

Fatigue Management Plan

A practical guide to developing and
implementing a fatigue management plan
for the NSW mining and extractives industry



Industry &
Investment

Acknowledgements

This plan was prepared by the NSW Mine Safety Advisory Council's (MSAC) Fatigue Working Party, with assistance from consultant Dr Tim Driscoll of ELMATOM Pty Ltd. It draws on information from a variety of sources, but is based particularly on two sources: a report prepared by Andrea Shaw (*Guidelines on Fatigue Management*) which, in turn, had input from Dr Sally Ferguson of the Centre for Sleep Research at the University of South Australia and which incorporated comments and suggestions from throughout the mining industry, and material based on Queensland's *Guidance Note for Management of Safety and Health Risks associated with Hours of Work Arrangements at Mining Operations*; and a jointly authored WorkSafe Victoria and WorkCover New South Wales report (*Fatigue - prevention in the workplace*). A third relevant publication, the WorkSafe Victoria publication *Fatigue in Mines*, which incorporates some of the first two publications, was also consulted. With permission, passages from the first two documents have been reproduced and incorporated into the text of this document without individual identification and attribution because this would have significantly interfered with the flow of the document.

Organisations represented on the MSAC Fatigue Working Party are: the Australian Workers Union; Cement Concrete and Aggregates Australia; Construction, Forestry, Mining and Energy Union (Mining and Energy Division); Mine Safety Advisory Council; Industry & Investment NSW; and the New South Wales Minerals Council.

NSW Mine Safety Advisory Council

The NSW Mine Safety Advisory Council has the strategic objective of achieving world-leading occupational health and safety through the development of changes in health and safety culture throughout the mining industry in NSW.

The Council was established in 1998 following recommendations made in the 1997 Mine Safety Review and Gretley Inquiry. The Council was strengthened in 2006 through: the setting up of a secretariat within the existing structure of Industry & Investment NSW; the appointment of two independent

experts in OHS; and making resources available, when appropriate through Industry & Investment NSW, on the Council's recommendation to explore issues and commission research.

The Council includes senior officials from some of the most respected bodies in the mining industry including the CFMEU (Mining and Energy Division), Australian Workers Union, NSW Minerals Council and Cement Concrete and Aggregates Australia. Two independent experts in occupational health and safety are also part of the Council. Mr Norman Jennings was appointed Chairman of the Council in 2006.

The Council was established to provide the Minister for Mineral Resources with advice on critical OHS issues to the NSW Government. The Minister brings these matters to the Council for its consideration, requesting its advice on appropriate ways forward in the continual drive to foster improved OHS performance in the industry.

Research into key OHS issues in the mining industry was commissioned by the Council and released as the *Digging Deeper Report* in 2007. The Council hosted a CEO Summit in November 2008 which issued a communiqué outlining a joint vision for the industry and an agreement on a set of guiding principles that will help ensure the industry has a dynamic culture to address key health and safety issues.

The Council is focused on addressing the areas of culture change; fatigue; negative impacts of safety incentive schemes and production bonuses; the disconnect between OHS systems and practice; contemporary health issues, including musculoskeletal disorders; and OHS issues affecting contractors and inexperienced workers.

Development and implementation of a Fatigue Management Plan for the NSW mining and extractives industry.
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Glossary

Active work	Total time spent at work including overtime. This does not include time traveling to or from the work site or rest breaks during shifts.
Employee/worker	Any person who works on the site, regardless of their employer. This includes contractors.
Operator/employer	Any person or organization responsible for the employment of one or more employees/workers on site.
Extended working hours	Any working hours in excess of established rostered hours, including overtime.
OHS	Occupational health and safety.
Rostered hours	The hours for which an employee/worker is rostered to work.
Time not working	Time outside of working hours. Does not include time traveling to or from the work site.
Work cycles / rosters	The working period scheduled between any significant break away from work.
Work schedules	The hours to be worked for each day, shift, week, month or year, as scheduled by the employer.
Shift	The hours between the start and finish of established rostered hours.

Obligations and NSW legislative and regulatory requirements

Relevant laws oblige fatigue to be eliminated or controlled Obligations exist under the *Occupational Health and Safety Act 2000* and *Occupational Health and Safety Regulation 2001*, the *Coal Mine Health and Safety Act 2002*, and the *Mine Health and Safety Act 2004* to eliminate, or where they cannot be eliminated, control fatigue risks.

Duty holders

Duty holders under these laws are

- Operator
- Controller
- Employer
- Employee

Obligations of operators, controllers and employers

Operators, controllers and employers must apply systematic prevention programs

- Ensure the health, safety and welfare of employees and visitors to the workplace with regard to fatigue
- Have a health and safety management system or plan
- Consult with employees and those doing the work on fatigue risks
- Identify fatigue hazards
- Assess fatigue hazards
- Eliminate or control fatigue risks
- Provide information and instruction on managing fatigue risks
- Provide supervision of work practices

OHS law obliges operators / employers to provide a safe and healthy work environment All mining operators/employers are subject to the New South Wales occupational health and safety legislation. This legislation requires all employers, including mining operators/employers, to act in certain ways and to achieve certain outcomes. Amongst other things, this means that all mining operators/employers are required to provide a safe and healthy working environment for their employees/workers and visitors to the workplace. Individual behavior outside of work can have a considerable influence on fatigue.

Employees and visitors

Report hazards; cooperate in managing risks

- Cooperate in managing fatigue risks
- Report any hazards or problems relating to fatigue

What is fatigue and why is it a problem? (Chapter 1)

Fatigue is a state of impairment Fatigue can be defined as a state of impairment that can include physical and/or mental elements, associated with lower alertness and reduced performance.

Who needs a fatigue management plan? (Chapter 2)

All sites to conduct a fatigue risk assessment to decide if a fatigue management plan is needed All mines must conduct a fatigue risk assessment. A written and auditable management plan is required for all operations that have working time arrangements that:

- do not only have a day shift (that operates between 6:00 am and 7:00 pm);
- involve more than 48 hours in any consecutive five-day period (working on each day); or
- do not have a minimum of two consecutive days off in any seven-day period.

A fatigue management plan is also required if a fatigue hazard is identified during the risk assessment.

An operation's fatigue management plan should cover managers, professional staff, contractors and those who work on planned rosters and unplanned work, such as overtime and call outs. Commuting times should also be considered.

Developing and implementing a fatigue management plan (Chapter 2)

Help to develop a site-specific fatigue management plan This document is designed to help operations and mining contractors develop a comprehensive fatigue management plan that is specific to their work. It proposes a suggested structure and approach, however, each plan can be expected to be different because it must take into account the specific hazards, risks and tasks at the mine. An implementation and management plan must be developed through a consultative process. The developed plan should be clearly documented, readily available for use and inspection by all relevant persons, and reviewed on a regular basis. It should also be integrated into the overall site health management plan, contractor management arrangements and the operation's health and safety management system or plan. The fatigue management plan should be implemented as soon as possible.

Policy commitment (Chapter 3)

A commitment to effectively manage fatigue The organisation should make a firm policy commitment to effective fatigue management. This policy should make it clear to management, employees/workers (including contractors) and visitors that the operator/employer is committed to ensuring proper control of fatigue risks that might affect the health and safety of those involved in the work or those affected by the work.

Consultation (Chapter 4)

Involve those most likely to be affected by fatigue Development of the fatigue management plan requires early and on-going consultation with all relevant groups. Such consultation is legally required. It is important to involve employees/workers, as they are the persons most likely to be at risk of developing ill health as a result of work-related exposures.

Role clarity (Chapter 5)

Identify everyone's role The roles and responsibilities of persons within the organisation who will have responsibility for developing and implementing the plan should be identified.

Risk management (Chapter 6)

Risk management is the key to an effective fatigue management plan The key aspect of developing a fatigue management plan for a specific workplace is to undertake thorough risk management. This involves hazard identification and risk assessment, control of the risks and evaluation of the effectiveness of the risk control process. Risk assessment is a dynamic process, and the work environment and systems should be evaluated regularly. To assist the risk management process, tools and guidance are provided in Table 2 and Appendix 2 of this document.

Documentation (Chapter 7)

The plan must be documented A fatigue management plan must be fully documented and integrated as part of an overall health and safety management system or plan. The plan must be able to be audited and assessed.

Implementation (Chapter 8)

Risk controls must be put into action if the plan is to be a success The fatigue management plan must be properly implemented. Without adequate risk controls being put in place, the work that has gone into preparing the fatigue management plan will not be useful. Key issues to consider in implementing the plan include timeframes, training, roles and responsibilities, communication and participation.

Evaluation (Chapter 9)

The plan must be reviewed to make sure it is working All aspects of the fatigue management plan should be audited and reviewed at regular intervals to ensure continuing suitability, adequacy and effectiveness of the controls for eliminating risk. The plan must be reviewed when circumstances change at the mine, rostering patterns change, or when there is any indication that fatigue risks are not being controlled.

1.1 Background

What is fatigue?

When fatigued, physical or mental activity becomes more difficult to perform

Fatigue can be defined as a state of impairment that can include physical and/or mental elements, associated with lower alertness and reduced performance. Signs of fatigue include tiredness even after sleep, psychological disturbances, loss of energy, and inability to concentrate. Fatigue can lead to incidents because employees/workers are not alert and are less able to respond to changing circumstances. As well as these immediate problems, fatigue can lead to long-term health problems.

What causes fatigue?

Fatigue builds when there is not enough rest or sleep between activities

Fatigue results from insufficient rest and sleep between activities (eg from poor quality sleep). The inter-related causes of fatigue include:

- the time of day that work takes place
 - the length of time spent at work and in work-related duties
 - the type and duration of a work task and the environment in which it is performed
 - the quantity and quality of rest obtained prior to and after a work period
 - activities outside of work, such as family commitments or a second job, and
 - individual factors, such as sleeping disorders.
-

Acute fatigue arises from long periods of wakefulness without adequate rest

Acute fatigue is caused by immediate episodes of sleep deprivation; for example, because of long periods of wakefulness from excessively long shifts or night shifts without adequate daytime rest. Ongoing sleep disruption can lead to sleep debt and chronic sleep deprivation, placing individuals in a state of increased risk to themselves and to others. It results in:

- unpleasant muscular weariness
- tiredness in everyday activities, and
- reduced coordination and alertness.

If sleep deprivation continues, work performance can deteriorate even further.

Fatigue can result from features of the work and the workplace and from features of an employee/worker's life outside work. Levels of work-related fatigue are similar for different individuals performing the same tasks. Work-related fatigue can and should be assessed and managed at an organisational level. The contribution of non work-related factors varies considerably between individuals. Non work-related fatigue is best managed at an individual level.

Work-related causes of fatigue

Work-related causes of fatigue include:

- aspects of the tasks being undertaken (eg greater workload within standard shifts)
 - roster design (eg too many consecutive night shifts)
 - Unplanned work, overtime, emergencies, breakdowns and call-outs
 - features of the working environment (eg noise or temperature extremes) and
 - commuting times.
-

Non work-related causes of fatigue

Non work-related causes of fatigue include:

- sleep disruption due to ill family members
 - strenuous activities outside work, such as a second job
 - sleep disorders
 - inappropriate use of alcohol, prescription and illegal drugs, and
 - stress associated with financial difficulties or domestic responsibilities.
-

Why is fatigue a problem?

Fatigues increases the risk of incidents and long-term health problems

Fatigue causes an increased risk of incidents because of tiredness and lack of alertness. When employees/workers are fatigued they are more likely to exercise poor judgment and have a slower reaction to signals. This can increase all risks on site because fatigued employees/workers are less able to respond effectively to changing circumstances, leading to an increased likelihood of incidents due to human error.

Fatigue can also result in long-term health problems, such as:

- digestive problems
 - heart disease
 - stress
 - harmful drug and alcohol use, and
 - mental illness.
-

1.2 Fatigue in the NSW mining and extractives industry

Hours of work were found to be longer in NSW than elsewhere

The NSW Mine Safety Advisory Council's report, *Digging Deeper*¹, examined aspects of occupational health and safety in the NSW mining and extractives industry and revealed that fatigue is an important issue in the industry. The report found that hours of work in the NSW mining and extractives industry were high, and much higher than the average hours of work in the mining industry in other parts of Australia (49.8 hours per week compared to 44.7 hours per week). The hours of work were high in all sectors, but highest in the metalliferous sector (54.3 hours per week), compared to the extractives sector (50.3 hours per week) and the coal sector (48.1 hours per week). Employees/workers in management and professional occupations worked longer hours than those in other occupations; contractors worked slightly

¹ Shaw Idea. *Digging Deeper Final Report*. NSW Department of Primary Industries: Sydney, 2001. See <http://www.dpi.nsw.gov.au/minerals/safety/consultation/digging-deeper>

longer hours than employees/workers; employees/workers at large sites worked longer hours than those at smaller sites; and employees/workers at mines in the far west worked longer hours than those at mines elsewhere.

Rosters did not always effectively control risks associated with extended hours

In addition to the long average working hours per week, the report identified many aspects of work in the industry that increased the risk of fatigue in employees/workers. These included:

“Roster arrangements on most sites with extended shift rosters (both high and medium risk) are not designed to accommodate circadian rhythms. Some high-risk shift rosters do not allow for long enough breaks so that workers can get sufficient rest between shifts. Many high and medium risk rosters do not provide adequate breaks within shifts...”

Some high and medium risk rosters work so many consecutive shifts and/or involve such extensive on-call work for at least some groups of workers that a cumulative sleep debt is likely to be accrued...”

The report concluded that “Roster arrangements therefore do not effectively control the risks associated with extended hours and shift work in all cases.”² and that a systematic approach to fatigue risk management was required. The relevant part of the Executive Summary from the *Digging Deeper* report is included at Appendix 1.

Shift work and extended hours rosters should be assessed to identify fatigue issues

Common rosters in the industry were analysed. The NSW Mine Safety Advisory Council’s fatigue working party looked at planned and actual hours of work (planned and unplanned) in the industry and the likelihood that they would result in fatigue. This analysis found problem areas in both planned and actual rosters associated with blocks of night shifts and blocks of extended-hours shifts, including day shift. The working party considers that all shift work and extended hours rosters should be formally assessed regarding their likelihood of resulting in fatigue.

The *Digging Deeper* report also indicated that managers, supervisors and professional staff work long hours that are not monitored or controlled. The survey of hours worked found that 52% of these people worked more than 48 hours per week and that 28% worked more than 55 hours a week. This demonstrates a need for the monitoring of hours worked by managers, supervisors and professional staff, and the management of fatigue risks associated with these hours of work.

² Shaw Idea. *Digging Deeper Final Report – Executive Summary*. NSW Department of Primary Industries: Sydney, 2007. pages xi and xii. See <http://www.dpi.nsw.gov.au/minerals/safety/consultation/wran-consultancy-project-2007/Digging-Deeper-final-report---executive-summary.pdf>

1.3 Purpose of this document

Guidance on how to systematically manage fatigue risks

The purpose of this guide is to provide guidance to mining operators/employers on how to systematically manage fatigue risks in the workplace so that the operators/employers comply with the legislative framework. The guide will help operators/employers develop and implement a fatigue management plan which will contain strategies to effectively control the risks of fatigue. It sets out a risk management approach based on consultation with the workforce. The approach requires that mine sites:

- identify the hazards of fatigue
 - assess the risks of fatigue
 - implement effective risk control measures, and
 - monitor and review regularly the effectiveness of the controls.
-

Plans must cover core areas as well as site-specific needs

The guide is not prescriptive, which means that individual operators/employers can develop a plan that is specific to their needs. However, all plans should address each of the main areas identified in this document. The fatigue management plan should also be incorporated in the overall health and safety management system or plan (including contractor management arrangements).

2. Fatigue management plan: Development and implementation overview

2.1 Introduction

A fatigue risk assessment must be carried out

Every mine must conduct a fatigue risk assessment. A written and auditable fatigue management plan is required for all operations that have working time arrangements that:

- do not only have a day shift (that operates between 6:00 am and 7:00 pm)
- involve more than 48 hours in any consecutive five day period (working on each day) including unplanned work, emergencies, overtime, breakdowns and call-outs, or
- do not have a minimum of two consecutive days off in any seven-day period.

A fatigue management plan is also required if a fatigue hazard is identified during the risk assessment.

What a plan should cover

An operation's fatigue management plan should cover managers, professional staff, contractors, those who work on planned rosters and unplanned work such as overtime and call outs. Commuting times should also be considered.

How to develop and implement a fatigue management plan

This chapter considers the approach that should be used to develop and implement the fatigue management plan in the workplace and integrate it with the health management plan, contractor management arrangements and with the overall operational health and safety management system or plan.

2.2 Approach

Policy commitment and consultation are central

The development and implementation of a fatigue management plan begins with making a firm policy commitment to the effective management of fatigue risks in the workplace and establishing a consultation procedure. Consultation is central to the development and implementation of an effective plan. The process of development and implementation is described in detail in the various sections of this guideline and is outlined in Figure 1.

Everyone's roles and responsibilities must be identified

Having committed to the policy and established the consultation procedures, it is important to identify the roles and responsibilities of persons within the organisation who will have responsibility for developing and implementing the plan. The risk management approach of identification, assessment, control and evaluation must then be developed and implemented. This will involve training before development and as part of the implementation. The fatigue management plan will then need to be documented and implemented. The effectiveness of the various control measures should be monitored and evaluated on an on-going basis, and the results used to review the plan on a regular basis. The aim of this process is to produce a fatigue management

plan, to implement the plan, and to integrate this process with the overall operational health and safety management system or plan. This is illustrated in Figure 1.

An effective fatigue management plan details a systematic program

In summary, the development and implementation of an effective fatigue management plan requires:

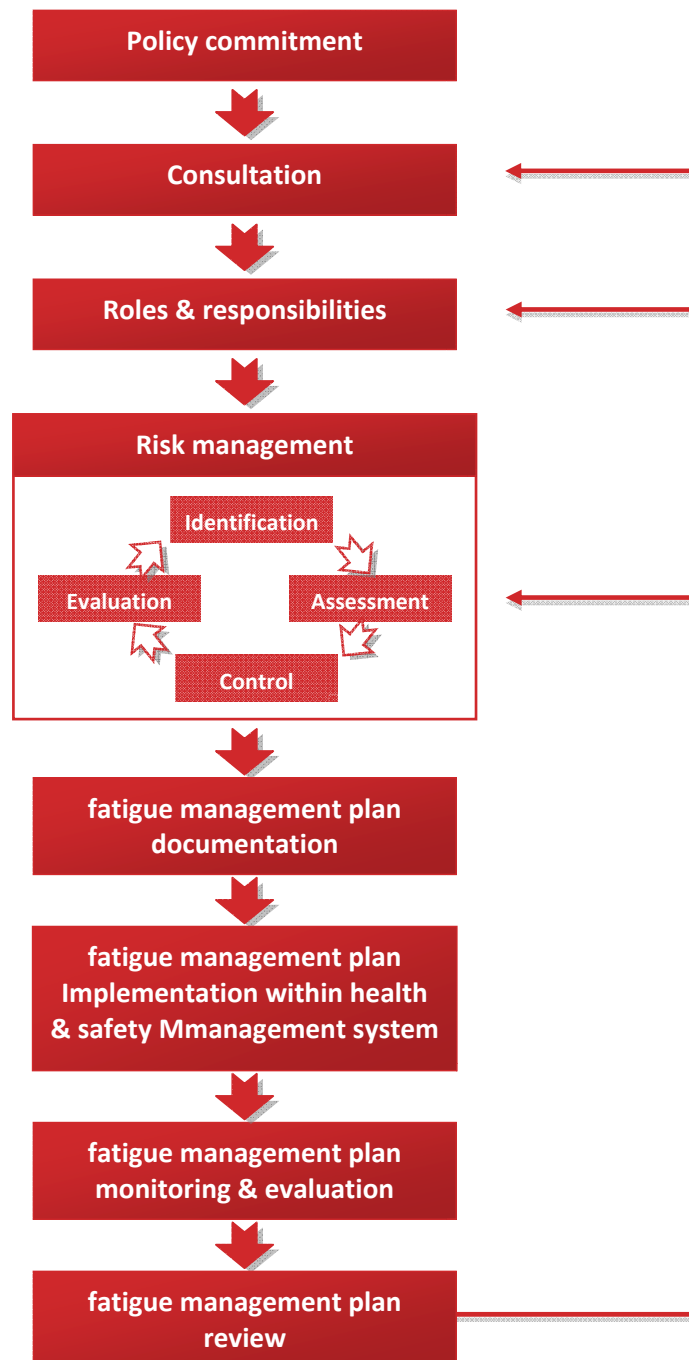
- making a firm policy commitment to effective fatigue management
 - early and on-going consultation
 - establishment of roles and responsibilities
 - risk identification, assessment, control and evaluation
 - documentation of the plan
 - implementation of the plan
 - development and implementation of assessment and monitoring procedures, and
 - regular review and resultant modification of the plan.
-

2.3 Resources needed for an effective fatigue management plan

Appropriate resources are essential, including competent people

Those responsible for the development and implementation of the fatigue management plan must ensure that appropriate resources are made available. These resources include competent people to conduct the risk management process and conduct the safe system of work agreed through the consultation process. Further advice on accessing external resources is found in Appendix 4.

**Figure 1: fatigue management plan:
Development and implementation overview**



3. Policy

The policy should demonstrate senior management's commitment to effectively controlling fatigue risks

All health and safety management systems or plans should reflect the mine operator/employer's health and safety policy. It is important to ensure the fatigue component is strongly reflected in the policy. Policy should be developed by management in consultation with employees/workers. This policy should make it clear to management, employees/workers (including contractors) and visitors that the operator/employer is committed to ensuring the proper control of fatigue risks that might affect the health and safety of those involved in the mining work or those affected by the mining work. This commitment should be explicitly made at senior management level and demonstrated by the actions of those at senior management level.

4.1 Introduction

Consult with employees most likely to be at risk	As with any important aspect of health and safety connected to work, appropriate policies and procedures concerning fatigue must be developed in consultation with employees/workers, as they are likely to have the best practical understanding of work processes and the potential for exposure to various hazards as a result of the work processes. Such consultation is legally required. In addition, employees/workers are the persons most likely to be at risk of developing ill health as a result of work-related exposures.
A process of consultation must underpin the fatigue management plan	<p>Key aspects of the required consultation relevant to the development of a fatigue management plan include:</p> <ul style="list-style-type: none">• Consultation by the operator/employer with the employees/workers of the employer to enable them to contribute to the making of decisions affecting their health, safety and welfare at work.• Information that must be shared includes matters that affect or may affect the health, safety or welfare at work of employees/workers covered by particular consultative arrangements.• Consultation must be undertaken when:<ul style="list-style-type: none">▪ assessments are made of risks to health and safety▪ decisions are made on measures to control or eliminate those risks▪ changes are made to premises, systems or methods of work, or to plant or substances used for work, that may affect health, safety or welfare at work, and▪ decisions are made about the consultation arrangements.
There are different ways to consult	Consultation must be undertaken by means of an OHS committee, an OHS representative or other agreed arrangements, or a combination of these approaches. ³ The <i>WorkCover OHS consultation Code of Practice</i> provides guidance as to how this should be done. ⁴

³ Based on Cliff D, Farrelly K (2007). *Review of health monitoring and surveillance requirements and practice in Australian mining OHS jurisdictions and a description of best practice conducted for the NSW Mining Industry Health Working Party*. Unpublished.

⁴ WorkCover New South Wales. [OHS consultation - Code of Practice 2001](http://www.workcover.nsw.gov.au/Documents/Publications/LawandPolicy/CodesOfPractice/cop_ohsconsult_311.pdf). WorkCover New South Wales: Sydney, 2001. See http://www.workcover.nsw.gov.au/Documents/Publications/LawandPolicy/CodesOfPractice/cop_ohsconsult_311.pdf

4.2 Approach

The process should be flexible enough to deal with different views

The fatigue management plan must be developed and implemented in a consultative, participative manner, involving all affected employees/workers (including contractors) throughout the process and in decision-making about the outcomes. During the consultative process, employees should be given the opportunity to consult with a representative of an employee industrial organisation, if applicable. The plan is likely to be most effective when it is developed through appropriate consultation with employees/workers. The sensitive nature of many of the issues involved in this area means that how the fatigue management process is undertaken may be at least as important as which control measures are established. Experience shows that the rigid application of rules is counter-productive and that the approach should be flexible enough to respond to the views of the workforce.

Consultation must accommodate the variable hours people work

Fatigue has a direct impact on the work/life balance of all who work in the industry. Hours of work and fatigue have an effect on the individual at work and off site. Sensitivity to the communication and consultation needs of those who work shift work is also critical; those who work nights and weekends may require special attention in communication strategies. Special attention may also be required for inexperienced employees/workers, and for contractors and their employees/workers.

5. Roles and Responsibilities

5.1 Operator/employer

Employers have the main responsibility for controlling fatigue risks

The employer (operator and controller) holds the fundamental responsibility for controlling the risks associated with fatigue. The fatigue management plan should nominate those responsible for different actions. It is the operator/employer's responsibility to make sure that the fatigue management plan is implemented. The fatigue management plan should be signed off by the most senior appropriate person representing the operator/employer. Adequate resources should be provided to allow the plan to be properly implemented.

5.2 Employee/worker

Employees must not put themselves at risk of being fatigued

Employees/workers are responsible for ensuring that their behaviour does not create or exacerbate risks. They should ensure that they use the opportunities provided to obtain sleep, report occasions when adequate rest is not obtained and do their best to remain fit for work.

6. Fatigue risk management

6.1 Introduction

Risk management is a four-step process This chapter considers fatigue risk management in detail. Risk management encompasses the identification, assessment, control and evaluation of hazards that pose a meaningful risk to the health and safety of employees/workers (including contractors) and visitors to the workplace.

Hazard **identification** involves identifying the activities that may pose a risk.

Risk **assessment** describes the process of evaluating the extent of the risk arising from exposure to the hazard.

Risk **control** is the process of addressing the risk by eliminating or minimising its effect.

Evaluation is the process of checking the extent to which the control measures have been successful.

Assessing risks helps set priorities Risk assessment is a dynamic process, with risks being assessed and prioritised and the new work environment evaluated regularly. This provides information to be used in the next risk assessment which will probably have a different set of prioritised risks that require control.

Risk assessments must be done by people who are trained and competent for the task Risk assessment must involve appropriate consultation between all relevant parties. In particular, it is important that the employees/workers potentially affected by fatigue hazards have an opportunity to provide input to the risk assessment process. The employees/workers' practical knowledge of the tasks and associated hazards and risks provides an extremely valuable input into the risk assessment process. However, formal and comprehensive risk assessment can be a demanding undertaking and it is essential that those carrying out the risk assessment be adequately trained and assessed as competent to undertake such an assessment. In some situations this will involve bringing in expertise in risk assessment from outside the organisation.

Useful documents to consult when developing the fatigue management plan can be found in Appendix 4.

6.2 Hazard identification: Identifying factors that may contribute to fatigue

Identifying common factors that contribute to fatigue

Risk factors for fatigue can be identified in a variety of ways. Typically this would start with consulting the workforce and contractors. In addition, examining records to look at incidents and health concerns that have occurred previously sometimes provides useful information. Common factors that can contribute to the development of fatigue are:

- mental and physical demands of work
 - work scheduling and planning
 - work environment conditions
 - excessive commuting times, and
 - individual and non-work factors.
-

Mental and physical demands of work

The mental and physical demands of work can contribute to an employee/worker becoming impaired by fatigue in a number of ways. Concentrating for extended periods of time, performing repetitious or monotonous work or performing work that requires continued physical effort can increase the risk of fatigue by producing mental and/or physical tiredness.

Work scheduling and planning

The way work is planned and scheduled, the time work is performed and the amount of time worked can increase the risk of fatigue. Scheduling work in a way that fails to allow employees/workers enough time for travel to and from work and/or physically recover and socialise can produce fatigue. Working at times when employees/workers are biologically programmed to sleep (which can disrupt an employee/worker's body clock) and working for long periods of time can also produce fatigue. Particular issues to look for include:

- night shifts, including the number of consecutive night shifts
 - long hours of work in a single shift, or across a shift cycle, or because of on-call duties. This includes travel time, especially for remote sites
 - short breaks between or within work shifts
 - shift start/finish times (eg a start time between 10pm and 6am)
 - changes to rosters
 - Unplanned work, overtime, emergencies, break downs and call outs.
-

Work environment conditions

Working in harsh and/or uncomfortable environmental conditions can contribute to the risk of fatigue in a number of ways. Heat, cold, noise and vibration are some of the environmental conditions that can make employees/workers tire quicker and impair their performance.

Excessive commuting

Having to travel long distances before or after work is an important potential cause of fatigue.

Individual and non-work factors

In addition to the work-related factors that contribute to fatigue, it is important to identify factors that cause fatigue due to sleep deprivation. These include:

- lifestyle: eg having caring or child-care responsibilities, voluntary work, having more than one job, level of fitness, social life or diet
 - home environment: eg noisy neighbours or a bedroom that is too hot or not dark enough for day-time sleep, and
 - health conditions: eg insomnia, sleep apnoea, or alcohol or drug dependence.
-

Effect of exposure for longer periods

When taking a risk management approach to fatigue, it is very important to look at how fatigue, and long working hours in general, can interact with other workplace hazards. Exposure to some hazards can be increased when working extended hours – eg manual tasks and exposure to hazardous chemicals, dust and noise.

6.3 Risk assessment

Risk assessments consider two aspects - likelihood and severity

One of the keys to effective risk management is to properly assess the risks arising from a hazard. Assessing hazards related to fatigue means looking carefully at the identified fatigue risk factors to decide whether they have been eliminated or adequately controlled.

The risk assessment has two aspects – assessing how likely it is that the exposure will occur, and assessing the severity of the outcome that can be expected as a result of the exposure. This dual assessment allows control activities and monitoring to be prioritised. Priority should be given to risk factors likely to result in significant fatigue, even if they are relatively rare, and to common risk factors that can be easily controlled.

Each hazard should be examined in detail to determine its impact on sleep opportunity and quality, the length of time individuals are required to be awake, and the intensity of the work. This requires:

- input from employees/workers (including contractors)
- reviewing errors and incidents to determine any contribution that fatigue has made
- the use of relevant data sources (such as WorkCover guidance material, industry codes of practice, Australian Standards), and
- (sometimes) advice from experts in the field.

The results of the risk assessment should be clearly recorded.

Aspects that would commonly be considered for the most important fatigue risk factors are shown in Table 1. The information in Appendix 2 provides an example of how to assess the risk associated with each major risk factor.

Table 1: Fatigue risk factors

Risk factor	Aspects to consider
<i>Mental and physical demands of work</i>	
Repetitive or monotonous work	<ul style="list-style-type: none"> • Do jobs involve repetitive or monotonous work, eg haul-truck driving?
Sustained physical or mental effort	<ul style="list-style-type: none"> • Is the work physically demanding? • Is there time pressure due to a heavy workload? • Is work fast paced? • Is work intensive? • Can employees/workers vary work pace or work tasks as desired? • Have employees/workers been consulted regarding work tasks or how to carry them out?
Complex physical or mental tasks	<ul style="list-style-type: none"> • Is high vigilance and/or concentration required? • Are there different demands that can be difficult to combine? • Are complex, difficult or strenuous tasks required at the end of shifts or shift cycles?
<i>Work scheduling and planning</i>	
Night shifts, including the number of consecutive night shifts	<ul style="list-style-type: none"> • Are too many consecutive night shifts worked? • Is more than eight hours work required over night shift? • Are more than four consecutive 12-hour night shifts worked? • Are more than five consecutive 10-hour night shifts worked? • Are more than six consecutive 8 - hour night shifts worked? • Are tasks requiring sustained physical or mental effort undertaken on night shift? • Are complex physical or mental tasks undertaken on night shift?
Long hours of work in a single shift. This includes travel time, especially for remote sites	<ul style="list-style-type: none"> • Does one shift involve more than 12 hours in a day (including call outs)?
Long hours of work across a roster cycle	<ul style="list-style-type: none"> • Do hours of active work (total time spent at work including overtime) exceed 48 hours in any seven days, or 624 hours over a three-month (13 week) period?
Long hours because of on-call duties	<ul style="list-style-type: none"> • Are there irregular and unplanned schedules as a result of call outs? • Is the working day or working week extended beyond 12 hours in a single day, 48 hours in any seven days, or 624 hours over a three-month (13 week) period as a result of call outs?
Short breaks between work shifts	<ul style="list-style-type: none"> • Is there enough time between work shifts to allow for adequate sleep? • Enough time in a break for five hours uninterrupted sleep in 24 hours (only for one night); AND

	<ul style="list-style-type: none"> • Enough time in breaks for 12 hours of sleep in 48 hours and at least six hours in 24 hours; AND • Enough time in breaks for 50 hours sleep in seven days? • Is the break between shifts less than 10 hours? • Are there at least two consecutive night time sleep opportunities (48 hours) every seven days?
Short breaks within work shifts	<ul style="list-style-type: none"> • Are breaks within shifts long enough and frequent enough to allow employees/workers to rest, refresh and nourish themselves?
Shift start/finish times	<ul style="list-style-type: none"> • Do any shifts start or finish between 10pm and 6am? • Are split shifts required or offered? • Are complex, difficult or strenuous tasks required at the start or end of such shifts?
Changes to rosters	<ul style="list-style-type: none"> • Do employees/workers get sufficient notice of roster changes? • Is fatigue management taken into account in roster changes?
Work environment conditions	
Stress	<ul style="list-style-type: none"> • Do jobs involve high demand, but low control? • Are there poor social relations at work, eg bullying? • Is there low social support from peers and supervisors at work? • Is there low recognition for the effort involved in the work?
Adverse working conditions	<ul style="list-style-type: none"> • Do adverse working conditions exist, eg exposure to: <ul style="list-style-type: none"> • Noise? • Heat? • Cold? • Dust? • Hazardous substances?
Excessive commuting times necessary	
	<ul style="list-style-type: none"> • Is significant travel to and from work necessary each day so that time for adequate sleep is reduced? • Are long-distance commutes necessary at the beginning of a work cycle?
Individual and non-work factors	
	<ul style="list-style-type: none"> • To what extent is there evidence of problems as a result of: <ul style="list-style-type: none"> • Family commitments? • Insufficient quality sleep? • Sleeping disorders? • Psychological issues? • Alcohol and drug use? • Second job/non-paid work?
Effect of exposure during extended shifts	
	<ul style="list-style-type: none"> • Is there significant exposure to hazardous chemicals, dust and noise? (Note that exposure standards may need to be adjusted.)

Individual testing can be a risk assessment tool

Individual testing can be a tool for risk assessment. It can involve a variety of different types of tests, ranging from cognitive psychomotor tests (eg hand-eye coordination) to central nervous system tests. But testing is not a control measure since it does not prevent fatigue. It is a tool for assessing risks and, on its own, may not give enough information to allow accurate risk assessment. These tests are not infallible. The fact that an individual employee has passed a fatigue test does not provide any guarantee of fitness for work for the remainder of the shift, particularly in the absence of proper risk control measures. Also, testing needs to be clearly related to the job tasks of the employee/worker.

6.4 Risk control

Risks that arise from hazards must be controlled according to the 'hierarchy of control'

The key aim of any fatigue management plan is to ensure that hazards that pose an important risk to the health of the employee/worker or to others who may come into contact with occupational hazards are properly controlled. An important concept in developing this control is the so-called "Hierarchy of Control". This hierarchy provides a set of approaches and principles, including systems of work, that can be used to control hazards. Approaches at the top of the hierarchy should be considered before those further down the list. There are many forms of the hierarchy, but essentially the control measures, in descending order of preference, consistent with OHS legislation, are as follows:

- elimination
- substitution
- isolation
- engineering
- administrative approaches, and
- personal protection.

This shows, for example, that personal protective equipment (PPE) or administrative approaches can be used as control methods but, wherever possible, approaches higher up the hierarchy should also be incorporated.

Examples of hierarchy of control for fatigue risks

Examples of the use of the hierarchy for control of fatigue risks include:

Eliminate: eliminating night shifts in some areas or for high risk tasks.

Substitute: increasing the length of breaks in a shift.

Engineering: improving ventilation and heating to improve alertness and ensure exposure to hazardous substances is reduced during extended shifts.

Administrative: using a checklist to help supervisors identify and assess fatigue impairment.

PPE: ensuring appropriate equipment is used. For example, standard hearing protection devices may not provide sufficient attenuation over a 12-hour shift as opposed to an 8 hour shift.

Note: Isolation has not been included in these examples because it is not directly applicable to fatigue risk.

Suggested controls for the most common fatigue risk factors are shown in Table 2 and in Appendix 2. A list of tips for individuals on how to help avoid fatigue is provided in Appendix 3.

Some risk controls may need to be trialled before introduced

Some control measures may need to be tested before they are permanently put into place. For example, if a roster is re-designed, it could be piloted with one work group before the final arrangements are made. This testing will often identify any unexpected problems. It can also give the workforce a chance to trial the new arrangements without the normal day-to-day work pressures.

6.5 Evaluation

Risk controls must be regularly evaluated

As part of the risk management process, it is important that the control of risk factors be evaluated on a regular basis. This risk evaluation forms part of the overall monitoring and evaluation of the fatigue management plan, as described in Chapter 9.

Table 2: Examples of control measures for various fatigue risk factors

Risk factor	Control measures to consider
<p><i>Mental and physical demands of work</i></p> <p>These include, for example:</p> <ul style="list-style-type: none"> • repetitive or monotonous work; • sustained physical or mental effort; • sustained and/or complex physical or mental tasks 	<ul style="list-style-type: none"> • Re-design jobs to eliminate boring, repetitive tasks • Improve communication • Provide training to allow multi-skilling and effective job rotation • Use alarms and monitors, particularly for solo work (eg driving vehicles) • Use plant, machinery and equipment to eliminate or reduce the excessive physical demands of the job • Reduce the amount of time employees/workers need to spend performing sustained physically and mentally demanding work • Ensure there are adequate employees/workers and other resources to do the job without placing excessive demands on staff • Roster enough employees/workers during peak times and demands • Ensure adequate breaks during shifts to allow recovery • Allow supervisors and employees/workers to reschedule tasks if fatigue becomes a problem • Ensure work demands gradually increase towards the middle of the shift and decrease towards the end • Eliminate sources of risks that might exacerbate fatigue (eg lack of job control, manual handling, extremes of temperature) • Improve communication processes • Improve the duration and timing of work • Ensure safe and efficient shift hand-over
<p><i>Work scheduling and planning</i></p> <p>Night shifts, including the number of consecutive night shifts</p>	<ul style="list-style-type: none"> • Eliminate or limit night work where possible • Eliminate the use of night shifts for particular jobs or activities • Schedule complex tasks for daytime • Schedule work for hours when the risks may be lower – for example, complex and safety-critical tasks are best undertaken during normal day shifts when employees/workers are less likely to be fatigued, rather than during low body clock periods (ie don't schedule tasks between 2am and 6am and, to a lesser degree, between 2pm and 4pm) • Avoid scheduling higher risk tasks on the first night of a night-shift cycle. If unavoidable, when planning the task consider additional controls such as job rotation or additional rest breaks • Minimise or redesign routine administrative tasks to ensure employees/workers can focus on core duties during their night work • Limit the number of consecutive night shifts worked – no more than four night shifts in a row • Allow regular night-shift employees/workers periods of normal nights sleep to catch up on their sleep deficit • Ensure that rosters allow for at least two full nights sleep after the last night shift • Arrange shifts so that day sleep is adequate • Use a forward-rotation shift system (ie morning to afternoon, afternoon to night) • Improve the order, speed, direction and length of rotation of the shift cycle • Except for emergencies, give at least 24 hours notice before night work. Consider

	<p>providing a longer period of notice so that employees/workers have time to adjust their activities</p> <ul style="list-style-type: none"> • Allow for naps during night shifts
Long hours of work in a single shift. This includes travel time, especially for remote sites	<ul style="list-style-type: none"> • Reduce working hours • Increase resourcing • Eliminate the use of extended hours for particular jobs or activities • Control the length of shifts • Limit the use of overtime, especially unscheduled overtime • Monitor hours of work • Provide alternative transport at end of overtime/long shift
Long hours of work across a shift cycle	<ul style="list-style-type: none"> • Develop a working-hours policy on daily work hours, maximum average weekly hours, total hours over a three-month period and work-related travel • Reduce working hours • Reduce the number of consecutive day shifts that can be worked • Eliminate or reduce the need to work long shifts for more than four consecutive days • Allocate shift employees/workers consecutive days off, including some weekends, depending upon their fatigue-risk level • Avoid working arrangements that provide incentives to work excessive hours • Control overtime, shift swapping and on-call duties • Offer alternatives to employees/workers who may have difficulties adjusting to working hours
Long hours because of on call duties	<ul style="list-style-type: none"> • Limit use of standby and on-call duties • Ensure that exchange of shifts does not result in excessive hours • Ensure that responding to emergencies does not result in excessive hours
Short breaks between work shifts	<ul style="list-style-type: none"> • Increase the length of breaks between shifts • Allow for recovery between work periods • Defer non-urgent work to allow appropriate rest and recuperation for employees/workers • Provide rest days (opportunity for two consecutive night sleeps) • Improve the timing of shifts • Allow for family and social commitments between shifts and shift cycles • Make sure that there is enough time in a break for six hours uninterrupted sleep
Short breaks within work shifts	<ul style="list-style-type: none"> • Provide more and/or longer breaks to allow for recovery within work periods • Provide adequate resources to cover breaks • Ensure adequate number and location of crib and toilet facilities • Reduce the use of split shifts • Where split shifts are used, arrange timing so sleep of employees/workers is not disrupted due to the times they are required to work
Shift start/finish times	<ul style="list-style-type: none"> • Don't start or finish between 10pm and 6am • Ensure time for adequate communication at shift handovers • Match shift times to the availability of public transport

Changes to rosters	<ul style="list-style-type: none"> • Set shift rosters ahead of time and avoid sudden changes of shifts to allow employees/workers to plan leisure time • Reduce irregular and unpredictable work schedules • Manage workload and work-pace change caused by machinery breakdowns and planned and unplanned absences • Allow for family and social commitments within the roster cycle
<i>Work environment conditions</i>	
Stress	<ul style="list-style-type: none"> • Improve job control and the other risk factors associated with stress • Ensure opportunities to clarify stress-related issues
Adverse physical conditions	<ul style="list-style-type: none"> • Avoid working during periods of extreme temperature • Control exposure to hazardous substances and environments • Provide effective protective clothing and equipment, allowing for different shifts • Use heating and cooling to control ambient temperatures to support alertness • Provide adequate facilities for rest, sleep, meal breaks, onsite accommodation (if appropriate) and other essential requirements, such as bathroom facilities • Install adjustable, vibration-free seats in appropriate machinery and vehicles • Ensure the workplace and surroundings are well lit, safe and secure
<i>Excessive commuting times necessary</i>	
	<ul style="list-style-type: none"> • Start work at long distance commute sites on the day <i>after</i> arrival and start travel home on the day <i>after</i> the shift cycle is finished • Assist with travel arrangements, eg provide transport • Reduce active working time to account for long commuting time or distance
<i>Individual and non-work factors</i>	
	<ul style="list-style-type: none"> • Provide suitable professional advice, eg an employee assistance program, sleep disorder clinic • Maintain vigilance in identifying non-work related factors • Subsidise modifications to private homes to improve sleeping conditions (eg air conditioning) • Provide information and education about how non-work related factors can increase the risks of fatigue • Provide a mechanism to encourage employees/workers to report non-work factors that might affect fatigue management
<i>Effect of exposure during extended shifts</i>	
	<ul style="list-style-type: none"> • Employees/workers who perform repetitive manual tasks should have regular rest breaks • Ensure exposures are carefully monitored and exposure levels adjusted. For example, exposure during a 10-hour shift may not equate to 1.25 times the exposure experienced during an eight-hour shift

7. Fatigue management plan documentation

The plan should be integrated into the OHS system

A fatigue management plan should be integrated as part of an overall health and safety management system or plan. The plan should be:

- specific to the site
 - developed through consultation
 - available to employees/workers and visitors (eg on display)
 - communicated regularly and appropriately (eg in inductions), and
 - reviewed to take account of changes in site needs and knowledge about the risks.
-

The plan should be fully documented

The fatigue management plan should be fully documented. The documentation should include:

- a policy commitment to managing fatigue
 - a statement of the principles for managing fatigue
 - roles and responsibilities for all levels of the organisation
 - the risk assessments that have been undertaken
 - the risk controls that are and will be in place, along with an implementation strategy
 - a description of how actual hours of work and sleep will be monitored and reviewed
 - the support systems that already exist and that will be set up along with an implementation strategy (eg hours-of-work monitoring, employee assistance programs, training programs, monitoring systems), and
 - the approach to monitoring and reviewing the plan.
-

The plan should be audited and assessed

Finally, the plan must be able to be audited and assessed by appropriate authorities. Therefore, the fatigue management plan must be structured in a way that allows it to be evaluated and monitored, both internally and externally.

8. Fatigue management plan

8.1 Introduction

Risk controls must be put in place The fatigue management plan must be properly implemented. Without adequate risk controls being put in place, the work that has gone into preparing the fatigue management plan will not be useful. Key issues to consider when implementing the plan include timeframes, training, roles and responsibilities, communication and participation.

8.2 Timeframes

Action must be implemented in a timely manner Establishing and keeping to the agreed timeframes is very important to ensure that adequate control measures are in place as soon as possible. The workforce will also become less supportive if they cannot see the agreed actions being done. Actions should be monitored regularly to make sure that the agreed timeframes are being met.

8.3 Training

Training gives people the knowledge and skills to implement risk controls Many of the new risk control measures will involve training. Training is not a suitable control measure in itself, but training is essential to good risk control. Training gives the workforce the skills and knowledge they need to work with risk controls for fatigue. It also provides appropriate information about the fatigue hazards and risks in the workplace. All site personnel, including contractors, must be informed about the fatigue management plan and have the skills and knowledge they need to fulfill their roles and responsibilities. In addition, operators/employers must provide education and awareness about the site's fatigue policy and procedures whenever:

- new employees/workers are appointed
- induction or refresher training is provided
- contractors are engaged (as part of the contractor management plan)
- managers or supervisors are appointed or promoted, and
- changes are made to the fatigue management plan.

The education and awareness training should include coverage of issues such as:

- the nature of fatigue
- the warning signals of fatigue
- possible effects of fatigue
- factors that decrease or exacerbate the likelihood or effects of fatigue, and
- control measures, including the fatigue management plan.

Training must be arranged so it is available to all employees/workers on all shifts during rostered hours.

8.4 Communication

The workforce, plus contractors, must know about the fatigue management plan

The entire workforce, including contractors, needs to know about the fatigue management plan. As with any important workplace communication, when communicating the requirements of the plan, the different needs of various groups on the mine site should be taken into account. These needs include that some employees/workers may not be able to read English very well; night shift employees/workers may not get the informal communication that day shift employees/workers receive; and some employees/workers may have difficulties attending information meetings because they work away from a central workplace. As a result, different communication methods may be needed for different groups.

8.5 Participation

All workforce to participate in implementing the plan

All employees/workers on site, including contractors, must be involved in implementing the fatigue management plan and in making sure it is followed.

8.6 Supervision

Adequate supervision is required

Legislation requires proper supervision of employees/workers (including contractors) and appropriate supervision is an essential part of the fatigue management plan.

Supervisors need to be able to identify when fatigue is a problem so that they can initiate immediate control measures and report problems that need to be addressed.

8.7 Reporting

Reporting fatigue should be encouraged, not criticised

It is essential that employees/workers (including contractors) are able to report fatigue problems affecting themselves or others without attracting criticism. This will require understanding and support from supervisors and colleagues. Reporting is more likely in a working environment where fatigue is recognised by all levels of the organisation as being an important health and safety issue that should be properly managed.

9. Fatigue management plan: monitoring and evaluation

The plan should be regularly audited and reviewed to make sure it is still relevant

All aspects of the fatigue management plan should be audited and reviewed at regular intervals to ensure continuing suitability, adequacy and effectiveness of the controls for eliminating risk. The plan must be reviewed when circumstances change at the mine, rostering patterns change or when there is any indication that fatigue risks are not being controlled. The hours worked by all employees/workers, including professional staff and management, should also be monitored and evaluated as part of the fatigue management plan. Incident investigation tools must be able to identify the contribution that fatigue may make to incidents.

Specific review factors must be considered

Specific factors to consider include:

- have control measures been implemented as planned?
- are they working?
- are there any new problems? and
- incidents, near misses, injuries and other data, such as absenteeism and staff turnover rates.

Further review of control measures should be undertaken when methods, tasks, equipment, hazards, operations, procedures, rosters or schedules are introduced or the environment changes or there is any indication risks are not being controlled.

Appendix 1: Extract from the executive summary of the Digging Deeper Report

Hours of work and fatigue management

Hours of work

Hours of work in the NSW mining industry are high (average 49.8 per week) and far in excess of the hours worked in the mining industry on average around Australia (average 44.7 per week). The following factors affect the hours of work:

- *Occupation.* Those in management and professional positions work longer hours than those in blue collar and administrative positions.
- *Sector.* Those working in the metalliferous sector work significantly longer hours (54.33) than in the extractive (50.33) and coal (48.10) sectors.
- *Employment status.* Contractors work longer hours (51.86) than direct employees (50.12) across the industry. The difference between contractors and direct employees is largest in the metalliferous sector (65.85 compared with 52.40).
- *Size.* Those employed at large sites work longer hours than those at small and medium sites. In particular, those employed at large sites in the coal and metalliferous sectors work significantly longer hours (52.24) than those employed at small and medium sites (48.39).
- *Location.* Those employed at sites in the far west of the state work significantly longer each week (55.75) than every other region.

Monitoring hours of work

The census of the industry showed that the overwhelming majority of sites use timesheets to record and monitor hours of work and that the use of swipe cards, while limited, is spread across large sites in all three sectors. Many sites reported that the data collected about working hours are monitored to ensure agreed maxima are not exceeded. However, even where swipe cards are used to record hours of work, information about hours on site is not always used to track hours so that those on site approaching or exceeding a specified limit can be identified and alerted.

As this suggests, the main control measure over hours on site is not the monitoring system. For blue collar employees, the main control is the existing industrial arrangements over hours of work that specify when overtime is worked. For white collar employees, there are few, if any, controls. Management and professional employees all reported that their hours were not formally monitored or reviewed.

Given the long working hours identified in the NSW industry, more rigorous and interventionist monitoring of hours would be useful. Given that hours of work information is collected at almost all sites, this would not require the introduction of new systems. Rather, existing systems should be extended to staff positions and the full functionality of existing systems should be used. This does not necessarily mean that staff should clock on and clock off, but sites should be tracking and, where necessary, controlling the hours worked by all workers on site.

On the whole, a smart card system has strong support, but we are concerned that this is because sites may see this as an easy solution, and not undertake the risk management action needed to effectively manage hours of work and fatigue. A smart card system would not address the problems we observed with monitoring and assessing hours of work in the NSW mining industry. For existing smart card systems to have maximum functionality, the systems established by different providers must be able to interconnect to read records of hours worked stored on cards provided by other companies.

Shift arrangements and fatigue

Many people interviewed reported that they were fatigued as a result of their hours of work and shift arrangements. Respondents reported statistically significant differences between fatigue according to shift. Night shift was reported to cause significantly worse effects on work performance and fatigue levels than either afternoon or day shift. Afternoon shift was significantly worse than day shift. The finding that night and afternoon shift have such effects on key parameters such as work performance, alertness and ability to concentrate suggests that current shift arrangements are not adequately managing the risks associated with shift work.

Our data show that fatigue and other problems arise primarily from the time of day that work is being done, not the number of hours involved.

Each site was assigned a risk rating based purely on the roster arrangements using criteria that are well established to contribute to increased fatigue-related risk. On the basis of these factors, 24 rosters were low risk, 16 were medium and 11 were high risk. We found that:

- Roster arrangements on most sites with extended shift rosters (both high and medium risk) are not designed to accommodate circadian rhythms
- Some high risk shift rosters do not allow for long enough breaks so that workers can get sufficient rest between shifts
- Many high and medium risk rosters do not provide adequate breaks within shifts. This accounts for nearly half of all of the rosters we identified
- Some high and medium risk rosters work so many consecutive shifts and/or involve such extensive on-call work for at least some groups of workers that a cumulative sleep debt is likely to be accrued and was reported to us.

Roster arrangements therefore do not effectively control the risks associated with extended hours and shift work in all cases. The NSW mining industry recognises the importance of effective control of OHS risks arising from fatigue and hours of work. Despite this, few sites provided evidence of systematic risk assessments of fatigue. We found limited evidence that sites had a thorough understanding of the causes of fatigue, with most attitudes to fatigue focused around non-work causes, rather than the contributions made by working arrangements. The importance of addressing the inter-related personal and organisational factors was not widely recognised.

The industry has had significant opportunity to voluntarily adopt effective, preventive approaches to fatigue risk management and a number of sites in our sample demonstrated both the benefits and the barriers faced by such approaches. However, the limited adoption of such an approach suggests that voluntarism in this area has limitations. As a result, we have found that DPI (now Industry & Investment NSW) should intervene more directly in this area.

A key underpinning of effective risk management of fatigue and hours of work is accurate and reliable information about fatigue related incidents. Existing “no blame” approaches to incident reporting and investigation must extend to fatigue as well.


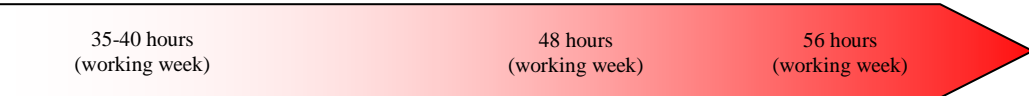
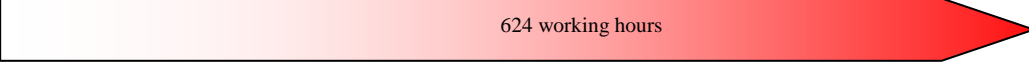

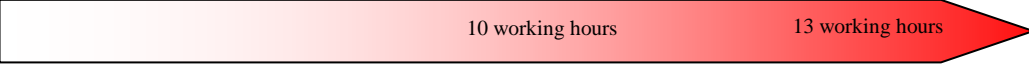

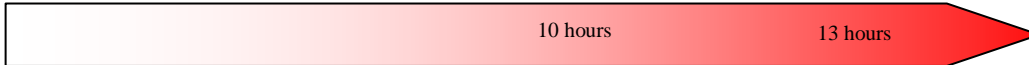

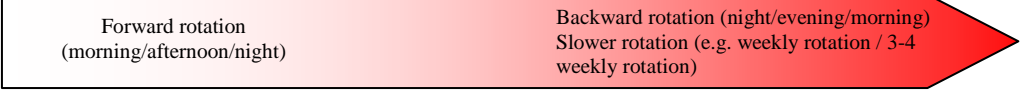

In summary, the industry’s approach to fatigue risk management must recognise that working long hours and at night will necessarily result in fatigue. A risk management approach that seeks to shift responsibility for this to individuals is bound to fail and may result in serious negative consequences. More effective approaches to fatigue management that recognise the responsibilities of employers, as well as employees, have benefits broader than just OHS. The potential of more family-friendly working arrangements to aid the recruitment and retention of skilled workers at a time of serious labour shortages was well recognised by participants at the *Future Inquiry Workshop*.

Appendix 2 Risk Assessment Chart






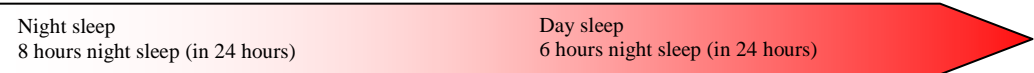


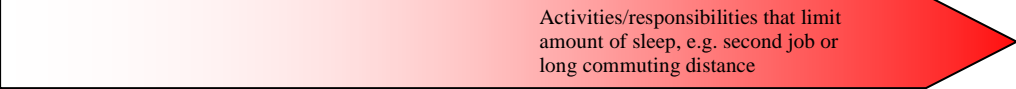
This chart is based on Appendix 2 of the joint Worksafe Victoria / NSW Workcover report *Fatigue prevention in the workplace*.⁵

Hazards	General risk indicator for hazards	Control measures
<p>Step 1. Hazard identification Identify potential hazard factors at the workplace/ industry, such as those listed in the column below. Consider hazard factors in the context of specific workplace/industry circumstances.</p>	<p>Step 2. Risk assessment To assist risk assessment, a general level of risk for each hazard factor is indicated along arrow guides. In assessing risk: consider interaction between hazard factors that could influence level of risk; and as level of risk for each hazard factor is only indicative, take into account specific workplace/industry circumstances that may influence it.</p> <p>Where the assessed risk falls into the area of medium/higher risk, undertake Step 3, risk control</p>	<p>Step 3. Risk control Where a hazard factor is assessed as medium/higher risk, consider implementing control measures, such as those outlined in 'controlling fatigue risks' in this guide.</p>
<p>MENTAL AND PHYSICAL WORK DEMANDS</p> <p>Repetition (physical and/or mental)</p> <p>Physical</p> <p>Mental</p>		See Table 2

⁵ Worksafe Victoria and NSW WorkCover. Fatigue prevention in the workplace. 2008. See http://www.worksafe.vic.gov.au/wps/wcm/resources/file/eb87fc08b727473/vwa_fatigue_handbook.pdf

Hazards	General risk indicator for hazards 	Control measures
WORK SCHEDULING AND PLANNING Hours Average weekly hours Total hours over a three-month period Daily work hours Daily work hours and work-related travel Scheduling of work	    	See Table 2
WORK SCHEDULING AND PLANNING Shift work Length of shift Time of shift Speed and direction of shift Split shifts/variable shifts	   	See Table 2

Hazards	General risk indicator for hazards	Control measures
<p>WORK SCHEDULING AND PLANNING</p> <p>Night work Shift end (for those working eight hours or more between 10.00pm and 6.00am)</p> <p>Length of shift</p> <p>Sequential night shifts</p> <p>Period of non-work following a sequence of night shifts</p> <p>Breaks during work - frequency</p> <p>Breaks between work periods - recovery time</p> <p>Seasonal work arrangements - hours worked</p>	<p data-bbox="645 284 1682 347">Lower risk Higher risk</p> <p data-bbox="645 443 1682 523">After 10.00 am Before 6.00 am</p> <p data-bbox="645 555 1682 619">8 hours 10 hours 12 hours</p> <p data-bbox="645 659 1682 754">6 or more 8 hour shifts 5 or more 10 hours shifts 4 or more 12 hours shifts</p> <p data-bbox="645 786 1682 850">48 hours Less than 48 hours</p> <p data-bbox="645 882 1682 946">Adequate and regular breaks Infrequent or no breaks</p> <p data-bbox="645 978 1682 1042">Adequate time for sleep, travel and meals, etc Inadequate time for sleep, travel and meals, etc</p> <p data-bbox="645 1074 1682 1137">Regular hours over 12 months Long hours during peak season</p>	<p data-bbox="1720 475 1883 499">See Table 2</p>

Hazards	General risk indicator for hazards <div style="text-align: center; border: 1px solid black; padding: 5px; background-color: #f0f0f0;"> Lower risk Higher risk  </div>	Control measures
ENVIRONMENTAL CONDITIONS Exposure to hazardous substances and atmospheric contaminants Exposure to noise Exposure to extreme temperatures Exposure to vibration	<div style="border: 1px solid black; padding: 5px; background-color: #f0f0f0; margin-bottom: 5px;"> For hazardous substances, low risk calculated using national exposure standard For hazardous substances, high risk calculated using national exposure standard  </div> <div style="border: 1px solid black; padding: 5px; background-color: #f0f0f0; margin-bottom: 5px;"> Low risk calculated according to formulae in AS/NZS 1269.1 High risk calculated according to formulae in AS/NZS 1269.1  </div> <div style="border: 1px solid black; padding: 5px; background-color: #f0f0f0; margin-bottom: 5px;"> Minimal exposure Long period exposure  </div> <div style="border: 1px solid black; padding: 5px; background-color: #f0f0f0;"> Minimal exposure Long period exposure  </div>	See Table 2
INDIVIDUAL AND NON-WORK FACTORS Sleep (amount and quality) Health Fitness for work Lifestyle factors	<div style="border: 1px solid black; padding: 5px; background-color: #f0f0f0; margin-bottom: 5px;"> Night sleep 8 hours night sleep (in 24 hours) Day sleep 6 hours night sleep (in 24 hours)  </div> <div style="border: 1px solid black; padding: 5px; background-color: #f0f0f0; margin-bottom: 5px;"> Poor diet Recent illness/injury Sleep disorders  </div> <div style="border: 1px solid black; padding: 5px; background-color: #f0f0f0; margin-bottom: 5px;"> Influence of alcohol, drugs or amount of sleep  </div> <div style="border: 1px solid black; padding: 5px; background-color: #f0f0f0;"> Activities/responsibilities that limit amount of sleep, e.g. second job or long commuting distance  </div>	See Table 2

Appendix 3: Tips for individuals on avoiding fatigue

These tips are meant for workers/employees who may be subject to fatigue.

Sleep	<ul style="list-style-type: none">• The best sleep is night sleep• If sleeping during the day, darken the room and allow more time than normal to fall asleep• Choose a quiet, peaceful place to sleep and adhere to a routine• Seven to eight hours uninterrupted sleep is adequate• Seek medical advice for excessive snoring, irregular breathing and insomnia
Drugs and alcohol	<ul style="list-style-type: none">• Avoid excessive consumption of alcohol – it affects quality of sleep• Avoid stimulants – they delay the need for sleep• Do not consume coffee or tea before going to bed
Medical conditions	<ul style="list-style-type: none">• If you have a medical condition, you should seek advice from your doctor if you are in a job that involves shift work or long working hours• Tell your employer about any medical conditions that may limit your ability to work or make you susceptible to fatigue• Ask your doctor for an alternative medication if it causes you drowsiness when you need to be awake
Fitness	<ul style="list-style-type: none">• Maintain a basic level of fitness• Exercise regularly• Keep your weight in check – obesity contributes to sleeping disorders

Modified from the WorkSafe Victoria and NSW WorkCover report. *Fatigue prevention in the workplace*. 2008.

Appendix 4: Accessing further resources and references

Some enterprises or mine sites may not have the internal resources that are required to develop, implement, maintain and review an effective fatigue management plan. Instead, employers and operators/employers may need to identify qualified specialists in various areas to help with certain aspects of the plan. The web sites of some of the organisations likely to be of most use, and some useful references, are listed below.

Resources

OHS organisations:

[Industry & Investment NSW - Industry Assistance Unit](#)

[Coal Services Pty Ltd](#)

[WorkCover NSW](#)

Occupational Physicians:

[Australasian Faculty of Occupational and Environmental Medicine](#)

[Coal Services Pty Ltd](#)

Ergonomists:

[Human Factors and Ergonomics Society of Australia](#)

Other sources

[Authorised medical practitioners \(WorkCover site\)](#)

[Construction, Forestry, Mining and Energy Union](#)

[Australian Workers Union](#)

[Minerals Industry Safety & Health Centre](#)

[New South Wales Minerals Council](#)

References

Industry & Investment NSW. NSW Mines Safety Advisory Council. *Guide to the development and implementation of a health management plan for the New South Wales mining industry*. WorkSafe Victoria and NSW WorkCover. *Fatigue prevention in the workplace*. WorkSafe Victoria: See http://www.Worksafe.vic.gov.au/wps/wcm/resources/file/eb87fc08b727473/vwa_fatigue_handbook.pdf WorkSafe Victoria. *Fatigue in mines*. WorkSafe Victoria: Melbourne, 2009. See <http://www.worksafe.vic.gov.au/wps/wcm/resources/file/eb3f2a43e517c67/VWA1197%20Fatigue%20handbook.pdf>

Department of Industry and Resources. *Fatigue management for the Western Australian mining industry*. See http://www.dmp.wa.gov.au/PDF/Guidelines/MS_GMP_Guide_FatigueManagement.pdf

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INDUSTRY & INVESTMENT NSW CONTACTS

Telephone 02 4931 6666
Website www.dpi.gov.au/minesafety
Email mine.safety@industry.nsw.gov.au

Maitland

Industry & Investment NSW
Mineral Resources
516 High Street, Maitland NSW 2320
(PO Box 344, Hunter Region MC NSW 2310)
Phone: 02 4931 6666
Fax: 02 4931 6790

Armidale

Industry & Investment NSW
Earth Sciences Building (C2)
Ring Road North
University of New England, Armidale NSW 2351
(PO Box U86 UNE Armidale NSW 2351)
Phone: 02 6738 8500
Fax: 02 6772 8664

Broken Hill

Industry & Investment NSW
Level 2, 32 Sulphide Street
Broken Hill NSW 2880
(Note changed PO Box number)
(PO Box 696 Broken Hill NSW 2880)
Phone: 08 8088 9300
Fax: 08 8087 8005

Cobar

Industry & Investment NSW
Government Offices, 62–64 Marshall Street
Cobar NSW 2835
(PO Box 157 Cobar NSW 2835)
Phone: 02 6836 6000
Fax: 02 6836 4395

Lightning Ridge

Industry & Investment NSW
Miners Association Building
Lot 60 Morilla Street, Lightning Ridge NSW 2834
(PO Box 314 Lightning Ridge NSW 2834)
Phone: 02 6829 9200
Fax: 02 6829 0825

Lithgow

Industry & Investment NSW
Hartley Building
Suite 1, Level 1, 184 Mort Street
Lithgow NSW 2790
(PO Box 69 Lithgow NSW 2790)
Phone: 02 6350 7888
Fax: 02 6352 3876

Orange

Industry & Investment NSW
161 Kite Street, Orange 2800
(Locked Bag 21, Orange NSW 2800)
Phone: 02 6360 5333
Fax: 02 6360 5363
After hours – emergency only –
02 6360 5343

Singleton

Industry & Investment NSW
Coal Services Building,
1 Civic Avenue, Singleton NSW 2330
(PO Box 51 Singleton NSW 2330)
Phone: 02 6571 8788
Fax: 02 6572 1201

Thornton

Industry & Investment NSW
8 Hartley Drive Thornton NSW 2322
(PO Box 343 Hunter Region Mail Centre NSW 2310)
Phone: 02 4924 4000
Fax: 02 4924 4080

Wollongong

State Government Offices
Level 3, Block F, 84 Crown Street,
Wollongong NSW 2500
(PO Box 674 Wollongong NSW 2500)
Phone: 02 4222 8333
Fax: 02 4226 3851



Industry &
Investment