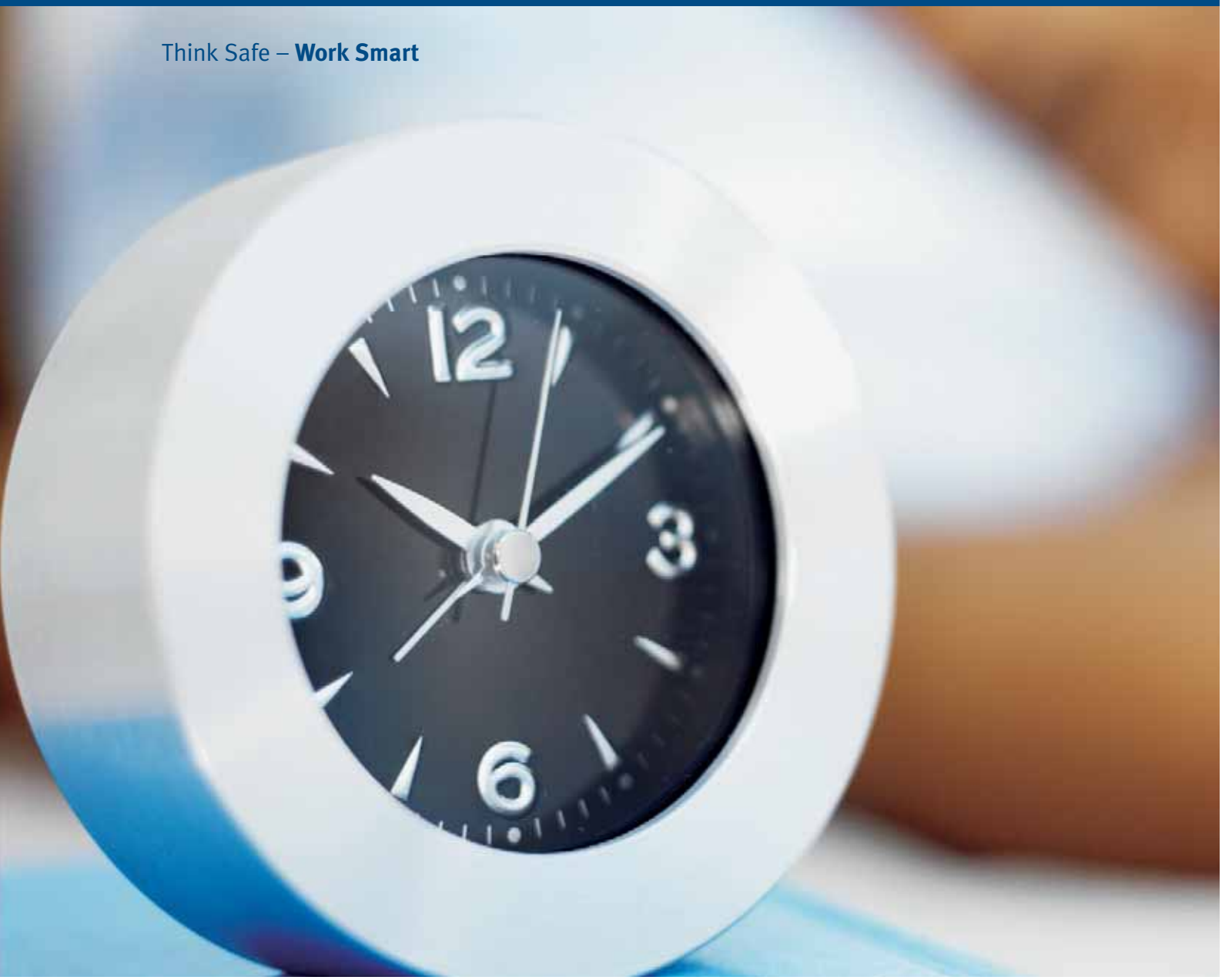
Fatigue management guide

Workplace Health and Safety Queensland

Think Safe – **Work Smart**



Queensland **the Smart State**

Queensland Government
Department of Industrial Relations

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Purpose

Fatigue affects a person's health, reduces performance and productivity within the workplace, and also increases the chance of a workplace accident occurring.

The *Fatigue management guide* has been developed to help employers, persons conducting a business or undertaking, and workers to address the issue of fatigue within Queensland workplaces.

This guide uses a non-regulatory strategy to manage fatigue. It does this by using a risk management approach, as used for workplace hazards generally.

This guide is intended to raise awareness of fatigue among employers, persons conducting a business or undertaking and workers. It does this by educating them on fatigue, how it is caused, and how it affects the human body. The guide then walks the reader through the risk management process and how it should be applied to best manage fatigue. This guide provides some best practice strategies for organisations and individuals to manage fatigue effectively. The guide also contains some practical tips for shift workers to address fatigue within their daily lives.

This guide provides advice that is generally applicable to any workplace within Queensland where fatigue is a workplace health and safety issue. As it contains general information that is applicable across industry, this guide is intended to compliment fatigue-related documents that apply to specific industries or industry sectors.

This guide identifies shift work and extended working hours as contributing factors to workplace fatigue. The possible adverse effects of shift work have long been recognised. In 1997, the Department of Industrial Relations published a brochure entitled *Managing shiftwork* and later a pocket guide entitled *Hints for shiftworkers*. Both of these publications address some aspects of fatigue management. This guide will replace both of these information products.

Fatigue

What is fatigue?

Fatigue is mental or physical exhaustion that stops a person from being able to function normally. Fatigue is mainly caused by a lack of sleep. However, fatigue is more than just feeling tired or drowsy — it is normal to become tired through physical or mental effort. Fatigue significantly affects a person's ability to function. It is associated with the following factors:

- spending long periods of time awake
- obtaining an inadequate amount of sleep over an extended period
- obtaining an insufficient quality of sleep over an extended period.

Fatigue is also caused by prolonged periods of physical and/or mental exertion without enough time to rest and recover. The level of fatigue varies, and depends on the following:

- workload
- length of the shift
- previous hours and days worked
- time of day or night worked.

Circadian rhythms

Circadian rhythms, or the internal body clock, are the body's natural rhythms that are repeated approximately every 24 hours. Circadian rhythms affect:

- body temperature
- digestion
- hormone levels
- sleeping patterns
- many other functions of the human body.

Human beings are day-oriented. We are designed to work during the day and sleep at night. Circadian rhythms are responsible for this. Most of the body's functions show maximum activity during the day and minimum activity during the night. For instance, the following functions rise during the day and fall at night:

- body temperature
- heart rate
- blood pressure
- respiration rate
- adrenalin production.

Due to circadian rhythms, the human body is programmed for different levels of wakefulness depending on the time of day. The human body experiences a depression or reduction in activity in the midnight to dawn period. This decline is a fundamental characteristic of the human body and can not be changed.

Work schedules that require people to be awake and active at night, or to work for extended periods of time, disrupt circadian rhythms. These disruptions:

- adversely impact on the quality and quantity of sleep
- adversely impact on task performance
- may also create a sense of personal dislocation and imbalance.

The time of day when work takes place is a key factor in fatigue. Accidents are more likely to occur at night, particularly during the period when the circadian cycle is at its lowest point (midnight to dawn) when a person would ordinarily be sleeping.

The sleep cycle

While muscles can recover with rest, the brain can only recover with sleep. Sleep is the only effective long-term counter-measure to fatigue. Maintaining sufficient levels of sleep will prevent fatigue.

Human beings experience two stages of sleep:

- rapid eye movement (REM)
- non-rapid eye movement sleep (NREM).

Sleep usually begins with a cycle that consists of approximately 80 minutes of NREM sleep followed by approximately 10 minutes of REM sleep. This cycle is repeated three to six times each night. Within each cycle, the amount of NREM sleep progressively decreases and the proportion of REM sleep progressively increases. Human beings require several sleep cycles, which include both types of sleep, to enable the brain to recover completely and avoid the onset of fatigue.

Sleep debt

The optimum amount of sleep required by a person varies, with seven to eight hours of daily sleep considered the average amount required by an adult. People who continually get less sleep than that necessary for them will accumulate a sleep debt.

A sleep debt is the difference between a person's required amount of sleep, and the actual amount of sleep obtained. For example, if a person who requires eight hours of sleep only obtains six hours of sleep, then this person is deprived of two hours of sleep. If this occurs over four consecutive nights, the person will have accumulated an eight hour sleep debt. Sleep debt leads to increased levels of fatigue.

Causes of sleep loss

A number of factors in the workplace and in a person's private life can cause sleep loss. Examples from the workplace include:

- extended working hours
- irregular and unpredictable working hours
- time of day when work is performed and sleep obtained
- shift work
- having more than one job.

Sleep loss may also be caused by health conditions such as obstructive sleep apnoea. *Obstructive sleep apnoea* is a condition which occurs while sleeping, where the muscles of the throat relax and block the airway above the voice box. This causes breathing to stop until the brain registers a lack of breathing and sends a small wake-up call, briefly waking the sleeper before drifting immediately back to sleep (the sleeper is not aware of having woken up). This process can repeat itself many times through the night, causing a person to feel fatigued during the day.

Workers often drink caffeinated drinks to assist them to manage fatigue. However, stimulants such as coffee will contribute to sleep loss if they are taken within six hours before sleep. This effect may be increased when combined with medications containing ingredients such as pseudoephedrine hydrochloride.

Effects of fatigue

Fatigue and work performance

Fatigue has an adverse effect on every aspect of human performance. High levels of fatigue cause reduced performance and productivity in the workplace, and increase the risk of accidents and injuries occurring. Fatigue affects the ability to think clearly, which is vital when making safety-related decisions and judgements. People who are fatigued are unable to gauge their own level of impairment. As a result, fatigued people are unaware that they are not functioning as well or as safely as they would be if they were not fatigued.

When fatigued, a person may experience micro sleeps. A micro sleep is a brief nap that lasts for approximately four to five seconds. People who suffer from micro sleeps are not always aware when a sleep occurs — this can have a significant impact on safety.

A decrease in performance capacity is linked to fatigue. Performance levels drop as work periods become longer and sleep loss increases. Recent studies have shown that staying awake for 17 hours leads to the same level of impaired performance as having a blood alcohol content of 0.05%. Staying awake for 21 hours is equivalent to a blood alcohol content of 0.1%.

The most common effects associated with fatigue are:

- desire to sleep
- lack of concentration
- impaired recollection of timing and events
- irritability
- poor judgement
- reduced capacity for effective interpersonal communication
- reduced hand-eye coordination
- reduced visual perception
- reduced vigilance
- slower reaction times.

Evidence also suggests that fatigued people are more likely to engage in risk taking behaviour.

Each of the above effects is relevant to many, if not all, occupations. Not only do these effects decrease performance and productivity within the workplace, but they simultaneously increase the potential for accidents and injuries to occur. People working in a fatigued state may place themselves and others at risk, most particularly:

- when operating machinery (including driving vehicles)
- when performing critical tasks that require a high level of concentration
- where the consequence of error is serious.

Health effects of fatigue

Lack of sleep has been indirectly linked with the following health effects:

- heart disease and high blood pressure
- stomach ulcers and other gastrointestinal disorders
- depression
- lower fertility.

Fatigue and irregular sleeping habits disrupt circadian rhythms. Circadian disruptions affect eating and sleeping habits and have been linked to the following types of cardiovascular disease:

- coronary heart disease (blocked arteries in the heart)
- ischaemic heart disease (blocked arteries leading to lack of oxygen to the heart muscle)
- high blood pressure
- myocardial infarction (heart attack).

Gastro-intestinal disorders are the most common health problem related to fatigue. The body rhythm for digestion is designed for food to be eaten during the day irrespective of whether an individual is working or resting. This can cause problems when heavy or fatty foods are eaten during the night. The most common complaints include:

- bowel habit changes
- digestive complaints
- increased risk of peptic (stomach) ulcers.

Fatigue can also affect mental health. Anxiety and depression can be triggered or made worse by fatigue and irregular sleep patterns.

The effects of fatigue increase with age. People over 50 years of age tend to have lighter, fragmented sleep. This can prevent them from receiving the recuperative effects from a full night of sleep, and can make them more likely to become fatigued.

The metabolism of certain medications follows the body's circadian rhythm. When the circadian rhythm is disrupted, for example when working at night and sleeping during the day, the treatment of some medical conditions can be affected. Examples of medical conditions which may be affected include:

- asthma
- depression
- diabetes.

Women's reproductive health can also be affected by fatigue. Fatigue and irregular sleep patterns have been associated with a number of negative effects for pregnant women and fertility rates. These negative effects include:

- increased risk of miscarriage
- low birth weight
- higher occurrence of premature births.

Shift work and extended working hours

Shift work

Shift work is defined as any work which is conducted outside of the standard 8am to 6pm work cycle. Shift work includes:

- permanent night shifts, or other permanent shifts that extend into hours that would normally be spent asleep
- compressed work weeks with extra long work days
- rotating work shifts, or shifts where workers work permanently on one shift.

Extended working hours

Approximately one third of all Australians are now working significantly longer hours than the standard working week. The report *Extended Working Hours in Australia: Counting the Costs* (2001), which was commissioned by the Department of Industrial Relations, identified the following:

- approximately 2.6 million workers (29.6 per cent of the work force) work overtime on a regular basis
- approximately 250,000 workers (2.8 per cent of the work force) work full-time and have a second job.

The report also identified that the number and proportion of employees working extended hours (over 44 hours per week) has significantly increased:

- since 1981 the number of employees working over 44 hours has increased from 33 percent to 46 percent, indicating that just under half of Australia's current working population now work extended hours
- between 1977 and 1996, the number of Australian employees working in excess of 60 hours per week has increased from three per cent to seven per cent. This figure is now the second highest within the developed world.

Effects of shift work and extended working hours on fatigue

The times when a person works and sleeps will affect the amount of sleep obtained, the quality of the sleep and the subsequent fatigue experienced. Long hours and shift work patterns that disrupt the body's circadian rhythms often result in workers becoming fatigued.

Shift workers as a group tend to obtain significantly less sleep than those who work equivalent hours that do not intrude on the typical sleep period (11pm – 7am). Sleep during the day is typically of a poor quality due to circadian disruptions and also due to environmental factors such as daylight, traffic and household noise.

Extended working hours, particularly for shift workers, adversely affect the amount of time available for sleep and social activities. As work hours increase, the individual compensates for the increased time spent at work by reducing the amount of time available for sleep and other activities. Once a person works more than 48 hours within a week, the increased competition between sleep and other activities results in sleep of a limited quality and length. As hours of sleep are reduced, the individual begins to accumulate a sleep debt. This causes fatigue levels to rise, which leads to poor effects on health and safety.

Responsibilities and obligations

The Workplace Health and Safety Act

The *Workplace Health and Safety Act 1995* (the Act) imposes obligations on people at workplaces to ensure workplace health and safety. When managing fatigue, workplace health and safety is ensured when persons are free from the risk of death, injury and illness created by fatigue.

Relevant obligation holders under the Act include:

- employers and self-employed persons
- persons conducting a business or undertaking
- workers.

People may have obligations in more than one of the above roles. Please refer to sections 28 to 36 of the Act for a full list of obligation holders

Sections 28 and 29 of the Act require *employers* and *self-employed persons* to ensure their own health and safety in the conduct of their business or undertaking. *Employers* and *self-employed persons* also have an obligation to ensure the safety of other persons, such as members of the public. *Employers* have the additional requirement to ensure the workplace health and safety of each of their workers at work.

Section 29A of the Act requires persons who conduct a business or undertaking to ensure the workplace health and safety of each person who performs a work activity for the purposes of the business or undertaking. This includes contractors and volunteer workers.

Therefore, under the Act, employers and persons who conduct a business or undertaking are obliged to protect workers and persons who perform a work activity for the purposes of the business or undertaking from the adverse effects of fatigue.

Section 36 of the Act contains the obligations for *workers* or anyone else at a workplace. Relevant worker obligations when managing fatigue include:

- not to wilfully place at risk the workplace health and safety of any person at the workplace
- not to wilfully injure himself or herself.

This means that workers should ensure that their personal behaviour outside of work does not contribute to workplace fatigue. Some practical information is contained in *Appendix 1: Tips for shift workers*, which may be of assistance.

Under section 81 (1) (f) of the Act, workers (through their workplace health and safety representatives) are entitled to be consulted about any changes in the workplace that affect or could affect their workplace health and safety. This includes any changes to rosters or working hours which can have an effect on workplace fatigue.

Fatigue management responsibilities

Fatigue management is a shared responsibility between management and workers as it involves factors both inside and outside of work. Employers and persons conducting a business or undertaking are responsible for using a risk management approach to manage fatigue. More information on using risk management is available below.

It is the responsibility of workers to ensure that they make appropriate use of their rest days and are fit for duty on rostered shifts.

Managing fatigue

Risk management

Fatigue within the workplace should be managed by using a risk management approach. There are five basic steps in the risk management process, as outlined in section 22 (2) of the *Workplace Health and Safety Act 1995*. They include:

1. **identifying** hazards
2. **assessing** risks that may result because of these hazards
3. **deciding** on control measures to prevent or minimise the level of risks
4. **implementing** control measures
5. **monitoring** and **reviewing** the effectiveness of control measures.

The recommended risk management approach when managing fatigue is outlined below. For more information on how to use the risk management approach to meet workplace health and safety obligations, please refer to the *Workplace Health and Safety Risk Management Advisory Standard*.

Step one: identify factors that contribute to fatigue

The first step when managing fatigue is to identify factors within the workplace that may contribute to fatigue. Employers or persons conducting a business or undertaking should develop a list of all the factors within their business or undertaking that have the potential to contribute to fatigue within the workplace.

One particular workplace factor that should be carefully considered is roster design. Shift length and roster design may be placing workers at risk of sleep deprivation and fatigue. When looking at rosters, it is important to assess whether the roster provides workers with a sufficient opportunity for rest and recovery between shifts. When determining if roster design is contributing to fatigue, consider the following:

- length of shifts worked — the length of shifts worked can contribute to fatigue
- previous hours and days worked — the effects of fatigue are cumulative, workers may have sleep debt due to the previous hours and days worked, which can contribute to fatigue
- type of work being performed — pay particular attention to the level of physical and/or mental effort that is required
- Time of the day when the work is being performed — remember that disrupting the body's circadian rhythms can cause fatigue and also impact on task performance.

There are many ways to identify workplace factors that contribute to fatigue. They include:

- inspecting workplace rosters
- consulting with workers — ask them if they regularly feel fatigued. Also ask about any problems they have encountered, or any near misses or unreported injuries
- consult with workplace health and safety representatives and workplace health and safety committees
- conduct a safety audit
- analyse injury and incident reports, pay particular attention to injuries and incidents that occur in periods of high fatigue (i.e. the latter half of shifts and night work — particularly 2am to 6am)
- undertake worker surveys.

Step two: assess risk

The second step when managing fatigue involves assessing the risks associated with the workplace factors that contribute to fatigue. *Risk* is the likelihood that death, injury and illness may result because of the factors that contribute to fatigue. To assess risk, it is necessary to consider both likelihood and consequences. For each of the risks:

- determine the likelihood (i.e. very likely, likely, unlikely, very unlikely) of an incident occurring at the workplace, bearing in mind the existing control measures
- determine the consequences (i.e. extreme, major, moderate, minor) of an incident occurring at your workplace, bearing in mind the existing control measures
- combine the likelihood and consequences estimates to rate the risk.

Once the above process has been completed, the ratings of each risk should be prioritised for further action. For further information about this process, please refer to the *Risk Management Advisory Standard*.

The following should be considered when assessing the factors that contribute to fatigue:

- time of day — incidents are more likely to happen in circadian low points (such as night time, especially between the hours of 2am to 6am)
- length of shifts worked — the effects of fatigue are cumulative; workers are more likely to feel fatigued in the final hours of a shift, than in the first few hours of a shift
- lack of opportunity to recover from fatigue — incidents are more likely to occur if workers are not given a sufficient opportunity to recover from fatigue
- how often the situation occurs — generally, the more often a worker is fatigued, the greater the likelihood is that an incident will occur
- how many people are fatigued — generally, the greater the number of people who are fatigued, the more likely an incident is to occur
- the skills and experience of persons fatigued — consider training and competence both to perform work-related tasks and manage fatigue

- any special characteristics of the people involved — for example if a worker is on medication for a medical condition that is affected by circadian rhythms and night shift work (such as asthma, depression or diabetes)
- the duration of exposure to fatigue — generally, the longer a person is fatigued, the more likely an incident will occur
- the level of risk inherent in the work — incidents are more likely to occur in work that is generally hazardous, such as when operating heavy machinery or plant.

Step three: decide on control measures

The third step when managing fatigue involves deciding on control measures to manage exposure to fatigue. Employers and persons conducting a business or undertaking should implement control measures that adequately control exposure to fatigue. Control measures should be introduced according to the hierarchy of control, as outlined within the *Risk Management Advisory Standard*.

According to the hierarchy of control, the ideal solution when managing fatigue is to completely eliminate factors that contribute to fatigue. This may involve the elimination of night shifts and extended working hours. If this is not possible, there are a number of control options that may be used alone, or in combination, to minimise and control exposure to fatigue. Because fatigue is caused by a combination of factors, the most effective way to manage it is by using a combination of risk control measures. Examples include:

- limiting shift work to essential jobs and tasks that must be completed at night
- redesigning work practices so that routine administrative tasks are minimised for night shift workers, allowing them to focus on core duties during night work
- scheduling later start times so that maximum night sleep can be obtained before starting work (however this can affect those on night shift)
- scheduling low risk work during periods of high fatigue, such as night time (especially during the hours of 12am to 6am) and/or in the latter half of shifts
- scheduling complex tasks to be performed only during the day.

Administrative controls are last on the hierarchy of control. Administrative controls should not be relied on as the primary means of risk control until the options higher in the list of control priorities have been exhausted. In general, administrative controls should only be used:

- when there are no other practical control measures available
- as temporary measures until a permanent solution is found
- to supplement other controls.

Examples of administrative controls that may be used to manage fatigue include:

- sufficient supervision, particularly during periods of high fatigue (such as night time, or in the latter half of shifts), and especially for hazardous work
- contingency plans if workers become fatigued — this would involve removing fatigued workers from work activities where there is a considerable risk to health and/or safety (e.g. operating heavy machinery or plant)

- effective emergency responses
- strict controls and procedures if performing hazardous work during high fatigue periods (especially during 2am to 6am)
- job rotation for repetitive or monotonous work, or work that involves heavy physical demands.

Step four: implement control measures

The fourth step when managing fatigue is putting the selected control measures in place. This involves undertaking those activities that are necessary to allow the measures to operate effectively. These activities include:

- developing work procedures
- communicating control measures
- providing training and instruction
- supervision.

Work procedures need to be developed to ensure that fatigue control measures are effective. Effective fatigue control measures should define and communicate responsibilities. For example, employers and persons conducting a business or undertaking are responsible for providing a shift system that provides staff with sufficient opportunity for rest and recovery.

Employers and persons conducting a business or undertaking should inform workers about the control measures to be implemented. It is important to clearly communicate that the control measures are being introduced to effectively manage fatigue. When communicating control measures to workers, it is important to remember that under section 81 (1) (f) of the Act, workers (through their workplace health and safety representatives) are entitled to be consulted about any changes in the workplace that affect, or could affect, their safety.

This consultation may be achieved through the workplace health and safety committee, including the workplace health and safety officer and workplace health and safety representatives. This consultation should include:

- the possible health and safety impact of changes
- the benefits and problems associated with the proposed changes
- measures needed to eliminate or control any adverse impact on health and safety
- processes for incorporating any special needs of workers with impairments (e.g. workers on medication that could be affected by changes to night shifts)
- procedures for workers to notify supervisors of any impairment or potential impairment that may place any person at risk before starting work
- definition and communication of responsibilities.

Employers and persons conducting a business or undertaking should provide training and instruction for workers and supervisors on fatigue. This should include information about:

- common causes of fatigue including shift work, extended working hours and roster patterns
- potential health and safety impacts of fatigue
- how workers are responsible for making appropriate use of their rest days, and how they should ensure they are fit for duty on rostered shifts.

Training should be arranged so that it is available to all workers on all shifts. If workers must attend training outside the normal shift, they should be considered at work and rosters should be adjusted accordingly.

Appendix 1: Tips for shift workers contains additional information that may be useful when training workers about fatigue.

Employers and persons conducting a business or undertaking should also provide adequate supervision to ensure that new control measures are being used correctly.

Step five: monitor and review

The final step in the fatigue management process is to monitor and review the effectiveness of fatigue control measures. When working through this step, it is useful for employers and persons conducting a business or undertaking to consider:

- have the chosen control measures been implemented as planned?
- are the chosen control measures working?
- are there any new problems?

When answering these questions, employers and persons conducting a business or undertaking can:

- consult with workers, supervisors, health and safety representatives, workplace health and safety officers, and workplace health and safety committees
- measure exposure to fatigue — are workers still getting fatigued?
- monitor incident reports and assess the likelihood for fatigue contributing to incidents — pay particular attention to injuries and incidents that occur in periods of high fatigue (i.e. the latter half of shifts and night work — particularly 2am to 6am).

To best manage fatigue, employers and persons conducting a business or undertaking should ensure there is a process for ongoing monitoring and evaluation of workplace fatigue. This process should be regularly reviewed.

Factors to consider when managing fatigue

Roster design

Roster design should not place workers at risk of sleep deprivation and fatigue. The following components need to be considered within roster design to control fatigue:

- number of consecutive night shifts worked — ideally, few night shifts should be rostered in succession
- starting and finishing times of shifts — should take circadian rhythms into consideration
- length of shifts — depends on physical and mental load of the work
- distribution of leisure time — should allow for adequate rest and recovery
- regularity of shift system — regular shift systems allow workers to prepare for work and minimise the potential of workers arriving to work fatigued.

The key to managing fatigue successfully is ensuring that workers are given sufficient time for recuperative sleep between shifts. As outlined in section 1.4, adults require approximately seven to eight continuous hours of daily sleep. While roster designs may not always be able to give workers seven to eight hours of daily sleep, it is important to remember that workers may develop a sleep debt if they are not getting enough sleep between shifts. Within work environments where workers are unable to get seven to eight hours of daily sleep, it is important to give them regular periods of rest time to recover from their sleep debt. One way of doing this would be giving workers two successive full days off within a seven day period, so workers can catch up on their night sleep.

Commuting

Commuting hours also need to be taken into account when managing fatigue. Excessive hours spent travelling to and from work can extend the effective length of a shift, and reduce the time available for sleep and recovery between shifts. This can have significant effects on fatigue levels. Driving can be a mentally and physically fatiguing activity for many people. When combined with work-related fatigue, driving to and from work can become a significant hazard. To minimise the effects of fatigue when commuting, some employers in remote areas provide bus transport to ensure that workers get home safely after a long shift.

Shift rotation

If the starting times of shifts vary throughout the cycle of shifts, the cycle should begin with an early start and move progressively later. Where a rotating three shift system is in operation (i.e. day shift, afternoon shift and night shift), the preferred rotation is in the order of day, afternoon and night. This is because changes from a late start to an early start reduce the number of rest hours between shifts, which makes it harder for people to gain sufficient sleep between shifts.

Sleep inertia

Sleep inertia can occur if a person is woken after sleeping for more than 40 minutes. This means that if a person is woken after sleeping for more than 40 minutes, the person may be slow to respond. Some people will feel drowsy and disoriented, and it may take up to 30 minutes before complex tasks can be performed efficiently.

Sleep inertia has implications for safety when workers are on-call for emergencies. Suggested measures to control sleep inertia and the subsequent impairment in work performance include:

- minimising naps taken at work that exceed 40 minutes
- planning for recovery times of up to 30 minutes for workers who may be subject to sleep inertia, before they are to perform hazardous tasks.

Breaks

Breaks are an important control measure when managing fatigue. Time spent away from the work environment has the potential to allow workers to recover from fatigue and improve work performance, vigilance, safety and efficiency. For this reason breaks should be taken during work shifts, and should not be traded for an early finish time for the shift.

Consider the following when deciding on the length and frequency of breaks within a shift:

- type of work being performed — generally the greater the physical and/or mental effort required to perform the work, the longer the total break time required per shift. Regular rest breaks are also needed
- Length of shifts worked — generally the longer the shift, the longer the total break time required per shift. Regular rest breaks are also needed.

Occupational exposure levels

Extended working hours may increase the risk of health effects that are generally associated with work. Exposure to hazards such as noise, heat and chemicals may be increased, and should be carefully monitored. National and international exposure standards are usually based on five, eight hour days per week. Therefore, workplaces where extended hours are worked will need to adjust their exposure levels.

It is recommended that expert advice is sought in adjusting exposure levels. This is because the increased exposure of workers over, for example, a 10 hour shift may not be simply 1.25 times the exposure for eight hours. Models need to take into account the reduced recovery time after exposure to a hazard where extended shifts are being worked. Workplaces should always aim for best practice, aiming to keep all exposures significantly below the specified standards to allow for daily variability in exposure levels. This will ensure that workers will not be over-exposed to a hazard.

Manual tasks

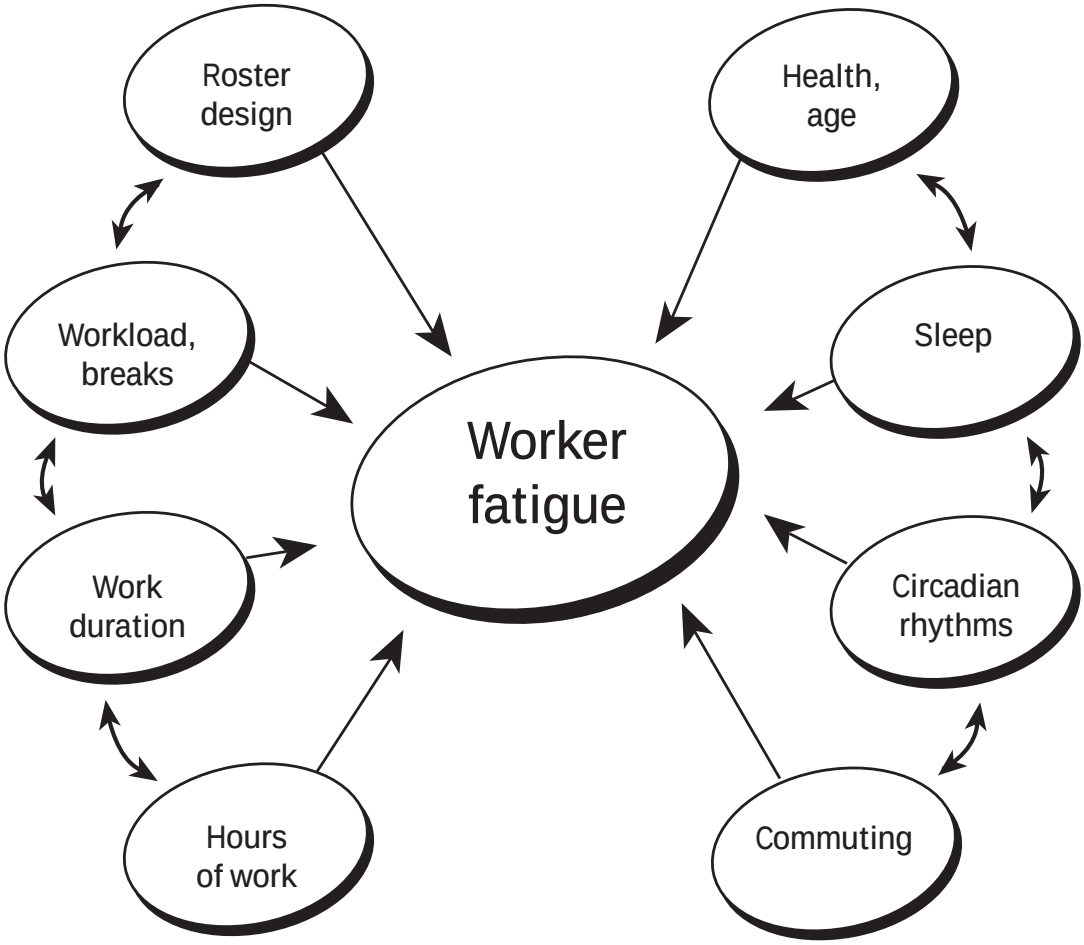
Manual tasks are those workplace activities requiring the use of force or exerted by a person to grasp, manipulate, strike, throw, carry, move (lift, lower, push, or pull), or hold or restrain an object, load or body part. The prolonged performance of repetitive tasks without the adequate chance of rest and recovery may result in an *occupational overuse injury.* The risk of a musculoskeletal injury occurring may also be increased within extended shifts due to the cumulative effects of muscle fatigue, strains and sprains. Twelve hours shifts increase the risk of injury occurring. In general, workers involved in repetitive manual tasks should have regular breaks.

The *Manual Tasks Advisory Standard* provides guidance on eliminating and controlling risks associated with manual handling.

Factors contributing to fatigue

Work factors

Worker factors



Appendix 1: Tips for shift workers

Tips for sleeping

If you work outside of normal hours, your body's circadian rhythms will cause you to have:

- more trouble getting sufficient sleep
- poorer quality sleep.

It is important for shift workers to get as close to the average amount of required daily sleep (or rest in bed) as possible. The quality of day sleep will not be the same as night sleep. Day sleep is lighter than night sleep, and is more likely to be disturbed by noise. This is why planning is required to ensure that conditions for day sleep are as favourable as possible. The following tips may help you avoid unwanted disruptions while trying to sleep during the day:

- blinds or curtains with backing will reduce the light level in bedrooms during the day — consider using heavy curtains and sound insulation on doors and windows to also reduce noise levels
- cool conditions can help in getting to sleep and staying asleep
- inform relatives and friends of your work schedule and sleep times to avoid unwanted disruptions
- use an answering machine, or turn the phone down to help minimise disturbances
- develop ways of ‘unwinding’ after the afternoon or night shift, e.g. take a walk or watch some television
- take a shower or a relaxing bath before going to bed
- go through all of the normal rituals of going to bed as you would before a normal sleeping night
- avoid having a television in the bedroom
- don't get upset if you can't sleep straight away. Reading the paper or listening to music may help, but remember that rest in itself is important
- be cautious with the use of sleeping tablets, which may appear useful in the short-term, but can actually be quite harmful to health in the long-term.

Tips for eating and drinking

Food and drink consumed before going to bed can affect sleep quality. This is because the digestive system is controlled by circadian rhythms and has its own regular rhythm of activity and rest. Digestion slows down at night irrespective of bodily activity. The timing of meals and the quality of foods eaten can affect sleep, and may lead to digestive complaints such as heartburn, constipation and indigestion. As a result, heavy or fatty food eaten at night is difficult to digest.

Shift workers should be aware of the following tips:

When to eat and drink:

- wherever possible, keep to daytime eating patterns
- when working a night shift try having two meals at regular times and a light meal in the middle of the night shift
- consider having the largest daily meal during the day
- do not have a big meal or drink too much liquid before sleeping
- eat a meal before 1am as the effects of digesting a meal can decrease alertness in the second part of the night shift. It is better to eat before becoming fatigued at night.

What to eat and drink:

- alcohol lowers the quality of sleep and overloads the bladder. It is recommended that alcohol is not consumed in the last few hours prior to sleeping
- avoid drinks which contain caffeine (such as tea, coffee or cola) in the last few hours prior to sleeping
- eat light, healthy food that is easy to digest.

Tips for driving

Driving while tired is a major killer on the roads. Fatigue slows your reaction time and affects your scanning ability and information processing skills. Workers should be aware of the effects of fatigue when driving to or from work. Some precautions include:

- avoid driving when you are tired
- avoid using the car heater as it can make you feel drowsy. In cool conditions direct warmth to your feet and open the window a little to allow fresh air on your face
- keep the mind active by listening to the radio while driving home
- make the car as windy, noisy and uncomfortable as possible
- share the drive with other people
- try not to drive in the hours when you would ordinarily be asleep (especially midnight to dawn).

These methods only have an effect for approximately 15 minutes. Therefore, whenever you are driving a car and begin to feel fatigued (i.e. find it difficult not to fall asleep while driving), then turning up the radio or relying on cold air should only be used as a method to stay awake until you find a safe place to pull over and rest.

Tips for health and physical fitness

It is recommended that people consult their doctor before beginning shift work if they:

- are on regular medication (e.g. insulin for diabetes or antidepressants)
- have a chronic medical condition (e.g. asthma or epilepsy).

Shift workers tend to have more health-related problems than day workers. Shift workers should seek medical advice if they experience:

- depression
- sleeping problems
- heart problems
- indigestion, or other stomach or bowel problems.

You should also report these effects to your health and safety representative. As your health and fitness are contributing factors to fatigue, it is important for you to maintain a good level of physical fitness. Shift workers should make an effort to increase their physical activity during leisure time.

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