



Accompanying letter to -

“Work Design, Fatigue and Sleep” – a Report by the Centre for Sleep Research

As the peak industry organisation representing Australia’s exploration, mining and minerals processing industry, nationally and internationally, the Minerals Council of Australia (MCA) considers the safety and health of the industry’s workforce as its number one priority.

The achievement of a safe workplace is a constant challenge, which requires the design of appropriate work practices, the training of employees and securing the more elusive attitudinal compliance coming together to achieve the desired result.

To assist the industry to achieve its goals, the MCA encourages the dissemination of good science. In this context, to promote a better understanding of the relationship between working hours, fatigue management and employee health, safety and welfare, the MCA commissioned Dr Angela Baker and Dr Sally Ferguson of the Australian Centre for Sleep Research at the University of South Australia, to document the relationship between sleep, working arrangements and fatigue, drawing on their own experience and research and the publicly available literature.

Working hours and fatigue management are not new to the minerals industry. Given the diversity of minerals production and processing operations and working environments and the complexity of social and cultural factors, it is simply not possible to design generic roster systems. As the researchers concluded, there is no such thing as a perfect roster, nor is there such a concept as “no risk” – risk management is the key.

These resource documents prepared by Drs Baker and Ferguson present information in a non-prescriptive manner relevant to managing fatigue in the workplace with the intention of assisting those responsible for the design and management of working arrangements. The objective of this work is to promote those relevant elements a minerals company should take into account when designing shift roster systems within their risk management strategies. The documents do not cover fatigue management strategies for fly-in fly-out operations.

The publication *Work Design, Fatigue and Sleep* is presented as two documents – a summary booklet, and a larger volume providing the underlying scientific evidence. They are provided as a resource to assist those responsible for designing working arrangements.

This information is made available to assist companies in striving towards establishing a safe and secure workplace free of industrial accidents. It is a matter for each company to decide what specific risk management arrangements are appropriate in individual circumstances.

MINERALS COUNCIL OF AUSTRALIA

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WORK DESIGN, FATIGUE and SLEEP

A resource document for the minerals industry

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Glossary

Circadian rhythms

Human beings are programmed to sleep during the night hours and to be active during the day. The sleep/wake cycle is a circadian rhythm. The term circadian comes from two Latin words, circa – about, and diem – a day. Thus circadian rhythms refer to physiological functions that cycle over a day. Examples are the sleep/wake cycle, alertness and performance, body temperature, production of hormones like melatonin and cortisol, and heart rate. These rhythms are generated by a clock in our brains, which controls their timing. Circadian rhythms do not generally adjust easily to shiftwork.

Fatigue

A state of impaired physical and/or mental performance and lowered alertness arising as a result of inadequate restorative sleep. Other mediators of fatigue are time of day and length of time awake.

Forbidden zones

The times at which the circadian rhythm inhibits sleep are known as the forbidden zones. They are approximately between 5pm and 9pm and between 8am and 12 noon.

NREM sleep

Non-rapid eye movement sleep. Can be divided into four stages that relate to the depth of sleep (Stages 1 to 4). Stage 1 is the lightest and Stage 4 sleep is the deepest.

REM sleep

Rapid eye movement sleep, or dreaming sleep.

Sleep debt

Occurs when an individual does not achieve adequate restorative sleep. A sleep debt can accumulate over a period of days of inadequate sleep or a night without sleep. This debt may result in impaired performance, reduced alertness and higher levels of sleepiness and fatigue. A sleep debt can only be repaid with recovery sleep.

Sleep deprivation

Loss of sleep. This occurs in two forms – total sleep deprivation (a whole night's sleep loss) or partial cumulative sleep deprivation (some sleep lost each night over a period of nights). Both forms of sleep deprivation result in reduced levels of alertness and performance.

Sleep duration

The length of time an individual sleeps in a single sleep period.

Sleep opportunity

This describes the time within a 24-hour period that a person has available for sleep. Work time and commute time are not considered available for sleep and are therefore not included. Within a sleep opportunity period a person may sleep, eat, socialise, relax carry out home duties or other such activities. The balance between these activities will determine the amount of actual sleep the person gets. Hours of work, together with commute times, primarily dictate the duration of the sleep opportunity, and the type of work (eg. 9am to 5pm, or shiftwork) will dictate whether the sleep opportunity is regular or irregular, predictable or unpredictable.

Working time arrangement

This term refers to design of work arrangements and the management of work hours, including overtime. It also encompasses breaks, scheduling of tasks etc.

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Dr Sally Ferguson is a research fellow with the Centre for Sleep Research, University of South Australia. Her PhD examined the circadian 'body clock' and neurotransmission. Sally's recent work has focused on human circadian function, sleep and fatigue, particularly in its relation to the minerals and medical sectors. She studied at Adelaide University in the School of Medicine.

Caveat

This work was commissioned to assist people in the minerals industry to assess existing or proposed working time arrangements, audit the effectiveness of those arrangements, and identify fatigue related issues and concerns.

This document may help people identify areas that require corrective action or continual active management and those that would benefit from review and monitoring. Ultimately the in house audit process might help operational sites to manage hours of work in relation to fatigue.

Further, this document does not seek to address fatigue management strategies for fly in fly out (FIFO) operations as there is a paucity of valid research in this area.

The authors, editors and other consultants (and to the extent that they may have had input, the Minerals Council of Australia, its members and the employees of each) accept no liability (including liability in negligence) for and give no undertakings concerning the accuracy, completeness or fitness for purpose of the information provided. They take no responsibility for any loss or damage which the user of this publication or any third party may suffer in relying on the information provided when making a decision affecting their interests.

Before relying on the material in any important matter, users should carefully evaluate its accuracy, currency, completeness and the relevance for the purpose, and should obtain any appropriate professional advice relevant to their particular circumstances.

1 Introduction

Work Design, Fatigue and Sleep is a comprehensive resource developed for the Australian minerals industry to provide guidance in the development, assessment and/or modification of working time arrangements.

The basis of Work Design, Fatigue and Sleep is that individuals require a minimum amount of sleep to maintain performance. This minimum sleep requirement refers not only to the most recent sleep period, but also to sleep periods over previous days. Another important consideration is that sleep is not as easy to obtain, or as restorative, during the day. For example, there are some times of the day when it can be very difficult to get to sleep (8am-12noon and 5pm-9pm). Information such as this can be invaluable when considering working time arrangements that minimise sleep loss and the impact of fatigue.

Sleep deprivation and fatigue are largely dependent on working time arrangements. Figure 1 illustrates some aspects of work design that directly affect sleep opportunity, each of which is discussed in detail in the main document. However, a number of other factors in an individual's life outside of work also interfere with sleep and these are also described in Figure 1.

In order to develop working time arrangements that aid sleep, health and well-being, Work Design, Fatigue and Sleep provides detailed information about the interaction between human physiology and the working time arrangement.

Work Design, Fatigue and Sleep is presented as two documents:

- > The booklet containing the basic questions that should be addressed by those who administer working time arrangements. These questions will provide the user with guidance when modifying existing arrangements or designing new arrangements. There is also summary information about managing fatigue inherent in the working time arrangement.
- > A larger volume, which provides the underlying scientific evidence and describes in more detail the importance of sleep and its effect on fatigue. It also provides detailed information about managing fatigue and designing working time arrangements that minimise fatigue by maximising the opportunity for sleep.

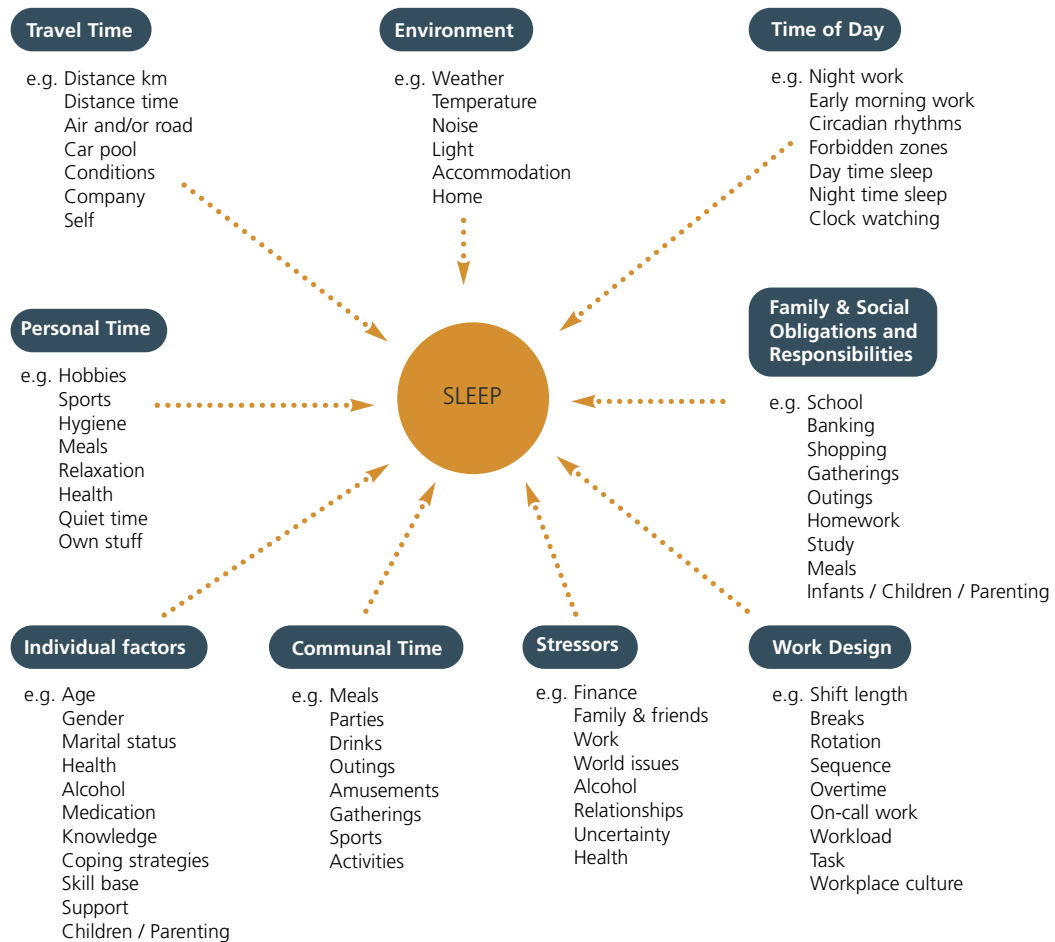


Figure 1.1 The schematic illustrates the many things which can impact on an individual's sleep. This occurs either by reducing the time available/ allocated for sleep (e.g. social obligations), or reducing the quality/quantity of the sleep (e.g. environment).

2 Working time arrangements

The risk of work related fatigue is inherent in any working time arrangement employing night shifts, irregular or long hours. Completely eliminating fatigue is impossible. Fatigue management should be viewed as a shared responsibility between employer and employees. This section presents a number of questions that challenge the operation to examine the working time arrangement from the perspective of sleep and sleep opportunity. If a change to the working time arrangement is deemed appropriate there is some summary information in this booklet to assist in that process (and more detail in the main document). However, if change is not appropriate or cannot be made immediately, a number of specific suggestions are included to help reduce the impact of sleep loss and fatigue.

Always keep in mind that:

- > A minimum amount of sleep is required to maintain performance. It is recommended that individuals obtain between seven and eight hours per 24-hour period. However this does vary between individuals.
Section number: 6.1; 6.3; 6.5; 6.6
- > Not all times of the day are equally conducive to sleep. There are 'forbidden zones' for sleep between 8am-12 noon and 5pm-9pm during which it can be more difficult to get to sleep. A 12-hour break starting at 7am will generally produce less quality sleep than a 12-hour break starting at 7pm.
Section number: 6.3; 7.2.1

- > A fatigue management plan is a very valuable tool. It enables a company or organisation to ensure all stakeholders are working to minimise the risks of fatigue.
Section number: 4; 5
- > Inadequate rest and recovery between work shifts might mean that an individual has to resume work in an unrested and therefore an unfit state.
Section number: 6.6
- > Breaks are important. In some circumstances it can be beneficial to allow breaks to be self-selected. In an eight-hour shift three breaks should be made available; at least one 30-minute minimum meal break and two shorter 'coffee' breaks. In a 12-hour shift there should be allowance for longer coffee breaks.
Section number: 7.2.6
- > 'Sleep opportunities' span more than just sleeping time. They cover the time in which a person has an opportunity to sleep, to eat and to socialise and relax. Work time and commuting time are not available for sleep and therefore are not included in the sleep opportunity.
Section number: 7.2.3; 7.3.6

No Perfect Roster:

It is important to understand that there is no perfect roster that will cater for every organisation, every work type, or every individual.

A roster that suits a single person might not be right for someone with a young family. Similarly, a roster that suits you today might not be right for you in another 10 or 15 years.

What is most important to understand when designing or modifying a working time arrangement is that both the employee and the organisation are jointly responsible for managing the working time arrangement.

The organisation must consider the sleep opportunities that are provided within the working time arrangement to ensure that employees have enough time away from work to get recovery sleep. On the other hand, employees need to use their time away from work (or sleep opportunity) to get recovery sleep and return to work in a fit state.

Thus, each working time arrangement should be evaluated according to all the factors that will affect the sleep opportunity. Some of these factors include the actual roster, the amount of overtime worked by employees, travel time to the site and travel arrangements for the workforce. These factors will be unique to each operation, and may therefore require the design of working time arrangements to reflect this uniqueness.

2.1 Sleep

Things you should know:

- > A minimum amount of sleep is required to maintain alertness and performance.
Section number: 6.5; 6.6
- > Inadequate sleep over a series of nights/days results in a sleep debt.
Section number: 6.5
- > Partial sleep loss over several days can have a worse effect than a single, whole night's sleep loss.
Section number: 6.5
- > Daytime sleep is lighter and shorter and less recuperative than night sleep.
Section number: 6.3; 6.4
- > Travel time to and from work affects the time people have for sleep.
Section number: 7.2.10
- > People often sacrifice sleep in favour of other non-work activities.
Section number: 7.3

Things you can do:

- Does the schedule provide opportunities for a continuous seven to eight hour sleep each 24 hours?
- and
- Does the schedule provide for at least 50 hours' sleep in every seven days?
- If the answer to either question is NO, consider:
- > Changing working time arrangements to provide more sleep opportunity. Refer to section 3, Designing working time arrangements.
 - > Maintaining the present working time arrangements, but helping individuals get adequate sleep by:
 - Having no less than a 12-hour break between shifts.
 - Avoiding overtime on 12-hour shifts.
 - Providing facilities for individuals to rest at work.
 - Promoting self-selected rest breaks. These are more beneficial than scheduled breaks.
 - Protecting breaks as much as is practical if there are emergencies, unplanned events, or absences.
 - Under extenuating circumstances or in a crisis, providing more frequent breaks during the work period, and providing longer breaks away from the workplace when the crisis is over.

2.2 Consecutive night shifts

Things you should know:

- > People don't adapt fully to night work.
Section number: 7.2.2; 7.2.5
- > Night work requires sleep during the day, which is shorter, lighter, and less restorative.
Section number: 6.4
- > Inadequate or poor sleep over a series of days results in accumulated sleep loss and a sleep debt.
Section number: 6.5
- > At least two full nights' sleep are needed to recover fully from a night without sleep.
Section number: 6.7
- > Research indicates two or three consecutive night shifts require one to two days for recovery and seven consecutive night shifts require three or more recovery days. This may vary if other risk management strategies promote recovery
Section number: 7.2.2
- > Alertness and performance are lowest at night. Accident risk is highest between 3am and 5am.
Section number: 7.2.1
- > Accident risk is significantly higher on the third night shift and higher still on the fourth night, compared with the first.
Section number: 7.2.2
- > The longer it takes to recover from night shift, the less useable non-work time is available.
Section number: 7.3

Things you can do:

Does the work design include four or more consecutive night shifts?

If YES you should consider:

- > Changing the work design to reduce the number of consecutive night shifts. Refer to section 3, Designing working time arrangements.
- or
- > Keeping the present system and helping promote proper rest by:
 - Ending shift times no later than 8am.
 - Allowing individuals to choose their break times but observe the minimum breaks for the shift length.
 - Limiting each night shift to 12 hours or less, including overtime.
 - Providing at least a 12-hour break between shifts.
 - Taking into account commute times.

2.3 Early work start times

Things you should know:

- > Work start times before 6am require people to wake up early and therefore truncate their sleep in the morning. Also, there is a 'forbidden zone' in the evening that makes it difficult to get to sleep earlier than normal to compensate for early awakening.
Section number: 6.3; 6.4; 7.2.2
- > An early start can cause people to worry about not being able to wake up in time, resulting in disturbed sleep or 'clock watching'.
Section number: 6.3; 7.2.10
- > Inadequate or poor sleep over a few nights/days results in accumulated sleep loss and a sleep debt.
Section number: 6.5
- > A sleep debt reduces alertness and performance, which increases accident risks.
Section number: 6.5; 6.6
- > Early starts may require people to work at the low point in the circadian performance and alertness rhythm, with implications for safety.
Section number: 7.2.1
- > Early starts may require commuters to drive at the low point in their performance/alertness rhythms.
Section number: 7.2.10

Things you can do:

- Does the morning or day shift start before 6am?
- If YES consider:
- > Changing this arrangement to eliminate or minimise starts before 6am. Refer to section 3, Designing working time arrangements.
- or
- > Keeping a pre-6am start and helping individuals get adequate rest by:
 - Not adding any overtime to the BEGINNING of a day shift with a pre-6am start.
 - Making sure individuals don't have more than five consecutive pre-6am start shifts.
 - Providing transport for long commutes.

2.4 Shift Length

Things you should know:

- > Long shifts reduce the time available for sleep. Inadequate sleep over a series of nights or days results in accumulated sleep loss.
Section number: 6.5
- > Maintaining a balance between work and non-work activity can be difficult and sleep is often sacrificed for other non-work activities.
Section number: 7.3
- > A longer time at work maintaining mental and physical effort needs longer recovery time.
Section number: 6.7
- > Longer shifts reduce time available for non-work activities such as family, social and leisure activities.
Section number: 7.3
- > Shifts longer than 12 hours are associated with very high accident risk. Research has shown that risk rises after nine hours, and rises exponentially after 12 hours. Research has also shown that accident risk increases when 4 or more consecutive 12 hour shifts are worked.
Section number: 7.2.4; 7.2.7
- > The nature of the work and the workload will largely dictate the appropriate shift length at a particular site.
Section number: 7.2.3.2
- > A risk management approach can determine whether shifts longer than eight hours are appropriate for individual sites.
Section number: 3.3
- > The positive aspects of extended shifts include prolonged periods of time off, providing opportunity for complete recovery before a return to work. **Section number:** 7.3

Things you can do:

Is the normal shift length more than eight hours?

If YES consideration should be given to the following to help individuals get proper rest, including:

- Ending night shifts no later than 8am.
- Allowing individuals to choose their break times, but observing the minimum breaks for the shift length.
- Limiting single shifts to 12 hours, including overtime.
- Ensuring breaks of at least 12 hours between shifts.
- Limiting the number of consecutive 12 hour shifts.

2.5 Direction of rotation

Forward rotation means morning shift is followed by afternoon shift then night shift. Backward rotation means morning shift is followed by night shift then afternoon shift.

Things you should know:

- > Forward rotating shifts match the body's natural rhythmic changes and therefore reduce performance impairment due to desynchronisation.
Section number: 7.2.5
- > Forward rotating shifts result in fewer disturbances to biological rhythms, including sleep.
Section number: 7.2.5
- > Shift systems that rotate forward maximise the quality and quantity of sleep.
Section number: 6.3; 7.2.5

Things you can do:

Is the rotation of shifts in a forward pattern?

If the answer is NO then you should consider:

- > Changing the working time arrangement to a forward rotation (refer section 3, Designing working time arrangements).
- or
- > If you continue operating under a backward rotating regime, you can help to maximise sleep opportunity and reduce fatigue by ensuring:
 - A minimum 12-hour break between shifts.
 - Night shifts that end no later than 8am.
 - Allowing individuals to choose their break times but observe the minimum breaks for the shift length.
 - A minimum 48-hour break after a block of night shifts, this will provide for 2 night period sleeps.

2.6 Overtime

Things you should know:

- > Overtime added to the end of a shift can dramatically reduce time available for sleep, resulting in sleep debt.
Section number: 6.5
- > Overtime on scheduled days off can affect the opportunity for recovery sleep, which people may use to 'repay' their sleep debt.
Section number: 6.5
- > A minimum amount of sleep is required to maintain alertness and performance.
Section number: 6.1; 6.6
- > Unplanned overtime can disrupt non-work time. Therefore voluntary unplanned overtime might be better than mandatory unplanned overtime.
Section number: 7.3
- > People who work beyond 12 hours might not be fit for work.
Section number: 7.2.4

Things you can do:

- Is overtime worked?
- If YES, assess the possibility of eliminating overtime.
- If eliminating overtime is not practical, you can minimise and manage fatigue by:
- Avoiding overtime at either end of a 12-hour shift.
 - Allowing individuals working overtime at the end of a regular shift to take a break before beginning overtime.
 - Providing opportunity for people working overtime on days off to have 50 hours' sleep in every seven-day period.
 - Allowing individuals to choose their break times, but observing the minimum breaks for the shift length.
 - Ensuring breaks of at least 12 hours between the end of one work period and the beginning of the next, whether it has been a regular shift or overtime.
 - Recording and monitoring the individual overtime of all employees and contractor staff.
 - Using overtime records to assign overtime based on recent hours of work and sleep opportunities.

2.7 On-call work

Things you should know:

- > Being called into work reduces the opportunity for sleep.
Section number: 6.3
- > The anticipation of being called out can reduce sleep quality.
Section number: 7.2.9
- > Depending on the time of day the on-call period occurs, sleep quality can be greatly affected. On-call work often occurs at night, when the best quality sleep is achieved.
Section number: 6.3
- > Being on-call for consecutive days or nights might interrupt successive sleep periods, resulting in cumulative sleep loss.
Section number: 6.5
- > At least two full nights' sleep are required to recover fully from a night without sleep.
Section number: 6.7
- > If an individual is called out between work shifts they might not recover adequately before recommencing work.
Section number: 6.7
- > Impaired alertness and performance are common when people first wake from sleep.
Section number: 7.2.9
- > On-call work often occurs at night when alertness and performance are lowest.
Section number: 7.2.1
- > Being on call might restrict access to non-work time and limit a person's activities in the non-active on-call period.
Section number: 7.3

Things you can do:

- Do you require people to be on call?
- If YES, modify the working time arrangement so that cover is achieved without the need for on-call work;
- owr
- Help individuals who are on call to maintain their fitness for work by:
- Limiting the number of consecutive 24-hour periods that an individual is on call.
 - Being flexible about the time individuals who have been called out are required to start work again.
 - Rostering more than one person to be on call at any time so that someone who is not well rested is not required to work.
 - Avoiding individuals who are on call having to transport themselves to and from the workplace. Arrangements could include use of taxis or pickups by shift supervisors.

2.8 Returning after a break

Things you should know:

- > Shiftworkers often sleep longer and later on days off to catch up on sleep lost while on shift. Thus, after time away from work for annual or long service leave, sleep patterns might change significantly from those established while on shift.
Section number: 7.2.8
- > Readjusting to the shift pattern might affect sleep quality and quantity on return to work.
Section number: 7.2.8
- > Inadequate sleep, caused by circadian rhythms being out of synchrony with the shift pattern, might impair performance on return to work.
Section number: 6.6
- > Alertness and performance might also be out of synchrony, especially in night work or after early starts.
Section number: 6.6; 7.2.1

Things you can do:

In general, employees should be reoriented to the workplace after a break from work (annual leave, extended sick leave, long service leave, etc) via tool-box meetings. Information should include changes to terrain, machinery or practices (this information should also be provided after rostered days off). Consideration should be given to reducing the negative impact of fatigue on individuals returning after a break.

Strategies could include:

- > Ensuring that individuals who have been away from work for an extended period do not return to work on night shift.
- > Ensuring individuals start no earlier than 6am on their return from a long break.
- > Ensuring overtime is not worked in the first week back, to ensure they get proper sleep.
- > Allowing individuals to choose their break times but observe the minimum breaks for the shift length.
- > Providing a break of at least 12 hours from the end of one shift to the beginning of another.

2.9 Commuting

Things you should know:

- > Commuting to work affects the amount of time available for sleep.
Section number: 7.2.10
- > Where people commute, early starts might require them to drive during the low point of their performance and alertness rhythms.
Section number: 7.2.10
- > Motor vehicle accident reports indicate a clear peak in accident risk at 0200hr, with a smaller peak at 1500hrs.
Section number: 7.2.10

Things you can do:

- > Is the average commute time for employees greater than 45 minutes one way?

If YES you should revise your working arrangements to minimise the risk of a long commute. The most effective controls are shortening shifts or providing company transport (refer section 3 – Designing working time arrangements).

Other fatigue management strategies include:

- Promoting self-monitoring so that individuals who have long drives are able to assess how tired they are before they leave the workplace and during the drive.
- Promoting rest before the drive home, and providing facilities for that rest.
- Providing kitchen facilities for people to prepare drinks and meals.
- Promoting the use of company transport or taxis if individuals are unfit to drive.
- Allowing individuals to self select their roster types. For example, they could choose the shift best suited to their personal preferences where this was possible.
- Determining the nature of travel – the time taken, distance, road conditions.
- Tracking accidents and near misses to and from work and sharing this information in the workplace.
- Encouraging car pooling so individuals do not travel alone.

3 Designing working time arrangements

The information about designing working time arrangements refers to all aspects of the working time arrangements, including the roster, overtime, on-call work, task scheduling and much more. Section 3 in the main document is designed to help you to develop new working time arrangements or to change an existing structure. You should refer to it for more detail but a summary is provided here.

3.1 Summary

It is important to ensure that all stakeholders are consulted and have an opportunity to take part in changes to working time arrangements. This will mean that the results are a balance between the functional and operational needs of the business and the desires and needs of its employees.

To promote discussions and to aid development it is important to:

- > Establish a working time arrangements design committee with representatives from all stakeholder groups.
- > Identify and clarify the reasons for change.
- > Determine the required staff mix for the operation.
- > Determine required staffing levels for the operation.
- > Understand the existing working time arrangement and why it was established in its current form.
- > Determine short and long-term goals for the operation and its people.

- > Comply with legislation and regulations.

- > Comply with internal policies.

Some working time arrangements may be potentially hazardous for employees or employers. Hazardous schedules may be based on unsound or limited knowledge of the financial, biomedical, physiological and psychosocial impacts of shiftwork that significantly compromise health and safety.

The best schedule is generally considered to be a balance between the needs, responsibilities and commitments of the business and its employees. There is no perfect roster. However, there will always be rosters that are viewed as either 'better' or 'worse' than others depending on the industry, operation and the individuals concerned.

The individuals who are most familiar with the working time arrangement (ie, those who work it) should be engaged in its design and development in conjunction with other stakeholders. When combined with individual and operational parameters this can ensure the working time arrangement is more widely accepted by the workforce. Thus, potential and actual changes to working time arrangements may be perceived as beneficial by both employees and the operation.

To assist operations and individuals to develop and manage their own working time arrangements, in-house training and educational programs might have to be created where managers, supervisors and employees can learn about shiftwork and its impact on themselves, their partners, the operation and the community.

3.2 Developing a working time arrangement

Despite the stress inherent in a major change of working time arrangements, it is possible to change a system if the process is initiated and supported within the workplace and all stakeholders understand the potential benefits of the change. It is also important that there is a clearly defined framework for the change.

The framework assumes that any working time arrangement is a 'best fit' to the current needs of the business and its employees. Consequently, the system should be continually evaluated against the changing needs.

There are five stages common to successful changes in working time arrangements:

Stage 1 Starting off

Stage 2 Informal consultation

Stage 3 Formal consultation

Stage 4 Detailed implementation

Stage 5 Evaluation and assessment

Each is summarised below and more detail is provided in section 3 of the main document.

3.2.1 Stage 1 - Starting off

- > Ensure a representative decision making process.
- > Involve everyone in the decision.
- > Elect a committee of stakeholder representatives.
- > Understand that a working time arrangement can only ever be a 'best fit' solution.
- > View working time arrangements as dynamic.

3.2.2 Stage 2 - Informal consultation

- > Broaden the basket of measures that determines the 'best fit' past business drivers, capital investment, personal reward, etc.
- > Committee members speak to all stakeholders to identify and represent all needs.
- > Promote discussion to produce a subset of potential work arrangement designs (e.g. between two and five).

3.2.3 Stage 3 - Formal consultation

- > Document the potential impact of the arrangements.
- > Help everyone make informed decisions.
- > Conduct an operational impact assessment.
- > Develop a variety of outcome and performance indicators.

3.2.4 Stage 4 - Detailed implementation

- > Ensure that all stakeholders make a well informed decision.
- > Committee members provide stakeholders with detailed outlines of all the potential arrangements.
- > Committee to circulate a draft covering each proposal.
- > Once all questions are answered a vote can be taken.
- > Set an implementation date.

3.2.5 Stage 5 - Evaluation and assessment

- > Ensure that changes have benefited employees and the business.
- > Monitor error rates, injuries and accidents following implementation.
- > Committee monitors the performance indicators informally but continuously.
- > Committee to evaluate the changes formally every three to six months.

Using this approach, changing hours of work may take from six to 18 months. While the first change might seem to take a long time, subsequent changes may be quicker.

Perhaps the best advice that can be offered to operations considering change is that there is no 'perfect' roster. Nevertheless, with good management and open discussion, working time arrangements can begin to reflect the current needs of employees and the business.

4 Management of fatigue

Operations should have four fundamental processes in place to support fatigue management strategies:

1. **Policy** - A document formally outlining the approach, commitment and accountability in which individual stakeholders are named, including a requirement for internal and external auditing processes (see Appendix 1 in the main book for policy outline).
2. **Training** - A training and education program to enable people to identify the signs and symptoms of fatigue and to adopt coping strategies and mechanisms within and outside the workplace (see Appendix 2 in the main book for a training and education template).
3. **Tracking Incidents** - A program for the tracking of all incidents, accidents and near misses for time of day, day of roster, hours of wakefulness and sleep length to determine the role of the roster and sleep.
4. **Support** - Medical and well-being support that includes diagnosis of sleep disorders, treatment of sleep problems and, where necessary, referrals to general practitioners, sleep psychologists, counselors or sleep clinics.

5 Countermeasures to fatigue

Operations can design and implement fatigue countermeasures that best suit their situation. Countermeasures will generally involve personal and company practices, together with a fatigue management plan.

The management of fatigue is not an exact science and the impact of fatigue factors will vary from person to person. The best countermeasure to fatigue is sleep. In the absence of sleep or sleep opportunities some of the strategies below may provide a functional approach to fatigue concerns.

5.1 Personal countermeasures

Personal countermeasures may include but not be limited to:

- > Using naps to prepare for or recover from work (e.g., before a night shift or after an early start), before driving home, at work where appropriate.
- > Seeking diagnosis and treatment for sleep disorders or problems.
- > Adopting healthy lifestyle choices which protect sleep periods.
- > Setting up a sleep environment.
- > Seeking assistance with sleep difficulties and health concerns such as insomnia, weight gain, functional restrictions, and gastrointestinal problems.
- > Pausing during a task or while driving, particularly to and from work, if fatigued. In these circumstances people should tell their supervisor of their condition and the need for a recovery break.
- > Following all workplace rules and instructions, including OHS and other legislation.
- > Attending fatigue and sleep training sessions and applying the knowledge where appropriate.
- > Letting family know about fatigue and how they can help minimise it outside the workplace.

- > Recognising the signs and symptoms of fatigue in themselves and others and acting in accordance with that observation.
- > Advising the workplace supervisor of sleep periods of less than six hours in any 24-hour period. Under these circumstances the possible reasons for sleep loss should be discussed and consideration given to rest and recovery time before resuming work.

5.2 Business countermeasures

Company countermeasures may include but not be limited to:

- > Analysing working time arrangements in accordance with Section 2.
- > Developing a fatigue management plan and communicating it to relevant site personnel.
- > Managing overtime processes based on previous work and future scheduled work.
- > Capturing incident, accident and near miss data, and linking the data to work designs and time of day factors.
- > Confining higher risk activities to times when two or more people are present.
- > Avoiding higher risk activities during the low point in the circadian alertness and performance rhythm (3am to 5am).
- > Allowing self-selected breaks.
- > Promoting self monitoring and self assessment.
- > Minimising or eliminating the times people have to work alone.
- > Maintaining radio communication contact at all times.
- > Implementing checklists and double checks for higher risk tasks.
- > Ensuring lighting is effective, premises are well ventilated and temperatures are not extreme.

- > Providing access to drinking water.
- > Undertaking wellbeing surveys and monitoring and managing hours of work.
- > Providing rest facilities.
- > Implementing regular rotation of tasks in areas of reported boredom and reduced variation.
- > Recognising that fatigue will affect everyone at a work site regardless of role and title.
- > Training of workforce in fatigue and sleep issues.
- > Conducting health checks - e.g. blood pressure, weight, sleep problems.
- > Providing an employee assistance program including support services to the spouses of workers away from home on night shift.
- > Encouraging people to advise their supervisor if they have a fatigue problem while at work and provision of a mechanism to support the individual.
- > Encouraging employees to tell their supervisor of sleep periods of less than six hours in any 24-hour period. Under these circumstances, discussing the possible reasons for sleep loss and options for rest and recovery time before resuming work.
- > Providing kitchen facilities.
- > Using working time arrangement analysis tools to determine work related fatigue levels associated with different work designs before they are worked.

