewed by the client, who had to approve the design.
- Constructability was a key consideration for design.

❖ **Constructor**

- Communicated safety information to sub-contractors.
- Safety was written into contract of the constructor and the sub-contractors appointed by the constructor. The constructor undertook pre-award interviews which determined other projects each sub-contractor had previously worked on to determine their experience and the personnel they intended to appoint.
- Safety initiatives included an emphasis on keeping the site clean. Other internal initiatives included safety awards and occasional BBQs.
- Communication to the community was deemed as essential. This was undertaken by constructor representatives and included letter drops and advisory notices.



Cobram Barooga Bridge, NSW: This project featured a computer surveillance management System to monitor progress and environmental aspects during construction.

4.5 Eastern Freeway, VIC – Infrastructure

Key information	Summary	Award
Client: VicRoads	The commitment to safety began at the tender stage. The management system was based on safety. The client was responsible for overseeing safe design – which was supported by the inclusion of ‘safe design’ selection criterion in the tender. The client formulated and distributed a brief that encompassed the scope of work for the potential designers. The constructors were also required to develop a construction safety plan based on the tender design. A safety management plan was developed at the tender stage and approved by the client. The constructor appointed a safety team and the client also had its own OHS personnel on-site.	Winner: Civil Constructors Federation Case Earth Award (Environmental Excellence in the Construction Excellence \$10 million and over category) <i>Criteria for this award included:</i> <ul style="list-style-type: none"> • Innovative methods • Industry best practice and use of new technology • Overcoming construction constraints and client satisfaction • Quality, OHS and environmental management • Interface with other project parties and/or components • Completion within timing deadlines and cost budgets • Technical complexity • Workplace training.
Designer: FRH Group Pty Ltd		
Constructor: Bovis Lend Lease		
Cost: \$24.1 million		
Injuries: ‘Wall’ works = 0 LTIs Few minor injuries, such as sprains, pinched fingers		

4.5.1 Summary

- ‘Quality assured’ contracts from the client.
- Surveillance manager employed by the client on-site at all times.
- Requirements of the contractor were specified in the clients’ safety requirements documentation, which included a safety audit of the contractors’ safety system conducted by the clients’ surveillance manager and junior engineers every 3 months.
- Formal design meetings were held and attended by the client, designer and constructor.
- Client undertook site inspections nearly every day.

4.5.2 Best Practice

For the Eastern Freeway project, constructability and maintainability were paramount in design safety reviews. The focus on safety was evident in the VicRoads tender document and safety management systems, which included reviews of designs focusing on constructability from both technical and safety points of view.

In Victoria, designers have a legislative responsibility for designing safe workplaces. The client recognised that designers need to consider constructability and safety during maintenance works, in addition to design.

The client's contract was quality assured, that is, the client undertook their own site surveillance to verify that the work was being done according to the documents. The client maintained a full-time surveillance manager on-site who observed, checked records and confirmed dimensions, checking the contractor's Quality Assurance (QA) records.

In particular, the clients' on-site works manager was an experienced structural manager who focused on safety while building at heights, especially safety issues involving scaffolding.

The client kept robust documentation stipulating the contractor's safety requirements. The client's specifications required a compliance audit on the contractors' safety systems every three months. Furthermore, the contractor needed to undertake OHS audits. The client also conducted independent spot auditing of the constructor's records. The client's surveillance manager and junior engineers undertook the auditing role.

According to the client, the designer did not have 'design responsibilities' for safety, but when an aspect of the design needed to be changed, the client consulted with the designers to see what effect the potential change would have.

❖ **Meetings and Communication**

Formal design meetings were held weekly, or on a needs basis as issues arose. These meetings provided a forum where the designer, constructor and client representatives could talk directly and openly about safety. The meetings also clarified the clients' needs and ensured consistency of the stakeholders' understanding of the project.

The client undertook site walks and inspections most days. If there were issues, a design representative would meet the client on-site to discuss it and work out a resolution. The client representative advocated face-to-face communication though on-site meetings. Project meetings were regularly held on-site. Face-to-face communication was followed up by distributing notes or minutes from the meetings to relevant parties. This was deemed necessary to ensure consistency and next course of action.

Impromptu and informal site meetings also took place for the stakeholders on-site to determine the next course of action. The designers worked in an external office, but they regularly visited the site and undertook informal site-walks with the client.

Design meetings were held weekly until arrangements had to be made for the change of design. Once these design changes were documented, site inspections were held to ensure that the structure was being completed according to intent. The client attended design meetings

❖ **Training and Inductions**

Stakeholder engagement and safety issues were discussed at toolbox meetings. Inductions were run by the engineer and contractor.

❖ **Monitoring**

The client was based close to the contractors' site office. This gave the client representative an incentive to visit the site regularly. Sub-contractors attended the site office regularly, which enabled the client to maintain regular contact with those involved on the project. The contractors' project manager and engineer were on-site full-time, as were design engineers from the design company and the clients' own architects. Client representatives visited the site every day, since the team leader administering the contract visited the project 'on the way to work'. They spent a couple of hours inspecting works.

Digital photographs of the site were taken and sent to the designer to help identify potential threats to safety. External audits arranged by the client occurred every three months. The client provided an experienced surveillance manager who was on-site on a full-time basis.

4.5.3 Stakeholder Perspectives

❖ Client
<ul style="list-style-type: none"> • Close physical proximity to constructor allowed good communication. • Communicated safety information to the designer and constructor. • Managed risk, improved safety performance. • Preferred face-to-face interaction with the constructor. The client then resolved contractual issues quickly. • Client contracts were quality assured, so a client representative undertook surveillance. They conducted site inspections on a daily basis. • Attended regular design meetings. These were held weekly during certain phases of design and construction processes. • Early resolution of conflict is critical in a contracting situation. This should be supported by alternative solutions and prompt responses. • The focus on safety was set out in the tender documentation and safety management system. This needs to be supported by design reviews to ensure constructability both from a technical and safety perspectives.
❖ Designer
<ul style="list-style-type: none"> • Attended impromptu meetings on-site. • Visited the site regularly and undertook casual site inspections with the client. • Designers play an integral role in safety by ensuring that risks are designed out. • The designer considered constructability and the end-users in their designs. • Best practice is building in a way that delivers the safest solution both during construction and in service. However, safety during construction is a more important issue than service. • Addressed and managed OHS requirements on-site. • Went through a risk assessment during tender processes. <p>Design meetings, and consistent email and telephone contact supported effective communications between client, designer and constructor.</p>
❖ Constructor
<ul style="list-style-type: none"> • Said that those personnel working for the construction firm were the most approachable regarding safety matters. • Safety procedures were adhered to and reflected on-site. • Was on-site twice per day and communicated safety messages. They said that other safety messages possibly came from the foreman and engineers. • Continual surveillance and inspections were features. • Photographed the site to identify potential risks. • The workshops run by an external consultant about manual handling were beneficial to personnel.

4.6 Eastlink, VIC – Infrastructure

Key information	Summary	Award
Client: ConnectEast, Victoria roads, Southern and Eastern Integrated Transport Authority (SEITA)	Due for completion in November 2008, this project involved the construction of about 40 km of new road and tollway, with nearly 90 bridges and 17 interchanges. It includes twin tunnels at the northern end. Each tunnel is 1.6 km long and has three lanes in each direction. This project spans a number of different regions. Dividing the works ensured construction occurred concurrently along the corridor. This enabled all issues (including community concerns) to be managed appropriately at each location. The client team had its own independent safety program that ran parallel with the constructor and designer's safety focus.	An award was not presented for this project. This project was selected by the taskforce for its low injury rates.
Designer: Thiess John Holland		
Constructor: Thiess John Holland		
Value: \$2.5 billion		
Injuries: Zero injuries in work performance TIFR: 4.0 TRIFR: 64 LTIs: 2 LTIFR: 2.9		

4.6.1 Summary

- inCITE project management software was used to track the progress of the project and ensure that everyone involved was updated. This included a 'risk' section that showed the outcomes from safety and design workshops.
- Regional safety and OHS committees acted as a consultation point for managers since the site was so large.
- The client appointed an independent reviewer to work daily on-site and provide monthly reports to the client.
- *Crew Connect* magazine was used as a communication tool and for reminders about safety.
- A leadership program, focused on behavioural-based safety, was used to analyse incidents and breakdown behaviours that led to incidents occurring.

4.6.2 Best Practice

The software package inCITE was used to track the project throughout the planning and execution stages. It also operated as a documentation repository. This system was used as a management tool to communicate with all parties on project issues, including safety.

The 'risk' section of the package was used to monitor project safety threats identified from the safety and design workshop. Safety aspects were either resolved at the workshop and recorded on the database for future reference, or marked as needing ongoing attention. For example, a lifting mechanism for a bridge was identified as a potential safety hazard and was therefore designed in a specific way in order to avoid dangers. The designer communicated the design to the constructor through the software package. The designer also communicated safety information to the constructor through a design handover workshop. In

these ways, all parties were made aware of whether safety issues were resolved, and the manner in which this was achieved.

Regional safety and OHS committee structures were needed to control and cover the entire site because it was so large. These acted as consultation points for managers.

The client appointed an independent reviewer who worked on-site daily and reported to the client on health and safety monthly. In addition, the main constructor produced monthly reports to the client's representative.

A leadership program, which is a behavioural-based safety program, was put in place to provide analysis of incidents linked from induction through to an intensive on-site program. From this program, it was found that there were eight behaviours that led to incidents.

❖ **Meetings and Communication**

Crew Connect magazine was distributed monthly. The magazine covered basic components of safety, progress and included news from the site. It also incorporated motivational messages and encouraged worker participation in safety.

The client communicated safety information primarily to the community, mainly using the Internet. This was supported by community forums, in which the constructor regularly met with councils and members of the community to discuss the project. Up to 300 people at a time participated in these forums. The team were very focused on safety, and the client team maintained its own independent safety program. This ran in conjunction with the constructor and designer's safety focus, which also incorporated community issues and public opinion.

Regional safety and OHS committee structures assisted with effective consultation on health and safety issues. Through the management system, a series of regular meetings were established. The project safety director and project director met weekly, specifically regarding health and safety matters. Fortnightly, the project safety director met with the general managers to discuss health and safety. The project safety director's meetings with the client were also fortnightly.

❖ **Training and Induction**

The contractor measured and reported any specific injuries to determine if there were any trends in injuries, e.g. eye or hand injuries. This allowed training programs to be implemented to address specific emerging trends.

Every person along the supply chain was required to complete an induction.

❖ **Workshops**

A design workshop was held with the constructor and the designer. This enabled the two parties to work together to reduce risk during the design phase of the construction process. This safety workshop was a mandatory requirement of the design plan. It was required by the client and audited by a client-appointed external agent.

❖ **Safety Development across Project Stages**

The project runs over a three-year period and is strategically divided into three main areas of focus. The first year was about due diligence and establishing systems, especially for those working in the field operations. The second year's focus is on leadership and 'challenging the culture', according to the constructor. This means galvanising the managers, supervisors and foremen to drive health and safety throughout the project stages and to take ownership of the safety systems. The third year will focus on 'value', according to the constructor. This means that safety is not necessarily a priority where its importance can be shifted from less to more, but is an entrenched philosophy that is part of everyday activities.

4.6.3 Stakeholder Perspectives

❖ Client
<ul style="list-style-type: none">• Complimented the constructor for effective use of health and safety plans (provided to the client) and follow-up procedures that kept injury rates low.• Communication was consistent and effective; safety was a focus for management ‘from top to bottom’.• Involved with safety meetings and met the constructor regularly to discuss safety issues as they arose.• Recognised that the site was ‘tightly managed’.• Enhanced safety practices by health and safety consultations, induction processes with all parties involved, risk assessment, and ongoing management of safety on-site.• Appointed an independent reviewer for safety to undertake: regular audits; inspections; observation of contractors’ work; and liaison with key personnel about safety issues. The reviewer also considered public and community safety.• Asked constructor to report on 16 different aspects on a monthly basis. These included various LTI rates for different time periods.• Monitored the constructor to ensure their safety performance was up to standard, with the assistance of the independent reviewer.• Was prepared to step in to drive safety as a priority, but the constructor was thorough enough that the client did not need to.• Appointed a higher number of stakeholders than average, including the independent safety reviewer and review stakeholders for various other aspects of the project.
❖ Designer
<ul style="list-style-type: none">• Best practice is ensuring that there can be safe operation and maintenance.• Safety and design workshops worked really well, as there was a large stakeholder group that met face-to-face to finalise aspects of safety. These workshops were more effective than electronic communication. The workshops were reported through every design package. Each package has risk review undertaken.• Design director was the driver of safety. Safe design was an aspect included in the design brief.• Safety messages came from the top through to the project director and were instigated by the board. Messages were filtered down to all parts of the project through workshops, toolboxes and direct communication of design elements.• Everybody engaged in safety issues throughout all phases of the project.• Safety was a high priority and was openly discussed. Issues raised were nearly always ‘designed out’.• Clients required safety audits to be undertaken on all design packages.• Constructor effectively communicated any constructability issues to designer.

❖ **Constructor**

- Consultative OHS arrangements for the company are different to normal industry practice.
- Managing plant and tracking plant equipment (including risk assessments and the on-going management) were effective.
- OHS committee structures assisted with the consultation process.
- Management system was supported by weekly and fortnightly meetings.
- Project safety director and general managers met fortnightly, solely to discuss health and safety.
- Appointed a communications group, which ran the *Crew Connect* magazine. This communicated messages 'out on the field'.
- Project safety director organised for the health and safety representatives to meet outside the regular forums and without project directors, to discuss any issues.
- Safety goals and objectives were set out at initial induction to include all personnel in safety.
- Senior management commitment to safety was crucial.
- Community group ran community forums to encourage engagement and communications.
- A survey of 1000 people across different stakeholder groups was undertaken and determined that everyone was committed to safety in some way.

4.7 Flinders Street Overpass, VIC – Infrastructure

Key information	Summary	Award
Client: VicRoads	Removal of the Flinders Street overpass. Challenges arising during the project included managing traffic and noise. The constructor implemented an open-door policy, where the client was welcome at all times. No incidents and injuries were recorded over the duration of the construction of the project. Overall safety was primarily driven by the constructor, who was contractually responsible for this aspect.	Winner: Victorian CASE Earth Awards Construction excellence <i>Criteria for this award included:</i> <ul style="list-style-type: none"> • Innovative Methods • Industry best practice and use of new technology • Overcoming construction constraints and client satisfaction • Quality, OH&S and environmental management • Interface with other project parties and / or components • Completion within timing deadlines and cost budgets • Technical complexity • Workplace training <p>The award recognises what was achieved on the project within the contractual and physical restraints on the job, which included managing traffic flows, the staging of the Commonwealth Games, time constraints and delayed possession of the site.</p>
Designer: Connell Wagner		
Constructor: FRH Group		
Value: \$9.8 million		
Injuries: Lost time: 0 Injuries: 13 Near misses: 3 TIFR: 4.0 TRIFR: 64.0		

4.7.1 Summary

- The client was heavily involved in driving safety by leading a top-down approach.
- A suggestions form was available for workers to highlight if more training was needed for certain aspects of the project.
- The client stipulated guidelines in methods statement during pre-tender meetings for the future designer and constructor.
- A client-driven communications strategy set out to inform public and workers of project works.
- The client invited tender submissions only from pre-qualified contractors with a proven health and safety record.
- Mitigation strategies were required to manage the high volume of traffic around site and specific traffic management training was undertaken.

- The constructor distributed pamphlets, written in plain language.

4.7.2 Best Practice

Meetings, workshops and communication were all client driven. The client was an effective communicator to the public and to those working on the construction site. The client implemented communication strategies using the internet, and media such as television advertisements and flyers.

The client was involved in selecting a safety contractor from the pre-tender stage. Contractors were short-listed to tender for the job and were required to list specific project OHS management plans. In addition, key personnel from prospective contractors were interviewed before selection in order to assess their commitment to OHS.

VicRoads only invited tender submissions from those pre-qualified contractors with occupational health and safety systems in place. The client required them to submit OHS management systems for review by the principal, or by VicRoads themselves. These requirements were communicated through the pre-contract tender documents or in the contract itself.

Pamphlets detailing the constructors' safety policies – specifically covering drug and alcohol rehabilitation, quitting smoking and additional training in “common labourer language” – were distributed to workers and used effectively, according to the constructor representative.

❖ Meetings and Communication

During pre-tender meetings, the client set out guidelines and requirements for the future designer and constructor. Guidelines for the requirements for designers were outlined in a ‘methods statement’. The client’s representative, project manager, occupational safety manager and constructor were all present at these meetings.

Monthly safety meetings were specified in the contract. In practice, however, meetings were held every 15 days. During these meetings design, programming and methods were discussed. An open-door policy was implemented.

Constructor-driven communication included formal meetings and informal communication. This included relationship building on-site, an effort to influence safety issues, rather than an exclusive reliance on formal meetings to fix problems or highlight risks. Open communication between stakeholders was encouraged.

The communication on safety between the constructor and the designer occurred in this manner: the contract documents specified clearly the requirements for safety and that was made quite clear in the stated purpose of the documentation and more specifically in the specific clauses of the contract specification (Client).

❖ Training and Inductions

Most management personnel had worked with at least one other person on the project. As a result, there was a pre-existing working relationship. Everyone could talk about safety in an open and frank fashion.

A ‘training suggestion form’ was available so that, if workers felt that they needed additional training to do the job safely, they could write it down and the constructor would take action. The constructor would then discuss the highlighted skills – informal discussions were a regular feature of the project.

A one-day induction course was held before construction, in which all management staff participated. Site walks were conducted to identify the hazards, while re-inductions reinforced safety procedures.

Managing the high volume of traffic was identified as the biggest risk that required mitigation strategies and specific training. All direct labour personnel and the on-site workforce were

trained in traffic management certificates and work site traffic management. Refresher training sessions were also held periodically.

There were quite a number of experienced people on the project that had worked in tough environments...and through their skill and knowledge we were able to identify the risks (Constructor).

❖ Workshops

Risk management workshops were held during the pre-construction phase to identify possible threats to worker safety. An external independent auditor was appointed to review the systems and indicate if the design requirements were being fulfilled.

4.7.3 Stakeholder Perspectives

❖ Client
<ul style="list-style-type: none"> • Safety was prescribed through tender documentation at the initial stages of the project. • Safe design and safety messages were promoted and communicated regularly. • Communicated regularly and effectively with the constructor and designer. • Improved safety performance by ensuring constructor and designer had appropriate safety management frameworks at tender stage. • Best practice was performance based with measurable outcomes. • Managed safety of public and workforce.
❖ Designer
<ul style="list-style-type: none"> • Worked with the constructor when necessary – this was an extension of the designer’s safety leadership. • Designed for safety and communicated safety information to the constructor. • Managed risk at the design level. • Integrated approach to safety, from the design stage to ensure safety from the construction phase to post-construction handover. • Safety of all users in the vicinity while the bridge was demolished was highly important from the design perspective • It was imperative to ensure that safety barriers complied with all relevant standards and could not be penetrated, while at the same time ensuring that demolition debris did not get onto the road beneath or the adjacent carriageways while the work were undertaken. • Specific requirements were set-out by Vic Roads which had to be met. In particular, the level of protection that needed to be provided for users of the bridge, whilst demolition works were undertaken. • A series of safety workshops were held on-site, run by the constructor. The designers were invited to attend. • A careful planning process was undertaken prior to demolition works. • Regular weekly design site meetings were held. These were usually between the designers and the constructor, and also involved the project manager and site engineers.

❖ **Constructor**

- Certain risks could not be 'engineered out' in design. These high-risks works on-site were effectively managed. Risk mitigation strategies for traffic management were imperative to the project.
- Workforce was chosen based on proven experience.
- Stakeholders developed an effective working relationship where agreements were reached based on 'give and take'.
- Effective communication, 'open-door policy' from the offset.
- Encouraged feedback regarding safety from personnel on-site (i.e. suggestion box for training, photos of incidents displayed at site office).
- Mitigated identified safety risks quickly.
- Identifying work strategies, then processing the materials and resources required. The high number of experienced personnel working on the project assisted with effectively identifying risks and mitigation strategies.
- Management personnel were taken on-site as part of the constructors safety inductions.
- The client recognised the importance of risk mitigation and safe work practices.
- Safety was a priority from the planning and tender stages. There was an allowance at the tender for a two-man safety crew, to be working throughout the project attending to safety.
- Photos were displayed to show comparisons between 'good' and 'bad' practices.

4.8 Future Port Expansion Seawall Alliance, QLD – Infrastructure

Key information	Summary	Award
Alliance: Port of Brisbane Corporation, Leighton Contractors Pty Ltd, Coffey Geosciences Pty Ltd, Parsons Brinckerhoff Australia Pty Ltd, WBM Oceanics	The seawall is one of the largest marine-based projects undertaken in Queensland, involving reclamation works to provide an additional 230 hectares of usable land. The reclamation involved constructing a 4.6-km perimeter seawall, with the enclosed area to be filled progressively over 10 to 15 years. The FPE alliance was established as a result of an effective client, designer and constructor team, who all contributed high-level, continual communication. The alliance facilitated teamwork. Communication was enhanced by the communal office space shared by all parties.	Winner: National CASE Earth Category 3 – Construction Excellence Award and the Overall Construction Excellence Award. Winner: 2005 Queensland Engineering Excellence Award for Project Infrastructure, Winner: 2005 CASE Earth Award (Queensland) Construction (over \$10 million). Finalist: Banksia Awards, category of ‘Environmental Leadership in Infrastructure and Services’.
Client: Port Brisbane Corporation		
Designer: Parsons Brinckerhoff		
Constructor: Leicon		
Value: \$90 million		
Injuries: Safety milestones were recognised throughout the project: 150,000 man hours with 0 LTIs		

4.8.1 Summary

- Safety culture was communicated along the supply chain.
- Safety charter was established.
- Focus on ‘quality of life’, including free medical examinations and a ‘sun cancer day’.
- Work-life balance approach.
- Safety officer was on-site and monitored activities.
- Safety was measured through LTIs and reported to the client at board meetings.
- Training scope was extensive, with some personnel completing a full WHSO accreditation (Workplace Health and Safety Officer) training program. All personnel undertook training for a motor-vessel licence.

4.8.2 Best Practice

Safety culture was supported from top to bottom. All project personnel from management to sub-contractors were involved in taking ownership of work practices. There was effective and open discussion, and accurate reporting of safety issues and unsafe work practices.

A safety charter was established on the second day of the project by the alliance. This charter detailed the safety philosophies that would be followed on the project by incorporating the well-established Leighton corporate and branch policies.

There was a focus on ‘quality of life’. This included a day for free medical examination for all alliance staff and wages personnel by the Wesley Clinic and a second ‘sun cancer day’ that

consisted of a sun awareness talk, followed by free skin check and motivational talk. The latter focused on major causes of non-fatal and personal injuries.

The 'work-life balance' approach was based on that used for the Wivenhoe Alliance project. They shortened working hours and established a five-day working week, down from a 55-hour working week, but with slightly longer hours per day. This approach ensured that every worker was able to enjoy a full weekend where they could relax and engage socially. It was felt that this would improve their attitude to work and increase productivity.

A full-time safety officer was on-site at nearly all times. The client described the safety officer as 'energetically' pursuing all safety issues.

One of the selection criteria for determining the successful alliance team was a leading systems and risk approach (which related to the level of safety that would be promoted, and what the different organisations thought about safety).

Information regarding incidents was communicated to the client, who was present at the board meetings. The primary indicator for safety was the measurement of lost-time injury (LTI) frequency rate.

❖ **Meetings and Communication**

Project meetings were held weekly. Personnel could voice their opinions on their particular part of the project. These views were recorded in the minutes. The designer was closely involved with safety through meetings and on-site visits.

An alliance coach held team-meeting-like gatherings to discuss and sort out communication and relationship issues between parties. The client said that everyone had "a healthy respect for everyone else and it worked really well".

Pre-start meetings were held every morning to obtain feedback on particular issues about which workers might be concerned, or find out if something had been overlooked in the constructors' planning of the work method. If required, the work methods were modified to move forward with the job. The work method statement was a daily brief at the commencement of work. If an activity was due to commence in the middle of the day, a special toolbox meeting would be called.

❖ **Training and Inductions**

Project-specific inductions were set up by the alliance, in addition to general industry-standard inductions. These alliance specific inductions covered project background, objectives, emergency response, and how to work as a community.

Personnel completed competency based training that covered first aid, plant-operator and safety-committee training. All staff and supervisory personnel undertook a two-day safety management training course that detailed all aspects of the alliance's Health and Safety Management Plan.

Some personnel completed a full WHSO accreditation (Workplace Health and Safety Officers) training program. All Alliance personnel undertook training for a Motor Vessel Licence. This type of training meant that any person could safely operate a boat if necessary.

Two types of inductions were held for the Seawall Alliance project, the first being a site induction. As this was a Queensland project, the State specifies that each person entering a site must carry a standardised Blue Card. Furthermore, there were site-specific inductions primarily covering safety requirements, but also cultural, heritage, environmental, emergency response, and community liaison issues.

Changes in traffic conditions caused by construction works were covered in meetings. Staff members working from offices were notified when meetings to discuss traffic changes were held.

4.8.3 Stakeholder Perspectives

❖ Client
<ul style="list-style-type: none">• Safety focus that was driven by the Alliance Board was established from the outset.• Safety issues were “energetically pursued” from Board level to the toolbox talks with personnel working on-site.• Safety milestones were signs of the project’s success.• Any safety issues that arose were addressed immediately at toolbox meetings.• Communicated safety information and appointed an alliance coach to improve communication and resolve disputes.• Alliance structure facilitated team building and communication between all stakeholders. Direct communication between the client, designer and constructor was a consistent feature.• Continual team-building efforts.• Selection and subsequent success of the alliance was determined, as were the systems and risk approaches.• Alliance-approach focused on non-cost parameters, which was useful for safety.
❖ Designer
<ul style="list-style-type: none">• The design team were focused on the construction process as well as the end user.• Communicated safety information working closely involved on-site and through meetings.• Having the client and the constructor equally focused “set the scene” for safety.• Alliance contract was deemed most effective to effectively manage the significantly high-risk nature of works undertaken in the project. Constructor and designer worked collaboratively in the same office.• The end-product and constructability designs were crucial. Constructability of the designs was driven by both the designer and constructor.• The design was scrutinised continuously “every conceivable possible model of failure” was scrutinised.• A strong policing element featured, where the safety officer drove around continuously to ensure no shortcuts were taken.• The tender documentation outlined the client’s expectations in terms of safety and their requirements in a prescriptive manner.
❖ Constructor
<ul style="list-style-type: none">• All parties were involved in the planning process.• Safety was built in to all practices.• Safety plans and risk-management strategies were established from the offset.• Personnel with initiative and understanding of safe, effective and efficient work practices through risk management• The alliance structure allowed for innovation. New ideas were considered from the beginning.• If a safety issue arose, it was communicated immediately and a resolution was reached with input from various stakeholders.

4.9 Geraldton Southern Transport Corridor, WA – Infrastructure

Key information	Summary	Award
<p>Client: Main Roads WA and Public Transport Authority</p>	<p>Completed nearly 6 months ahead of schedule, the Geraldton Southern Transport Corridor involved constructing a new road and rail connecting route into the port of Geraldton, as well as upgrading the main north-south and east-west traffic routes through the city. It replaced the original rail system that used to run along the foreshore of Geraldton.</p> <p>It comprises around 10 km of new railway line and around 4 km of new highway, in addition to interconnecting road works and a number of bridges to replace existing road infrastructure within Geraldton and to provide bridges for the new and existing roads across the new railway.</p> <p>The project was undertaken as a design and construct contract for Main Roads and PTA. The needs of the City of Geraldton and the Geraldton Port Authority were integrated into the project.</p>	<p>Winner: 2005 Earth Case Awards (Category 3, project over \$10 million)</p> <ul style="list-style-type: none"> • Environmental Excellence • Construction Excellence <p><i>Criteria for the Construction Excellence award included:</i></p> <ul style="list-style-type: none"> • Industry best practice and use of new technology • Overcoming construction constraints and client satisfaction • Interface with other project parties and/or components • Quality, OHS and environmental management • Completion within timing deadlines and cost budgets • Technical complexity • Workplace training. <p>Finalist: Engineers Australia: 2006 Australian Construction Achievement Awards</p>
<p>Designer: BG&E and SMEC (managed by Thiess)</p>		
<p>Constructor: Thiess</p>		
<p>Value: \$88 million</p>		
<p>Injuries: Over 500,000 man hours worked with 0 LTIs</p>		

4.9.1 Summary

- Risk assessments at the beginning of project and also at various stages and phases.
- The part of the design work that involved safety was well documented to determine different levels of safety and risk (some of these safety aspects were embedded in main roads specification documents).
- Design criteria were developed by the design team, design reviews were consistently practised and the constructor also reviewed designs for buildability.
- ‘Wagon-wheel principle’ meant that project ran itself (all aspects of the project were attended to equally).
- Effective supply chain communication and relationships.
- Positive external relations with council and public.
- Constructor was expected by the client to maintain independent management systems for safety and capacity to enforce safety in an effective fashion.

- Meetings thoroughly covered all aspects of the project, i.e. what had happened, the current progress, safety, and potential hazards.

4.9.2 Best Practice

This major West Australian project was delivered as a design and construct contract. The client first released an expression of interest, followed by a request for proposal.

The client said that undertaking risk assessments not only at the beginning but also at different stages of the work was effective. These risk assessments determined strategies to mitigate risk and ensured that, as much as possible, the likelihood of hazards and any accidents would be reduced.

The principal safety goal was no lost time injuries (LTIs). The project achieved more than 500,000 working hours without injury. This figure included the client staff and Main Roads PDA staff, who were based on-site. The subsequent goals of the project were to generate a safe environment for the community through effective traffic management and ensuring a proactive approach to managing spills and dust.

The client said the safety officer was “proactive” in ensuring safety.

Part of the design work involved safety, such as checking for obstructions next to the road that could wipe out sidelines. These aspects of the project were well documented. This also applied to rail safety and bridges, which were a component of the road design. Safety levels were defined for the different types of pedestrian and vehicle safety. Some of these safety aspects were embedded in Main Roads specification documents.

The contractor outlined the ‘wagon wheel principle’, by which safety is ideally integrated into a project. This model works on the concept that all aspects of a project require equal attention; if one area is given more attention, the other areas will not work as effectively.

A wheel has to be round: the concept of a proper safety program is that everything works together, even though it is only a little program, as long as the issue is there, the spokes are all equal, your program will run smoothly. Where you find a project manager that suddenly takes a big interest in his production and not so much interest in safety or recruiting, you finish up with this shape as your overall package (Constructor).

❖ Meetings and Communication

The constructor said that the public and local council were confident in approaching them about issues, something which demonstrated positive external relations. The constructor regarded communications as a key issue and ensured that the safety personnel working on the project were valued.

Weekly meetings included discussions about safety. Furthermore, the project manager, who was based on-site, would liaise with the client on a ‘needs basis’ regarding safety matters. All items of relevance to safety were documented in meeting minutes and memos.

Communication between the client and the project manager took place via phone or face-to-face meeting as matters arose. If the client and project manager felt that there was a safety risk related to a particular aspect of the works, they would raise the issue with the contractor, who would engage the safety officer.

The client-appointed surveillance officer, who was based on-site, needed to be informed of any safety directives given to the contractor. The constructor had possession of the site. The surveillance officer worked with those safety directives, and copies of the flyers and leaflets were distributed to the sub-contractors.

The client saw that it was necessary to go beyond what was required contractually to deliver the project effectively.

The client said that they sought a work safety ethic in their contractors and their own organisation. This was exemplified through holding toolbox meetings and branch meetings to

review the situation in respect to safety. In these meetings, the team looked at trends that might be developing, and collectively discussed and managed issues or hazards. Furthermore, the team implemented necessary systems and strategies to avoid any occurrence or re-occurrences of these identified issues.

If there was an incident, the safety representative would personally explain what had happened to the client and potentially the client's quality officer on-site, and that was almost immediate so we knew what was happening and we were assured that things were being done to address whatever the issue was (Client).

❖ **Contractual Specifications**

The designer highlighted that, for road and rail projects, safety standards and obligations are well embedded in the defining document because of the inherent safety risks involved in these construction sectors. This included the legal liability of the Government bodies, which have defined compliance standards.

The client looked for contractors that had already developed and implemented safety mechanisms themselves. This included development of an effective safety management plan. In addition, the client said that the constructor rigorously imposed those strategies and standards on their sub-contractors and worked with their sub-contractors to improve their safety practices and processes.

The client attributed the success of the project to having “the right people”. The client added that the project management team always displayed the right attitude and employed appropriate processes.

❖ **Safety Development across Project Stages**

All communication about design went through the lead designer. Other designers reported to the lead designer, who then reported to the client.

The design team requested an information system that documented all queries. The designer produced a series of documents for an independent reviewer and the client to review. Design issues were experienced at various stages. These stages were broken up into components of the project.

At the first stage, the design team developed design criteria. The purpose of these criteria was to clarify any anomalies or additional constraints that the design team thought should be incorporated into the design or required further definition. The reviewer and the client reviewed this and returned the document. Each stage was reviewed for compliance and to ensure adequate understanding of the key elements.

Since design guidelines for safety were embedded into the project, achievement of agreed-upon safety criteria was obligatory. Design in relation to construction was also a minor consideration. At each stage, personnel from the construction side reviewed the drawings for constructability and would include any safety aspects they might see as necessary.

4.9.3 Stakeholder Perspectives

❖ Client
<ul style="list-style-type: none"> • Defined risk, safety ethics and strategies to mitigate risks. • Sought an effective work safety ethic in the constructors they engaged. The constructor taking the initiative to review the project status and identify possible trends, collectively discuss and manage issues or hazards and put mitigation strategies into place exemplifies this. • Expected that the constructor would “rigorously impose” high standards of safety on their sub-contractors and work with their sub-contractors to improve their safety practices.

- Worked with the constructor to assist with collectively delivering a safe outcome.
- The primary goal was no injuries. Other goals included a safe environment for the community and traffic management, and a proactive approach to ensure spillages were cleaned-up immediately.
- Safety messages came from all supervising staff and were communicated particularly at toolbox meetings.
- A combination of the contractors, project managers and their safety representatives (as this was their role) were the most active regarding safety. The client had a good rapport with these parties.

❖ Designer

- Maintained direct communication with the constructors.
- Consultation and working with the constructor to review designs to ensure safety in construction were considered “most important”.
- Injury rates were released once a month, with examples of injuries that had occurred. This sent strong messages about how injuries could reasonably be avoided.
- Designers were obliged to achieve the design criteria without compromise. This is a relatively standard aspect of design. Some minor sub- components of design in relation to construction were also required.
- At various stages of design, representatives from the construction side reviewed the drawings for constructability, which would include any safety aspects they might see as necessary.
- The design manager acted as a point of contact for all aspects of design. This manager reported to the client.

❖ Constructor

- Extended safety practices by means of an ‘open door’ communication policy.
- Special attention was given to internal relations and developing relationships with workers.
- An effective safety program has to work like a wheel, where all work together equally.
- Community relations were an important issue to limit the disturbance and dangers to the public.
- Communicated effectively with all stakeholders, including the community, who were engaged in community forums. People felt confident in discussing issues related to the project.
- Communication was led from the top down.
- Pre-start meetings allowed supervisors to assess if the contractors were in a fit state to work.
- Identifying weaknesses in the workforce and assisting with improving their behaviour and work ethic were seen as improving the holistic functionality of the project and affecting safety outcomes.

4.10 Hallam Bypass, VIC – Infrastructure

Key information	Summary	Award
Client: VicRoads	The project comprised design and construction of 7.1 km of new dual carriageway freeway, and 2 km of widening works on the existing Monash Freeway. It included construction of 12 freeway bridges, a 140 m cable-stayed pedestrian bridge, 8.5 km of shared pathway and 63,000 m ² of architectural timber noise walls with heights up to 8 m. This project was finished under time and under budget.	Winner: Civil Contractors Federation CASE Earth Award for Engineering Excellence, projects \$10 million and over This award was for two of the three stages of the project: <ul style="list-style-type: none"> • Dandenong Creek to Belgrave, and • Belgrave Hallam to Narre Warren North Road.
Designer: KBR Design Group Pty Ltd (Kellogg Brown & Root Pty Ltd)		
Constructor: FRH Group Pty Ltd		
Value: \$84 million		
Injuries: TIFR: 4.0 TRIFR: 64.0 Over 2,712 working days with no injury		

4.10.1 Summary

- ‘Round table’ communication between parties so that messages were discussed across the stakeholder groups, they did not ‘trickle down’ from the top.
- Positive relationships were developed with external parties to manage the effects of the works on the community.
- Preparation was extensive, with design meetings beginning months before construction.
- Safety officers held training sessions on a needs basis for those who requested specific development.
- WorkSafe representatives were invited to attend meetings between the client and constructor and were also regularly present on-site to provide guidance.
- Client was the driver of a ‘partnering arrangement’ with the contractor. This aimed to “separate issues from people”, to encourage professional and effective communicate if conflict arose.
- Incident and injury registers.

4.10.2 Best Practice

Communication, consultation and planning were highlighted by all stakeholders as the most effective and positive initiatives for improving safety on the project. Communication forums, such as meetings, were conducted daily, and feedback was a regular feature. Formal meetings clarified information that was conveyed during the informal meetings. These meetings included union representatives.

The client fostered a ‘partnering arrangement’ with the contractor. The project was not a formal alliance contract, but more of a positive relationship. Emphasis was placed on “separating people from issues” to resolve conflicts as they arose.

[It is critical to] consult with the people who are doing the work specifically and take on board their feedback and suggestions on how you might be able to do it better [and to] share that information not only with the guys on the ground, but other contractors and sub-contractors, and suppliers, and with the client ... (Client).

One of the challenges for the construction team was maximising the efficiency of the project while minimising traffic impact. The Hallam Bypass was finished 17 months early.

Positive relationships were developed with outside stakeholder groups to manage the impact of the construction work on the community. For example, effective collaboration took place with the construction team and Telstra (500 metres of Telstra assets were relocated without disruption to services).

The client emphasised safety from the outset. One of their key initiatives was fortnightly safety meetings. A WorkSafe representative on-site was considered valuable in fostering safety. Also, incident and accident registers were highlighted as effective safety initiatives.

❖ **Meetings and Communication**

The client emphasised that there was ‘round table’ communication. Messages were not simply passed along the supply chain or “watered down” from management; they were actively disseminated to all relevant parties.

Design meetings were held every three months before construction began. The client was not involved in the weekly toolbox meetings held by the contractor, but the client’s surveillance managers attended these meetings. The client acknowledged that toolbox meetings were important. Aside from the design and toolbox meetings, co-ordinated safety meetings involved the project manager and safety representatives of the two contractors.

During safety meetings discussions included emergency procedures, identity of first aid officers (which included showing their photos), and discussion of the OHS philosophy, which specified that every incident should be recorded.

When the client representatives met with the constructor, WorkSafe representatives were invited to improve communication and consultation and promote information-sharing. The client representative said that meeting agendas often included details of changes to WorkSafe policy or government legislation and how these could affect the project. When the contractor developed new procedures or updated their systems, these meetings provided important opportunities to share information.

The client completed a checklist to make sure that safety items were being completed appropriately. If any previously highlighted issues had not been resolved, the affected area of the site was closed until the problems were corrected.

Safety messages regarding safe work practices were displayed in each of the site huts.

A fortnightly site walk was undertaken by the safety management team, comprised of the safety surveillance manager, an engineer, and a constructor. They would go through and tick off checklists to ensure they were satisfied with the safety standards and practices.

❖ **Inductions and Training**

The VicRoads safety officer attended the site on a needs basis. For example, if one of the client’s engineers needed additional training or development in a particular area, the safety officer would conduct a training session for the whole client team. The contractor would also be invited to participate. The safety officer undertook random audits and site visits if the client wanted a particular safety aspect reviewed.

The engineers and foremen would generally run the toolbox sessions and conduct Job Safety Analyses (JSAs).

4.10.3 Stakeholder Perspectives

❖ Client
<ul style="list-style-type: none"> • Was involved in safety initiatives, though the constructor was in charge of leading them. • Client representatives attended some meetings. • Recognised effective communication as best practice, including informal communication. • Worked proactively to improve safety through communication and encouraging 'partnering arrangement' between parties (constructor, designer and client worked on good terms). • Main message to client team was 'separating issues from people'.
❖ Designer
<ul style="list-style-type: none"> • The client and constructor were more involved with safety issues. • Focused on training the other designers (on the team) to design for safety. • The designer recognised safety as closely related to design, but was not highly involved with promoting safety in design after the design phase. • Safety was discussed at the fortnightly meetings. It was included in tender documents and the current standards for web design had a high level of safety. • The design was a "safe design", which was assisted through design meetings. An element of the design review process considered safety in design. This review was undertaken by the constructor and Vic Roads. • The safety focus of the designer was to ensure the guideline requirements set out by Vic Roads were met.
❖ Constructor
<ul style="list-style-type: none"> • Demonstrated safety leadership, exemplified by holding inductions and promoting design for safety. • Consulted with the designer when necessary. • In charge of the Surveillance Management System and integrated it effectively in the 'construction team'. • Ensured all personnel, including sub-contractors, were well trained in risk identification and management, as well as in performing their work effectively and safely. • Safety was prioritised from the top down. This was promoted with cultural and behavioural programs that engrained safety in the organisation and personnel working on the project. • Planning crane-lift work involved effective planning and risk-management strategies, engaging all stakeholders in a pre-work meeting.

4.11 Morwell River Diversion, VIC – Infrastructure

Key information	Summary	Award
Client: TRUEnergy	This project involved the diversion of a river through a working mine and power station.	Winner: 2005 Victorian Engineering Excellence Award for 'Urban or Regional Infrastructure projects over \$10 million'
Designer: SMEC	The constructor described it as "basically building a dam on top of a mine" so that mining could continue for 30 years, without interfering with the river.	<i>Criteria for this award included:</i>
Constructor: Thiess/RTL (Thiess representative was interviewed)	It also involved extensive environmental work and consideration for endangered species living near the site.	<ul style="list-style-type: none"> • Commitment to and achievement of best practice health and safety; • Demonstrable economic, environmental and/or quality of life improvements (assessment against triple bottom line criteria); • Effective communication with local communities and other stakeholders on the project; • Pre-contract planning and control; • Integrated risk management strategies; • Proactive approach to quality assurance; • Use of external standards to monitor implementation of quality assurance.
Value: \$100 million at the beginning, but became \$120 million over the four years of the project.	There were time limits on the project – it had to be completed by 2006.	Winner: National Association of Women in Construction Award for 'Outstanding Achievement' (Project Manager was recipient)
Injuries: LTIFR: 2.8 LTIs: 0 Injuries: 13 Near misses: 3 710,000 man hours with no lost days		Winner: Victorian Case Earth Award for Environmental Excellence
		Finalist: Australian Construction Achievement Awards
		Finalist: National Engineering Excellence

4.11.1 Summary

- Assessment criteria established for prospective constructors, who had to develop detailed safety plan at tender phase. The client interviewed key people who could potentially work on the project, to assess safety activities and priorities.
- The client established a project team at the early stages to independently assess the safety plans, which formed part of selection process.
- Promoted all stakeholders to take 'ownership' of the site so that responsibility for safety would be shared equally.
- Risk analysis and subsequent mitigation strategies, such as safety procedures and work methods statements, were established during phases of the project.
- Training and inductions were updated as project stages progressed, and personnel going on-site had to re-take these activities.
- Long-term considerations of works were imperative, considering its purpose of diverting a river from a mining site that was planned to be used over the next 20+ years.

4.11.2 Best Practice

The client demonstrated effective safety leadership by incorporating safety into the assessment criteria for prospective constructors. At the tender phase, potential constructors were asked to develop a detailed safety-management plan and identify appropriate safety systems. Contractors were assessed on the basis of these plans, and chosen on account of their ability to demonstrate that they could maintain safety as a key priority. The client also required the names of the key people who would be involved in the project and, as part of due diligence, interviewed these people to identify whether safety was a priority and determine how safety was to be managed.

Safety systems were established holistically. All potential risks underwent analysis and a process was established to translate the mitigation of those risks into safer procedures and work methods. A specific project plan documented these processes and the means by which better safety could be implemented.

At an early stage, the client established a project team to independently assess the safety plans put forward by constructors bidding for the project, and then rate the plans. This formed part of the selection process. The translation of the project management plans to the actual site was also a critical aspect. Workshops determined the project risks and allocated risk management strategies.

At the end of the day, companies can lay out their magnificent documentation, but if you don't get the key people that is where you fall down (Client).

Safety awards and dinners were used as recognition when key milestones were met.

❖ Meetings and Communication

Since this was an alliance-style project, the client was only represented by one person. That made communication very direct between the client, the project management and the team.

The project worked very well ... everyone talked to each other. Ultimately you can have all those structures in place but it depends on the people involved – actually making sure that they do talk to people and they get things sorted out, organised, understood, whatever it needs to be. It is probably more important, the attitude of the people involved (Designer).

Formal communications were scheduled weekly and informal communications on a day-to-day basis.

The contractor and their work group were on-site everyday. The client was on-site but in a different office area to the other stakeholders. Despite this, they visited the site regularly. The project manager and his team delivered and directed safety.

Regular meetings engaging the designer were held on-site at least once a month during construction. These would incorporate a site visit and meeting, and would typically take one day. These regular meetings dealt with ongoing performance and day-to-day issues arising during construction. Most of the designers' direct communication was with the constructor.

If there was a design aspect requiring a decision from the client, or if there were design issues that the design team wanted the client to be aware of, the client was contacted.

At the construction level, safety was discussed at daily meetings. The client ensured that safety was the first item on the agenda of all meetings.

❖ **Training and Inductions**

According to the client, good safety performance depends on translating the safety message to the workers and sub-contractors on-site. This means ensuring the communication of safety messages at inductions and upfront briefings from management. This will empower all stakeholders to take 'ownership' of the site.

The safety manager generally held inductions, or the engineers when the safety manager was not available, the. The client contributed to what the inductions should include, as they did not have their own corporate induction.

Inductions were carried out at the early stage of drawing up the contract: at the stage when risks were identified and risk management strategies were determined contractually.

It was company policy that anyone going on-site had to be inducted. During the design phase, the design team were inducted by means of a basic face-to-face induction. They undertook two subsequent inductions which included: a video induction before beginning work, and an in-depth induction once the construction phase began.

The final, comprehensive induction was delivered by both the client and the constructor in an electronic format. The designer had to be accompanied on-site at all times until they undertook this final induction. The final induction was valid for two years and allowed the designer to enter the site unaccompanied. The designer was on-site regularly.

❖ **Workshops**

At the pre-construction stage, a workshop was held to look into threats to worker safety and determine how risk would be managed. This workshop was run by a convenor. All the parties attended the workshops to work out strategies and funding for them.

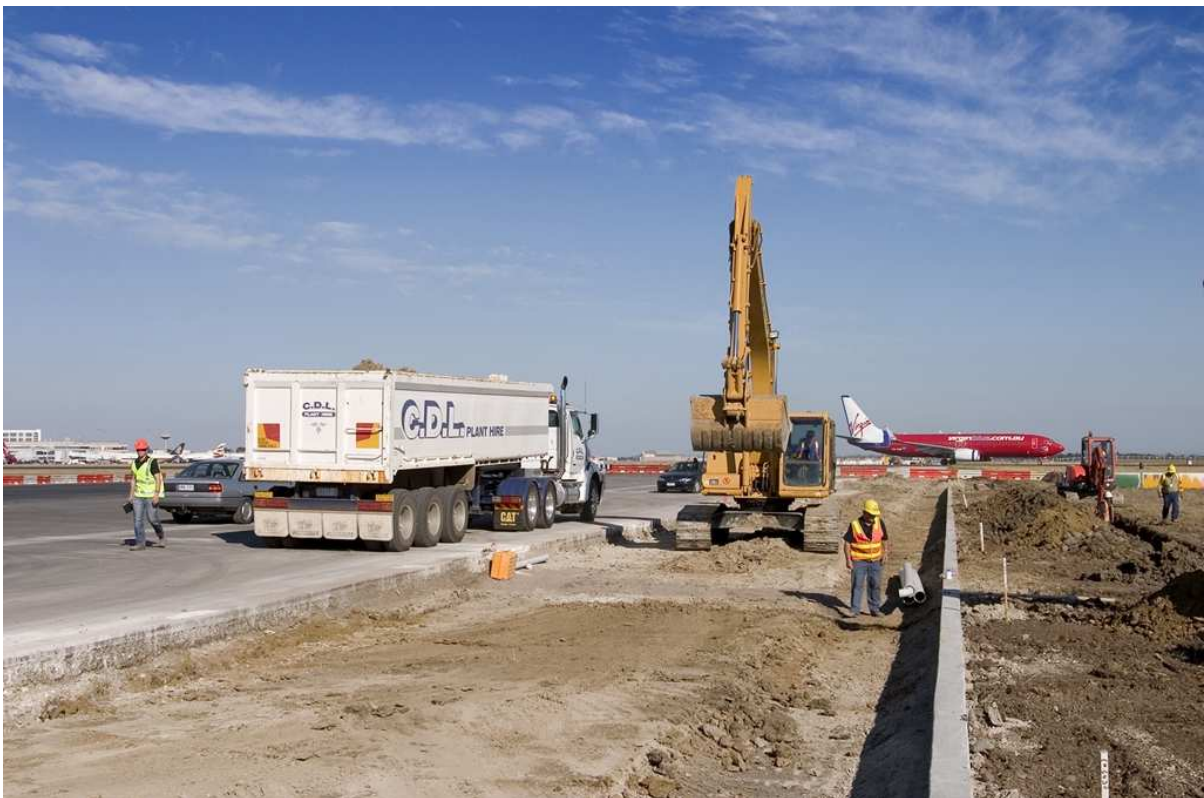
❖ **Safety Development across Project Stages**

From the designers' perspective, safety was two-fold. This meant ensuring that safety was considered during the construction phase, since the technical issues associated with construction could have led to a failure, and ensuring safety over the long-term (from a technical point of view related to the structure). For this project, that meant ensuring that the diverted river would sustain in the long-term.

4.11.3 Stakeholder Perspectives

❖ Client
<ul style="list-style-type: none"> • Safety was a key criterion for selecting a constructor. They had confidence in the safety management of the constructor based on their reputation and the size of the organisation. • Commitment to communication was stipulated at the tender phase. • Communication was effective, as the client was represented by one main person who liaised with all other parties. They communicated with the project management and the team. • Managed risk by ensuring safety management plans of the constructor at the tender stage. • Located on-site, but in a different office to the construction team. The client representative was on-site at the construction level on a regular basis. • Key interface was with the project manager. • Involved with the design aspects to understand the details of the purpose of the designs. • Undertook 'hands-on approach' with site visits, monitoring and reporting any safety issues.
❖ Designer
<ul style="list-style-type: none"> • Demonstrated safety leadership through direct contact with client and constructor, and regular meetings during construction. • Promoted safe design through a two-phase approach: construction; and over the life of the structure. Most important safety aspects were to ensure safety during construction and the technical issues associated with the works which could have led to a failure. This included considering the structural safety and maintenance in the long-term. • Undertook a number of inductions and was only allowed on-site unaccompanied after completing the higher-level induction. • Communication and cooperation were highly positive aspects of the project. • Project had a high profile of safety awareness and effective safety culture. • Their influence on safety 'on the job' is effectively limited to the product that they produced. The designers can provide the features and facilities in the design to address safety issues, but their role is limited to that. • Best practice includes regular meetings with workers, advertising bad or good safety practices that were employed on the site, and personnel stopping and dealing with safety risks immediately. • Constructor was very approachable to discuss safety.
❖ Constructor
<ul style="list-style-type: none"> • Personal relationships between stakeholders had already been established which greatly improved team building. Everyone worked as a collective. • Thiess was the 'real driver' of the safety initiatives, followed by the Alliance itself. • Tried to appeal to the workers (mainly sub-contractors or those working on-site) on a personal level.

- If there was an incident that needed particular attention the constructor would be personally involved in the incident review, to exemplify their commitment to safety.
- Held a 'family day' which gave the opportunity to send the safety message to families and emphasised the personal care of each worker.
- Project manager ensured that people were not complacent or passive towards safety and took 'ownership' of safety.
- Best practice is constantly re-assessing, ensuring to avoid complacency and constantly improving behaviour.
- Mediation is better than severe discipline for managing unsafe behaviour, and openly discussing the behaviour in a group with other personnel generates communication and awareness of safety. This also encourages everyone to monitor what is happening around them.
- Safety messages came from the safety manager and internal site engineers.
- Openly discussed safety with the client and safety manager. Had an excellent relationship with these two people.



Morwell River Diversion VIC: This multi-award winning project featured a stringent pre-qualification process.

4.12 Replacement Research Reactor Lucas Heights, NSW – Infrastructure

Key information	Summary	Award
Joint Venture: John Holland and Evans Deakin Industries	The project involved building a replacement nuclear reactor. The nuclear research reactor has three primary functions: to make radio isotopes, with a focus on medical isotopes; the irradiation of a silicon semi-conductor for working purposes; and to provide neutrons for science. This project was a design and construct commission.	Winner: National Commercial Builder of the Year (2006) Australian Master Builders Association Finalist: (2006) Australian Construction Achievement Award Winner: NSW Project of 2006.
Client: Inbat		
Cost: Approx. \$300 million		
Injuries: Low LTI rate		

4.12.1 Summary

- Open management system developed.
- Inclusion of client safety officer in day-to-day collaboration with the constructor's safety manager during construction phase.
- Project officer reviewed safety audits.
- Knowledgeable client assisted the constructor and designer to better understand the safety issues specific to the type of project.
- Scenario Planning was used as an effective crisis management tool.
- Strict guidelines and protocols because of the high-risk environment required specific responses.
- Safety measures adapted from those in high risk and close environments rather than conventional construction contexts; 'look after yourself and look after your buddy' philosophy adopted.

4.12.2 Best Practice

A key to success was the open management system established with the workforce and management on-site. The project site was under the control of the contractor until the handover. However, before handover, an Australian Nuclear Science and Technology Organisation (ANSTO) safety person was included to collaborate with the OHS manager.

Conventional safety audits and walks were conducted with management. An added dimension was that these required review by the project director.

The presence of a 'knowledgeable client' created a best-practice context because a team had been working on the particular project for some fifteen years before the construction of new reactor. Since the facility was operated in a way that paid the highest attention to safety, this approach flowed through to all the design team, in addition to the construction team.

Our contract required the contractor to have quite thorough processes of training of people coming into the project. Their induction was fairly robust and they had a very active safety officer (Client).

At completion of the concept design, there was engagement between the designer and client in order to ensure communication and agreement on concepts before the project went to a more detailed design stage.

The designers had a direct interface with John Holland/Evans Deakin joint-venture sub-contractors.

The facility required strict guidelines for the construction, since requirements set by the International Nuclear Authorities were in force. These concerned the construction as well as the operation of the project. To construct the facility, the contractor had to obtain a licence from the regulator for nuclear facilities.

We had to prove to them all our safety, security and design before they would issue us a licence to construct ... There wouldn't be a workplace that had a more detailed protocol than this (Constructor).

The client provided a safety officer in addition to the project safety officer. These worked with the three sub-contractors to ensure that the workforce interacted well. Scenario planning was used to ensure appropriate facility design for crisis management, including safe evacuation of people from the building in the event of earthquakes or fires.

Design forums were held, and included experts from around the world representing the International Atomic Energy Association.

CHAIR (Construction Hazard Assessment Implication Review) sessions were used to develop safe ways of operating during construction, and to anticipate design problems with the completed construction. The process was adopted since the technique was considered best practice at time.

The implementation of the CHAIR process ensured that the design was appropriate for the end-user of the building.

We had a couple of sessions through the design where we had the appropriate people represented – client, constructor, designers, architect – and it was in a facilitated forum and we went through the design and looked at safety issues. That process was mainly safety issues related to construction and then to the end-user ... it was looking at simple things like, if you are going to design windows, how does the client clean them, is there safe access onto the roof? (Designer)

A designer was situated on-site for the first eighteen months to be able to respond proactively to any issues that arose in the design:

It wasn't written into the original contract, it was something we developed when we went into the construction stage. I think it was a collaborative discussion where we both agreed that it was in the best interests of the project to have that site presence for interfacing issues back into the design team or for dealing with particular issues as they arose on the site (Designer).

❖ Meetings and Communication

Regular project meetings were conducted, generally once a week.

We had meetings with the workforce and with the project director and also the client safety people, and this overlapped with the security meetings that were held with the client's people. They have their own rescue and safety people based with them, and there were also regular audits outside our own QA system, which was fairly stringent. I've never seen anything quite like it, but over and above that again, we had an audit system covering safety and security from ANSTO's establishment, from their people, and we never failed any of those (Constructor).

Toolbox meetings were short, to avoid time-wasting exercises. Management monitored what was being relayed, to update people on different phases of the project.

Safety committee members were moved around. Safety bulletins were used to communicate project information. There were a couple of different bands of radio, because of the security.

There was also a very strict protocol regarding radio communications on the site, as well as nurse calls and mobile phone transmissions.

Design forums on particular design matters were scheduled as the need arose. Formal reviews with the client in certain stages of the design also took place.

Frequent face-to-face communication was critical. Emails and the ability to transfer design information quickly were useful, as was video conferencing with the international partner.

❖ Training and Inductions

Training was paramount and it was incorporated into all aspects of the construction phases.

Induction was mandatory for all, including the design team. The constructor said that the inductions “went beyond the bounds of normal construction inductions”.

We actually gave them a background to what happens in a nuclear reactor, not just what they were going to do there on the project, but this meant going a little bit deeper than just saying, ‘here is a road and cars travel along it and you are going to be part of a railway’, we went that step further and explained to all our workers, sub-contractors and suppliers and everyone had to go through it, all the client people, specialist technologists, through this induction, which meant that they did understand the nuclear environment that they were working in (Constructor).

4.12.3 Stakeholder Perspectives

❖ Client
<ul style="list-style-type: none"> • The Master Builders’ award recognised that the project was complicated, but was done well. • Contracts required the constructor to include: a thorough training process for their sub-contractors, robust inductions and a highly active safety officer. • Communication between all sub-contractors was enhanced through the provision of a client-provided safety officer. • Promoted safety in design by the client working with designer to ensure safe design. • A feedback process was in place to improve workplace safety. • Due to the nature of nuclear works, the project was managed differently to typical operational activities. Health and physics surveyors actively managed many safety issues. Radiation protection was a critical issue, along with OHS. • Consultation with the client was a consistent feature.
❖ Designer
<ul style="list-style-type: none"> • Liaised with world experts representing the International Atomic Energy Association. • Designer communicated directly with sub-contractors to improve safety of design. • Recognised that safety was critical in design, buildability, and in operational processes. • Safety is a collaborative process undertaken by all parties. • Continual design review process was important to ensure safety. • Regular face-to-face communication was critical. • Safety of the end-user was included in the design.

- The design brief provided by the client and Federal Government to the designers set out rigorous requirements. The brief was tested incrementally in the review process by these parties. It was crucial that the designer understood the client and Government's requirements.

❖ **Constructor**

- The constructor aligned with the client's operational safety protocols to ensure project safety.
- An open management system was established with the workforce and management on-site.
- Standard safety audits and walks were conducted, but followed up with a mandatory review by the project director, which was an additional feature of this project.
- A buddy system was effectively promoted and carried out to support the workforce in the high-risk environment.
- Inductions covered background information about the nuclear reactor, to understand the nuclear environment. This induction covered more than a standard induction.
- There were several bands of radio due to the high security nature of the works. Strict protocols were in place for radio communications. Other communications used were "nurse call" (emergency communications tool) and mobile phones.
- Regular audits by external parties were conducted (covering safety and security) on top of the constructor's QA system.
- High security allowed for more effective monitoring of personnel through the use of swipe cards and record keeping.
- The client was a 'knowledgeable client' that had undertaken thorough and extensive preparation work for the project.



Replacement Research Reactor, Lucas Heights NSW: Image provided by the Australian Nuclear Science and Technology Organisation (ANSTO)



Replacement Research Reactor, Lucas Heights NSW: Image provided by the Australian Nuclear Science and Technology Organisation (ANSTO).

4.13 Rouse Hill Town Centre, NSW – Infrastructure

Key information	Summary	Award
Client: The GPT Group	The Rouse Hill Town Centre project is a mixed-use town centre comprising retail, commercial and residential sites. Safety was outlined from the outset with an EHS (Environmental Health and Safety) plan, which set out the minimum framework for managing health and safety. Added to the EHS was the 'incident and injury free' program. These two leadership initiatives were implemented together to shift <i>from</i> a focus solely on the systems and procedures that the EHS plan provides, <i>to</i> encouraging people to consult, communicate and look for best practices.	An award was not presented for this project. This project was selected by the taskforce for its safety excellence.
Designer: RHTCA: A joint venture between Rice Daubney, Allen Jack + Cottier and GroupGSA		
Constructor: Bovis Lend Lease		
Cost: Total development: \$470 million Design & Construct contract: \$330 million		
Injuries: LTIs: 6 Fatalities: 0 First aid treatments: 40		

4.13.1 Summary

- Initiatives-based safety program, not systems based. Incident and injury free program formed the base of the safety framework and well-being was critical to site safety.
- WET computer-based system stores data on LTIs and first aid injuries to identify and analyse injury trends.
- Design reviews and re-reviews were a significant aspect involving all stakeholder representatives.
- 'Buddy system' to mentor younger apprentices and raise awareness of safety.
- Constructor was driver of safety, consistently asserting safety messages and practices. For example, shirts printed with 'See you tomorrow' were a feature of the safety messages.
- Safety was measured by setting out safety goals in the initial EHS plan and meeting these targets.

4.13.2 Best Practice

The 'incident and injury free' (IIF) program was organised around six imperatives: leadership, employees, systems, supply chain, client and community. A steering committee implemented and monitored the plan. The steering committee ensured that the program stayed on track against its plan and achieved milestones through the life of the project. The program focused on 15 to 20 small initiatives over a period of time, designed to encourage cultural shift within the organisation.

One component of the plan involved mentoring apprentices by getting them involved in work groups in a 'buddy system' to encourage younger workers to pay more attention to safety. Site managers were rotated, to facilitate sharing safety information across projects.

A system called 'WET care' supported OHS statistics so that any first aid injuries or LTIs could be analysed to establish trends. WET is a global, internet-based, real-time reporting system. On any given day, the system provides the ability to understand trends and possible risks in comparison with other projects

Design reviews and re-reviews were important aspects of this project. For each design review, outcomes were documented and distributed to everyone. Responsibilities were also allocated. Design reviews and re-reviews occurred weekly, in addition to design workshops. The relevant project manager, relevant designer, and the client's development manager were generally in attendance.

Leadership initiatives included non-traditional measuring systems for productivity and lost time. Site managers were rotated across the different sites. An on-site safety day was held once every six weeks at the site office, which was closed for this safety day. This was attended by personnel such as sub-contractors and workers. No numerical or mathematical goals were used, but safety was measured through achieving the EHS plan. Base targets were adhered to, but not benchmarked, so that the project was not 'caught up in goals'.

The constructor developed a specific systems-based EHS plan at the start of the project that set out a minimum framework for managing health and safety. Although the EHS contributed to the safety strategy, an 'incident and injury free' (IIF) plan comprised an initiatives-based system that aimed to change the safety culture. The IIF program set targets of no more than three lost time injuries (LTIs) per 200,000 working hours. The elements in the IIF were not 'systems-based' – with the use of checklists, procedures and monitoring – but were instead 'initiatives-based'.

❖ **Meetings and Communication**

A steering committee was established to manage the site safety plan. Site managers are rotated between sites and during visits, share information.

The client, architects and constructor held weekly design meetings. The designers and architects also visited the site weekly.

People have to be able to get to spaces, the lifting of things, how are we going to get this panel up here, and locations of the cranes, can someone move this about, are also issues... we look to construction managers for guidance in how we are doing things, like the pre-cast panels can only be this size. If they are so many more times bigger than that, we have to get a bigger crane in and because of the nature of this design. So we have got to restrict the panel sizes ..., the structural engineer will say to us well a piece of concrete this size, will weigh this much. If our panel sizes are twice what is allowed, we can't lift it, we can't use the crane, well then we have failed (Designer).

In addition, there were many informal meetings and email contact. Email was especially useful to allow communication between the designer and other project professionals, for example, scanned sketches were sent across to the structural engineer, civil engineer or services personnel to comment on the design. Co-ordination of the design issues of the project was a major focus of communication.

❖ **Training and Inductions**

An on-site safety team day was held once every six weeks over a period of four hours. On this day, project members became engaged in safety in an area largely unfamiliar to them. This safety team day was attended by around 40 people, who were split into teams and given briefs to monitor safety in a number of areas. One brief was to identify and repair hazards if possible and the second was that, if hazards could not be repaired, to make them temporarily safe and note them for future rectification.

The other two briefs specified the review of at least two work method statements and that workers should be engaged on-site to check for accuracy. The final brief stipulated that personnel should engage with 20 workers in the field and ask for feedback regarding how the site is being run and if any aspects can be improved.

❖ **Workshops**

A workshop format was used to review the project. Participants included project managers, the architect responsible for that particular part of the job, the client, and the relevant design consultant. These parties worked systematically through the issues raised to ensure a safe outcome for customers and end-users.

The architects, or project managers, would typically go away, get something marked up on a set of plans, and bring that back to us. We then go through a couple of workshops or design reviews and then ultimately when everyone was happy that would manifest itself in the final set of drawings (Client).

4.13.3 Stakeholder Perspectives

❖ Client
<ul style="list-style-type: none"> • Emphasised the importance of top-down safety promotion. • Promoted safety in design by putting forward a brief that set out goals and objectives, before entering into a contract with the other parties. At different stages of the design, a discussion would take place to 'fill out the detail around the brief'. • Emphasised the importance of safety for end-users, not just during construction. • Internal workshop were ran before the project commenced which identified risks, including design risks and set-out outcome targets that were improvements on previous, traditional outcomes. • All stakeholders worked together (including: operators, developers, project management team, consultants and sub-contractors) to collaboratively develop solutions to safety issues. • Continuously improved safety performance through design reviews and re-reviews. Outcomes from various reviews were documented and distributed to all stakeholders.
❖ Designer
<ul style="list-style-type: none"> • Demonstrated safety leadership by being proactive in engaging with stakeholders including structural engineers and construction managers to develop a design that is not only safe for end-users but also is safe to build. • High-level communication and co-ordination between project professionals. • Communicated safety information by being involved in formal and informal meetings and visiting the site regularly during construction. • Improved safety performance through attention to buildability and concern for ways end-user would use and interact with the completed building. • Emphasised the importance of end-user safety. Clean and well-maintained site was of high priority. • Accessibility and movement around the site post-construction were key considerations.
❖ Constructor
<ul style="list-style-type: none"> • The constructor drove the safety focus, in particular implementing a safety program, Incident and Injury Free. • Continuously improved safety performance by making a many incremental small initiatives (around 15-20 small changes) and then seeking a cultural shift within the organisation. • Entrenched safety practices to ensure fit, healthy and motivated people talked to the workforce about being fit, healthy and motivated and, able to make change. • Rewarded good safety performance of personnel, including sub-contractors. • Building "logically" was flagged as an effective safety initiative. • On-site action such as mentoring of apprentices, safety talks, meetings and safety walks were deemed successful leadership initiatives. • Shirts printed with "See you tomorrow" on the back were given to all sub-contractors to ensure all site personnel had a slogan that united the site in a personal way

4.14 Tullamarine Calder Interchange (TCI), VIC – Infrastructure

Key information	Summary	Award
<p>Alliance project: Victoria State Road Authority, Victoria Roads, Boulderstone Hornibrook and Parsons Brinckerhoff</p>	<p>This project is located at the conjunction of two freeways. Before construction began, the area was considered one of the worst traffic bottlenecks and accident black spots. The project's main objective was therefore to provide safer and easier traffic merging from the Tullamarine and Calder Freeways. It reconfigures local access ramps to eliminate waving manoeuvres through fast-moving freeway traffic.</p> <p>This project lessens traffic on local roads and reduces the number of drivers diverting off the freeway, which has caused accidents and peak congestion. Adjacent residents were protected from noise disruptions while works were carried out and the safety of drivers and their passengers was a priority. One of the challenges was that works were carried out at night.</p>	<p>An award was not presented for this project.</p> <p>This project was selected by the taskforce for its low injury rates.</p>
<p>Cost: \$150 million</p>		
<p>Injuries: Medically treated injuries: 3 LTIs: 350,000 working hours without injury</p>		

4.14.1 Summary

- Each stakeholder appointed safety champions.
- Safety performance was measured with traditional lagging and leading indicators but also safety was an overall.
- Good performance was rewarded.
- A two-step safety framework was implemented. The first step focussed on providing adequate resources for on-site personnel to advance safety measures and the second step was to have thorough induction processes for site personnel that concerned safety processes along with safety goals.
- Communication of safety information along the supply chain was supported by cross-overs of different groups, such as field workers meeting with office staff and then taking information to other workers in the field.
- The safety team was driven by the constructor, with each person in the team responsible for different aspects, such as management, administration and communication.

4.14.2 Best Practice

One of the distinguishing features of this project is that it was the first alliance project for road infrastructure in Victoria. All parties assumed responsibility for safety on the construction site.

Although the designers did not see themselves as having a direct influence on on-site safety arrangements, they felt responsible for taking care of safety aspects of the design.

A two-step safety approach was developed. The first step was to adequately resource the number of people solely available to ensure that safe practices are delivered on the site, and the second component was to have thorough, meaningful induction processes to induct people onto the site and introduce them into the safety objectives and requirements of the site, and the safety goals.

Safety champions were appointed by each of the different stakeholders: constructors, unions and management. Good safety performance was rewarded with monetary vouchers and acknowledgement in toolbox meetings. These rewards were organised by the client and constructor. Safety performance was routinely measured and monitored using a combination of traditional lagging indicators (such as LTI frequency rates, medical treatment incidents and first aid treatment incidents) and 'leading' indicators. These leading indicators were designed to measure positive steps to manage safety before the occurrence of harmful incidents.

On this job here we have actually set out a number of goals and principles, they are all important, but one of the principles that we set ourselves was to ensure the safety and well being of ourselves, our work mates and those we interact with everyday. So from our point of view safety is making sure that people that work on the job can go home the same way that they came to work, but also the people that drive through our site, because we are building to an existing operating highway (Client).

The safety team ran campaigns to raise awareness about certain hazards and common injuries. These were conducted as training sessions. The sessions discussed injury prevention and involved most of the field team, but not necessarily people from the office. Impromptu meetings were also called when safety issues arose.

❖ **Meetings and Communication**

Toolbox meetings were held each Friday for all office staff, including the design team. These weekly toolbox sessions covered the whole site, so that everyone heard the same message and it gets communicated consistently as well. The designer said that these meetings were an opportunity to 'pre-empt' any critical aspects of the project which the team needed to be made aware of. The designer added that these meetings focused on disseminating information from the office to the site workers, some of whom also attended these regular meetings. Out on the field, three or four 'satellite sites' also conducted their own toolbox meetings.

The designer perceived that the project had no communication barriers. As a result, information spread quickly.

The safety team, who headed the safety campaigns as they arose, were all Boulderstone employees. The team comprised a safety manager, the administrative officer who processed applications for inductions, kept records and ensured that Job Safety Analysis documentation was completed, and a person who acted as the conduit between the site and the site office.

❖ **Training and Inductions**

The safety team ran campaigns to raise awareness about certain hazards and common injuries such as hand injuries and rolled ankles. These were conducted as a "training-type session" according to the client representative. The sessions discussed injury prevention and involved most of the field team, but not necessarily people from the office. This was different to the *ad hoc*, informal meetings that took place when specific issues arose. The informal meetings were planning meetings discussing changes to the traffic during different stages.

4.14.3 Stakeholder Perspectives

❖ Client
<ul style="list-style-type: none">• Demonstrated safety leadership by being involved actively across all project stages and processes as an alliance group.• Entrenched safety practices to develop principles that ensure the safety and well-being of all on-site.• VicRoads were proactive leaders during the entire project and supervised the rest of the team in a contractual framework.• Promoted design for safety, and communicated safety information through meetings, inductions and intranet.• Managed risk, along with the other alliance parties, from the pre-tender stage, and developed a specific policy on protective equipment worn on-site.• The inductions were the best way to “capture the [safety] message”.•
❖ Designer
<ul style="list-style-type: none">• The designer worked with the constructor where necessary to address safety issues• Continuously improved safety performance by delivering a culture and awareness of safety on-site as well in the design office.• Communicated safety information about design to the constructor.• The construction team actively addressed safety.• Promoted safety in design by involving the construction team early in the design process and providing opportunities for feedback. A major feature was the evolution of design changes with the input of experienced construction professionals from the off-set.
❖ Constructor
<ul style="list-style-type: none">• Promoted design for safety by being involved early in the project with the designer.• Communicated safety information to the designer and client.• Identified the alliance method as driving stakeholders to act as one team with common objectives.• Demonstrated safety leadership by the client and the constructor working together to develop a performance indicator that looked at safety performance on-site. Lead and lag measures were developed to examine LTIs and medically treated injuries. Inspections acted as lag measures.

4.15 University of NSW – Commercial

Key information	Summary	Award
Client: University of NSW	The project involved the North Wall Development Zone for the University of New South Wales. It consisted of four main projects: the law building, the science building, the commerce and economics building and precinct works. The constructor signed up sub-contractors on behalf of the university.	An award was not presented for this project. This project was selected by the taskforce for its low injury rates.
Designer: FJMT Architects		
Constructor: Bovis Lend Lease		
Value: \$200 million		
Injuries: Injury frequency rate over the whole project: 4.7 out of 653,000 hours worked.		

4.15.1 Summary

- Consideration of EHS in all parts of development, from concept to completion.
- ‘Incident and injury free’ (IIF) program (specific to Lend Lease) encouraged all personnel to monitor the site to ensure activities were taking place safely.
- Sub-contractors working for a longer period on the project were subjected to tender interview, which included specifications to familiarise themselves with the IIF program.
- Design development report defined processes and equipment previously applied to the project, to determine ways to refine the design.
- Communications system was electronically based.
- Safety was the first agenda item at meetings across all project stages (including pre-construction meetings and design meetings).
- Implemented ROAD (Risk, Opportunity and Design) review, including: identifying known risks and significant aspects of the project in the initial design briefing.
- Designer, client and constructor worked together for the design phase to integrate the client’s design standards and to develop effective, buildable and safe designs.

4.15.2 Best Practice

A certified EHS system was developed at the concept stage of the project.

The IIF program was implemented. This program, specific to Lend Lease, entails each person working on the project taking responsibility for themselves and others. The message to personnel from the construction representatives was that it was not just one person’s responsibility to monitor the site and ensure that everyone was acting in a safe manner, this was a shared effort.

Sub-contractors working on the project for a reasonable length of time were interviewed at a tender interview. At the tender interview, the constructor specified that all personnel must be familiar with the IIF program.

A design development report defined the process that had previously been used during the project. This assisted with refining the design. The report also outlines in a highly detailed way the agenda for the meetings and schedules together with site-specific hazards and safety elements.

This report identified and itemised every piece of equipment that would be used and where it was to go. It also covered other project-specific requirements, such as electro-magnetic influence and radiation hazard.

❖ **Meetings and Communication**

The constructor corresponded with an OHS representative who was appointed to manage the project. The constructor visited the site on a needs basis – which was at least once a week, to ensure that OHS responsibilities and safety standards were being upheld. The constructor would, if there were a particular issue that needed attention, be on-site daily. Any meeting held needed a clear agenda, due to the project's time constraints.

The communications systems were electronically based, and the OHS representative would contact the constructor this way when there was a safety issue to deal with. Safety was the first agenda item at any meeting, to highlight the importance of integrating safety through the whole process. The project operated with an integrated EHS system that was discussed at all meetings. These included the pre-construction meetings and design meetings.

Weekly project meetings were mostly held on-site. The client, the client's project manager, the constructor's project manager and consultants attended these meetings. Email and phone communication was also used and the contractor implemented an internet-based project management and records system. This was used as the primary communication tool by all stakeholders. Most meetings were formalised with minutes or notes taken and distributed.

Ad hoc meetings were held for particular issues. There was also a series of user meetings, with approximately half of these related to work on the laboratories. These user meetings were held both before and during construction. Comments from user meetings were incorporated into a report summarising the meetings.

Having a clear idea of what each meeting is for was considered vitally important. Having a clear agenda for meetings was considered vitally important. If meetings are called without a specific purpose, this can waste time. Without a clear agenda, people arrive unprepared, so to get answers another meeting needs to be called, when the issue could have been handled in one meeting.

❖ **Training and Inductions**

A two-hour training session was held, with the initial site induction integrated into this. This site induction ran for half an hour and briefly covered the 'incident and injury free' (IIF) program. Every second Thursday, the constructor offered a two-hour voluntary IIF session, aimed at sub-contractors, their personnel and supervisors. At this session, the safety program was discussed in further detail. Inductions are obligated by law and were run by the site manager and the safety representative.

We try to make the site induction personal, so that people have an understanding that they are just not responsible for their own safety, but to look out for somebody else on the site (Constructor).

A representative from the construction side said that even though the IIF was not compulsory, practically all personnel were involved.

In addition to the IFF, a video 'Remember Charlie' was shown to all personnel. This video reinforced the safety message by telling the story of a construction worker who was severely injured in a near-fatal accident. The video also shows how a serious injury can affect a worker and their family in the long term. This message is presented by the worker.

The IFF was covered in more depth in a program which ran for four hours. Sub-contracting companies and their directors participated.

Having a site architect based at an office on-site contributed to clarity and speed of work.

❖ **Safety Development across Project Stages**

From the outset, safety was included in all processes: from the bid works, winning and tendering, right through to construction. The EHS plan was integrated into the design and all stages of project development. Safety aspects were also integrated into the project reviews.

You make the design and the system work together. You can't totally change it, but if you are in early enough you can modify it and massage it, so that you don't have to spend a huge amount of money to change things to suit safety (Constructor).

The initial design briefing stage involves identifying any known risks and significant aspects of the project. Both this preliminary design work and subsequent design reviews across project stages are part of the ROAD reviews. The client also had their own design requirements and standards.

The designer worked very closely with the client during the design phase, writing the design brief collaboratively with the client. The designer used a client questionnaire to identify issues they might encounter, such as work with lasers, radioactive material or acids. The design team also worked with the constructor to review designs.

Potential hazards were identified by the design group during the design phase. The designers then worked to mitigate or eliminate these hazards. During the construction phase, the designers were less involved.

We are not actually physically doing the work, so I suppose that is about being educated about the particular site safety policies by the builder and making sure our team are aware of all of that. We go through the normal inductions (Designer).

❖ **Incentives**

IIF initiatives are rewarded monthly. Awards included movie tickets and BBQs. State and federal-based awards were also used as incentives for safety.

We involve our key sub-contractors, all being part of the supply chain we try to involve them in it, and give them recognition [with awards]. It is certainly something that our sub-contractors would feel if they got an award ... if they are the same price as another sub-contractor what is going to make a difference [is safety] so that encourages them.

... You don't always have to get a monetary or materialistic award for it – there is a reward for it in reputation value as well (Constructor).

4.15.3 Stakeholder Perspectives

❖ Client
<ul style="list-style-type: none">• There was a 'complex dynamic' of stakeholders involved on the project. These stakeholders included: office staff, visitors and students in the university and construction personnel.• Managing external parties and activities was the biggest challenge for safety on the project.• Constructor had a pre-established safety system. This was part of the tendering process that they allow the client to test the quality of their system.• The constructor communicated safety information to their staff. The staff then communicated safety to sub-contractors. Safety messages were reinforced through inductions, informal social events, posters, and conversation.• Much interaction between stakeholders, including the client, occurred during planning for activities such as moving personnel or shutting down an area.• An independent consultant was appointed as the client's project manager. Due to the size of the project a clear hierarchy was established with the project manager overseeing the day-to-day management.• Best practice safety initiatives included: the appointment of a project manager, who was on-site at all times, flexible communication arrangements and building relationships. Specifically, relationship building was supported by all personnel identifying themselves as member of a team and having shared objectives.• Appointed safety personnel (who were different to the safety committees). These staff members, as part of human resources, reinforced messages regarding on safety processes and the role of Work Cover.• On-site BBQs were held to celebrate milestones, such as completion of a section of works. This also provided the opportunity to get personnel together on the building site and reinforce the safety message. This assisted with relationship building and entrenching safety practices.• Intervention was essential to preventing accidents. Noticing activities on-site, reporting any incidents or potential incidents and firmly reminding the person who was putting themselves at risk of the dangers, were identified as effective processes to support injury prevention.
❖ Designer
<ul style="list-style-type: none">• Safety information was communicated in two main ways, site visits and sharing offices. The designers were not located on-site, but visited the site regularly. The site architect, who was part of the design team, shared the project manager's office on-site. This site architect was the main site contact for most of the construction phase.• The designers focused on constructability of the design and how it was going to be built safely and efficiently. Safety and efficiency were considered crucial design considerations.• Safety risks were managed by detailed reviews with the users being undertaken. Particular hazards, possible risks or outstanding aspects of various facilities were identified.• Initiated a design development report. This report defined the process to refine the

design, outlined the attendees and agendas for meetings and the series of services meetings, schedules and detailed site hazard, and safety reporting. This report identified each piece of equipment that was to go into the building, where it was to go, and any unusual requirements, that might have to do with electro magnetic influence or radiation hazard.

❖ **Constructor**

- Managed safety risks by monitoring the site on a needs basis, going on-site as issues arose and spending as much time as necessary there.
- Contributed and assisted with the review and auditing process – saw this as an important part of their role.
- Entrenched safety practices by personalised site inductions. This included showing the video ‘Remember Charlie’ to emphasise the on-going effects that an accident can have.
- Continuously improved safety performance through integrating all parties in the decision-making process, such as inviting all parties to attend meetings and getting sub-contractors to contribute to safety process and decisions.



University of NSW: Company-specific, Incident and Injury Free (IIF) and Risk, Opportunity and Design (ROAD) safety programs developed by Bovis Lend Lease assisted with excellent safety outcomes.

4.16 Wivenhoe Alliance, QLD – Infrastructure

Key information	Summary	Award
Client: CEQ Water	<p>As owner-operator of the Wivenhoe Dam, SEQ Water formed the Wivenhoe Alliance in 2003 with Leighton Contractors, Coffey Geosciences, Dept of Commerce (NSW) and MWH in order to upgrade the Wivenhoe Dam.</p> <p>The Alliance aimed to achieve results using a multi-targeted approach in order to build a culture focused on health, safety and environment. They achieved results that surpass industry best practice.</p> <p>Recent studies by the Bureau of Meteorology showed that the Wivenhoe Dam was no longer capable of holding enough water to contain a maximum flood event. SEQ Water had to come up with a method of increasing the capacity of the dam or developing mechanisms to manage a potential flood event, thus forming the alliance.</p>	<p>Highly commended: 2005 Business Excellence through OHS&E Management.</p> <p>This award recognises leadership and excellence in integrating occupation health, safety and environment within business operation systems.</p>
Designer: Seq Water		
Constructor: Leightons Pty Ltd		
Value: Value data not provided		
Injuries: 1134 employees worked on the project. 362,930 hours were worked with no LTIs recorded.		

4.16.1 Summary

- Work-life balance commitment and support from the client, including a five-day week and 'energy for life' program that promoted health and lifestyle.
- All stakeholders were satisfied with the openness of communication that was achieved with the assistance of an external facilitator.
- Data management system used to record safety information.
- Team-building exercises gave personnel the opportunity to get to know each other.
- Informal mentoring.
- Enforcing the correct completion of all Job Safety Analyses (JSAs), work-method statements and risk assessments.
- Alliance was galvanised by client-appointed external facilitator who worked through goals and objectives.
- 'Innovation board' implemented to monitor all innovations and cost-benefits of each best practice.
- Internal awards for safety and best practice (both small-scale and for the overall organisation) embraced by personnel.
- Key Performance Indicators (KPIs) were specified to drive safety performance.

4.16.2 Best Practice

The client's leadership initiatives included a commitment to work-life balance, specifically by promoting a five-day working week and implementing an 'energy for life' program. These initiatives offered health information and supplied personnel with fresh fruit and vegetables to contribute to a healthier lifestyle.

Stakeholders were satisfied with the level of communication and best practice. New ideas on safety or design were encouraged. Furthermore, safety was built into the practices used on the project. As soon as any issues became apparent, open communication and acceptance meant that the alliance management team could re-design or change aspects to improve project outcomes. Any changes made to the design were communicated to everyone, to ensure that all parties were working from the same design.

The client said that the data management system used to record all information on the project was an effective method of information storage. It marked progress on every part of the project, determined exactly how the project was running and monitored each day's events.

The client also recognised the importance of team-building exercises, such as team sporting activities and BBQs, to familiarise workers with each other and raise morale. Personnel would also be set challenges for team building and were also asked to think about safety and a number of other issues, such as the community and the environment. The client also encouraged workers to get together on their rostered days off so that they could get to know each other better. The client said that these initiatives encouraged workers to work better on-site as a team, "not just showing up for work, but looking after each other".

The design and construction team in this project worked closely together. This arrangement provided a constant and seamless channel of communication. The alliance team was driven by an external facilitator supplied by the client who worked through the alliances' goals and objectives.

The constructor emphasised that a key component of best practice is making personnel carry out risk assessments, work method statements and Job Safety Analysis (JSAs). The constructor added that these formalities should be supported by "systems of culture and getting people at the right level, who are aware of their responsibilities and have relevant experience". In addition, the constructor promoted a mentoring and training scheme so that new personnel, or those changing roles, could receive the experience needed, along with access to mentors.

An innovation board was set up to track all innovations and benefits associated with them regardless of whether they were cost or non-cost. A set of principles and values for the alliance were agreed on and included in the safety charter.

Wivenhoe and other alliances ... tend to take a lot more time upfront developing values and behaviours that we want to be important, and enrolling people in that, and getting a high level commitment, raising the bar in how we want the project delivered and safety is part of that (Constructor).

❖ Meetings and Communication

The alliance structure facilitated an effective forum for communication, especially since all stakeholders shared the same work space. The designer saw that the key issue to developing good communication was "working through different personalities". Communication was assisted by an external facilitator organised by the client. This facilitator conducted team-building activities for the group. The external facilitator also worked through the alliance objectives and goals.

It is very easy in an alliance environment because you bring everyone together and they all work out of the same office and you basically create a corporate entity in itself, so you take off your own hat ... everyone is working for the Wivenhoe Alliance (Constructor).

The alliance team spent time getting to know each other – for example having lunch once a week as a group. The designer reported that social events were held outside work hours to help “build relationships outside of the workplace”.

Regular safety meetings acted as the main forum for communication. Outcomes were reported to a project manager. The Alliance management team was made up of representatives from each stakeholder group – client, designer and constructor – as well as the project manager and deputy project manager.

The management board met monthly, and the meeting always included a representative of the client, in addition to the alliance partners. For day-to-day progress monitoring, the alliance management team met weekly. The team comprised the manager for each discipline, these being the construction manager, design manager, systems and quality manager, project manager, assistant project manager, environmental manager and stakeholder manager.

❖ **Training and Inductions**

At each new phase of the project, the designer and constructor developed a risk assessment process and further induction procedures. In specific terms, these 1.5-hour inductions addressed safety, environmental and emergency procedures and issues relating to the project’s overall progress. The client was primarily responsible for developing the safety inductions that took place during the construction phase. A representative of the client monitored the construction progress through project team meetings.

Each person entering the site received an alliance induction. Aside from safety, inductions covered environmental awareness, outcomes with regard to community, public and internal perceptions of the project, and finances.

For each of the activities on-site, there was a risk assessment that was collated and prepared, a safety analysis, basically all the activities were looked at and then procedures put in place, in consultation with the people who were going to do the work, then that was all communicated again at the toolbox at the beginning of each activity, or each day (Designer).

❖ **Workshops**

A workshop was held for the project alliance board, senior people and day-to-day managers. These parties worked together in the same room for three days. They worked together on what the project was going to look like, and discussed what would be successful and what would not.

Before the initial design office was set up and design process undertaken, workshops were held to set out goals and objectives. During these workshops, it was decided that safety would be regarded as an important component of the project.

❖ **Measuring Safety**

Key Performance Indicators (KPIs) were set at initial meetings and used to monitor the project’s progress. KPIs included safety, social and environmental indicators. Initiatives for meeting these targets were then built into the project’s operation. The board and project team mapped progress against these KPIs. One of these KPIs involved winning a major award in each of the following areas: design, construction, safety, environment and community, and project management.

❖ **Incentives**

Internal awards were given out. These included smaller awards for team-building exercises and major awards for overall best practice and initiatives. The constructor said that these opportunities for recognition were embraced by personnel. There were both individual and team awards. Further, monthly project manager’s awards were given on account of performance relating to safety. These monthly awards were often given to teams that

completed tasks ahead of time, or on time. The prizes included tickets to the football or a weekend away.

You are constantly reinforcing achieving programs, best practices, meeting targets such as safety. [Best practice is] ... very open communication with the workforce, and two-way communication with constant feedback (Constructor).

4.16.3 Stakeholder Perspectives

❖ Client
<ul style="list-style-type: none"> • Extremely pleased with communication across the project since each stakeholder put in a 'team effort'. • Encouraged flexibility in safety and design. Considered all new suggestions to improve safety by modifying the designs. • Any changes made to the design needed to be clarified across the board to ensure that all parties were working from the same design. • Data management system was used to record all information related to the project and proved an effective method of information storage. This system marked progress on every part of the project, exactly how the project was tracking, and monitored what was happening on a daily.
❖ Designer
<ul style="list-style-type: none"> • Was totally satisfied with the standard of communication and relations on-site, although acknowledged that it was a time-consuming and difficult process to promote an effective standard of communication. • Commitment was made from the start that all parties would work together; this was set out contractually. • Saw constructor as mostly responsible for safety since they had the systems in place. • Design and construction teams worked in the same office, which meant that the construction staff were available to provide input during the design phase on issues related to safety, constructability and cost. • Designs were reviewed by construction team to assess construction methods and strategies. Comments were taken back to the designers who either designed safety risks out, or looked at design alternatives.
❖ Constructor
<ul style="list-style-type: none"> • Highlighted importance of getting the right culture from top management right down to the labourers. • Advocated setting high safety performance targets and reinforcing safety message from site induction to construction phase by means of toolbox meetings. • Strong systems that kept reinforcing safety, and recorded accurate safety information. • Effective communication and project management was attributed to the alliance structure.



Wivenhoe Alliance (QLD): The strong 'work-life-balance' focus demonstrated a commitment to improving the safety of personnel

4.17 Coles Myer Somerton, SA – Commercial

Key information	Summary	Award
Client: Coles Myer	Part of the Coles Myer transformation program, this is one of two national distribution centres which is referred to NDC Vic 07. The building is in the order of 75,000 square metres in total, plus an equivalent amount of external space completed over a thirteen-month construction program. The project was brought in around six weeks ahead of schedule.	This project was selected by the taskforce for its low injury rates Bovis Lend Lease National Safety Award for best practice in roofing was awarded to sub-contractor
Designer: Peddle Thorp Architects Pty Ltd		
Constructor: Bovis Lend Lease		
Value: approx. \$80 million		
Injuries: LTI frequency rate: 1.15 350,000 man hours worked with 2 LTIs recorded First aid treatments: 55		

4.17.1 Summary

- Established a comprehensive system of pre-construction and construction safety planning, meetings and documentation to ensure safety in both design and construction.
- Implementation of the corporate ‘incident and injury free’ (IIF) program.
- Use of the ROAD (Risk, Opportunity and Design) review system, plus regular site meetings and audits.
- Intensive communication strategy for site safety between the constructor and other parties, including client, designer and sub-contractors.
- Highly visible safety messages on-site, including safety slogan banners and signage for safety clothing.
- Developed risk mitigation plan focused on a height plan because working at heights was identified as a possible major safety risk on-site.
- Ensured sub-contractors had a history of safe working and could demonstrate awareness of safety policies and practices on-site.

4.17.2 Best Practice

Pre-construction planning and incorporating that planning in design was a key feature of the project. Adopting the ROAD program to review the impacts of the design, was a major initiative, and was instrumental in investigating areas such as the end uses of the building, access to the roof, and vehicle movements. This program and the risk management plan formed the major safety initiatives of the project.

Through the ROAD process, the designers got involved and became more focused on constructability very early on (Constructor).

Through the corporate IIF program, the entire process from building concepts through to hand-over was focused on safety. A safety checklist was developed to ensure the project complied with on-going project design safety, along with operational reviews of end-user usage of the building. This ensured that safety issues from both a design perspective and statutory requirements were addressed.

This project has been good in so far as it has given us to some degree a benchmark. I think it has to do with integrating those safety aspects into our own internal programs (Client).

Working at heights was identified as a major safety risk, so a safety height mitigation plan was developed. Consideration of aspects such as ground service, wind conditions and overhead power lines were included in the plan. Two elements were working at heights and temporary electricians, and most of the services were run underground to reduce the number of overhead cabling works. The height mitigation plan was a formalised document that detailed all the risks associated with working at heights on the project and formed part of the safety plan for the project. It allowed formalisation through a document, which was then used to communicate safety aspects to key sub-contractors.

The design was constantly reviewed for safety. During the roofing process, the safety wire was pulled from one end of the warehouse to another. A sub-contractor had developed a mechanical method of pulling the wire from one end of the warehouse to another which essentially reduced the amount of time that the workers would spend at heights. Because this method was identified in project meetings, it was then able to be incorporated into the project.

The project's internet-based system for correspondence, drawings and messages was very easy to use. The system was easy to navigate and made the job of planning and communicating simple.

The project web system had simple things like correspondence, RFI's, transmittals, document library, so there were only a few areas and they were just all very easy to use and refer to, and if you wanted to find previous correspondence you just had to look it up. A lot of systems get so fancy that you can't find anything (Designer).

Identifying a 'safe' sub-contractor was a key safety aspect raised by the constructor. It was suggested there is a need to vet sub-contractors for their approaches to safety and then make them aware of the policies and procedures with regard to safety.

I think it is the environment that you create; you have got to lead from the front and, by example, you have got to encourage it [safety] (Constructor).

❖ **Meetings and Communication**

The client conducted a series of regular meetings, including project control group meetings and weekly meetings with the end-user in mind, to make sure that the communication filtered through to and from everyone involved. The client visited the site approximately twice a week.

The designer was engaged by the builder, and all design aspects were communicated to the builder. The designer and the builder held regular project control meetings. There were fortnightly meetings held on-site, attended by the project manager for Bovis Lend Lease, the site construction manager and forepersons, the designer, and consultants from construction services and civil engineering.

The safety plan was a communication tool for the project team which formed the 'backbone' for the project. From this framework, weekly design meetings, weekly sub-contractor coordination meetings, weekly client meetings, and weekly safety meetings flowed.

Project personnel demonstrated commitment to the IIF program through adopting safety slogans and placing safety banners around the site so that, strategically, communication was integrated around the site by signage. All meetings had a section on safety and IIF, so safety was part of the agenda and minutes.

❖ **Training and Inductions**

The designer was required to attend safety induction along with site personnel.

Safety walks were conducted by the constructor for an extended group: sub-contractors, company representatives and OHS representatives. The constructor also conducted safety inspection meetings weekly, induction meetings and toolbox meetings.

The constructor established a training register in the safety meeting minutes and courses were run on-site. When training proposals were put forward, sub-contractors could nominate to attend. The site-based training courses included laser courses, OHS needs courses and first aid courses. There was also a training register held in head office and regularly updated. Through the salary review process, personnel needs in terms of safety training could be identified. As part of this process, training was provided in harness training to avoid falls from heights, plant and equipment training, competency training, boom lifts, scissor lifts, laser safety, first aid and the Sunsmart program.

Site inductions were held at 7.30 am, rather than 7.00 am. The later start enabled workers to arrive at the site and be initially inducted into the company's site-specific safety plan, before undertaking the site induction.

WorkSafe was invited to the site, and the project team had an open dialogue with them.

❖ Workshops

A Sunsmart policy was established as part of the IIF program, incorporating the 'slip, slop, slap' message, firm-supplied sunscreen, and an expert on skin cancer provided an education process on how to identify a skin cancer, dispelling some of the myths and facts associated with sun exposure, information about melanoma and skin cancer, how much time certain people can spend in the sun and the damage to skin.

❖ Monitoring

Project monitoring and documentation were undertaken. This process included audits. Audits were conducted every twelve weeks, including external audits, global internal audits and head office audits.

The height mitigation strategy was a formalised document that outlined all the risks associated with working at heights on the project and that formed part of the safety plan for the project. As the project progressed, the height mitigation plan was used to review the safety plans and JSAs of all sub-contractors. There was a team commitment to the height mitigation plan. The height mitigation plan was fed into the review of the JSAs and safety plans of sub-contractors.

They don't start on-site until we have signed off on the 'works to proceed' checklist. The key elements of their safety plans and JSAs are basically checked off on the 'works to proceed' checklist, if they are not there, they don't start (Constructor).

4.17.3 Stakeholder Perspectives

❖ Client
<ul style="list-style-type: none">• Promoted design for safety by working through designs following the drawing stage.• Communicated safety information to the constructor and ensured communication was filtered through to all stakeholders through regular meetings.• Managed risk by supporting the 'incident and injury free' program.• Demonstrated safety leadership by ensuring that all the stakeholders operated from a safety management aspect and integrating safety elements into pre-existing internal programs.
❖ Designer
<ul style="list-style-type: none">• Demonstrated safety leadership by incorporating safe design principles throughout the design, construction, commissioning and maintenance of the building.• Promoted design for safety by considering the design aspects for safety in the maintenance and end-user stages of the project.• Communicated safety information regularly to the constructor by engaging in regular 'project control' meetings with the builder. There were regular fortnightly meetings on-site and these were attended by the project manager for Bovis Lend Lease, the site construction manager and foremen, designer and other construction services consultants.
❖ Constructor
<ul style="list-style-type: none">• Demonstrated safety leadership by developing a culture of safety within the organisation.• Worked closely with the designer.• Communicated safety information through regular planning and review meetings with all parties.• Risk was managed with the development of a tailored risk mitigation plan.• Improved safety performance by visible safety initiatives and extensive communication.• Extended safety practices through detailed attention to site-specific safety plans, review and monitoring.

4.18 Energy Australia Stadium, NSW – Commercial

Key information	Summary	Award
Client: Department of Commerce as agent for Hunter International Sports Centre Trust	A construction-only contract, Energy Australia Stadium construction project expanded the existing stadium in Newcastle to more than double the undercover seating capacity. In effect, a new eastern view stadium, and associated civil and building works to increase capacity and provide grandstand accommodation for patrons, was constructed. The project was funded primarily by contribution from the New South Wales State Government, with some local funding from the Council of Newcastle.	Winner: Master Builders Association (2005) Award for Best OHS & Site Management Winner: Master Builders Association (2005) Excellence in Building Civil Engineering Industrial & Infrastructure Projects over \$10 million
Designer: Arup		
Constructor: John Holland		
Value: Value data not provided		
Injuries: Few injuries were recorded LTIs: approximately 1-3		

4.18.1 Summary

- ‘No harm mantra’: prevention of near misses, first aid treatment injuries, LTIs and more serious injuries.
- A full-time OHS manager appointed.
- Daily Job Safety Analysis (JSA) sign-off.
- Ensure that site-specific work method statements are not just copied from other projects, but unique to this particular project.
- WorkCover notices and changes in legislation were presented clearly.
- Construction method briefings preceded high-risk activities.
- Master Builders Association were involved in safety development and providing advice, including visiting the site and monitoring insurance certificates, workers compensation certificates, and superannuation payments.
- Safety committee was formed and meetings attended by representatives from the constructors’ side, project management company, client and end-users, the Newcastle Knights.
- The ‘passport to safety’ program was successfully implemented, and assisted in the safety training of all personnel. This initiative raised the overall awareness of safety.

4.18.2 Best Practice

Use of a consultative process through the whole project, with all parties working together, was highlighted as best practice by the constructor. Further, the constructor recommended that this approach be supported both by achieving safe outcomes on the site and by planning. Most importantly, planning provided greater certainty that safety risks were properly managed. The constructor commented that directors of the businesses involved should have a personal responsibility for safety.

Running an organised safety system was recognised by the contractor as best practice for safety. The constructor's mantra was 'no harm'. This approach meant preventing near misses, first aid treatment injuries and LTIs, as well as more serious injuries.

A full-time OHS manager was employed. Job Safety Analysis (JSA) checks were signed off daily. According to the constructor, safety monitoring included ensuring that work method statements were site-specific and not copied from previous projects.

WorkCover notices and any information about changes in legislation were made available to personnel.

Construction method briefings were given when high-risk activities were going to take place.

The Master Builders Association (MBA) was involved in safety development. The MBA visited the site monthly, provided advice, monitored insurance and ensured that workers compensation certificates were current and that top-up insurance redundancy payments and superannuation payments were made.

The designer recommended that safety be considered from the very early stages of the project. This meant considering safety from the conceptual stage.

In the same way as you are designing a new project ... thinking about how you can build it ... [designers] should be thinking about how it can be built safely. Having conceived of a project that can potentially be built safely, then it is a question of all parties in the industry participating in that dialogue from the start through to finish, to make sure safety is considered (Designer).

❖ Meetings and Communication

Early meetings were held with the designer to discuss methodology and minimise risk, along with weekly toolbox meetings. There were also weekly site meetings between client and constructor.

A safety committee was formed, with representatives from each sub-contractor. Weekly safety committee meetings included representatives from the constructors' side, project management company, client representatives, and the end-users, the Newcastle Knights. The football team was involved to assist with information about managing the football games, specifically, ensuring that the flow of patrons was safe when home matches were held.

The construction company also held their own internal safety committee meetings.

The project manager, construction company and client were all located on-site. The project manager's representative highlighted this as an important aspect in making daily communication easy.

Unless it is an immediate safety issue it is better to maintain communication channels that are established, so that proper records can be kept and proper processes can be put in place. If you start chopping corners then you start creating unworkable processes. In the end we want to have a good relationship with the builder and we don't want to be seen as undermining his authority with sub-contractors so it is all about trust on-site and that he trusts us, it is all about relationships (Client's Project Manager).

❖ Training and Inductions

Daily site inductions were conducted. Anyone going on-site needed to take part.

The constructor's 'passport to safety' system was developed to train all John Holland staff. This assisted all personnel, who should have an understanding of safety but do not necessarily have a direct influence over it, to take part in a holistic training program. 'Passport to safety' was also relevant to office staff.

I think [passport to safety] will really help people to understand every element of safety procedures (Constructor).

Members of the safety committee and first aid team were familiar to personnel on-site. The relatively small size of the workforce on the project facilitated delivery of more personalised safety messages.

Any safety issues were raised by personnel at toolbox talks. These talks were seen as an effective and open forum to discuss safety concerns or questions.

❖ Safety Development across Project Stages

The client appointed a project management company and other consultants, who worked under the clients' direction to complete the design. The constructor tendered for the construction works and managed the construction contract through to completion.

Weekly site meetings were held with the client and constructor at the site office. The project manager for the project management company, project manager for the construction company, and the constructor would meet to discuss important ongoing issues, including safety.

That wasn't an overall picture of safety, but internally John Holland would have their own safety meetings, so if there was anything that we had an issue with, we would explain that to John Holland's project manager and hopefully he would pass that down to his guys on-site (Client).

4.18.3 Stakeholder Perspectives

❖ Client
<ul style="list-style-type: none"> • Safety initiatives identified by the client included: displaying current WorkCover notices and changes to legislation, daily site inductions, ensuring safe work method statements were site specific and not copied from previous projects, and construction method briefings when risky activities were undertaken. • Best practice in safety is both achieving safe outcomes on the site, and planning the works which gave comfort that risks were being managed effectively. • There was frequent informal communication between the client and the project manager. Safety was mentioned in these discussions. • The constructor issued the client with safe work method statements and JSAs to review, to demonstrate compliance. The most important safety aspect from the client's perspective was that the constructor appointed a full-time safety manager. • From their industry experience and undertaking daily site walks, the client could tell that the site was a 'safe site'. This was demonstrated by good signage and protection, a clean and well managed site. Although, many notices were issued to improve the cleanliness of the site. • Site specific inductions were held daily for new workers on site. A television was set-up and the induction videos were updated as the project advanced. As areas of the site changed, this was reflected on the video. The client participated in inductions but not 'refresher' inductions. • The client had been involved in other stadium projects so were able to identify any potential issues before they arose. • Site inspections were conducted on a daily basis. The client took a camera with them to photograph any unsafe practices. As a result, these images provided evidence for a safety notice and example of unsafe practices. • The client participated in weekly committee meetings and site meetings in order to discuss safety.

❖ Designer

- Promoted design for safety and started the process of building safety into design from the beginning of the concept.
- Communicated design-related safety information to the constructor and client.
- Best practice involves considering safety from the early stages. Buildability and safety in construction should be design considerations. All parties in the industry should then participate in dialogue from the concept stage and carry through to the post-construction stage, to ensure safety is considered.
- The project was successful in terms of safety. However, there was still not a 'great overlap' between the design and construction aspects in terms of feedback. The design team were procured earlier on. Then the constructor was involved later in the design stage, which meant safety in construction is considered at a later stage and their influence on the design aspects were limited.
- Much dialogue took place between the builder and designers to determine the safest way to build the roof.
- There are two aspects to safety: safety during construction (which is the constructor's responsibility) and safety of the operation of the building in the longer term. The second is the responsibility of the designer.
- The design team were periodic visitors to the site. They would undertake inspections and attend the meetings when required.
- During the design phase, designer led meetings became led by the constructor once the constructor was appointed. This was due to the constructor assuming responsibility for control of the site. The minutes from design meetings were circulated to the team.
- Due to the elevation of the grandstand design, the works were considered high risk. The construction was to take place whilst games were still happening on the oval. The designers had to consider this in their designs.

❖ Constructor

- The constructor took the lead in implementing safety measures and initiatives for the project.
- Safety leadership was demonstrated with the implementation of the 'passport to safety' system and the 'no harm' corporate vision of the construction company.
- Getting all personnel home everyday safely, running an organised safety system and having a consolidative process through all project stages were considered best practice.
- Safety was a focus for the constructor from the design stage. The constructor met with the designer at the design stage to discuss different construction methodologies to minimise risks associated with working at heights and pinch point injuries.
- Employed a full time OHS officer on-site.
- Communication was a key focus for the constructor who was satisfied with the communications on the project. The constructor saw value in the safety manager and other safety representatives establishing a good relationship with the foremen on-site, and discussing safety issues.
- The constructor's tender package clearly exemplified a comprehensive safety system.
- The constructor worked through safe construction methods with the designer.
- The site exemplified good management.

- The constructor tried to create an atmosphere where personnel could make suggestions regarding safety to the safety officer as they conducted site walks. Personnel were familiar with the safety officer. The toolbox meetings provided an effective forum to make suggestions regarding safety.
- All personnel were familiar with the safety committee members and first aid officers on-site. This was assisted by the small size of the workforce.



Energy Stadium NSW: A multi-award winning, 'new build' project

4.19 Millennium Arts Project, QLD – Commercial

Key information	Summary	Award
Client: Queensland Government	<p>The Millennium Arts Project is made up of four projects:</p> <ul style="list-style-type: none"> • Gallery of modern art (GoMA), as a separate project • The millennium library project (MLP) • The site infrastructure works (SIW) and • New entry to the existing gallery. <p>The project included clearing buildings and removing 24,000 cubic metres of contaminated material from the 3.5 hectare site.</p> <p>As part of the site infrastructure works, temporary dam walls were constructed in the Brisbane River to ensure that project activities were sequenced with tides and that public boardwalk access was maintained.</p> <p>The project was delivered on time and on budget and incorporated over-and-above best-practice safety standards.</p>	<p>Winner: Australian Constructor's Award</p> <p><i>Criteria for this award included:</i></p> <p>Complexity and difficulty of the construction task:</p> <ul style="list-style-type: none"> • special requirements of the site and location; • construction complexity; • Risk management. <p>Leadership and management of the project delivery:</p> <ul style="list-style-type: none"> • project team relationships including clients, employees, consultants and sub-contractors; • Best practice in development and/or delivery; • management contribution in the design process; • planning and control of construction operations; • occupational health and safety management; • training and development of project resources. <p>Overall outcomes achieved:</p> <ul style="list-style-type: none"> • achievement of time, cost, quality and safety objectives; • client satisfaction and general success of the project; • general satisfaction of stakeholder groups including: users, community and employees.
Designer: Architectus (GoMA) Donovan Hill and Peddle Thorp (MLP and SIW) Robin Gibson (QAG new entry)		
Constructor: Bovis Lend Lease		
Value: \$290 million		
Injuries: LTIFR: 1.52 per 200,000		

4.19.1 Summary

- ROAD (Risk, Opportunity and Design) reviews procedure assessed and re-assessed designs and plans, and also provided and assisted with opening communication between the designer and the client.

- Client was based on-site and maintained direct interactions and communication with other stakeholders.
- Incentive programs were integrated into team-building exercises, e.g. BBQs were a reward for good safety practices and provided an opportunity to build communications and affirm relationships.
- 'Project web' acted as a communication tool for works through different project stages to be reviewed and modified by different stakeholders.
- Safety was outlined in the tender stage for constructors.
- High performance targets were set, e.g. safety was measured against safety targets;
- Focus on end-user of the project; the end-user was represented at the Project Control Group meetings by someone from Arts Queensland.
- Appointed safety officer was well known on-site, demonstrated presence and proactively worked on safety issues.

4.19.2 Best Practice

From the outset, the communication between the designer and the client was galvanised by the ROAD procedure. The second phase of ROAD involved establishing designs and plans that re-assessed the building to check areas that previously had safety issues. Another aspect of safety was considering the cleaning and maintenance of the buildings.

Designs included safety considerations and focused on end-user safety. A Project Control Group (PCG) was formed with the constructor, client and end-user, represented by someone from Arts Queensland. The PCG, which met monthly, looked at controlling project costs. Although these groups are standard across the industry, a framework was established to set the agenda for the project.

Site inspections were undertaken each week. Personnel in charge of a particular area of the site would inspect another person's work area to 'bring a fresh set of eyes' to safety checks. Breaking the job up into responsibilities for different areas clarified the roles and responsibilities for safety.

The constructor described being on-site, becoming familiar to personnel, such as sub-contractors, and being seen to fix problems as effective ways to contribute to a safer project. Most importantly, acting on safety, rather than merely "talking about it", built confidence in the workforce and wider construction team.

[Encouraging safety means] walking up and stopping at an area and saying: 'Listen guys you've put the handrail up, but you've missed the bit at the end ... stop that, pull it down, re-do it and let's go forward again'. You always grab the safety rep ... and let him have the profile of being involved with it. Then [the workers see] ... the rep involved [and that the safety representative] actually cares as well. You must lift their profile (Constructor).

The constructor said that the sub-contractors, who all worked for different companies, collaborated well on-site, and encouraged and promoted safety.

According to the designer, the site was well maintained, which improved safety and kept the space tidy. Further, safety signage was recurrent and visible.

A 'project web' was used to support communication. All safety issues, including design modification, were documented in writing. The designer emailed the drawings, a member of the construction team reviewed or changed the designs and then sent the amended designs back through the system.

The client was based on-site so that they could become more involved with end-user considerations. The client was given statistics every month at the PCG (Project Control Group) meeting. The constructor conducted a safety report and informed the client of first aid

reports, number of lost days recorded, the number of safety inductions undertaken, and number of personnel on-site.

The site was divided up and one person was responsible for safety in a particular area. This system involved describing and clarifying roles and responsibilities regarding safety.

❖ **Meetings and Communication**

Team meetings were held weekly, with the constructor, consultant and designer in attendance. These meetings considered construction, program, safety and design. Toolbox meetings were also held weekly, with each sub-contractor encouraged to lead the toolbox meetings in turn. Safety meetings attended by safety representatives were held weekly. A safety program was also set up for safety representatives who were going to work on the project. Meetings were held if an issue arose, and then action was taken.

If an issue arose, the safety committee could be called together and briefed so they could inform their workers about the issue. The constructor described how the role of the safety committee effectively lifted the profile of each member on the committee. Each member was regarded as having a specific role to play.

The designer said that these safety officers were well-recognised on-site. More specifically, the head workplace health and safety officer liaised with Government departments and undertook the safety paperwork. A full-time safety officer worked under a head Workplace Health and Safety Officer (WHSO). Safety officers were appointed for each of the different areas.

The constructor added that, to ensure personnel understand safety and improve their safety skills, messages are most effectively conveyed in meetings, such as toolbox meetings. If results are positive, the constructor recommended rewarding the team, rather than individuals.

Communication occurred typically between the constructor and client. Further, the designer and constructor communicated on a frequent basis. The constructors' safety manager, the client and designer, mainly communicated during design meetings, which were attended by an architect's representative. Several design aspects were changed to follow risk and cost analysis.

❖ **Training and Inductions**

Project-specific inductions were set up by the alliance, in addition to the general industry-standard inductions. These alliance-specific inductions covered project background, objectives, emergency response, and how to work as a community.

❖ **Incentives**

The constructor encouraged safety representatives to make themselves known to over 1000 personnel working on the project. This was achieved by bringing everyone together at a BBQ breakfast as a reward for a full month of work without a lost time injury.

When they were cooking breakfasts, I would make them a hat to identify them. They would all get together and talk, and it broke down the barriers where the form worker would talk to the steel fixer, and they would try and get them in the same boat (Constructor).

❖ **Safety Goals**

Safety was embedded in the bid put together at the tender stage. Safety was part of the construction methodology. Before work began on-site, safety goals were outlined at the pre-construction meeting. Safety goals were targeted at a lost time frequency rate of 2. The constructor exceeded the initial goal, achieving 1.5.

4.19.3 Stakeholder Perspectives

❖ Client
<ul style="list-style-type: none"> • Managing safety elements was primarily the constructor’s responsibility, who had a good reputation for building safely. • Communicated primarily with the managing constructor. Informal communication was facilitated by the client sharing a work space with the managing constructor. Other communication occurred at regular meetings. • Safety requirements were communicated from the senior managing constructors down to the individual sub-contractors. Whenever the client participated in a site-walk, they noticed safety aspects, which they attribute to the constructor driving safety awareness to ensure everybody was responsible. • Specified their safety expectations in the tender documentation. • If incidents occurred they were reported to the client. Monthly injury reports were provided.
❖ Designer
<ul style="list-style-type: none"> • The designer said that the site “felt safe”; signage was implemented to mark areas that were off-limits, and areas where workers entered were site-managed by the constructor. • The designer focused on safety both during construction and for the end-user. • Safety leadership was demonstrated in design. • Communicated safety information at meetings. • The designer worked to all WorkCover and BCA compliances, in addition to Australian Standards Disability access.
❖ Constructor
<ul style="list-style-type: none"> • The client worked on-site with the constructor. • Risks were identified at the design phase. • A safety plan was submitted by the constructor, which identified all the threats to worker safety and also included budget, safety and communications. • Rewards incentives for excellent safety performance were given as an incentive to encourage good practices if no lost time injuries were reported for a one-month period. • Led safety training and workshop sessions for sub-contractors. • Eliminated ‘Chinese whispers’ on-site by engaging a safety representative to disseminate accurate information.

4.20 Alice Springs to Darwin Rail Link, QLD – Rail

Key information	Summary	Award
<p>Client: Australasia Rail Corporation (ARC) and it is delivered by Asia Pacific Transport (APT) Pty Ltd.</p>	<p>The Alice to Darwin section completed the north-south crossing by extending the existing section from Adelaide to Alice Springs. It was a Build, Own, Operate and Transfer (BOOT) project to construct a railway from Alice Springs to Darwin and take over an existing railway from Tarcoola to Alice Springs.</p> <p>The project involved a consortium of companies, which had integrated joint management of the project, with responsibilities and sponsorship roles taken on by the individual contractors.</p> <p>Asia Pacific Contracting delivered the government-funded component and Asia Pacific Transport (ATP) delivered the privately funded component. The project was delivered by APT.</p> <p>APT had ADrail do the design and construction. ADrail is a joint venture between Halliburton/Kellogg Brown & Root, Barclay Mowlem, John Holland Group and McMahon Holdings.</p> <p>The Government Stakeholder was the Australasia Railway Corporation (ARC).</p>	<p>Winner: Australian Construction Association / Engineers Australia (2004) Australian Construction Achievement Award – Leadership and Management of Project Delivery (category): Occupational Health and Safety Management.</p> <p><i>Criteria for this award included:</i></p> <ul style="list-style-type: none"> • Achievement of time, cost, quality and safety • Client satisfaction and general project success • General satisfaction from stakeholder groups including users, community, employees and designers
<p>Designer: Joint venture Adrail</p>		
<p>Constructor: Joint venture Adrail</p>		
<p>Value: \$1.2 billion</p>		
<p>Injuries: Over 5 million man hours worked, LTI rate of 2.0</p>		

4.20.1 Summary

- Safety goals were defined from the outset, to determine what should be achieved. This was supported by a reporting structure to notify safety problems and issues. The reporting structure was used to determine how to correct problems to meet the safety goals.
- Safety was integrated into the project at the design phase by establishing a design working group; consultation used a 'round table' structure.
- A safety plan was developed, with contributions from contracting companies and safety representatives.
- Design plans standardised work procedures, which meant they were repetitive and limited the time required for learning each different job/task.
- A safety conference was held at the beginning of the project for managers.

- Professional-looking, comprehensive and easy-to-read induction booklets were developed.
- The induction process was closely monitored and everyone needed an ID photograph displayed at all times to show they had been inducted.

4.20.2 Best Practice

Taking three years to negotiate and 30 months to construct, the rail project was finished six months ahead of time and within the original budget. There was no litigation and a good safety record was achieved.

I think with best practice you have to first of all have a plan and make sure the plan is executed correctly and communicated. All of those were achieved. We achieved the goal of the lost time frequency rate (Client).

Safety was communicated throughout the entire project. Being a rail project, it had to comply with the rail safety regime. Those involved worked 'around the table' so had some input in design. Further, design working groups covered every aspect of the project.

The client representative said that the communication aspect was positive. When construction began, the safety program was enhanced and submitted to the client, who went through it with the constructor. It was then submitted to the government representative for approval before proceeding. Much of the work was designed to be repetitive, an initiative which reduced the learning cycle and standardised design and execution methods.

A safety plan was established based on the input of various contracting companies and safety representatives. An initial safety conference was held for management personnel, including fleet managers, construction managers, and superintendents.

Project managers and site managers, including the project director, were visible to personnel on-site and actively promoted safety, which demonstrated effective management.

The safety manager was considered to be the most proactive person on-site with regard to safety. He was described as knowledgeable and approachable, with an extensive knowledge of the industry. He provided assistance and followed up on incidents.

❖ Meetings and Communication

There were monthly meetings between the owner, Asia Pacific Transport, the controlling body, Australasia Railway Corporation (ARC), and the designer/constructor, ADrail. APT built, owned and operated the project, although they appointed a consortium of constructors (ADrail) for the construction phase.

Safety was high on the list of items that had to be reported on monthly.

The project involved a design and construct contract, with Adrail as the constructor, which meant that, during the design stage, the design team consulted with various safety groups.

There were weekly meetings held during the design stage to ensure that the design was practical and effectively considered aspects of constructability.

❖ Training and Inductions

Once the project started, each person had to participate in a 3–4 hour induction, including the client representatives. Safety was a major aspect of the induction program.

When works were undertaken, there was a safety manager appointed to monitor on-site activities. A team of safety officers reported to the safety manager, who answered directly to the project manager.

The client explained that the induction process was policed quite rigidly. Everyone needed an ID photograph displayed at all times. This identified that they were inducted and, as a

consequence, permitted on-site. When work was undertaken on facilities, there was a further induction specifically for working on the track, and close to the track.

The inductions were carried out by the safety management personnel, who delivered the first round. After this first round, a number of fleet managers delivered the inductions, because of the remote and dispersed locations of the project.

The constructor commented that they were pleased with the induction booklet, produced by safety management personnel, which they said was “easy to read”, written in plain language, and very professional.

❖ Workshops

Mobile workshops were a significant capital investment for the duration of the project. The standardisation used in the design, and particularly the reduced duration of the job (completion six months ahead of schedule), led to less capital being spent on the mobile workshops than anticipated. The workshops covered the fitters working on-site, particularly on machines. The workshops were equipped with lighting facilities, hand-rails and stairs rather than ladders (which addressed fatigue). Fitters are usually exposed to a high degree of risk since they perform a variety of tasks and some heavy manual work. Safety Development across Project Stages

The collaborative group driving the project (a governmental consortium) was the Australasia Railway Corporation (ARC). There were monthly meetings between ARC, Asia Pacific Transport (the Build Own Operate Transfer consortium) and Adrail (the contractor). These organisations coordinated the construction, operations and management of the project through construction.

The client had to provide a submission detailing how they would build the structure, operate and transfer it, and how much time would be required to complete it. They had to justify what benefits each consortium that was bidding would provide to the community, in particular to South Australia and the Northern Territory.

Safety goals were defined from the outset to determine what should be achieved, and supported by a safety reporting structure.

The designer and the constructor were responsible for transmitting the safety culture to the Adrail partners and to the sub-contractors by controlling, monitoring and reinforcing the safety culture at all levels.

4.20.3 Stakeholder Perspectives

❖ Client
<ul style="list-style-type: none">• Promoted design for safety through the creation of Adrail.• Demonstrated safety leadership by working with the safety management plan and evaluation and working practices, not just the policies and procedures.• Compliance with local content for the Northern Territory meant relying on local resources. Only once these were exhausted, were other resources sourced from outside.• Goals were originally set –out regarding what should be achieved. A reporting structure was put in place throughout the project to determine if anything was going wrong and how to correct this to ensure all the goals were met.• Best practice meant having a plan and ensuring the plan is executed correctly and communicated. All of those were achieved.• The design working group (made up of a number of stakeholders) considered safety at the design stage in a comprehensive fashion.

- Once construction commenced the safety program was enhanced and submitted initially to the client. The program was then submitted to the government representative for approval before it proceeded. The safety plan had the input of the various construction companies and safety representatives.
- Safety was driven from the tender stage.
- All personnel were inducted. This included the client. Safety was a major part of the induction program. When work commenced on-site, a safety manager was appointed who answered directly to the project manager. This safety manager had safety officers working under him. Induction participation was policed quite rigidly and all personnel had to display an ID photograph to demonstrate that they had been inducted.
- The client estimated that they were on-site 30 percent over the duration of the works.
- Monthly reports were provided to the design and construction teams. All the participants that made up these groups received a copy. The reports were also provided to the various board levels of these companies and formed part of their internal company reporting.

❖ Designer

- Demonstrated safety leadership by being involved in the 'round table' discussions on safety.
- Worked with the constructor and client to promote design for safety.
- Communicated safety information mainly from the designing working group, managed risk, and improved safety performance.
- A Design Working Group was established with representatives of the Australasia Railway Corporation (ARC), the South Australian and Northern Territory Governments and the banker's engineers.
- Due to the structure of the project, all parties had with an interest or stake in the outcomes. All parties were well represented and therefore well informed. Information sharing was imperative. The participants were all highly experienced working in a project environment and the consensus view was accepted.
- In two cases the police commended the speed with which the Adrail staff responded to traffic incidents. This included Adrail attempting to render assistance and providing police with full details of the indent.
- Quick response time, enforcement, and supportive or collaborative approach were featured.
- Posters related to safety were displayed in lunch rooms or at entries to offices. Designated safety officer were situated at each site or site office. Safety officers managed inductions, toolbox meetings and undertook inspections.
- Safety was taken very seriously. There was the threat of instant dismissal for anyone who was seen to be flagrantly ignored safety requirements.

❖ Constructor

- The Adrail group demonstrated an effective coordination and communication effort.
- Demonstrated safety leadership by delivering the project under the initial budget and with a very low injury balance.
- The project manager appointed a 'very good' safety manager. The safety manager was

employed directly by the joint venture. Each fleet manager, (who were appointed by the project manager) effectively ran their fleets autonomously and took responsibility for the safety of their fleet.

- Safety messages were reiterated through various meetings such as toolbox meetings.
- Operator training took place as did some external training courses.
- There was a safety conference held for those at the management level including; the fleet managers, construction managers and superintendents.
- The safety manager was knowledgeable, approachable, easy to talk to and practical. He was very familiar with the construction industry. He provided assistance and followed-up on incidents.
- Outside work contact between the foremen, superintendents, construction managers assisted with relationship building and consequently meant that personnel were more approachable.
- AdRail implemented an excellent safety reporting process that encouragement report incidents and near misses.
- Safety reporting was driven by the project manager. Reminders were repeatedly distributed when incident reports were required.
- Yes, measured. Leads as well as lagging, in terms of the safety inspections. They were regularly reported to, it was an item on the agenda at the meeting, and reported up to senior management at the time as well as monthly. It was part of the monthly reporting.

4.21 Helensvale to Nerang Duplication, QLD – Rail

Key information	Summary	Award
Client: Queensland Rail	The scope of works was to duplicate the existing rail line. This involved constructing seven bridges. The bridge works sought to modify the existing structure, land pre-cast work and then finish the bridge. This was a civil construction project involving bulk earthworks, concrete structures, culvert extensions, and the erection of various bridges.	An award was not presented for this project. This project was selected by the taskforce for its low injury rates.
Designer: Golding		
Constructor: Wally Mooney, GHD Inspector		
Value: \$9.5 million		
Injuries: LTIs: 0 No major incidents		

4.21.1 Summary

- Constructor perceived safety practices as ‘over and above’ safety legislation.
- Safety officers were asked to do training on top of the standard Certificate IV.
- Any workers on-site were required to meet specific challenge assessments or be assessed through familiarisation processes.
- Leadership matrix assisted with the development of leadership strategies.
- Small number of workers on-site meant safety messages were personalised and communicated directly from the management to sub-contractors.
- Anyone working on-site needed to undertake three inductions: the state standard; Queensland Rail’s; and the project management company’s inductions.
- Inductions were consistent and thorough; project management company’s inductions were complemented by a multiple-choice questionnaire and discussion to ensure that safety issues and procedures were clearly understood.
- Principle contractor had ownership of the site and was therefore ultimately responsible for safety, however, the client’s own protection officers also monitored site activities.
- The client specified safety at tender stage and conducted a ‘pre-award interview’ with interested parties.
- The client set out prescriptive safety standards in contracts.

4.21.2 Best Practice

The constructor said that safety practices were ‘over and above’ basic legislation. The construction company became a Registered Training Organisation (RTO). This meant that safety officers undertook accessory training, in addition to Safety Certificate IV.

We don’t take it on face value that if a Joe Blow turns up with an excavator ... we don’t just assume that he knows what he is doing, we assess him through familiarisation or challenge assessment, and to demonstrate that we have done that assessment, there is paperwork to go with it (Constructor).

Other specific safety strategies included hazard analysis and implementation of leadership strategies, including development of a leadership matrix.

The construction team conducted a regular audit process. Project manager workshops, safety workshops and supervisor workshops were held – these were done through a leadership matrix. These safety initiatives were part of the construction company's 'vision' and were 'projected' through these workshops.

The client specified safety at tender stage. In addition, it undertook a 'pre-award interview' to determine prospective contractors' experience, based on performance on previous projects. The client's own protection officers were also on-site, which ensured that all construction activities complied with regulations.

❖ **Meetings and Communication**

Pre-start meetings were the primary vehicle for reinforcing safety messages, rules and procedures on a daily basis. The client said that, because of the small size of the workforce on the project, it was easier to personalise safety messages. The constructor agreed with this statement. Management of workers was considered straightforward.

Furthermore, posters were displayed on-site in order to communicate safety information. This ensured that consistent safety messages from management were transmitted along the supply chain. It also reinforced the message that "we are looking out for each other".

Meetings were held monthly with client, designers and the constructor. Daily pre-start meetings were held between the constructor and sub-contractor. Staff, including those working for the constructor, met weekly, with safety as the first agenda item.

❖ **Training and Inductions**

Interactive inductions were held for one hour for anyone going on-site. These inductions covered topics such as the environment, safety, quality, harassment, opportunity, counselling and other site-specific issues.

Three inductions had to be completed by anyone intending to work on-site. The first related to the generic blue card, the second obtained the QR Pink Card (which raised awareness of the hazards associated with working close to trains and overhead voltage power) and the third comprised the project management company's induction. The generic blue card induction took half a day, as did the procurement of the QR Pink Card. The project management company's induction took a minimum of an hour.

The project management representative ensured that inductions were attended by everyone, and that the content of these inductions thoroughly covered all safety aspects. The specific induction run by the project manager was followed up by multiple-choice questions to check that those attending had listened. The inductions incorporated an interactive 'lecture-style' delivery, with questions allowed at any point during the presentations.

... we try to make things personal, and it is a drive through project managers and supervisors pulling up safety, it is a team effort it is not an individual effort (Constructor).

❖ **Workshops**

The construction team held project manager workshops, safety workshops and supervisor workshops. If changes were made to any aspect of the project, these were discussed at these workshops, as were updates on legislation and training, and how to carry out specific JAPs and hazard analyses.

❖ **Ownership of Safety**

The principal constructor for the project was in charge of the site. According to existing legislation, this party was responsible for maintaining a safe work site. A safety inspector appointed by the principle contractor was on-site at all times and carried out roaming inspections about two to three times a day. This inspector was the main point of contact for the project manager with regard to safety.

The client had formulated their own safety standards, which were written into the constructor's contract. These standards were prescriptive.

4.21.3 Stakeholder Perspectives

❖ Client
<ul style="list-style-type: none">• Worked directly with the constructor and designer.• Communicated safety information to the general public.• The drive for safety by the client was exemplified in the inclusion of safety in the tender package, tender site inspection and other discussions.• The client had their own protection officers on site, to ensure rules regarding protection of their infrastructure were complied with.• Formal communication was conducted through monthly meetings. The client, engineering representative and constructor met on a monthly basis to discuss the project overall, safety, environmental and quality.
❖ Constructor
<ul style="list-style-type: none">• Primarily concerned about safety in the construction and post-handover phase.• Safety activities included: hazard analysis, JAPs and implementation of strategies to demonstrate good leadership and reviews of activities through a leadership matrix.• The constructor company encouraged supervisors to undertake accessory training on top of the standard Cert IV.• The principal contractor located on-site was ultimately responsible for safety, as they had possession of the site. It was their responsibility under legislation to maintain a safe work site.• The client had their own prescriptive safety standards which written into the constructor's contract.• Safety was discussed each day at pre-start meetings.• When work activities were developed, safety has to be considered immediately. This was achieved through work method statements or operating procedures. These were closely monitored by the constructor.• Before any sub-contractors were engaged, the constructor ensured that each sub-contractor they appointed had an effective understanding of safety. All sub-contractors were provided with all the necessary paraphernalia and were briefed on safety.• Safety was considered a cultural and behavioural issue that was discussed on a daily basis.• Part of the constructor's operating procedures included risk assessment and hierarchy control (which included hazard analysis).• At the end of the contract, the project manager provided a detailed post-construction report on all the activities on-site, including safety.• All incidents were logged onto the intranet. This meant the corporate safety manager could view the injury rates and project outcomes.

4.22 Forest Gardens, QLD – Residential

Key information	Summary	Award
Client: Daikyo, now Orics	<p>This project is 8 km south of Cairns' CBD. It borders on World Heritage rainforest, consists of 1560 lots and will house up to 5000 residents upon completion.</p> <p>The residential project consists of large allotments, some more than 2000 m², while over 42 ha is allocated to green, open space.</p> <p>An active revegetation program is underway and will incorporate planting some 750,000 trees and smaller plants.</p>	<p>Lend Lease 'Project of the year – incident and injury free' 2006</p> <p>Winner: Personal safety award (Awarded to Andrea Jackson of Delfin Lend Lease)</p> <p><i>Criteria for this award included:</i></p> <ul style="list-style-type: none"> Driving exemplary incident and injury free performance from the supply chain, while acting as a client and/or developer. <p>Andrea Jackson led the development of an annual incident and injury free action plan for Forest Gardens.</p> <p>She engaged all team members in completing self and peer assessments against the incident and injury free ABC scale.</p> <p>She personally conducted incident and injury free inductions for all contractors and their employees on the project, and organised events for stakeholders and the local community.</p>
Designer: Delfin Lend Lease		
Constructor: Delfin Lend Lease		
Value: \$500 million		
Injuries: LTIs: 0		

4.22.1 Summary

- The safety of the end-user was prioritised.
- A 'no blame culture', with all stakeholders directly involved.
- Client was present on-site and spent time with workers during breaks.
- 'Incident and injury free' (IIF) message and practices were communicated throughout the supply chain.
- Appointed a safety coordinator to deal with site management of safety issues and equipment, and communicate lessons learned.
- Families were invited to the site as part of a safety program to build better relationships, get to know the machinery and understand safety issues.

4.22.2 Best Practice

ROAD design reviews are a standard procedure across all Lend Lease projects. These reviews were conducted progressively throughout the various project phases, from conceptual design through to final design. The constructor liaised with the designers, engineers, marketers

and sales representatives to assess and re-assess the designs, considering the potential safety issues that may arise. The constructor said that one of the main priorities was looking at the design from the end-user perspective. The designer was especially focused on the residential end-users. The ROAD reviews provided the opportunity to improve their designs in terms of aesthetics and safety, in addition to potentially increasing profit.

The 'no blame' culture was developed to change attitudes towards safety. The designer was involved in holding the inductions, in which every person on the project took part. During these inductions, the designer did not talk extensively about technical aspects of design, but how those on-site could stay safe and the broader consequences when something goes wrong (especially the way in which this impacts on people close to the worker). The designer emphasised that safety was paramount over profit.

The management members of the project team would go on-site when the workers were taking their break and spend time with them. The designer said that management got to develop a personal relationship with the workers, which helped to build trust.

The management members of the project team go out on-site and spend time with the workers ... so we get to develop a personal relationship with them. This helps reinforce the caring element, but also it makes them feel safe to come to me or others in my project team. Over twelve months we have made such a change, they have actually come and reported the owner of the company doing something unsafe on the site, which we then followed through with (Constructor/Designer).

A safety coordinator was appointed and provided support if there had been a problem on-site. For example, if certain safety equipment had not been provided by the contractor, the safety coordinator would ensure that it was delivered.

4.22.3 Meetings and Communication

Meetings to discuss safety were organised by the safety manager. A strong relationship existed between the project engineer, foreperson and landscape construction manager.

Formal communication on-site was driven by the project manager (from the developer) to the constructor's site manager and then to the landscape construction manager. Communications were monitored by the developer.

Management communicated with workers not only through formal meetings but also through developing personal relationships with workers on-site.

A safety coordinator communicated lessons learned from other projects around the world where incidents have occurred.

Delfin Lend Lease operates on an 'incident and injury free' platform that is implemented as a philosophy as well as in practice. This platform was communicated to all workers through inductions, courses, and day-to-day communications. At the operational level, engineers and the landscape construction manager communicated this directly to staff on-site.

Communication with partners and children was trialled as part of the safety program. Families were invited to a BBQ, to get to know them personally. A tour of machinery and the site was undertaken and gave lessons on how to work machinery for partners and children in a safe way, so that they had an understanding of the risks involved on the job, in order to connect work and family.

4.22.4 Stakeholder Perspectives

❖ Designer
<ul style="list-style-type: none">• Demonstrated safety leadership by working on changing attitudes, and the focus is on caring about people staying safe.• Communicated safety information through a best practice approach that focussed on close communication and developing rapport on site between operatives and also between the project team. Informal chat sessions are also conducted fortnightly with operatives.• Entrenched safety practices through project meetings where all team members work through an agenda that includes an 'incident and injury free' item which focuses on safety, including issues with design, ideas to improve safety.• Forums were held, where safety was discussed. An open door policy was established and ad hoc meetings to address safety problems were encouraged.• Supported safety innovation.
❖ Constructor
<ul style="list-style-type: none">• Safety practices are entrenched in a safety culture that puts safety ahead of all aspects of the project including profit.• Continuously improved safety performance through thorough safety reviews.• Promote safety in design by consulting designers and relaying safety concerns. An example was the design of a footpath through a park being too steep and steps being too dangerous, as it gets slippery in the tropics. The team developed a process to look at ways to re-design the footpath in the park to get a safety outcome• Safety information is communicated through formal meetings – the 'incident and injury free' agenda item focuses on safety in the preceding week, including issues with design and ideas to improve safety and, informally, as safety issues arise or to implement an idea to improve safety, a team meeting is called on an ad hoc basis.• Safety leadership is displayed by management members of the project team attending the site and spending time with the workers to develop personal relationships and displaying a caring approach. Workers feel safe to come to the project team managers with safety issues.

4.23 Hyatt Regency Coolum, QLD – Residential

Key information	Summary	Award
Client: Lend Lease	Two parts were undertaken for the Hyatt Regency Coolum project: a land subdivision; and the residential development within the resort. There are 80 home sites: 40 dwellings built in 2 stages, consisting of two three-level apartment buildings and 28 two-storey houses.	An award was not presented for this project. This project was selected by the taskforce for its low injury rates.
Designer: Planit Architects		
Constructor: Calty Construction		
Value: \$350 million		
Injuries: LTIs recorded for stage 2 works (February 2006- July 2007): 1		

4.23.1 Summary

- Resort project required particular safety best practice, specifically for accessibility.
- Client directly communicated safety messages related to the overall project direction.
- EHS manager appointed by constructor.
- Used an ‘incident and injury free’ (IIF) program (a flexible orientation training program).
- Regular audits and reviews undertaken.
- ROAD (Risk, Opportunity and Design) reviews; circulated ‘live’ document so that designs could be changed and improved.
- Constructor was engaged through a tender process where safety goals were set out; these goals were included in the final contract and discussed at regular weekly meetings.

4.23.2 Best Practice

The key safety elements for this project were the factors that differentiated operating a resort to other construction projects. This included access to the site, which was adjacent to a golf course. This necessitated access to the private road running through the golf course. The constructor mostly engaged contractors from the domestic housing industry.

The client said that safety messages were communicated from “within our organisation”. In specific terms, the client’s CEO projected health and safety messages related to the overall direction of the project. Day-to-day messages would come from the EHS manager. A system was put in place in order to ensure that any incidents on any Lend Lease project would be communicated to the EHS manager, who would pass on the safety messages as a means to prevent the incident happening again.

The construction company’s foremen and key personnel were inducted into the IIF program. This program involved an orientation component that ran for four hours, in addition to a two-day workshop. IIF is flexible enough to be tailored to suit different contracted and sub-contracted companies. Regular audits and reviews were also undertaken.

❖ Meetings and Communication

The Lend Lease ROAD design reviews were circulated on a regular basis. They were considered ‘live’ documents. Decisions were recorded and added to the documents. They were also continuously checked and added to the documents as new issues as arose.

The ROAD review was the catalyst for [safety] discussions. Issues were raised in those meetings and through general discussions they were prioritised. Further work might have needed to be done on certain things and so it was always then added into the chart and as further work was done they basically closed various things as resolutions were made on the way through (Designer).

The constructor-appointed project manager was the main point of contact. The constructor was actively involved in all aspects of the project, including meetings, and was responsible for ensuring the continuity of the project. The constructor was also involved in design issues.

Formal communication with a project manager was preferred by the designer, who said that this meant “everybody knows where they stand”.

The client engaged a development manager, project manager, builder, and a team of consultants. The majority of the communication took place between the development manager, the construction manager who worked for the construction company, the head of the construction company and their on-site foreman.

There were a range of communication channels. These included regular weekly site meetings, with safety always included on the agenda. Other communications related to specific issues were made in writing or dealt with in site meetings.

[The safety message] comes from me, as the company director, and it goes down the ranks. I can't just leave it with the safety officer, it has to start with me, and go all the way down (Constructor).

❖ **Training and Inductions**

The ROAD review reinforced that safety was a priority and that any safety issues could be openly discussed. The construction company maintained a training system that was not job specific and discussed the overall safety goals.

❖ **Safety Development across Project Stages**

Three project stages were identified by the designer: a large client group worked out the style and size of houses; then a project manager worked through the whole design process; and, finally, another party was introduced at the construction stage.

The client engaged the builder through a tender process. The client specified their safety goals. These were discussed during tender negotiations. The goals were included in the constructor's contract and were then discussed at the regular weekly meetings.

We tried to get a builder who institutes and put in place a similar [safety] process with the sub-contractors that he engages (Client).

The designer coordinated the master design plan and acted as the primary design consultant, though they also worked, on occasion, with the other consultants. However the constructor, acting as the project manager, undertook the majority of liaison with the other consultants.

[Lend Lease] were sort of like the post box, so we would usually forward drawings to Lend Lease and they would distribute those drawings out to other consultants so they knew what issue was going out at each stage, so it kept central control of it (Designer).

Some important design considerations highlighted by the designer included maintenance, security and visibility of equipment, alleviating risks of falls (especially since some of the works were at heights), and building materials.

❖ **Incentives**

Regular safety awards were given. Once every two months, a site barbeque was held to present an award to the person who had done the most to improve their own safety performance. Other initiatives raised the level of safety awareness of areas relating to the

end-user, such as talks about safety in the home, having safety switches, and swimming pool safety.

4.23.3 Stakeholder Perspectives

❖ Client
<ul style="list-style-type: none"> • Integration of safety in design through the entire process is fundamental. • Training and a highly skilled workforce guaranteed safety performance. • Communicated safety messages across the supply chain to the builders and sub-contractors on-site. • Extended safety with an in-depth and specified tender process for constructors. • Safety messages were communicated from the client representative (CEO of the company); these included overall safety philosophies.
❖ Designer
<ul style="list-style-type: none"> • Promoted safety in design by integrating design aspects into all stages across the project. • Factoring in maintenance post-handover was considered crucial at the design stage. • Managed safety risks by implementing best practice to 'pre-empt' potential safety problems. • Planning and preparation for safety issues furthered safe practice – going above and beyond what is standard. • Communicated well with parties, including other design consultants and the project manager, who served as the "letter box" (all communication went through the constructor's project manager).
❖ Constructor
<ul style="list-style-type: none"> • Entrenched safety practices through education as it is the most valuable tool to improve safety. • Safety was communicated (between the constructor and sub-contractors) most effectively through the safety plans that each contractor was required to submit. • Communicating the possible outcome of risky behaviour was identified as best practice stakeholder engagement. • Thought the client was proactive about safety by being highly involved in reporting and monitoring on a near-daily basis. Commented that the client has an intensive focus on safety. • Wanted designers to focus a little more on safety at the post-construction phase. • Managed safety risks by reviews which are crucial to improving safety standards.

4.24 Scots Church Re-development, NSW – Commercial

Key information	Summary	Award
Client: Westfield (Development Executive) Westpoint (Construction and Developer)	This project was the first car stacker to be built under an existing building, with limited access and headroom, in Australia. The project involved the addition of seven mezzanine floors on top of the existing structure. The project had to overcome obstacles such as the proximity of live railway tunnels, which were within approximately 3 metres, and the limited space to allow access for machinery. The site was extremely difficult and there were major challenges in excavation and construction around an existing heritage building.	Winner: 2005 CASE Earth Awards construction excellence <i>Criteria for this award included:</i> <ul style="list-style-type: none"> • Innovative Methods • Industry best practice and use of new technology • Overcoming construction constraints and client satisfaction • Quality, OH&S and environmental management • Interface with other project parties and / or components • Completion within timing deadlines and cost budgets • Technical complexity • Workplace training
Designer: Milton Webster, Van Der Meer Consulting (Structural Engineer)		
Constructor: Civil Ward		
Value: Approximately \$60 million		
Injuries: Low injury rates		

4.24.1 Summary

- Constructor and client worked closely to document OHS conditions and develop a safety manual prior to commencement of works.
- Construction team had to commit to the safety plan.
- Effective communication between all parties was supported by an intensive communication strategy.
- Inductions, risk assessments, continual communication, providing adequate PPE and addressing on-site personnel's concerns and considerations were part of the safety strategy.
- High-risk excavation works required constant communication with the operators. System of warning lights for detecting vibrations near the train lines, near where excavation works took place.

4.24.2 Best Practice

Continuous communication through meetings, inductions and risk assessments, providing adequate PPE (Personal Protective Equipment) and taking safety concerns of on-site personnel into consideration formed a best practice safety approach.

The constructor/client team worked closely to document OHS conditions and prepare a safety manual before the project commenced. After documenting safety practices, it became a team obligation to commit to the safety plan.

Communication was predominantly between site management, the sub-contractors and the necessary authorities, such as State Rail and WorkCover.

With the uniqueness of the excavation works the communication needed to work particularly well. Regular monitoring and daily and weekly meetings assisted with effective communication. It was a difficult aspect of the project, and the fact that all parties were involved and communication was open, made it work.

The client/constructor had a whole project team right down to construction manager. The West Point developers didn't have anyone permanently on-site, they were located at the head office across the road.

A system of safety checks to ensure the existing building was adequate to carry additional floors needed to be initiated, as there was only a verbal assertion to that effect.

West Point (acting as the client) focused on safety by requiring the construction company to document a job plan, which involved safety. This was developed before beginning on-site, but from then it was really the responsibility of West Point construction to implement and further document site-specific procedures in terms of inductions, safety walks and in particular, difficult aspects such as the car stacker and excavation.

The site required a best practice approach to safety for underground excavation work and dust removal as it was an extremely hazardous environment.

Best practice safety was developed through an intensive communication strategy with all on-site personnel. Inductions, risk assessments, continual communication, providing adequate PPE and addressing on-site personnel's concerns and considerations were part of the strategy.

There was constant communication with the operators, based on the fact that the excavation was dug within approximately 3 metres of live train lines. The safety system was set up to ensure if the vibrations became too large, an orange flashing light would go off and work would have to stop and move away from that particular area until it was recorded and investigated.

❖ **Meetings and Communication**

With the State Rail in the excavation there were regular weekly meetings and reports, and daily monitoring. Other meetings included regular toolbox and site safety walks with the safety committee on-site. These were minuted and documented, including documentation for LTIs and near miss incidents.

The meetings with State Rail were attended by the contractor's president, an engineer responsible for that part of the work for the contractor, the civil contract/excavation and the State Rail, and also the geo-technical consultant. From West Point, the project manager and project engineer also attended.

❖ **Training and Inductions**

Each employee was inducted and made aware of particular site-specific requirements. The inductions lasted one hour. Communicating the safety focus occurred at the pre-award meeting when discussions took place with the sub-contractor's management.

Every time there was a lift required or a new part of the job started there was an induction and risk assessment.

4.24.3 Stakeholder Perspectives

❖ Client
<ul style="list-style-type: none">• Demonstrated safety leadership by ensuring all parties could adequately accommodate safety risks, including conferring with external stakeholders from Rail Authority.• Promoted safety in design by maintaining a constant line of communication with the designer.• Communicated safety information to all parties.• Managed safety risk by ensuring the design and safety plan could incorporate all the hazards of the site.• Continuously improved safety performance through communication between all parties.• Entrenched safety practices.
❖ Designer
<ul style="list-style-type: none">• Demonstrated safety leadership through continuous engagement throughout the project.• Promoted safety in design by adapting a lightweight structure for the extension of the heritage building.• Communicated safety information on an on-going basis throughout the entire project.• Managed safety risk through the design safety planning with constructor/client.• Entrenched safety practices by developing innovative solutions to a problematic site.• Architectural design in particular with regard to the façade focused on buildability.
❖ Constructor
<ul style="list-style-type: none">• Communicates safety information throughout all aspects of the project.• Manages safety risk by using appropriate equipment for the job and introducing innovative safety systems such as flashing lights for vibration monitoring.• An OHS conditions and manual (which included the site safety plan) was put together before the project commenced. These conditions and manual drove a team approach by getting out obligations for all stakeholders.• Communications occurred predominantly between site management and the sub – contractors, and the necessary authorities such as the State Rail and Work Cover.• Work method statements were provided. Safety aspects associated with these work method statements would be checked. This is a standard feature for construction works and sub-contractors must provide these.• Monitoring and daily inspections of site specific areas where there are safety issues occurred on a near-daily basis.• Close monitoring was carried out successfully to monitor high-risk excavation works.

4.25 Melbourne Airport Widening, VIC – Airport

Key information	Summary	Award
Client: Australian Pacific Airports, Melbourne	The works involved construction of 7.2 km of concrete pavement to widen the main north-south runway by 7.5 metres each side to accommodate the wingspan of the new A380 aircraft. Some concrete replacement was undertaken as part of the project, and the runway's lighting and other airfield services were also upgraded.	Winner: Australian Constructor's Association and Engineers Australia Construction Achievement Award 2006. <i>Criteria for this award included:</i> <ul style="list-style-type: none"> • Complexity and difficulty of construction • Leadership and project management • The outcomes achieved.
Designer: BECA		
Constructor: John Holland		
Cost: \$18 million		
Injuries: Workplace injuries or incidents: 0		
	Expected to take approximately six weeks (42 days), the project was completed on budget in just over 4 weeks (29 days). Planning, however, took 12 to 18 months.	
	The project was completed without workplace injury or incident. Melbourne Airport remained fully operational 24 hours a day during the entire project.	
	Consultation and talking about safety were significant and outstanding aspects of the Melbourne Airport widening project.	

4.25.1 Summary

- Client personally monitored the site.
- Each stakeholder had a different OHS monitoring system; despite this, information was shared and the project treated like an alliance.
- Safety staff included those without a construction background to give a 'fresh set of eyes' on safety performance.
- Designer-driven health and safety sessions for design team.
- High-risk project with tight timeframes – communication along the supply chain was absolutely essential.
- Design team moved on-site when construction commenced.

4.25.2 Best Practice

The client adopted a hands-on approach and undertook roaming patrols to monitor unsafe practices. The client extended the safety message so that it did not stop at management.

[The safety message] cascaded down to the guys who have actually got the shovel in their hand or screeding the concrete (Client).

The constructor employed full-time safety officers and safety representatives who conducted inductions and inspections on the field. Safety officers appointed by Melbourne Airport focused on identifying potential interface issues or conflicts on the live operational area. The airport also employed aviation safety officers for inspections. Although not that familiar with construction safety issues, the client said these aviation safety officers “brought a fresh set of eyes to look at what was going on.” The client added that the aviation safety officers would “see a construction activity and ... actually ask the question: ‘is *that* the safest way of doing that?’ The fact that they are seeing something brings it to the attention of the contractor.”

During the tender process, the client was looking for two main objectives: safety and finishing the work on time. The second phase looked at price. Designer-driven health and safety sessions were held for the design team, while regular meetings were held with the constructor, client and designers during the design process. This meant that the methodology of the construction process was attended to on a daily basis. Furthermore, the design side had their own OHS staff.

Each of the parties involved – client, constructor and designer – had their own OHS monitoring system. Although the project was a hard-money contract, all parties treated the project as an alliance. The client said that all information was openly shared, including information that contractors generally keep confidential such as production rates and whether they were meeting productivity forecasts.

We basically pushed the line ‘you are not an individual you are part of the team’, so to make sure everyone in the team, looks out of for each other. So it inadvertently ended up a sort of buddy system (Constructor).

❖ **Meetings and Communication**

Constructor, client and designers held regular meetings during the design process. This involved working daily on the methodology of the construction process. Weekly briefings were presented to the client and senior management. Once construction started, part of the design team moved on-site.

John Holland covered every particular aspect of the site in their toolbox meetings, which were described by the client as “very effective”. Area-specific safety analysis and toolbox meetings highlighted safety issues.

The Melbourne Airport project was a high-risk project, since there were over 30 significant services, including water mains, fibre-optic cables and communication links for the aircraft control centres. Because of this, the constructor called special toolbox meetings to brief workers about the dangers inherent in specific areas of the construction site. In addition, areas where excavation was banned were marked clearly on the ground. This exemplified the importance of communicating critical information to the workers ‘on the ground’ to ensure that, as the client put it, “nothing slipped through the net.”

❖ **Training and Inductions**

The constructor provided inductions for all staff members and workers, with a total of 800–1000 inductions for this project. Safety cards with pictures were provided. A full-time safety officer was appointed by the constructor to monitor safety, and the designer and constructor conducted joint weekly inspections.

Since this was an airport project, the client was unable to hand over the project to the constructor. Instead, the client had to give the constructor permission to enter the airfield. Personnel were not permitted to enter the work spaces designated in the methods of work plans unless they had been fully inducted by the Constructor. Further, the constructor had the right to exclude any personnel who did not hold an induction card. All airport staff were also expected to be inducted – even if they had access to the airfield prior to construction works.

4.25.3 Stakeholder Perspectives

❖ Client

- Proactively involved on-site and directly involved in decision making. The client signed off directly on any issues raised by the constructor or designer, without going through extensive paperwork. Decisions were made quickly and effectively. A follow-up memo would be sent confirming what had been agreed.
- Construction method plan had to allow for business to continue uninterrupted during construction phase. Consultation happened over 12 months with Civil Aviation Authority (who required the plan), client and constructor before a construction method statement was agreed upon.
- Strict cleaning guidelines were stipulated and enforced to remove any debris or loose construction materials, which posed major hazards to safety.
- Had strong duty of care in relation to operational safety of the aircraft. They had to protect the aircraft from any risks associated with the works.
- Complete instruction and briefing of the personnel working on-site.
- Communicated safety message along supply chain and praised constructor for effectively communicating safety messages.
- Was fully inducted on-site to ensure they took part in all safety processes.
- Open communication and information sharing between stakeholders, assisted with aligning objectives for completing the project on time and safely.
- Appointed independent safety personnel to oversee what happened.

❖ Designer

- Demonstrated safety leadership by organising their own safety-management plans.
- The design team were based on-site during the project construction phase.
- Communicated safety information to the designer and constructor.
- Undertook site inspections with constructor.
- The design team were closely involved during the planning stage.
- Design planning focused on safety especially, due to the location of construction works (i.e. need to take care of aircraft and the general public).
- Safety was prioritised for designers at formal meetings.
- Safety evaluations of designs were undertaken to determine buildability, operation, maintenance and demolition.
- Design side ran their own health and safety training sessions for their staff that were independent of project (company-specific).
- Closely involved in trying to ensure that designers on the design team integrated safety.
- Company has their own OHS staff. Designers' own OHS manager's role includes visiting sites of projects the company is involved with to carry out health and safety assessments, which are reported back to the managing director.

❖ **Constructor**

- Due to the nature of the works, security needs and time constraints, the constructor had to “virtually re-educate a workforce”. This was achieved through an in-depth induction process that also covered security.
- Security ID tags helped monitor safety effectively.
- Communication and stakeholder engagement were so good that the project “ran like an alliance”.
- Any aspect of the project that needed to be refined was effectively followed up, including ensuring that everyone had complied.
- The constructor-appointed safety officer undertook roaming patrols and communicated effectively with on-site personnel to inform them of any refinements.
- Charged everyone with ‘owning safety’. This also resulted in an informal ‘buddy system’.
- Drove a top-down approach to safety.
- Said the designer was proactive about safety, by allowing changes to the design that could affect safety outcomes, and by working on-site once the construction began.

4.26 Orange Aerodrome Reconstruction, NSW – Airport

Key information	Summary	Award
Client: NSW Government and Orange City Council	The aerodrome needed reconstruction works. After monitoring the pre-existing pavement, the constructor discovered a large portion of some sections would need replacing.	Winner: Australian Constructor's Association and Engineers Australia Construction Achievement Award 2006 <i>Criteria for this award included:</i> <ul style="list-style-type: none"> • Complexity and difficulty of construction • Leadership and project management • Outcomes achieved.
Designer: Pavement Management Services		
Constructor: Scott Young, Pavement Salvage Pty Ltd/Works and Infrastructure		
Value: Approx. \$0.5 million		
Injuries: LTIFR: 0		

4.26.1 Summary

- A 24/7 safety hotline was made available for any safety issues related to the project. This was accessible by anyone in the community and automatically registered issues on a computer system. This initiative also eliminated paperwork and delays.
- Design team developed six design options and potential hazards associated with each of these. This breakdown assisted the design team with selecting the best rehabilitation method.
- Safety benchmarks were set to assist maintenance of a safe workplace.
- Compliance with Aviation Authority legislation and guidelines for when the aerodrome would be operating and what areas were permitted for work were necessary.
- A best practice policy of gathering information was established where the constructor attempted to ensure that all written forms were filled in correctly and filed appropriately.
- Constructor worked with the aviation industry, particularly RPT Airlines, and negotiated work times to minimise disruption to flights.
- Constructor developed a methodology to set out construction work schedules and flight considerations.
- '600 eyes' program encouraged personnel to monitor, record and report any hazards.
- Disposable cameras were distributed in training sessions, and kept in Council vehicles for monitoring safety.

4.26.2 Best Practice

Inherent hazards and pavement design options were the biggest considerations from a design perspective. The design team covered six design options. The potential hazards associated with each of these designs were also considered. This breakdown assisted the design team with deciding which rehabilitation method to choose.

Since this was a small project, there was an informal approach to communication and a collective attitude to working together.

Before the commencement of works, stakeholders spent much time liaising and discussing strategies for developing the project.

Setting safety benchmarks for personnel assisted in the facilitation of a safer workplace. All relevant legislation was complied with, and standard Council work method statements were developed. Compliance with the Aviation Authority legislation was considered best practice by the constructor. The Aviation Authority set out guidelines for when the aerodrome would be operating, and the areas on which they were allowed to operate. This plan was developed before the work began.

A unique working plan was established. This working plan set out specific requirements for an aerodrome project.

The constructor implemented a best practice policy of gathering information, attempting to ensure that all forms were filled in correctly and filed appropriately. This was closely monitored to ensure full compliance.

❖ **Meetings and Communication**

Orange Council managed the project and communicated information to stakeholders at informal briefings. No formal meetings were held. Communication was the most effective aspect pointed out by most of the stakeholders.

When dealing with Orange Council we are comfortable with informal communication, but not with all clients. [Communication] is relationship based (Designer).

The constructor said that they spent time working and liaising with the Aviation Authority, in addition to RPT Airlines, with whom the constructor negotiated issues such as when works would take place (to minimise disruption to RPT's business). The constructor then developed a methodology that set out construction work schedules and flight considerations.

Before the project started, meetings were held weekly. These were attended by the aerodrome manager, the senior overseer and a constructor representative. The senior overseer liaised with a contractor, Pavement Salvage, who supplied a large amount of equipment and resources.

A toolbox meeting took place every morning, primarily to co-ordinate tasks. This included effectively managing nearly 41 kinds of plant equipment operating on the runway.

❖ **Training and Inductions**

Before personnel were allowed to work on-site, they had to obtain an induction certificate, insurance, and a license for the specific plant equipment that they would be operating.

Several personnel working for the constructor's team were trained in mitigation techniques. This meant that, in the case of an incident such as a public liability claim, workers' compensation issue or other safety incident, there were strategies in place to manage the event. All issues were discussed fortnightly at a senior staff level.

The designer did not participate in the induction since they visited the site before construction started. The designer communicated with other stakeholders by telephone.

❖ **Safety Development across Project Stages**

Orange City Council briefed the constructor regarding their requirements. In response, the constructor formulated draft ideas and then liaised with the Council. The Council provided suggestions to refine the plan, including design suggestions, and proposed a list of questions relating to the design.

Designs were limited by the materials that could be used, since some materials were regarded as being too risky to use on-site.

An aerodrome groundsman was on-site for the duration of works. This person monitored aircraft frequency and other related issues.

During the reconstruction process, the aerodrome was closed during the day. In the evening, some protocols were put in place. This ensured that the airlines were contacted and advised when and if the pavement was ready for landings. This meant breaking the work up into small components each day so that the job could be closed off at the end of the day, which would make the strip available for aircraft operations.

The reconstruction occurred while keeping the facility as operational as possible (Constructor).

A design consultant was employed for part of the design. The geometric design was undertaken in-house, and the pavement design was undertaken by Pavement Management Services. The constructor spent a lot of time liaising with the designers to develop the most effective design.

The design consultant, Pavement Management Services, which undertook the seal and pavement design works, had to altered the designs a few times to make the designs compatible with the resources and labour skills that the Council had available.

❖ **Monitoring**

The '600 eyes' program is used to instil the message into workers that they can identify risks and report them (Constructor).

The constructor said that the '600 eyes' program was an integral part of the project. There were no special payments for safety performance. However, the constructor encouraged personnel to monitor, record and report any potential hazards or risks. The constructor distributed disposable cameras in training sessions. These were kept in every Council vehicle to record any possible or actual safety incidences.

A twenty-four hour, seven-day-a-week hotline was set up so that anyone – including members of the community – could contact the Orange Council regarding the project. This hotline was answered by counter staff at the Council office during standard working hours and by a person working for the construction team in the evening. Security workers appointed by the client were responsible for answering the phone throughout the night. They would contact the appropriate person if there were a serious incident that needed to be dealt with immediately.

The hotline extended to the community. Cards were distributed at precinct meetings, where it was emphasised that, if anyone saw an incident or potential hazard such as a pothole, they should call the hotline. This also meant that council staff did not have to fill out paperwork since the relevant information was automatically entered into a computer system and tracked. All supervisors had mobile phones or two-way radio so they could call the hotline office to register any safety issue.

4.26.3 Stakeholder Perspective

❖ Client and Constructor
<ul style="list-style-type: none">• Liaised with other stakeholders progressively throughout project stages, including by means of a hotline.• Monitored safety rigorously with various community engagement programs and provided technological support mechanisms to carry this out.• During the planning stage, much time was spent liaising with stakeholders (including a number of design consultants) and discussing how work would be undertaken.• A design consultant was recruited for part of the design. Much time was spent liaising with them to develop the most appropriate design to complete the works.• The constructor ensured that the designs were commensurate with skills and the equipment available to undertake works.• Both formal and informal communication was 'very effective'. Strategic meetings were held throughout the project. Everyone was familiar with one and other.• Training was aided with inductions. All personnel had to possess a construction induction certificate and a license for any plant they would be using.• Much time was spent training personnel in OHS. The constructors own staff had more OHS training the sub-contractors.• Staff participated in a six hundred eyes program, where all employees were encouraged to identify any situation, act or condition that may be considered unsafe and report it. All staff took part in the program. The program was used to instil the message into workers that they can identify risks and report them.
❖ Designer
<ul style="list-style-type: none">• The design team was hired as consultants and were located off-site. Their role involved planning and developing specifications for the actual job.• The designer was responsible for developing the paper design for the structural rehabilitation design and the material specifications for the construction.• Identifying and limiting risks were recognised as best practice.• All communication was conducted through Orange City Council. The Council briefed the design team as to their requirements, the designers developed draft ideas, which were then sent back to the Council. The Council provided feedback for refining the designs, and they briefed the constructor. The designers were provided with list of questions.• Orange City Council drove safety as a priority. All briefings were informal. The small size of the project allowed for effective relationship building, where formal boundaries were not necessary and the approach was informally prescriptive.• The safety focus was included in part of the initial design scope provided by the client. The client effectively understood safety in the design process.• Safety initiatives included: JSAs, effective signage and induction training.• The designer did not participate in an induction as they only visited the site prior to the commencement of construction works.

4.27 Sydney Airport Gate 24, NSW – Airport

Key information	Summary	Award
Client: Sydney Airport Corporation Ltd (SACL)	This involved an upgrade to an existing facility. To accommodate the new A380 airliners, Sydney Airport Gate 24 needed to be extended to provide accessibility to fixed link and aero-bridges for these larger aircraft. The A380 requires three aero-bridges per gate. Wider and longer fixed link aero-bridges were developed for greater circulation space. These new upgrades mean that more than 400 or 500 people could be unloaded from an A380. The extension will also be suitable for 747 aircraft.	An award was not presented for this project. This project was selected by the taskforce for its low injury rates.
Designer: Hassell		
Constructor: Buildcorp		
Value: \$14.5 million		
Injuries: LTIs: 1 finger laceration		

4.27.1 Summary

- Client was intimately involved with activities on-site, maintained frequent communication with the contractor and closely monitored safety.
- Breaches for any sub-contractors that did not comply with the safety processes; notices were issued and a dismissal was warranted if three breaches occurred.
- Each contractor needed to produce a site-specific safety plan, which was reviewed by an independent consultant on behalf of SACAL and then the construction manager.
- OHS administrator was appointed by the construction company, and attended the site weekly.
- The Director of Assets Management for SACL met with all the project managers working on the project to discuss safety; this was followed by half-day courses covering the legislated safety responsibility of project managers.
- The project manager or an external consultant undertook spot checks, including checking that personnel had complied with their work methods statement.
- Safety policy was communicated during the tender process.

4.27.2 Best Practice

Airport works are high risk, so this project required great attention to safety. This was identified by all stakeholders. Safety considerations also included security on-site, and sufficient training and induction for any personnel who were employed by the client, Sydney Airport, but not necessarily for the construction project.

Although the site manager was primarily tasked with monitoring safety, they also monitored security aspects of the airport. According to the client, safety and security went “hand in hand”. Personnel were issued with a notice if they breached safety. If any person was issued with a third notice, they would be removed from the site permanently. Furthermore, a booklet was issued to record safety breaches.

SACL was obliged to ensure that anyone working at the airport had undergone training, especially for working at heights. Some of the meetings were the designer's responsibility and some were SACL's responsibility. The designer carried out the risk assessments on this project, although this is not typically their responsibility. Corporate Risk Assessment Services also undertook risk assessments, along with other safety specialists on the project. The designer was not involved from the beginning of the project.

The designer commented that the client appointed OHS personnel involved in the project to "stay abreast of all current issues" in order to minimise risks.

The construction company appointed an OHS administrator, who attended the site weekly. SWIMs were provided by each contractor. These documents detail specifications contractor such as access to the airport and work/safety procedures for being in close proximity to aircraft fuel points.

SWIMS that all the contractors issue are quite detailed in the way they have said they will perform their work. The SWIMS are then reviewed: we have a standard series of questions that we look at when we review the sheet. We send that back to the contractor and have them review their SWIM. Also, then the SWIM is submitted to SACL and they have an external consultant that then reviews it and makes comment as well (Constructor).

SACL maintained a regular presence on-site, as well as regular communication with the contractor, which, according to the project manager, demonstrated a joint effort to maintain safety on-site.

The safety policy was communicated during the tender process, which meant that safety procedures did have to be dictated continually to the contractor.

❖ **Meetings and Communication**

The client was based on-site, ensuring good opportunities to communicate daily with other stakeholders. The client was on-site nearly every day.

Weekly meetings were held with the contractor and SACL representatives to discuss operations. The client held internal meetings that dealt with other projects simultaneously being undertaken. This meant that any interactions between projects, such as any lessons learned from another project, were discussed fortnightly with other project managers within SACL.

Design meetings were held fortnightly. These were attended by the constructor. On-site issues and resolutions were discussed. Design issues were continually arising since it was a new project, thus requiring an RFI (request for information). This procedure was carried out along the supply chain from the contractor who requested information on design aspects to the site manager who liaised with the designer. The issue was tracked with a paper trail.

All communication between the designers and contractors went through the client's representative. The designer and contractor spoke directly on a few matters, but the client was always informed of the results of those conversations.

Airport safety was paramount for the constructor. The contractor reported safety results at monthly project control group meetings. The constructor said they maintained "excellent communication" with the client group from the tender period onwards. The constructor held weekly site meetings, as well as the monthly project control group meetings with the client.

SACL and their external consultant visited the site unannounced during the week at various times to conduct random safety audits.

❖ **Training and Inductions**

Before anyone could go on-site, they needed to participate in an induction and produce their safe work methods statement.

The client was involved in the site induction, which they said was “fairly standard”. They attended other people’s site inductions and some toolbox talks. The client was inducted so they could access the site as a party of the process.

❖ **Safety Development over Project Stages**

The design risk assessment report (called a Predictive OHS Risk Review for architectural considerations) was carried out following consultations with SACL, the design representatives and Airport Equipment Limited, who made the aero-bridges.

The scope of the report was to identify the risks associated with operation of the modified terminal facilities when used in accordance with normal operating procedures. The report determined and assessed the potential exposure to airport staff, contractors and other people who may be affected by activities at the airport. Furthermore, recommendations were included to mitigate risk and conform to occupational health and safety requirements. This report was coupled with a standard risk assessment matrix.

The SACL director of assets management met with all the project managers working on the project to discuss safety. This initiative was followed by a half-day course that covered the legal responsibilities of project managers for each project. The safety responsibilities for each of the project managers were clearly set out.

Spot checks without notice were undertaken on-site. Reviews of methods statements were followed up by an on-site visit by the independent consultant or project manager. This included checking that personnel had complied with their work methods statement. The client preferred that checks be undertaken roughly every two weeks.

A site-specific safety plan and safe work methods statements needed to be drawn up and reviewed before any contractor could access the site. These site-specific plans were reviewed by an independent consultant on behalf of SACL. They were also reviewed by the construction manager.

The design risk assessment undertaken before tendering was reviewed by the design team internally and then by SACL for issues such as safety in construction and long-term maintenance.

4.27.3 Stakeholder Perspectives

❖ Client
<ul style="list-style-type: none">• Demonstrated safety leadership by acting as the 'project manager' and reviewing the safety plan.• Communicated safety information through being based on-site and communicating daily with the constructor.• Was informed of any decisions that were made – not to take control of these decisions but to act as a type of mediator.• Extended safety practices by monitoring, reviewing and communicating safety on-site.• Managed safety risks by appointing an independent safety reviewer to monitor safety.
❖ Designer
<ul style="list-style-type: none">• Managed safety risks by undertaking extensive risk management and reviews before work began.• Meetings and communications specifically about design issues were a feature; on-site issues and resolutions were discussed.• Extended safety practices by incorporating safety aspects into designs and reviewing pre-tender design risk assessments after tender.
❖ Constructor
<ul style="list-style-type: none">• Best practice included continually monitoring and covering all safety aspects of the project for possible effects and variables.• Satisfied with the safety focus on the project.• Communicated safety along the supply chain; acted as the communication conduit for stakeholders.• Reviewed safety practices in the safety plans submitted by contractors.

5 CONCLUSIONS

The case studies contained in this report offer a comprehensive study of best practice safety in construction projects. This research has identified 27 projects drawn from the construction sub-sectors of infrastructure, commercial, rail, residential and airports across Australia that can demonstrate outstanding safety performances. The recognition of best practice safety in construction through awards indicates the existence of projects that have developed innovative and successful ways of achieving excellent safety outcomes.

These were often high risk projects where safety was at a premium. Risky conditions also meant that the exemplary safety performance was hard-won. Building close to live electric railway lines, constructing a new nuclear reactor in closely confined spaces, and working with specialised equipment at heights and in high winds are just three examples of hazards beyond the ordinary site conditions that projects selected for this study had to overcome, and which may have been expected to adversely impact on the safety record of the projects.

The research has found that clients, designers and constructors involved in the projects have all contributed to achieving safety best practice in varying degrees. This sense of shared responsibility and collaboration among the project team members allowed those involved in the project to develop innovative solutions to problems as they were identified in planning or arose during the project.

This research has analysed each project case study to determine the types of safety practices that have contributed to this superior performance. Planning, communication, information sharing, monitoring, incentives and training are key issues in safety. However, it is not simply the inclusion of these elements that provides the key to safety performance. The case studies have shown that projects are developing tailored and innovative responses to safety responsibilities in planning, communication, training and safety monitoring. Planning needs to be multi-level and ensure the early integration of stakeholders. Intensive and targeted communication, particularly along the supply chain, proved effective in improving the safety culture, which in turn improved safety performance.

Open management systems were one aspect of information sharing that established good safety outcomes in projects. Shared stakeholder responsibility offered both good relationships and good safety outcomes. Areas such as work-life balance also proved to be key contributors to safety, as initiatives that focused on promoting good health and quality of life resulted in attention to safety outcomes as part of overall health management. The role of incentives such as barbecues, dinners and awards in establishing good safety records is also clear in many projects. While monitoring is a required element of construction safety, often projects developed innovative approaches to safety monitoring, such as the use of disposable cameras for those on-site to photograph safety problem or issues. Training and inductions are another necessary step in promoting safety but best practices involved bringing designers and clients into the training and induction regime, ensuring that 'non-construction' safety-trained professionals were involved in assisting with site safety, and that safety training involved cross-disciplinary teams.

Thus we see that achieving exemplary safety records and outcomes requires first a strong commitment to safety by all stakeholders, and then a multi-strategy approach to achieving safety that is integrated across the project.

6 REFERENCES

- Alves Dias, LM (1999) "Construction Safety Coordination in Portugal", in id. and RJ Coble (eds), *Proceedings of the Conference on Construction Safety Coordination in the European Union*, CIB Publication 238, CIB Working Commission W99. Lisbon: CIB, pp. 153–163.
- Australian Government (2007) *business.gov.au* website:
<http://www.business.gov.au/Business+Entry+Point/Business+Topics/Fair+trading/Codes+of+Practice.htm> (accessed 15 Jan, 2007).
- Australian Procurement and Construction Council (1997) *National Code of Practice for the Construction Industry* website: http://www.apcc.gov.au/docs/code_of_practice.pdf (accessed 09 Jan, 2007).
- Australian Procurement and Construction Council (2006) *Implementation Guidelines for the National Code of Practice for the Construction Industry* website:
<http://www.apcc.gov.au/docs/implementationguidelines1june2006.pdf> (accessed 17 Jan, 2007).
- Cavana, R, B Delahaye & U Sekaran (2001) *Applied Business Research: Qualitative and Quantitative Methods*. Singapore: John Wiley & Sons Australia Ltd.
- Cole, T (2003) *Final Report of the Royal Commission into the Building and Construction Industry: Summary of Findings and Recommendations, Volume 1* (Cole Royal Commission Report). Canberra: AGPS.
- Lingard, H & S Rowlinson (2005) *Occupational Health and Safety in Construction Project Management*. New York: Spon Press.
- Rozen, P (2004) "Of Window Sills and Board Rooms: An Employer's Responsibility to Ensure the Safety of its Workplace", *Employment Law and Industrial Relations 2004:Session 9: Occupational Health and Safety*. Melbourne: Leo Cussen Institute.
- Supreme Court of Victoria (1992). In *Holmes v R.E. Spence and Co Pty Ltd* 5 VIR 119 at 123.
- Suraji, A, R Duff & SJ Peckitt (2001) "Development of the Causal Model of Construction Accident Causation", *Journal of Construction Engineering and Management*, 127(4) 337–344.
- Wild, B (2005) Occupational Health and Safety – The Caring Client. in K Brown, K Hampson & P Brandon (eds) *Clients Driving Construction Innovation: Mapping the Terrain*, 22–39. Brisbane: CRC for Construction Innovation, Icon.Net.

7 GLOSSARY

BCA	Building Code of Australia
CHAIR	Construction Hazard Assessment Implication Review
EHS	Environmental Health and Safety
FAIFR	First Aid Injury Frequency Rate
IIF	Incident and injury free program
JSA	Job Safety Analysis
KPI	Key Performance Indicators
LTI	Lost Time Injury
LTIFR	Lost Time Injury Frequency Rate
OHS	Occupational Health and Safety
PCG	Project Control Group
PPE	Personal Protective Equipment
ROAD	Risk, Opportunity and Design
SIW	Site Infrastructure Works
SuMS	Surveillance Management System
TRIFR	Total Recordable Injury Frequency Rate
WET	A global, internet-based, real-time reporting system
WHSO	Workplace Health and Safety Officer

APPENDIX A – INTERVIEWS

A Interview Research Questions

A.1.1 Best Practice

1. In your opinion, what is best practice in safety?
2. Please outline the elements of best practice in OHS in this project.

A.1.2 Communication

3. How did communication occur between the key project personnel? Through which channels? [project manager, designer, constructor/builder, client/owner]
4. What didn't work well with this approach to communication?
5. How would you change this for the future?

A.1.3 Safety Goals

6. How were safety goals communicated among the different contracting parties?
7. Who was primarily responsible for driving safety as a priority? Why? At what point in the project was this decided?
8. At the operational level, where did the safety messages come from? [line manager, direct supervisor, organisation, colleagues]

A.1.4 Organisational Safety Focus

9. How were stakeholders engaged/persuaded to prioritise safety/discuss safety issues?
10. What process/mechanisms were specifically in place to allow a safety focus?
11. Who did you feel you could most easily talk to about safety? [project manager/client/constructor/designer] Why?
12. What did they do to make you feel this way?

A.1.5 Evaluation of Safety Roles

13. In your opinion, what did the client/owner do to focus on safety?
14. How effective was this approach? What would you change for the future?
15. What are the key safety issues for the client?
16. In your opinion, what did the designer do to focus on safety?
17. How effective was this approach? What would you change for the future?
18. What are the key safety issues for the designer?
19. In your opinion, what did the constructor/builder do to focus on safety?
20. How effective was this approach? What would you change for the future?
21. What are the key safety issues for the constructor?

A.1.6 Safety Outcomes

22. What were the safety outcomes from this safety management practice? [LTIFR, TRIFR, first aid injuries, near-miss incidents, estimated cost versus actual cost?]

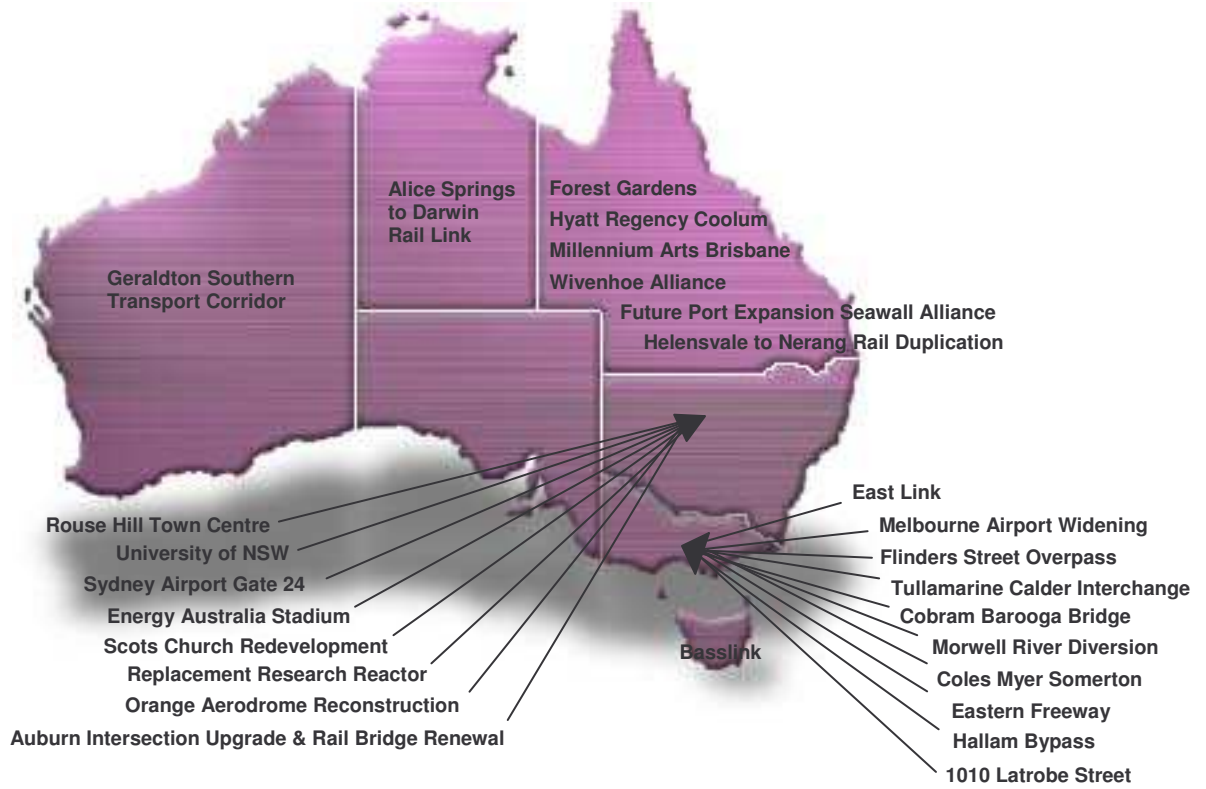
A.1.7 Other

23. Please outline other safety practices [both good and bad] inherent in this project.
24. Any other information you would like to add? Any other projects with above-average safety performance?

APPENDIX B – LIST OF CASE STUDIES

Project	From	Type
1. 1010 Latrobe Street	VIC	
2. Auburn Intersection Upgrade and Rail Bridge Renewal	NSW	Infrastructure
3. Basslink	TAS	
4. Cobram Barooga Bridge	VIC	
5. Eastern Freeway	VIC	
6. Eastlink	VIC	
7. Flinders Street Overpass	VIC	
8. Future Port Expansion Seawall Alliance	QLD	
9. Geraldton Southern Transport Corridor	WA	
10. Hallam Bypass	VIC	
11. Morwell River Diversion	VIC	
12. Replacement Research Reactor	NSW	
13. Rouse Hill Town Centre	NSW	
14. Tullamarine Calder Interchange	VIC	
15. University of NSW	NSW	
16. Wivenhoe Alliance	QLD	
17. Coles Myer Somerton	VIC	
18. Energy Australia Stadium	NSW	
19. Millennium Arts Project	QLD	
20. Alice Springs to Darwin Rail Link	NT	Rail
21. Helensvale to Nerang Rail Duplication	QLD	
22. Forest Gardens	QLD	Residential
23. Hyatt Regency Coolum	QLD	
24. Scots Church Redevelopment	NSW	
25. Melbourne Airport Widening	VIC	Airport
26. Orange Aerodrome Reconstruction	NSW	
27. Sydney Airport Gate 24	NSW	

APPENDIX C – LOCATION OF CASE STUDIES



CRC for Construction Innovation participants

INDUSTRY

GOVERNMENT

RESEARCH

ARUP

Bovis
Lend Lease

BROOKWATER

John Holland

WOODS BAGOT

dem

Rider Hunt

Queensland Government
Department of Main Roads
Department of Public Works
Department of State Development, Trade and Innovation

Building Commission

Department of Housing and Works

CRC Construction Innovation
BUILDING OUR FUTURE

CSIRO

RMIT UNIVERSITY

QUT

The UNIVERSITY of NEWCASTLE AUSTRALIA

The University of Sydney

Curtin University of Technology

BSA
BRISBANE CITY

ABCB



The *Guide to Best Practice for Safer Construction* has been developed following a detailed review of practical Australian and international best practice initiatives.

The Guide suggests a framework to improve safety performance on construction projects and covers all stages of a project: planning, design, construction and post-construction. Its overarching objective is to reduce the number of accidents and deaths on construction sites and to improve the ability of the industry as a whole to deliver safer construction projects and healthier employees.

The three primary stakeholder groups of the construction industry – clients, designers and constructors – have worked together to create a methodology which integrates occupational health and safety into strategic and operational decision-making at all stages of the project.

The Guide is intended to be an aspirational document that leads discussion and industry change, as well as a practical tool which can be used across the industry by clients, designers and constructors and by large firms and small and medium-sized enterprises.

Guide to Best Practice for Safer Construction: Implementation kit



The *Guide to Best Practice for Safer Construction: Implementation kit* is available from www.construction-innovation.info.

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