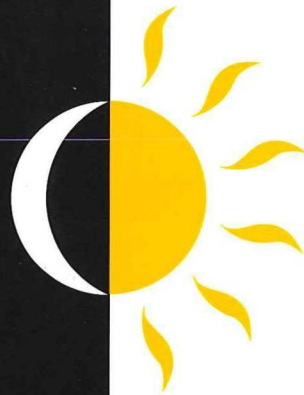


MANAGING

SHIFTWORK



OH&SC

South Australian Occupational
Health and Safety Commission

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FOREWORD

an estimated 20 to 25 percent of employees undertake shiftwork in a wide range of industries. Over the past decade this number, particularly in the manufacturing and service industries, has increased.

This booklet addresses the issues related to shiftwork and its effects on employees. Aimed at employers, managers, supervisors and employees, the booklet provides information on the biological, social and organisational difficulties associated with shiftwork, stimulates an examination of current practice, and suggests ways to mitigate adverse effects. It is hoped readers will be encouraged to examine their shift rosters and see where roster design may be improved.

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WHAT IS SHIFTWORK?

Shiftwork is any system of working other than by regular day work. The system may include:

- shifts which extend into hours that would normally be spent asleep;
- shifts which may be worked at any time throughout the week, with or without a free weekend;
- 2, 3 or 4 shifts per 24 hours; and
- employees on different shifts who rotate or work permanently on particular shifts.

Employment which involves night work only (e.g. security services or commercial and industrial cleaning contractors) is included, even if there is only one shift per 24 hour period.



THE CONNECTION BETWEEN SHIFTWORK AND WORKPLACE HEALTH AND SAFETY

Under the *Occupational Health, Safety and Welfare Act*, a number of general “duties of care” are set down. When an employer introduces a work process, there is a duty to take practicable, reasonable, precautionary measures to protect the health and safety of employees. Hazards arising from exposure to machines or hazardous substances have long been recognised, however the adverse effects arising from shiftwork are only now receiving recognition.

The employers' duty of care also extends to designing work schedules and programs which minimise any unwanted effects on the physical and psychological well-being of employees.

Employees must also exercise their duty of care by being aware of the potential health and safety consequences of shiftwork.

There are health and safety issues involved in shiftwork. Problems arise because people are not machines which can be “switched on” to perform at an optimal level at any time of the day or night. Night work is the most difficult part of shiftwork for most people. Historically, many major disasters (e.g. Three Mile Island, Chernobyl, Bhopal and Piper Alpha) have occurred at night. Understanding the adverse effects of shiftwork is necessary before current practice can be improved.



THE ADVERSE EFFECTS OF SHIFTWORK

The first questions to be answered before deciding if changes to facilities or rostering are necessary are:

- Is shiftwork necessary?
- Is it possible to rearrange duties to reduce the need for shiftwork?
- Is it possible to do without night and weekend shifts?
- Is it possible to reduce the number of employees doing shiftwork?

If the adverse effects of shiftwork are to be minimised, consider:

- How does job performance change with the time of day?
- Are there individual differences which make it easier for some people to adjust to shiftwork than others?
- What is the impact of shiftwork on an employee's domestic and social life?
- What medical conditions may be incompatible with unusual working hours?
- What education is needed to help employees cope with shiftwork?

Direct Effects of Shiftwork

The body clock

Human beings are day oriented. We are designed to work in the daytime and sleep at night. The internal body clock (circadian clock) is responsible for this. It causes a regular variation through 24 hours in different body and mental functions. This variation is referred to as the "circadian rhythm". For instance, body temperature, heart rate, blood pressure, respiration rate and adrenaline production normally rise during the day and fall at night.

Most of the body's basic functions show maximum activity by day, peaking at different hours, and minimum activity by night.

The body clock affects the behaviour, alertness, reaction times and mental capacity of all people by varying degrees.

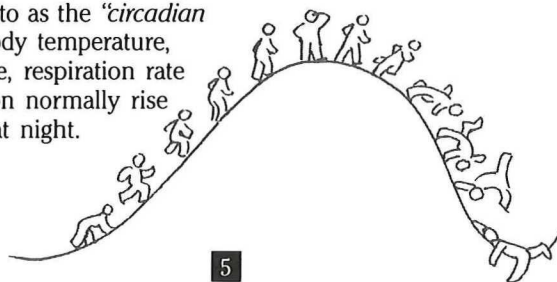
Adjustment to shiftwork

The body clock never fully adjusts to the sleep/wake cycle imposed by shiftwork, even after extended periods. Some adaptation is reached, yet the body returns to the normal daily variations when normal activity and sleeping patterns are resumed. During shiftwork, a partial adjustment may occur over successive shifts, but reversion to normal patterns will usually occur on days off.

There are differences in the abilities of individuals to adapt to changes in the timing of their work. *Morning types* rise early, work best early in the day and slow down in the evening. *Evening types* are late to rise, slow to get going and often at their peak in the evening. The 10-20% of people who are very strong morning types find it hardest to adjust to working at night.

Sleep duration, quality and deprivation

Sleep disruption is the most common problem for shiftworkers. Sleep duration is typically about 2 hours less than normal after working a night shift. A decrease in sleep length also affects those who commence work before 07:00 hours.



There is a physiological cause for not being able to sleep as long in the day time as during the night. During the morning hours the body is preparing for activity which is linked to an increase in alertness. Therefore, people get their longest sleeps when these sleeps start before midnight and their shortest when begun in the morning.



Fatigue and on-the-job sleepiness resulting from lack of sleep may impair work performance. The level of fatigue increases with the number of hours worked and is more pronounced during the second half of a shift, especially between 02:00 hours and 06:00 hours. Another common problem experienced with sleep loss is a high level of sleepiness when awake. Many shiftworkers actually fall asleep briefly while working. These "microsleeps" may last from 30 seconds to 3 minutes and some shiftworkers may not be aware that they have nodded off.

Increased feelings of fatigue and sleepiness at work may make it difficult for employees to maintain concentration. This has implications for workplace safety. Judgement is impaired and response time slowed.

Social Effects Of Shiftwork

Shiftwork often interferes with domestic and social life. It may adversely affect interpersonal relationships and reduce the shiftworker's quality of life. Shiftwork commonly results in domestic inconvenience for the employee, his or her partner and children because work hours do not match the domestic daily routine. The organisation of meal-times and other activities may be more difficult because the person working shifts needs to sleep at these times.

Family members find difficulty in coping with the added stress and disruption to normal household events brought about by shiftwork.

Many social activities take place in the evenings and over weekends, making it more difficult for a shiftworker to belong to organisations or to take part in normal social events. This can lead to social isolation.

Health Effects of Shiftwork

The health effects associated with shiftwork are compounded when superimposed on the health hazards that exist in the workplace for those doing regular day work. Shiftworkers and former shiftworkers show more signs of ill health than people on fixed day work. Factors which contributed to health problems include:

- the disruption to body rhythms
- chronic sleep loss and fatigue
- "stress" caused by problems with domestic and social life.

Health problems may appear after a short exposure to shiftwork, or may only be apparent after some years.



Gastro-intestinal complaints: These are the most common problem and include stomach ulcers. Body rhythms for digestive function are regulated for food to be eaten during the day. The digestive system is relatively inactive at night, causing problems with some foods which are tolerated well in the day time. Digestive complaints can also be aggravated by a higher intake of caffeinated drinks consumed at night to keep awake.

Depression and other psychiatric disturbances: These may be triggered or worsened by irregular sleep patterns and cumulative fatigue.

Pregnancy: Shiftwork must be considered an added risk factor during pregnancy.

Age: Shiftworkers may become intolerant of their work schedules when they reach their 40s or 50s, despite having done shiftwork successfully for many years. Also, older employees may find it more difficult to switch from 8-hour to 12-hour shifts.

Medicines for medical conditions: The effectiveness of certain medicines follow the body clock, so reversal of the sleep/wake pattern can interfere with the treatment of some diseases. Vulnerable conditions include *asthma*, *diabetes* and *epilepsy*.

Safety Effects of Shiftwork

People are least alert in the early hours of the morning when they would normally be asleep. This drop in the level of alertness occurs between 02:00 hours and 06:00 hours, and is exaggerated by insufficient sleep and fatigue. As a result, people may not always react as quickly and effectively as necessary.

The effects are felt even on the first night shift in a sequence, particularly if the employee has had insufficient sleep before starting work.

The type of work performed by the shiftworker is important in maintaining alertness. Sedentary monotonous work performed in a comfortable and quiet environment is not conducive to staying awake. Tasks involving interaction with other team members and plenty of movement help maintain alertness.

Rostering an employee to work alone at night should be avoided whenever possible, as he or she needs the mental stimulation generated by contact with others.

Some tasks such as plant maintenance are hazardous. Where there is a high potential severity of injury, shiftworkers should not work alone. Lack of alertness results in lapses in concentration, impaired performance and an increase in errors which could precipitate accidents. Work practices for night shift workers should be reviewed to incorporate as many safety checks as possible to overcome the tendency for reactions to slow down. This helps prevent accidents which could have far reaching effects on the workplace or the public.

Indirect Effects of Shiftwork

Shiftworkers working alone should have a way of communicating with colleagues to allow social contact. They should also be provided with access to help if injured or threatened.

Employers have a duty of care to ensure the safety of employees arriving at and leaving the workplace. Outside areas, walkways and workplace carparks should be clearly signposted, well lit and secure.

Appropriate security arrangements should be made for shiftworkers, particularly when working after dark or over weekends.



CONSULTATION

*M*anagement, employees and their representatives should work together in planning any roster changes. Consultation with shiftworkers is important because it alerts management to problems they may not have been aware of, and results in more effective solutions and greater worker satisfaction. Easily administered systems, or rosters which maximise time off, may not necessarily be the best.

If it is decided to change the shiftwork roster, there should be a trial period to allow for ongoing consultation, evaluation of rosters, and resolution of any disputes.

SOLUTIONS — MANAGING THE EFFECTS OF SHIFTWORK

Shiftwork Schedules

Length of Work Cycle. A work cycle is the number of successive days of rostered duty. A work cycle should consist of no more than **six** 8-hour shifts or **four** 12-hour shifts. Work cycles of more than seven continuous working days should be avoided.

Frequency of Rotation. The number of nights worked in succession should be limited for safety reasons. Rapidly rotating rosters with shift changes every 2 or 3 days are preferable to slowly rotating rosters with seven day cycles, or fixed shifts.

Direction of Rotation. Shifts should rotate toward later times in a forward or clockwise direction. It is easier for people to delay sleep than to go to bed earlier. Under a 3-shift system, it is better for employees to move, in succession, from the morning shift to the afternoon shift and then to the night shift and to repeat the same cycle.

Number of Consecutive Night Shifts. Nightwork should be reduced to a minimum, especially where it is not essential. **Three** 8-hour, or **two** 12-hour night shifts are the recommended maximum number of consecutive shifts which should be worked.

Week-end Shifts. Rostering should allow for **two** free weekends in four.

Duration of Shifts. Workload should govern the shift length. Jobs should be evaluated individually in terms of physical or mental effort involved and the nature of hazards encountered. Long shifts should be avoided where there is excessive heat, cold, noise, vibration, manual handling or exposure to hazardous substances.

Occupational exposure levels are calculated as an average over an eight hour day. When working longer shifts, exposure levels will need to be reassessed.

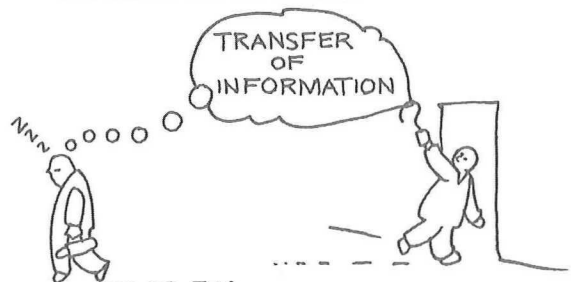
Overtime. Overtime should be avoided in jobs where there is exposure to special hazards or heavy physical or mental strain, except in exceptional circumstances. It is also preferable that no overtime be allowed before or after a night shift. Overtime should not be worked in conjunction with 12-hour shifts. Double shifts should be avoided.

Rest Breaks. Where practicable, a rest break or breaks should be scheduled during night shift to help employees maintain alertness.

Start and End of Shift. Day shifts should not begin before 06:00 hours. Some flexibility in starting time is preferable if the work allows. Working hours should permit the use of public transport where available.

Daily Rest Period. Allow no less than 11 hours between shifts, preferably 12 hours.

The Change-over Period. Consultation between employees finishing one shift and employees commencing the next shift should be provided for when arranging shift schedules. Systems for transfer of information and communication should be established and maintained.



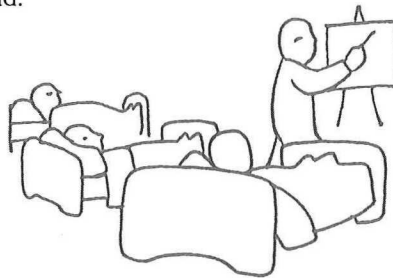
Rosters. Prior notice of shift rostering should be provided to employees to allow at least one week notice. Whenever possible, longer periods of notice should be given. Rostered days off should not be placed in the middle of a night shift sequence. Rostering an employee to work alone at night should be avoided.

Information and Training

All employees must be provided with appropriate information and training to ensure work can be performed safely, irrespective of the time of their shifts. Special arrangements may be required to hold training courses at times suitable for shiftworkers.

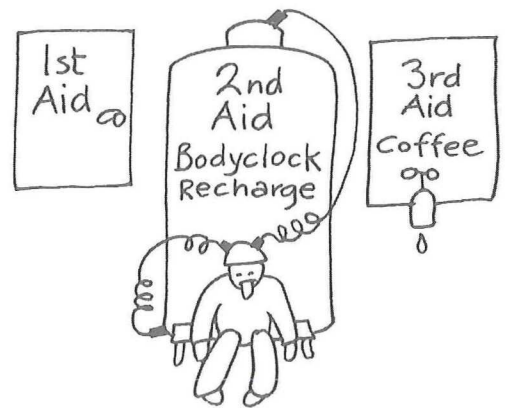
Access to Emergency Services

Shiftwork may introduce difficulties in accessing emergency facilities as the availability of emergency services may be reduced after hours. Information on how to reach help should be provided. All employees must have access to first-aid equipment. At least one person on each shift should have received instruction in first aid.



Education in Self-Care

Understanding how shiftwork affects the body clock, alertness, health and social life helps employees cope with shiftwork. Employers should provide employees with adequate information for self-care on matters related to coping with and facilitating adjustment to rotating and/or night shiftwork. Aim to maintain the health and well-being of employees by providing advice on minimising sleep loss and fatigue, keeping nutrition in balance with the sleep/work cycle, and general health matters.



Food Services and Rest Areas

Amenities should be provided for employees to take meal and rest breaks. Facilities at the workplace should enable employees to heat snacks or meals and drinks during meal and tea breaks. In some industries such as emergency services, facilities should include rest areas where employees may sleep when on call.



Health Surveillance

Shiftworkers should have access to occupational health services, periodic medical examinations, health counselling and advice on health care. It may be necessary to change rosters so medical attention can be sought during regular day hours.

Pre-placement health assessments are desirable before starting shiftwork. This may help identify potential health problems, and assist in the long term monitoring of the health effects of shiftwork.



IN CONCLUSION

a recognition of the effects on shiftworkers' lives, particularly of nightwork and rotating shiftwork has grown over the past decade. It is now critical for employers to find ways to help employees adjust and cope with shiftwork. The wide variety of individual, domestic and industrial circumstances make it difficult to define the "best" way of organising the working time of shift teams in order to meet both the demands of production and the needs of the workers.

Although it is impossible to eliminate all adverse effects of shiftwork, the improved health and safety of shiftworkers should be a realistic goal by reducing the number of incidents and accidents in which fatigue and lack of attention to detail play a part.

Achieving this goal is not simple, involving the shiftworker, the employer, the plant, the co-workers and many political, social and cultural factors.

Future effectiveness of these strategies will depend on the widespread co-operation of employers and employees. These are valuable lessons to be learnt from the experience of past and present shiftworkers. Suggestions and feedback on reducing adverse effects should be brought to the attention of employers and those administering the *workplace health and safety program*.

This information paper may be updated as the useful results of national and international programs for the better management of shiftwork come to hand.

WHERE TO FIND INFORMATION

Further information concerning shiftwork can be found in:

ACTU Code of Conduct on Twelve Hour Shift Work. 1990.

Guidelines for Shiftworkers. A. Wedderburn, European Foundation for the Improvement of Living and Working Conditions, Dublin, 1991.

How to Make Shiftwork Safe and Productive. T.H. Monk, University of Pittsburgh School of Medicine, 1988.

Managing Shiftwork. Report of the Brain Behaviour Research Institute, Victoria, 1989.

Night Work Convention (No: 171)
International Labor Organisation, 1990.

Night Work Recommendations (No: 178)
International Labor Organisation, 1990.

Protocol of 1990 to the Night Work (Women) Convention (No: 89) of 1948 (Revised).

Shiftwork. A.J. Scott (ed), Hanley and Belfus, Philadelphia, 1990.

Shiftwork Health and Safety: An overview of the Scientific Literature 1978-1990. Health and Safety Executive, U.K., 1992.

