

# **GUIDE FOR MANAGING THE RISK OF FATIGUE AT WORK**

NOVEMBER 2013



Safe Work Australia is an Australian Government statutory agency established in 2009. Safe Work Australia consists of representatives of the Commonwealth, state and territory governments, the Australian Council of Trade Unions, the Australian Chamber of Commerce and Industry and the Australian Industry Group.

Safe Work Australia works with the Commonwealth, state and territory governments to improve work health and safety and workers' compensation arrangements. Safe Work Australia is a national policy body, not a regulator of work health and safety. The Commonwealth, states and territories have responsibility for regulating and enforcing work health and safety laws in their jurisdiction.

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# 1. INTRODUCTION

This document provides practical guidance for persons conducting a business or undertaking and other duty holders on how to manage fatigue to ensure it does not contribute to health and safety risks in the workplace.

The information in this guide can be applied generally to all types of work and workplaces covered by the Work Health and Safety (WHS) Act. It is not designed to provide information on managing fatigue in specific industries and does not replace requirements related to fatigue under other laws, for example heavy vehicle driver fatigue laws or rail safety requirements. This information is available in the National Transport Commission's Guidelines for Managing Heavy Vehicle Driver Fatigue and the National Rail Safety Regulator's Guidance on Fatigue Risk Management Program. Working hours may also be subject to industrial awards or enterprise agreements.

## 1.1 What is fatigue?

Fatigue is more than feeling tired and drowsy. In a work context, fatigue is a state of mental and/or physical exhaustion which reduces a person's ability to perform work safely and effectively.

It can occur because of prolonged mental or physical activity, sleep loss and/or disruption of the internal body clock.

Fatigue can be caused by factors which may be work related, non-work related or a combination of both and can accumulate over time.

Chapter 2 provides further information about factors which may cause fatigue.

## 1.2 Why is fatigue a problem?

Fatigue can adversely affect safety at the workplace. Fatigue reduces alertness which may lead to errors and an increase in incidents and injuries, particularly when:

- operating fixed or mobile plant, including driving vehicles
- undertaking critical tasks that require a high level of concentration
- undertaking night or shift work when a person would ordinarily be sleeping.

The effects of fatigue can be short or long term. In the short term a person may show the signs or report the symptoms of fatigue outlined in section 1.3.

The longer term health effects of fatigue can include:

- heart disease
- diabetes
- high blood pressure
- gastrointestinal disorders
- lower fertility
- anxiety
- depression.

### 1.3 How can you tell if someone is fatigued?

The following signs or symptoms may indicate a worker is fatigued:

- excessive yawning or falling asleep at work
- short term memory problems and an inability to concentrate
- noticeably reduced capacity to engage in effective interpersonal communication
- impaired decision-making and judgment
- reduced hand-eye coordination or slow reflexes
- other changes in behaviour, for example repeatedly arriving late for work
- increased rates of unplanned absence.

A fatigued worker may also experience symptoms not obvious to others including:

- feeling drowsy
- headaches
- dizziness
- difficulty concentrating
- blurred vision or impaired visual perception
- a need for extended sleep during days off work.

### 1.4 Who has health and safety duties in relation to managing the risks of fatigue?

Everyone in the workplace has a work health and safety duty and can help to ensure fatigue does not create a risk to health and safety at work. Fatigue is not only caused by work-related activities – it is affected by all activities carried out when a person is awake.

**Table 1** Health and safety duties in relation to managing the risks of fatigue

Who	Duties
Person conducting a business or undertaking (section 19)	<p>Has the primary duty to ensure, so far as is reasonably practicable, workers and other persons are not exposed to health and safety risks arising from the business or undertaking. This includes ensuring, so far as is reasonably practicable:</p> <ul style="list-style-type: none"> <li>■ provision and maintenance of a work environment without risks to health and safety</li> <li>■ provision and maintenance of safe systems of work, and</li> <li>■ monitoring the health of workers and the conditions at the workplace for the purpose of preventing illness or injury of workers arising from the conduct of the business or undertaking.</li> </ul> <p>The duty on the person conducting the business or undertaking is not removed by a worker's preference for certain shift patterns for social reasons, their willingness to work extra hours or to come to work when fatigued. The person conducting the business or undertaking should adopt risk management strategies to manage the risks of fatigue in these circumstances.</p>

Who	Duties
Officers (section 27)	Officers such as company directors, must exercise due diligence to ensure the business or undertaking complies with its work health and safety duties. This includes taking reasonable steps to ensure the business or undertaking has and uses appropriate resources and processes to manage the risks associated with fatigue.
Workers (section 28)	Workers must take reasonable care for their own health and safety and must not adversely affect the health and safety of other persons. Workers must also comply with any reasonable instruction and cooperate with any reasonable policy or procedure relating to fatigue at the workplace, such as policies on fitness for work or second jobs.  Workers' duties in relation to fatigue do not mean they must never work extra hours. However, they should talk to their manager or supervisor to let them know when they are fatigued. They should also avoid working additional hours and undertaking safety critical tasks when they know it is likely they are fatigued.

## 1.5 How can the risks of fatigue be managed at the workplace?

Measures to manage the risks associated with fatigue will vary from one workplace to the next, depending on the nature of the work, environmental conditions and individual factors.

The risks associated with fatigue can be managed by following a systematic process (described in more detail in Chapter 2) which involves:

- identifying the factors which may cause fatigue in the workplace
- if necessary, assessing the risks of injury from fatigue
- controlling risks by implementing the most effective control measures reasonably practicable in the circumstances, and
- reviewing control measures to ensure they are working as planned.

Further guidance on the general risk management process is provided in the Code of Practice: *How to manage work health and safety risks*.

### CONSULTING WORKERS

Consulting workers at each step of the risk management process encourages everyone to work together to identify fatigue risk factors and implement effective control measures. Consultation also helps to raise awareness about the risks of fatigue.

Section 47

A person conducting a business or undertaking must consult, so far as is reasonably practicable, with workers who carry out work for the business or undertaking who are (or are likely to be) directly affected by a work health and safety matter.

Section 48

If the workers are represented by a health and safety representative, the consultation must involve that representative.

Consultation involves sharing information, giving workers a reasonable opportunity to express views and taking those views into account before making decisions on health and safety matters.

Workers and their health and safety representatives (if any) must be consulted, so far as is reasonably practicable when:

- planning and designing work schedules and rosters
- making decisions on how to manage the risks of fatigue
- proposing changes to working hours, work schedules and procedures
- making decisions about providing information and training on fatigue
- after an incident or 'near miss' where fatigue was a factor.

#### **CONSULTING, CO-OPERATING AND CO-ORDINATING ACTIVITIES WITH OTHER DUTY HOLDERS**

#### Section 46

A person conducting a business or undertaking must consult, co-operate and co-ordinate activities with all other persons who have a work health or safety duty in relation to the same matter, so far as is reasonably practicable.

Sometimes more than one person conducting a business or undertaking may have responsibility for health and safety because they are involved in the same activities or share the same workplace. In these situations, they must communicate with each other to identify and assess health and safety risks associated with fatigue and work together in a co-operative and co-ordinated way so these risks are eliminated or minimised so far as is reasonably practicable.

For example, if a business provides on-hire workers who carry out shift work for a host business, both businesses have a duty of care to the workers. The business owners will need to discuss whether fatigue may be a potential hazard and consider issues such as the mental and physical demands of the job, shift rosters and working hours. The on-hire business will need to take into account the cumulative effect of fatigue arising from all the different workplaces the worker is sent to and agree on arrangements to manage the risks of fatigue with each business.

Further guidance on consultation is available in the Code of Practice: *Work health and safety consultation, co-operation and co-ordination*.

## 2. HOW TO MANAGE RISKS ASSOCIATED WITH FATIGUE

### 2.1 Factors that may contribute to and increase the risk of fatigue

The first step in the risk management process is to identify all reasonably foreseeable factors which could contribute to and increase the risk of fatigue. There may not be obvious signs of fatigue at the workplace but this does not mean it is not occurring or factors which may increase the risk of fatigue are not present.

Fatigue is often caused by a number of inter-related factors which can be cumulative. The major factors contributing to and increasing the risk of fatigue involve:

#### **WORK SCHEDULES - SHIFT WORK, NIGHT WORK, HOURS OF WORK, BREAKS**

Work schedules which limit the time workers can physically and mentally recover from work may cause fatigue, for example early shift start times or late finishes, short breaks between shifts, shifts lengthened by overtime or double shifts and not enough non-sleep rest breaks during a shift.

Working at night when the body is biologically programmed to sleep can interrupt a person's body clock. The body clock is the body's natural rhythm repeated every 24 hours. It regulates functions including sleeping patterns, body temperature, hormone levels and digestion. As it is programmed for different levels of wakefulness, people experience different levels of alertness depending on the time of the day.

When a person's body clock is out of step alertness decreases making them feel fatigued. This increases the risk of making errors and causing incidents and injuries, either in the workplace or outside of work, including on the way to and from work.

#### **JOB DEMANDS**

Some types of work, for example concentrating for extended periods of time, performing repetitious or monotonous work and performing work requiring continued physical effort can increase the risk of fatigue.

Workers can be mentally and physically fatigued at the same time. Work which is reactive and performed under high pressure, for example emergency services, may also increase the risk of fatigue.

#### **SLEEP - LENGTH OF SLEEP TIME, QUALITY OF SLEEP AND TIME SINCE SLEEP**

While tired muscles can recover with rest, the brain can only recover with sleep. The most beneficial sleep is deep undisturbed sleep taken in a single continuous period.

The optimum amount of sleep varies for each person, however, an adult generally requires seven to eight hours of sleep daily.

When individuals get less sleep than they need in a day, they build up a sleep debt which accumulates until they can get enough sleep to overcome the sleep debt. Each extra day without enough sleep increases the debt, and when it becomes large enough fatigue can occur. It may take several days before a person recovers from a sleep debt. Sleep debt is common with night shift workers as they often experience difficulty getting enough undisturbed sleep during the day.

One sleepless night can have similar effects on someone as drinking too much alcohol.

#### **ENVIRONMENTAL CONDITIONS**

Working in harsh and uncomfortable conditions can contribute to fatigue, for example, exposure to heat, cold, vibration or noisy workplaces can make workers tire quicker and impair performance.

### NON-WORK RELATED FACTORS

Factors occurring outside of work may also contribute to fatigue. A worker's lifestyle, family responsibilities, health (e.g. insomnia, sleep apnoea, some medication), other work commitments, and extended travel between work and home may all increase the risk of fatigue.

## 2.2 How to identify factors that may contribute to or increase the risk of fatigue

Methods to identify factors which may contribute to or increase the risk of fatigue can include:

- *Consult with workers*, including managers, supervisors and health and safety representatives (if any) about the impact of workloads and work schedules, including work-related travel and work outside of normal hours (for example work a person has taken home to complete).
- *Examine work practices* and systems of work, for example
  - the degree of choice and control workers have over work hours, the pace of work and rest breaks, and
  - the type of work culture, for example where there is an accepted practice of working long hours.
- *Examine worker records*, for example sign in-out sheets, billing sheets and shift changeovers, to determine working hours and in particular whether excessive hours have been worked or hours have been worked at times which may have led to body clock disruption.
- *Obtain advice and information* on fatigue from relevant experts, research, guidance materials and data published by regulators, industry associations, unions or other sources.
- *Review workplace incident data*, including incidents travelling to and from the workplace, and ask the following questions:
  - What is the likelihood fatigue is contributing to the incidents?
  - What time of day do incidents occur?
  - When incidents have occurred, how long had the workers involved been working? For example time since start of shift, number of hours worked that week and in the preceding three months.
  - Do the incidents often happen when a worker's body clock is slowing the body down and concentration is poor?
- *Review human resource data*, for example rates of unplanned absenteeism, staff turnover and workers compensation claims. Those with an injury or illness may be at greater risk of becoming fatigued.

The checklist at Appendix A can be used to assist in identifying factors in your workplace which increase the risk of fatigue.

## 2. HOW TO MANAGE RISKS ASSOCIATED WITH FATIGUE

### WORKERS AT HIGH RISK OF FATIGUE

Some workers are at a higher risk of fatigue because their work typically involves some or all of the factors which contribute to fatigue, for example:

- shift workers
- night workers
- fly-in, fly-out workers (FIFO)
- drive in, drive out (DIDO)
- seasonal workers
- on-call and call-back workers
- emergency service workers
- medical professionals and other health workers.

### SAFETY CRITICAL TASKS

It is particularly important to identify fatigue risks which might arise when safety critical tasks are being carried out. Safety critical tasks are those where the consequences of a mistake or error in judgment could cause serious injury, for example:

- driving a road vehicle, such as a taxi or courier van, or operating a crane or other high risk plant
- working at heights
- participating in medical or surgical procedures and settings
- working with flammable or explosive substances
- other types of work identified as hazardous, for example electrical work.

### 2.3 Assessing the risks

A risk assessment can assist in finding out:

- where, which and how many workers (including contractors and subcontractors) are likely to be at risk of becoming fatigued
- how often fatigue is likely to occur
- the degree of harm which may result from fatigue
- whether existing control measures are effective
- what action should be taken to control the risk of fatigue
- how urgently action to control the risk needs to be taken.

When assessing risks, contributors to fatigue should not be considered in isolation. For example, job demands, hours of work and environmental conditions may all increase the risk of fatigue in the workplace. The risks of injury from fatigue may increase if workers work long daily hours in a physically or mentally demanding job. This risk of fatigue may increase when new workers begin their job and are adjusting to work demands.

Risk assessment methods are similar to the methods used to identify factors contributing to fatigue in section 2.1 therefore these steps can be carried out at the same time.

It is not necessary to conduct a risk assessment in all circumstances.

### 2.4 Controlling the risks

The best way to control the health and safety risks arising from fatigue is to eliminate the factors causing fatigue at the source.

If elimination is not reasonably practicable, the risks must be minimised.

What is reasonably practicable to do to manage the risk of fatigue will vary depending on the type of industry, the structure of an organisation as well as the person carrying out the work.

For example, control measures a small business implements to manage the risk of fatigue may differ from those implemented by a large corporation with 300 shift or night workers, or those implemented by an emergency service organisation when it is operating under emergency response conditions.

Factors contributing to the risk of fatigue are often inter-related. Incorporating a combination of control measures into general workplace systems, as well as control measures specific to the work, can help to minimise more than one contributor to fatigue. For example, increasing the amount of time between shifts and adjusting shift starting times may improve the opportunity for sleep.

#### **WORK SCHEDULING**

Control measures for fatigue risks which can be built into a work schedule may include:

- designing working hours and rosters to allow for good sleep opportunity and enough recovery time between work days or shifts for travelling, eating, washing and sleeping
- developing a working-hours policy on daily work hours, maximum average weekly hours, total hours over a three-month period, on-call work and work-related travel
- developing procedures to manage and limit excessive working hours, for example requiring minimum breaks on a regular basis, especially during longer shifts
- ensuring workers have and take adequate and regular breaks to rest, eat and rehydrate
- scheduling safety critical work outside the low body clock periods between 2am and 6am, and between 2pm and 4pm
- managing workload and work-pace change caused by machinery breakdowns or planned and unplanned absences
- avoiding work arrangements which provide incentives to work excessive hours
- managing overtime, shift swapping and on-call duties
- implementing processes to manage accrued leave balances and requests for leave, for example setting maximum limits of leave accrual to encourage workers to use it
- considering future rosters and schedules when approving request for leave or shift swaps, and ensuring leave is reflected in rosters
- having access to on-call workers for unplanned leave, emergencies or where workload increases
- developing plans to deal with workload changes due to absenteeism
- filling vacant positions as soon as reasonably practicable and maintaining a relief pool of staff in high demand areas where fatigue is a risk
- considering alternative options to face-to-face meetings, for example teleconferencing so workers are not required to spend time travelling to meetings.

## 2. HOW TO MANAGE RISKS ASSOCIATED WITH FATIGUE

### SHIFT WORK AND ROSTERS

When planning work schedules and rosters for specific work arrangements, including shift and night work, FIFO, DIDO, seasonal, on-call and emergency services work arrangements, consideration should be given to implementing additional specific control measures.

Specific control measures may include:

- structuring shifts and designing work plans so work demands are highest towards the middle of the shift and decrease towards the end
- avoiding morning shifts starting before 6am where possible
- avoiding split shifts or if there is no alternative to split shifts consider their timing, for instance whether they are likely to disrupt sleep
- setting shift rosters ahead of time and avoiding last-minute changes, to allow workers to plan leisure time
- allocating shift and night workers consecutive days off to allow for at least two full nights' sleep including some weekends
- aligning shift times with the availability of public transport or if required, provide alternative transport at the end of a long shift
- overlapping consecutive shifts to allow enough time for communication at shift handovers
- avoiding overtime allocation after afternoon or night shifts
- consider if night work is necessary and rearrange schedules so non-essential work is not carried out at night
- keeping sequential night shifts to a minimum, and
- providing information to shift workers containing tips for them to prevent and manage the risk of fatigue.

Appendix B provides further guidance for designing shifts.

### JOB DEMANDS

Control measures to prevent or minimise the risk of fatigue can include:

- ensuring fit-for-purpose plant, machinery and equipment is used at the workplace (for example, ergonomic furniture, lifting equipment and anti-fatigue matting for repetitive tasks performed while standing)
- encouraging workers to report concerns they may have about work-related fatigue
- redesigning the job to limit periods of excessive mental or physical demands
- introducing job rotation to limit a build-up of mental and physical fatigue
- developing contingency plans for potential situations where workers may have to unexpectedly work longer hours, more shifts or a long sequence of shifts, and
- planning for expected changes in work flow including anticipated peaks and troughs during the year.

### ENVIRONMENTAL CONDITIONS

- Avoid working during periods of extreme temperature or minimise exposure time through job rotation.
- Provide a cool area where workers can take a rest break and rehydrate in hot work environments.

## 2. HOW TO MANAGE RISKS ASSOCIATED WITH FATIGUE

- Install ventilation and mechanical cooling devices in hot, small and enclosed spaces such as truck cabins.
- Provide adequate facilities for rest, sleep, meal breaks, onsite accommodation (if appropriate).
- Install adjustable, low-vibration seats in machinery and vehicles and provide low vibration hand held equipment.
- Provide and maintain a workplace which is well lit, safe and secure.

### NON-WORK RELATED FACTORS

Work and lifestyle often impact each other. For example, if a worker leaves their job tired and exhausted they may be less able to perform out-of-work activities or could be a danger to themselves and others when driving home tired. Likewise, if a worker arrives at work fatigued they may be less productive or could be a danger to themselves and others in the workplace.

A person conducting a business or undertaking cannot control what a worker does outside of work. Workers have a duty to take reasonable care for their health and safety and this includes enough sleep so they can arrive at work ready for duty. However controls can be implemented to avoid potential conflicts between personal and work demands, for example:

- develop a fatigue policy for all workers including managers and supervisors,
- consult workers about managing fatigue not just when at work, the risks associated with fatigue and how it relates to their health and safety duties.

### WORKPLACE FATIGUE POLICY

A fatigue policy is not mandatory but may be an effective way to communicate the organisation's procedures to workers. Consider including information about:

- roles and responsibilities of supervisors and workers
- maximum shift length, average weekly hours and total hours over a three-month period
- work-related travel
- control measures for specific tasks, jobs and operations
- self-assessment checklists
- procedures for reporting potential hazards and fatigue risks, and
- procedures for managing fatigued workers, including what will happen if they are too fatigued to continue work (e.g. temporary task re-allocation).

A fatigue policy can be included with other work health and safety policies, for example policies on bullying, drugs and alcohol and fitness for work and should be developed in consultation with workers or their health and safety representative.

A risk management chart at Appendix C provides further guidance on identifying, assessing and controlling the risks associated with fatigue.

## 2.5 Information, instruction, training and supervision

### Section 19

A person conducting business or undertaking must provide, so far as is reasonably practicable, any information, training, instruction or supervision necessary to protect all persons from risk to their health and safety arising from work carried out as part of business or undertaking.

## 2. HOW TO MANAGE RISKS ASSOCIATED WITH FATIGUE

Providing information and training to workers about the factors that can contribute to fatigue and the risks associated with it will help them to not only do their job but also implement control measures to minimise the risk of fatigue in the workplace.

Training about fatigue and relevant workplace policies should be arranged so it is available to all workers on all shifts. Information and training for workers should include:

- the work health and safety responsibilities of everyone in the workplace
- the factors that can contribute to fatigue and risks that may be associated with it
- symptoms of fatigue
- the body clock and how fatigue can affect it
- effective control measures for fatigue, for example work scheduling
- procedures for reporting fatigue
- effects of medication, drugs and alcohol
- nutrition, fitness and health issues relating to fatigue
- balancing work and personal demands.

### **MANAGERS AND SUPERVISORS**

Managers and supervisors should be trained to:

- recognise fatigue
- understand how fatigue can be managed and how to implement control measures, including how to design suitable rosters and work schedules in consultation with workers,
- take appropriate action when a worker is displaying fatigue related impairment.

An appropriate level of supervision should be provided (for example a higher level of supervision for safety critical tasks), which may include monitoring work to ensure safe work practices are followed.

## 2.6 Monitoring and reviewing

Once control measures are implemented, they should be monitored and reviewed to ensure they continue to effectively manage fatigue. Consider implementing trial periods for any new work schedules and encouraging workers to provide feedback on their effectiveness.

To determine the frequency of monitoring and review consider the level of risk — high-risk hazards need more frequent assessments. Control measures should also be reviewed when:

- there is any indication risks are not being controlled
- new tasks, equipment, procedures, rosters or schedules are introduced
- changes are proposed to the work environment, working hours, schedules and rosters
- there is an incident due to fatigue at the workplace
- new information regarding fatigue becomes available, and
- the results of consultation, including a request from a health and safety representative, indicate that a review is necessary.

The case studies in Appendix D provide examples of ways to implement control measures in managing the risk of fatigue in the workplace.

# APPENDIX A – FATIGUE CHECKLIST

This checklist provides guidance to assist in identifying risks of fatigue but is not an exhaustive list of risk factors. If the answer is yes to any of the questions, fatigue risks may need to be further assessed and control measures implemented.

Mental and physical work demands	
Does anyone carry out work for long periods which is physically demanding? (for example, tasks which are especially tiring and repetitive such as bricklaying, process work, moving bags of cement, felling trees)	Yes/No
Does anyone carry out work for long periods which is mentally demanding? (for example, work requiring vigilance, work requiring continuous concentration and minimal stimulation, work performed under pressure, work to tight deadlines, emergency call outs, interacting/dealing with the public)	Yes/No
Work scheduling and planning	
Does anyone consistently work or travel between midnight and 6am?	Yes/No
Does the work schedule prevent workers having at least one full day off per week?	Yes/No
Does the roster make it difficult for workers to consistently have at least two consecutive nights sleep per week?	Yes/No
Do work practices include on-call work, call-backs or sleepovers?	Yes/No
Does the roster differ from the hours actually worked?	Yes/No
Does the work roster include rotating shifts?	Yes/No
Does anyone have to travel more than one hour to get to their job?	Yes/No
Work Time	
Does anyone work in excess of 12 hours regularly (including overtime)?	Yes/No
Does anyone have less than 10 hours break between each shift? (for example, split shifts, quick shift changeovers)	Yes/No
Is work performed at low body clock times (between 2 am and 6 am)?	Yes/No
Environmental conditions	
Is work carried out in harsh or uncomfortable conditions? (for example, hot, humid or cold temperatures)	Yes/No
Does anyone work with plant or machinery that vibrates?	Yes/No
Is anyone working with hazardous chemicals?	Yes/No
Is anyone consistently exposed to loud noise?	Yes/No
Non-work factors	
Are workers arriving at work fatigued?	Yes/No

# APPENDIX B – GUIDELINES FOR SHIFT DESIGN

There are many different shift work-schedules and each schedule has different features. The diversity of work and workplaces means there is no single optimal shift system which suits everyone. However, a planned and systematic approach to managing the risks of shift work can improve the health and safety of workers.

The key risk factors which should be considered in shift schedule design are the workload, the work activity, shift timing and duration, direction of rotation and the number and length of breaks during and between shifts. Other features of the workplace such as the physical environment can also contribute to the risks associated with shift work.

## GUIDELINES FOR SHIFT DESIGN

- Plan an appropriate and varied workload.
- Offer a choice of permanent roster or rotating shifts.
- Limit shifts to 12 h including overtime, or to 8 h if they are night shifts and/or the work is demanding, monotonous, dangerous and/or safety critical.

### Night shifts

- Restrict number of successive night shifts (no more than 3 to 4 if possible).
- Allow for at least 2 full night's sleep after the last night shift.
- Avoid keeping workers on permanent night shifts.
- Arrange shifts so day sleep is not restricted.
- Where possible, provide at least 24 hours' notice before night work.

### Early starts

- Avoid early morning starts and move early shift starts before 6am forward (e.g. 7am not 6am start).
- Limit the number of successive early starts (to 4 maximum if possible)
- Shifts involving an early start should be shorter in length to counter the impact of fatigue later in the shift.

### Shift length

- If 12-hour shifts worked then no overtime worked in addition.
- Avoid long working hours (more than 50 hours per week).
- If 8/10 hour shifts then no more than 4/2 hours extra overtime to be worked.
- Limit consecutive work days to a maximum of 5 - 7 days.

### Rest periods

- Allow minimum of 12 hours between shifts and avoid 'quick return' of 8 hours if possible. (Rest period between shifts should permit enough time for commuting, meals and sleep.)
- Build regular free weekends into the shift schedule, advisably at least every 3 weeks.

### Rotation

- Use a rapid rotation of shifts (a select number of days) or a slow rotation of shifts (a select number of weeks). A shift design should take into account individual differences and preferences as far as possible. Use forward rotation (morning/afternoon/night).

### Other considerations

- Arrange start/finish times of the shift to be convenient for public transport, social and domestic activities.
- Account for travelling time of workforce.

## APPENDIX B - GUIDELINES FOR SHIFT DESIGN

- Allow individual choice where possible to accommodate family commitments and offer alternatives where workers have difficulty adjusting to shift times.
- Keep the timing of shifts predictable.

# APPENDIX C – RISK MANAGEMENT CHART

This chart can be used to consider potential factors that contribute to the risk of fatigue. It outlines some control measures which can be implemented to manage the risk of fatigue in the workplace.

**Step 1: Hazard identification**  
Identify potential hazards and risks at the workplace. Examples of some factors that contribute to fatigue are listed below. Consider these factors in the context of your specific workplace or industry.

**Step 2: Risk Assessment**  
To assist risk assessment, a general level of risk for each hazard is indicated along arrow guides. In assessing risk consider interaction between hazard factors that could influence the level of risk. Also take into account specific workplace/ industry circumstances that may influence it.

**Step 3 Risk Control**  
Where a hazard factor is assessed as medium/ higher risk, consider implementing control measures, such as those outlined in section 2 of this code.

## Factors that contribute to Fatigue

### Work Scheduling and Planning Hours

- Average weekly hours (other than FIFO)
- Total hours over a three month period (other than FIFO)
- Daily work hours
- Daily work hours and work-related travel, including commute
- Scheduling of work

### Shiftwork

- Length of shift (other than FIFO)
- Time of shift
- Speed and direction of shift
- Split shifts and variable shifts

## General risk indicator for factors that contribute to fatigue

Lower risk

35-40 hours (working week)

48 hours (working week)

56 hours (working week)

624 working hours

12 working hours

13 working hours

9 working hours

10 working hours

Irregular and unpredictable hours, short notice of schedule, extended overtime, on call across shift cycle

Regular, predictable hours

Lower risk

Day shift

Afternoon shift

Night shift

Forward rotation (morning/afternoon/night)

Backward rotation (night/evening/morning)

slower rotation (i.e. weekly / 3-4 weekly rotation)

13 hour period

13 hour period

Higher risk

## Control measures

The most appropriate control measures should be implemented for the identified risk factor. Control measures may include:

- Scheduling safety critical work outside low body clock periods (i.e. between 2am and 6am)
- Structure shifts and work plans so that demands are highest towards the middle of the shift and decrease towards the end
- Use forward rotation roster systems (day-evening-night)
- Designing working hours and rosters to provide for adequate sleep opportunity (considering time for eating, washing, personal commitments etc)
- Monitor actual time worked against the allocated roster and identify if excessive hours are being worked

Additional control measures should be implemented for special work arrangements and can include:

- Considering sleep opportunity and recovery in instances where workers are required to work on call after a normal shift or on days off
- Avoiding quick shift changeovers, such as finishing at 11pm and starting again at 7am
- Use forward rotation roster systems (day-evening-night)
- Allocate shift and night workers consecutive days off to allow for at least two full nights rest including some weekends

## APPENDIX C - RISK MANAGEMENT CHART

Step 1: Hazard identification	Step 2: Risk Assessment	Step 3: Risk Control
<p><b>Hazards that contribute to fatigue</b></p> <p><b>Night Work</b></p> <ul style="list-style-type: none"> <li>■ Shift end (for those working 8 hrs or more between 10pm and 6am)</li> <li>■ Sequential night shifts</li> </ul>	<p><b>General risk indicator for hazards that contribute to fatigue</b></p> <p>Lower risk</p> <p>Higher risk</p> <p>After 10pm and before 6am</p> <p>10 hours</p> <p>12 hours</p> <p>8 hours</p> <p>6 or more 8 hour shifts</p> <p>5 or more 10 hour shifts</p> <p>4 or more 12 hour shifts</p>	<p><b>Control measures</b></p> <p>The most appropriate control measures should be implemented for the identified risk factor.</p> <p><b>Control measures may include:</b></p> <ul style="list-style-type: none"> <li>■ Planning into work schedules enough workers and other resources to do the job without placing excessive demands on workers.</li> <li>■ Keeping sequential night shifts to a minimum</li> <li>■ Avoiding overtime allocation after afternoon or night shifts</li> </ul>
<p><b>Breaks</b></p> <ul style="list-style-type: none"> <li>■ Period of non-working following a sequence of night shifts</li> <li>■ Frequency of breaks during work</li> <li>■ Recovery time / sleep opportunity between work periods</li> </ul>	<p>Lower risk</p> <p>Higher risk</p> <p>48 hours</p> <p>Less than 48 hours</p> <p>Adequate and regular breaks</p> <p>Infrequent or no breaks</p> <p>Adequate time for sleep, travel, meals, etc</p> <p>Inadequate time for sleep, travel, meals etc</p>	<p>The most appropriate control measures should be implemented for the identified risk factor.</p> <p><b>Control measures may include:</b></p> <ul style="list-style-type: none"> <li>■ Ensuring that workers have and take adequate and regular breaks so that they can rest, eat and rehydrate</li> <li>■ Including rest periods in the work schedule and allow time for controlled sleeping and napping if necessary</li> <li>■ Designing working hours and rosters to allow for good quality sleep and enough recovery time between work days or shifts for travelling, eating, washing and sleeping</li> </ul>
<p><b>Job demands</b></p> <ul style="list-style-type: none"> <li>■ Repetition (physical and/or mental)</li> <li>■ Physical</li> <li>■ Mental</li> </ul>	<p>Lower risk</p> <p>Higher risk</p> <p>Varying task demands</p> <p>Highly repetitive work and or high concentration work, with high demands over an extended period of time</p> <p>Minimal physically demanding work</p> <p>Highly physically demanding work that results in muscle fatigue</p>	<p>The most appropriate control measures should be implemented for the identified risk factor.</p> <p><b>Control measures may include:</b></p> <ul style="list-style-type: none"> <li>■ Install fit for purpose plant machinery and equipment for use at the workplace</li> <li>■ Redesign jobs to limit periods of excessive mental or physical demands</li> <li>■ Introduce job rotation to limit build up of mental and physical fatigue</li> </ul>

Step 1: Hazard identification	Step 2: Risk Assessment	Step 3: Risk Control				
<p><b>Hazards that contribute to fatigue</b></p> <p><b>Environmental Conditions</b></p> <ul style="list-style-type: none"> <li>■ Exposure to hazardous substances and atmospheric contaminants</li> <li>■ Exposure to noise</li> <li>■ Exposure to extreme temperatures</li> <li>■ Exposure to vibration</li> </ul>	<p><b>General risk indicator for hazard factors</b></p> <table border="0"> <tr> <td style="text-align: right; vertical-align: top;">Lower risk</td> <td>                     hazardous substances, low risk calculated using relevant exposure standard                      - exposure for short duration                      - low noise levels                      Short period of exposure                      Short period of exposure                 </td> </tr> <tr> <td style="text-align: right; vertical-align: top;">Higher risk</td> <td>                     For hazardous substances, high risk calculated using relevant exposure standard                      - exposure for long duration                      - high noise levels                      Long period of exposure                      Long period of exposure                 </td> </tr> </table>	Lower risk	hazardous substances, low risk calculated using relevant exposure standard - exposure for short duration - low noise levels Short period of exposure Short period of exposure	Higher risk	For hazardous substances, high risk calculated using relevant exposure standard - exposure for long duration - high noise levels Long period of exposure Long period of exposure	<p><b>Control measures</b></p> <p><b>The most appropriate control measures should be implemented for the identified risk factor. Control measures may include:</b></p> <ul style="list-style-type: none"> <li>■ Avoid working during periods of extreme temperature</li> <li>■ Install heating devices in cold work environments or provide access to cooled areas</li> <li>■ Install fit for purpose machinery (low noise)</li> <li>■ Install cooling devices in hot work environments like truck cabins and ensure shelters for shade are available in hot work environments</li> <li>■ Installation of adjustable, low vibration seats in appropriate machinery and vehicles and provide low vibration hand held equipment</li> <li>■ Taking reasonable steps to ensure the workplace and surroundings are well lit, safe and secure</li> </ul>
Lower risk	hazardous substances, low risk calculated using relevant exposure standard - exposure for short duration - low noise levels Short period of exposure Short period of exposure					
Higher risk	For hazardous substances, high risk calculated using relevant exposure standard - exposure for long duration - high noise levels Long period of exposure Long period of exposure					

## APPENDIX C - RISK MANAGEMENT CHART



4.

# APPENDIX D – CASE STUDIES

These case studies provide examples of ways to manage the risk of fatigue in various industries.

## Case Study 1: Work scheduling:

A local courier company schedules work and delivery routes for 20 drivers. It:

- ensures all shifts are scheduled to run between 6am and 2pm and overtime required is scheduled to end by 5pm
- provides opportunity for its casual workers to voluntarily place themselves on an on-call list in case unplanned absences arise and extra workers need to be rostered
- includes regular short breaks in its work schedule so drivers have time to rest for a short period, refresh themselves and confirm their next pick up or delivery address, and
- releases rosters one month in advance and ensures they reflect approved leave.

## Case study 2: Manufacturing

Situation	Risk Factors	Outcome
<p>A manufacturing company runs its operations 24 hours a day, with three shifts, morning, afternoon, and evening. All shifts are permanently allocated to three sets of workers. The night shift is carried out by staff provided through a labour hire company. There is no limit placed on the number of consecutive nights contractors could work and there is less staff rostered to work at night than in the day. The night shift also has minimal maintenance staff working. The company did not think it had a risk of fatigue until it undertook a health and safety review of injuries, near misses and incidents.</p> <p>The manufacturing company consulted the labour hire company and its workers in undertaking the review, which revealed a number of injured workers were the night shift contractors. These workers had worked more than 10 consecutive nights before their injuries.</p>	<p>The review of injuries, near misses and incidents revealed there were no effective fatigue risk controls in place during the night shift:</p> <ul style="list-style-type: none"> <li>■ no limit was placed on the number of hours which could be worked</li> <li>■ there was no monitoring of hours actually worked</li> <li>■ the continuous night shift roster did not provide enough recovery time to the people who worked it, and</li> <li>■ consistent night shifts meant the night workers rarely got good quality sleep.</li> </ul>	<p>The review recommended the following risk control measures be implemented:</p> <ul style="list-style-type: none"> <li>■ only operate the lower-risk production lines at night</li> <li>■ give the night supervisors and night maintenance staff permission to shut down the production line when necessary</li> <li>■ implement an organisation-wide fatigue management system to manage and monitor the number of weekly hours worked by each worker</li> <li>■ place a limit of 7 consecutive days and no more than 4 consecutive night shifts</li> <li>■ agreement with labour hire company to set limit on working hours of contractors, and</li> <li>■ workers must have a minimum of six days off every month.</li> </ul>

### Case study 3: Health

Situation	Risk Factors	Outcome
<p>After a medication administration error, a large city hospital conducted an investigation. During the investigation, they discover the nurse who made the error had worked more than 240 hours that month. She worked many long shifts, some were for 10 hours at night and some were for 12 hours in the day. The nurse had been required to work a number of night shifts at short notice to fill in for absent staff. Her unit manager had not been able to call on agency staff or casuals because of budget constraints. For the entire month, the nurse did not get two days off in a row. The shifts she worked over the month were often on a backward rotation.</p>	<p>The investigation revealed there were no effective risk controls for fatigue:</p> <ul style="list-style-type: none"> <li>■ there was no monitoring of the rosters staff actually worked</li> <li>■ many shifts were scheduled in a backward rotation</li> <li>■ often the rosters didn't provide enough recovery time between shifts</li> <li>■ some rosters meant staff did not get two consecutive days off a week</li> <li>■ shifts were often varied at short notice and</li> <li>■ no consideration was given to actual acquired sleep of staff and the amount of opportunity staff had to sleep between shifts.</li> </ul>	<p>The fatigue risk control measure the hospital implemented included:</p> <ul style="list-style-type: none"> <li>■ a safe hours policy which included clear guidelines on how to develop schedules minimising the risk of fatigue (including a maximum number of night shifts which could be worked in a roster cycle, minimum number of days off in a roster cycle and minimum hours break between shifts)</li> <li>■ a forward-rotating rostering system</li> <li>■ a roster-monitoring system which included checking rosters actually worked against the planned rosters every month</li> <li>■ budget allocation for agency staff to cover unplanned absences, and</li> <li>■ supervisor and staff training on the new rostering system.</li> </ul>

## Case study 4: Emergency Services

Situation	Risk Factors	Outcome
<p>At the peak of the bushfire season, a four-person crew from one region where there are no fires is sent to assist another region fighting a fire front which is 50km wide. The area needing the extra crew members is a four hour drive from the region's base. The crew are based at the fire ground for either five-day shifts or three-night shifts. The shifts are 12-hours long, including travel to and from a staging area at a community hall which is also used for meals and sleep. The community hall is used as a staging area for other emergency and support services and is therefore quite noisy and busy. A number of strike teams are in the same situation.</p> <p>The safety coordinator becomes concerned the strike teams are not getting the amount of quality rest and sleep time they need to avoid fatigue. The co-ordinator conducts a risk assessment with the health and safety representative to establish the main risk factors and put in place control measures addressing the fatigue risk factors.</p>	<p>Key fatigue risk factors identified:</p> <ul style="list-style-type: none"> <li>■ harsh environment caused by extreme heat, smoke and fire</li> <li>■ travel time was not adequately accounted for in shift arrangements</li> <li>■ the common rest area is noisy</li> <li>■ fire fighting is very physically demanding work and requires a high level of vigilance to be maintained, and</li> <li>■ not enough recovery time provided.</li> </ul>	<p>The following control measures were implemented:</p> <ul style="list-style-type: none"> <li>■ once the fire ground is contained, the number of teams working at night is reduced</li> <li>■ shift lengths are modified in consultation with workers to reduce fatigue</li> <li>■ supervisors on the fire ground monitor the teams for fatigue</li> <li>■ teams alternate between active fighting and asset protection tasks</li> <li>■ more suitable accommodation for sleeping is provided; where there is no motel accommodation a base camp is set up away from the main staging area</li> <li>■ buses are provided for transport to and from staging area and the meals and accommodation locations.</li> </ul>

# OTHER RESOURCES

Industry	Title and weblink
Heavy Vehicle Transport	<ul style="list-style-type: none"> <li>■ <a href="#">Heavy vehicle national law</a></li> <li>■ <a href="#">National Heavy Vehicle Regulator</a></li> </ul>
Rail	<ul style="list-style-type: none"> <li>■ <a href="#">Rail safety national law</a></li> <li>■ <a href="#">National Rail Safety Regulator</a></li> </ul>
Aviation	<ul style="list-style-type: none"> <li>■ <a href="#">Fatigue management for the Australian aviation industry</a></li> </ul>
Medical Professionals	<ul style="list-style-type: none"> <li>■ <a href="#">Managing the risks of fatigue in general practice</a></li> <li>■ <a href="#">AMA safe hours audit</a></li> <li>■ <a href="#">AMA code of practice</a></li> <li>■ <a href="#">ANF fatigue prevention</a></li> </ul>
Drivers (i.e. taxi drivers)	<ul style="list-style-type: none"> <li>■ <a href="#">Fatigue management (QLD)</a></li> </ul>
Emergency services	<ul style="list-style-type: none"> <li>■ <a href="#">Emergency Services Guideline for Risk Managing Fatigue. (SA)</a></li> </ul>
Mining	<ul style="list-style-type: none"> <li>■ <a href="#">Fatigue management - mining (NSW)</a></li> <li>■ <a href="#">Fatigue management - mining (WA)</a></li> <li>■ <a href="#">Fatigue Management- Mining (Qld)</a></li> </ul>
General information	<ul style="list-style-type: none"> <li>■ <a href="#">Managing Fatigue (QLD)</a></li> <li>■ <a href="#">Managing fatigue risks</a></li> <li>■ <a href="#">HSE Managing Shiftwork</a></li> <li>■ <a href="#">Fatigue risk index</a></li> <li>■ <a href="#">Human Factors: fatigue</a></li> <li>■ <a href="#">National Transport Commission</a></li> </ul>

