



Mining & Quarrying
OCCUPATIONAL HEALTH &
SAFETY COMMITTEE

Fatigue Guide

Promoting Work Health and Safety in the Workplace

The South Australian Mining and Quarrying Occupational Health and Safety Committee

Promoting Work Health and Safety in the Workplace

This workplace industry safety resource is developed and fully funded by the Mining and Quarrying Occupational Health and Safety Committee (MAQOHSC).

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Fatigue Guide

AIM

The aim of this Guidance Material is to provide Persons Conducting a Business or Undertaking (PCBUs) with practical guidance on managing the risks associated with fatigue.

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 work safely and effectively.

Fatigue is a complex issue that not only arises from hours of work and activities at the workplace but it is also influenced by factors outside of work, such as family responsibilities, stress, lifestyle, personal health, etc.

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

Most adults need seven to eight hours of sleep in every twenty-four hours to feel well rested. A sleep debt is built up by routinely getting less than seven to eight hours of sleep per night. This debt may result in impaired performance, reduced alertness and higher levels of sleepiness and fatigue. A sleep debt can only be repaid with restful sleep

2. Why is fatigue a problem?

Fatigue can adversely affect safety at the workplace. Fatigue can result in a lack of attention, difficulty following instructions, reduced ability to think clearly, and slower response to changing circumstances which may lead to errors and an increased risk of incidents and injuries, particularly when:

- Operating fixed or mobile plant, including driving vehicles;
- Undertaking critical tasks that require a high level of concentration; and
- 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 3.

The longer term health effects of fatigue can include:

- Heart disease;
- Diabetes;
- High blood pressure;
- Gastrointestinal disorders;

- Lower fertility;
- Anxiety; and
- Depression.

3. Signs of fatigue

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

- Long eye blinks;
- Repeated yawning;
- Frequent blinking;
- Bloodshot eyes;
- Poor reaction time;
- Slow speech;
- Loss of energy;
- Inability to concentrate;
- Excessive yawning; and
- Reduced hand-eye coordination.

A fatigued worker may also experience symptoms that are not obvious to others, such as:

- Feeling drowsy;
- Headache;
- Dizziness; and
- Blurred vision.

Note: *The above lists are not exhaustive and should be used as a guide only.*

4. Legislative requirements

As stated in the MAQOHSC Fitness for Work Guide, Persons Conducting a Business or Undertaking (PCBUs) / Mine Operators, in addition to the general Work Health and Safety requirements have an obligation under Regulation 640 to manage the risks to health and safety associated with fatigue.

Note: *See the MAQOHSC Fitness for Work Guide for specific legislative requirements.*

5. Fatigue management

The 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, location and individual factors.

The risks associated with fatigue can be managed by following a systematic risk management process which involves:

- Identifying the factors (hazards) which may cause fatigue in the workplace;
- Assessing the risks;
- Identifying control measures;
- Implementing the most effective control measures reasonably practicable in the circumstances; and
- Reviewing control measures to ensure they are working as planned.

5.1. Consultation

As stated in the MAQOHSC Consultation and Communication Guide, all persons in the workplace need to be consulted about issues which may affect their health and safety.

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.

Workers and their health and safety representatives (if in place) must be consulted 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; and
- After an incident or 'near miss' where fatigue was a factor.

5.2. Potential fatigue risk factors

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 related factors which can be cumulative. The major factors contributing to and increasing the risk of fatigue involve:

5.2.1. Work rosters

Work rosters, such as shift work and the length of shifts, 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;
- Not enough non-sleep rest breaks during a shift; and

- 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 which is repeated every twenty-four 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 potentially resulting in incidents and injuries, either in the workplace or outside of work, including on the way to and from work.

5.2.2. Work 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.

5.2.3. 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 a person gets 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.

5.2.4. 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.

5.2.5. 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 apnea and some medication), other work commitments, and extended travel between work and home may all increase the risk of fatigue.

5.3. Assessing the risks

A risk assessment will assist in identifying:

- 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; and
- 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 employment and are adjusting to work demands.

5.4. Controlling the risks

The most effective way to control the risks associated with fatigue is to eliminate the factors causing fatigue at the source.

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

What is reasonably practicable to do in managing the risks of fatigue will vary depending on the type of operation, the structure of your organisation as well as the person carrying out the work.

For example, control measures that a small business implements to manage the risk of fatigue may differ from those implemented by a larger corporation with 300 shift or night workers.

The 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 contributing factor. For example, increasing the amount of time between shifts and adjusting shift starting times may improve the opportunity for sleep.

5.4.1. Work rosters

Control measures for fatigue risks which can be built into work rosters 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; and
- Filling vacant positions as soon as reasonably practicable and maintaining a relief pool of staff in high demand areas where fatigue is a risk.

Note: *The above list is not exhaustive and should be used as a guide only.*

Shift work and rosters

When planning work rosters for specific work arrangements, including shift and night work, Fly-in fly-out (FIFO), Drive-in drive-out (DIDO), seasonal and on-call 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.

Note: *The above list is not exhaustive and should be used as a guide only.*

5.4.2. Work demands

Control measures to prevent or minimise the risk of fatigue in relation to work demands may 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.

Note: *The above list is not exhaustive and should be used as a guide only.*

5.4.3. Environmental conditions

Control measures to prevent or minimise the risk of fatigue in relation to environmental conditions may include:

- 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;
- 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; and
- Provide and maintain a workplace which is well lit, safe and secure.

Note: *The above list is not exhaustive and should be used as a guide only.*

5.4.4. Lifestyle 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 ensuring that they have 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 and implement a fatigue policy for all workers including managers and supervisors;
- Consult workers about managing fatigue not just when at work; and
- Inform the workers of the risks associated with fatigue and how it relates to their health and safety duties.

Note: *The above list is not exhaustive and should be used as a guide only.*

6. Information and training

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

Training about fatigue and relevant workplace policies should be arranged so it is provided 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;
- The effects of medication, drugs and alcohol;
- Nutrition, fitness and health issues relating to fatigue; and
- Balancing work and personal demands.

A record of the completed training must be maintained.

Note: *See the MAQOHSC Training and Instruction guide and the MAQOHSC Training Matrix template for further information.*

6.1. 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; and

- 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.

7. 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 encourage workers to provide feedback on their effectiveness.

To determine monitoring and review frequencies, consider the level of risk. For example, 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 where fatigue is a contributing factor;
- 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.

FURTHER ASSISTANCE

MAQOHSC Work Health and Safety Specialists are available to provide further advice and assistance on all Work Health and Safety matters.

MAQOHSC Work Health and Safety Specialists are able to be contacted via our website at www.maqohsc.sa.gov.au or email maqohsc@sa.gov.au.

ADDITIONAL INFORMATION

Work Health and Safety Legislation, Codes of Practice, fact sheets, Health and Safety Representatives (HSR) information and guides can be found at the following websites:

SafeWork SA – www.safework.sa.gov.au or call 1300 365 255

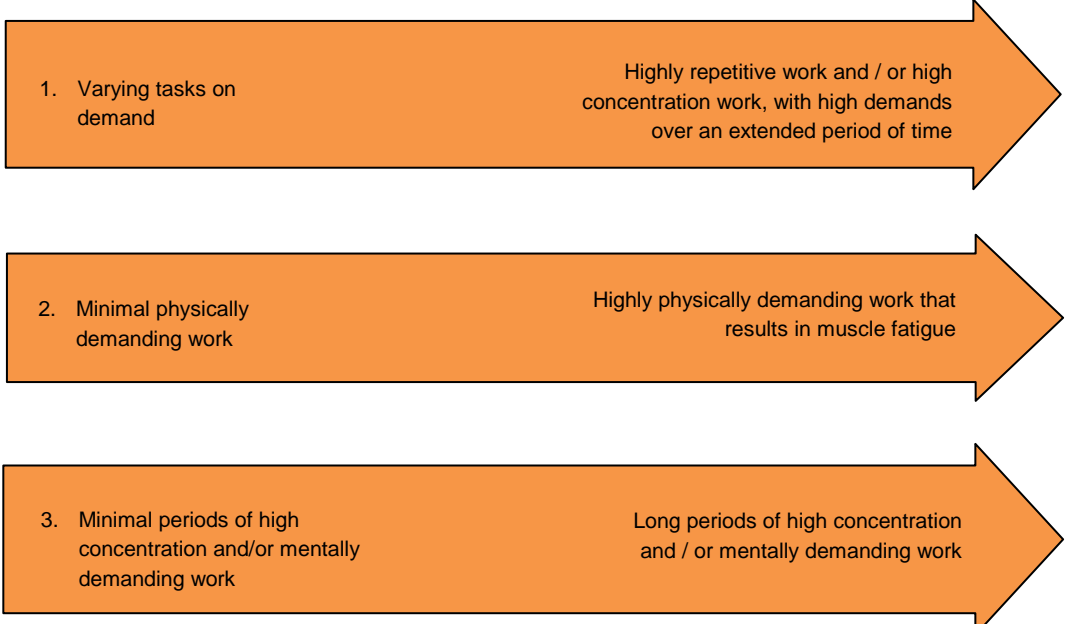

Safe Work Australia – www.safeworkaustralia.gov.au or call 1300 551 832

REFERENCES

Work Health and Safety Regulations 2012 (SA)



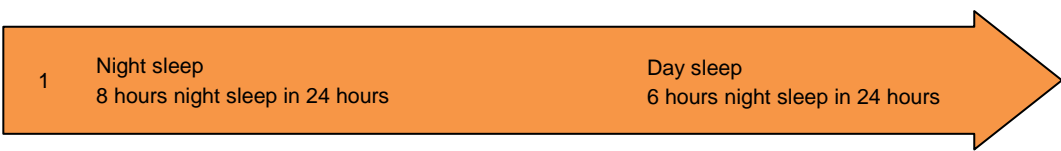


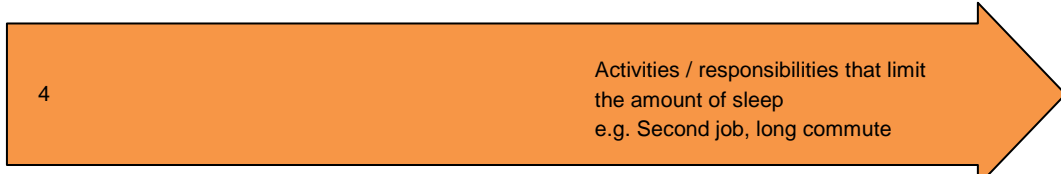
AS 1269.1:2005 – Occupational noise management Part 1: Measurement and assessment of noise immission and exposure

Appendix A: Fatigue Risk Management Chart

Hazard Identification	Risk Assessment			Risk Control
Mental and physical demands of work	Low Risk	Moderate Risk	High Risk	Options
Hazards may include: <ol style="list-style-type: none"> 1. Repetitive or monotonous work 2. Sustained physical or mental effort 3. Sustained and / or complex physical or mental tasks 				<ul style="list-style-type: none"> • Re-design jobs to eliminate boring or repetitive tasks • Improve communication • Provide training to allow multi-skilling and effective job rotation • Use alarms and monitors, particularly for solo work (e.g. driving vehicles) • Use plant, machinery and equipment to eliminate or reduce the excessive physical demands of the job • Reduce the amount of time workers need to spend performing sustained physically and mentally demanding work • Ensure there are adequate workers and other resources to do the job without placing excessive demands on staff • Roster enough workers during peak times and demands • Ensure adequate breaks during shifts to allow recovery • Allow supervisors and workers to reschedule tasks if fatigue becomes a problem • Ensure work demands gradually increase towards the middle of the shift and decrease towards the end • Eliminate sources of risks that might exacerbate fatigue (e.g. lack of job control, manual tasks, extremes of temperature) • Improve the duration and timing of work • Ensure safe and efficient shift hand-over
Work scheduling – Night work	Low Risk	Moderate Risk	High Risk	Options
<ol style="list-style-type: none"> 1. Shift end (for those working eight hours or more between 10.00pm and 6.00am) 2. Length of shift 3. Sequential night shifts 4. Period of non-work following a sequence of night shifts 5. Breaks during work – frequency 6. Breaks between work periods – recovery time 7. Seasonal work arrangements – hours worked 				<ul style="list-style-type: none"> • Eliminate or limit night work where possible • Eliminate the use of nightshifts for particular jobs or activities • Schedule work for hours when the risks may be lower – for example, complex and safety-critical tasks are best undertaken during normal day shifts when workers are less likely to be fatigued, rather than during low body clock periods (i.e. don't schedule tasks between 2am and 6am and, to a lesser degree, between 2pm and 4pm) • Avoid scheduling higher risk tasks on the first night of a night shift cycle. If unavoidable, when planning the task consider additional controls such as job rotation or additional rest breaks • Minimise or redesign routine administrative tasks to ensure workers can focus on core duties during their night work • Allow for naps during night shifts • Limit the number of consecutive night shifts worked – no more than four night shifts in a row • Allow regular night employees / workers periods of normal nights' sleep to catch up on their sleep deficit • Ensure that rosters allow for at least two full nights' sleep after the last night shift • Arrange shifts so that day sleep is adequate • Use a forward-rotation shift system (i.e. morning to afternoon, afternoon to night) • Improve the order, speed, direction and length of rotation of the shift cycle • Except for emergencies, give at least 24 hours' notice before night work. Consider providing a longer period of notice so that workers have time to adjust their activities

Work scheduling – Shift work	<p style="text-align: center;">Low Risk Moderate Risk High Risk</p>	Options
<p>1. Length of shift</p> <p>2. Time of shift</p> <p>3. Speed and direction of shifts</p> <p>4. Split shifts/variable shifts</p>		<p>Hours of work in a single shift. This includes travel time, especially for remote sites</p> <ul style="list-style-type: none"> • Reduce working hours • Increase resourcing • Eliminate the use of extended hours for particular jobs or activities • Control the length of shifts • Limit the use of overtime, especially unscheduled overtime • Monitor hours of work • Provide alternative transport at end of overtime / long shift
Work scheduling – Hours	<p style="text-align: center;">Low Risk Moderate Risk High Risk</p>	Options
<p>1. Average weekly hours</p> <p>2. Total hours worked over a three month period</p> <p>3. Daily work hours</p> <p>4. Daily hours and work related travel</p> <p>5. Scheduling of work</p>		<p>Hours of work across a shift cycle</p> <ul style="list-style-type: none"> • Develop a working-hours policy on daily work hours, maximum average weekly hours, total hours over a three month period and work-related travel • Reduce working hours • Reduce the number of consecutive day shifts that can be worked • Eliminate or reduce the need to work long shifts for more than four consecutive days • Allocate shift workers consecutive days off, including some weekends, depending upon their fatigue risk level • Avoid working arrangements that provide incentives to work excessive hours • Control overtime, shift swapping and on-call duties • Offer alternatives to workers who may have difficulties adjusting to working hours

				<p>Breaks between work shifts</p> <ul style="list-style-type: none"> • Increase the length of breaks between shifts • Allow for recovery between work periods • Defer non-urgent work to allow appropriate rest and recuperation for workers • Provide rest days; (opportunity for two consecutive night sleeps) • Improve the timing of shifts • Allow for family and social commitments between shifts and shift cycles • Make sure that there is enough time in a break for six hours uninterrupted sleep <p>Breaks within work shifts</p> <ul style="list-style-type: none"> • Provide more and / or longer breaks to allow for recovery within work periods • Provide adequate resources to cover breaks • Ensure adequate number and location of crib and toilet facilities • Reduce the use of split shifts • Where split shifts are used, arrange timing so sleep of workers is not disrupted due to the times they are required to work <p>Shift start / finish times</p> <ul style="list-style-type: none"> • Don't start or finish between 10pm and 6 am • Ensure time for adequate communication at shift handovers • Match shift times to the availability of public transport <p>Changes to rosters</p> <ul style="list-style-type: none"> • Set shift rosters ahead of time and avoid sudden changes of shifts to allow workers to plan leisure time • Reduce irregular and unpredictable work schedules
Excessive commuting times	Low Risk	Moderate Risk	High Risk	Options
				<ul style="list-style-type: none"> • Start work at long distance commute sites on the day after arrival and start travel home on the day after the shift cycle is finished • Assist with travel arrangements, e.g. provide transport • Reduce active working time to account for long commuting time or distance
Work environment conditions	Low Risk	Moderate Risk	High Risk	Options
<p>1. Exposure to hazardous chemicals and atmospheric contaminants</p> <p>2. Exposure to noise</p> <p>3. Exposure to extreme temperatures</p> <p>4. Exposure to vibration</p> <p>5. Effect of exposure during extended shifts</p>				<p>Hours of work across a shift cycle</p> <p>Stress</p> <ul style="list-style-type: none"> • Improve job control and the other risk factors associated with stress • Ensure opportunities to clarify stress-related issues
				<p>Physical conditions</p> <ul style="list-style-type: none"> • Avoid working during periods of extreme temperature • Control exposure to hazardous substances and environments • Provide effective protective clothing and equipment, allowing for different shifts • Use heating and cooling to control ambient temperatures to support alertness • Provide adequate facilities for rest, sleep, meal breaks, onsite accommodation (if appropriate) and other

				<p>essential requirements, such as bathroom facilities</p> <ul style="list-style-type: none"> • Install adjustable, vibration-free seats in appropriate machinery and vehicles • Ensure the workplace and surroundings are well lit, safe and secure • Employees / workers who perform repetitive manual tasks should have regular rest breaks • Ensure exposures are carefully monitored and exposure levels adjusted. For example, exposure during a 10-hour shift may not equate to 1.25 times the exposure experienced during an eight-hour shift
				
<p>Non-work related factors</p>	<p>Low Risk</p>	<p>Moderate Risk</p>	<p>High Risk</p>	<p>Options</p>
<p>1. Sleep (amount and quality) 2. Health 3. Fitness for work 4. Lifestyle factors</p>				<ul style="list-style-type: none"> • Maintain vigilance in identifying non-work related factors • Subsidise modifications to private homes to improve sleeping conditions (e.g. air conditioning) • Provide information and education about how non-work related factors can increase the risks of fatigue • Provide a mechanism to encourage workers to report non-work factors that might affect fatigue management
				
				
				

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