



# WorkOSH

Workplace Occupational Safety and Health

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## OCCUPATIONAL HEALTH IN NIGHT AND SHIFT WORKERS

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Night work refers to work carried out during the period between midnight and 7 a.m. on the following day.

#### A night worker is an employee:

- Who normally works at least 3 hours of his or her daily working time during night time (i.e. between midnight and 7 a.m. on the following day), and
- Who's 'night-time' working hours in each year is equal to or exceeds 50% of the total number of hours worked by him or her during that year [1].

People find it difficult to adjust to night work. If people work by night and rest by day, their circadian rhythms are disturbed and it never completely change to the new pattern of work and sleep. A partial adjustment may occur over successive shifts but normal circadian rhythms are usually quickly re-established on days off. As well, some people are early risers who work best early in the day and down in the evening. Others are late to rise, slow to get going and often at their peak in the evening. 10-20% of people who are early risers find it hardest to adjust to working at night.

Changes in the workplace such as job sharing, part-time work and more flexible work hours are indicators that shift work is on the increase.

Industries such as Airlines, Hospitals and Railways have long had round-the-clock operations and extended shopping hours are fast becoming common place. Research shows that there are significant health and safety issues associated with shift work [2].

**The possible effects of night/shift work** Night/Shift work may cause or contribute to the following effects:

#### 1. Biological Effects:

- cardiovascular disorders
- gastrointestinal disorders
- circadian dysrhythmia

#### 2. Psychosocial Effects:

- sleep loss/fatigue
- lowered performance
- increased accidents
- stress

#### 3. Individual Effects:

disrupted family and social life, e.g. isolation from friends, family, social events and celebrations, sports matches, etc.[1].



Fig. 1: Night workers and their health issues. (Source [3])

## CIRCADIAN RHYTHM (THE BODY CLOCK)

Human beings are day oriented and are designed to work in the daytime and sleep at night. For this our internal body clock (circadian clock) is responsible. In different individuals and mental states, it causes a regular variation through 24 hours. This variation is referred to as the circadian rhythm. For examples body temperature, heart rate, blood pressure, respiration rate and adrenaline production normally rise during the day and fall at night. It is these changes, which affect behaviour, alertness, reaction time and mental capacity of all people by varying degrees [2].



**Fig. 2: Model of the Sleep Wake Cycle (Source [4])**

After working in a night shift sleep cycle is usually about two hours shorter. A decrease in sleep length also affects those who start work before 7 am. Physiologically, in the early morning hours, the body is preparing for activity that is linked to an increase in alertness. It is noticed that people get their longest sleep when they go to sleep before midnight and their shortest when sleep begins in the morning [5].

## HEALTH EFFECTS

More signs of illness as are seen in the shift workers and former shift as compared to people on fixed day work. Occurrence of health problems may develop after a short period of shift work, or may be only apparent after some years. Shift work associated common health problems include:

**Gastro-intestinal complaints:** Body's rhythms for digestive function are regulated for food to be eaten during the day. At night the digestive system is relatively inactive, which in turn causes problems with some foods that are tolerated well in the daytime. It is noticed that the higher intake of

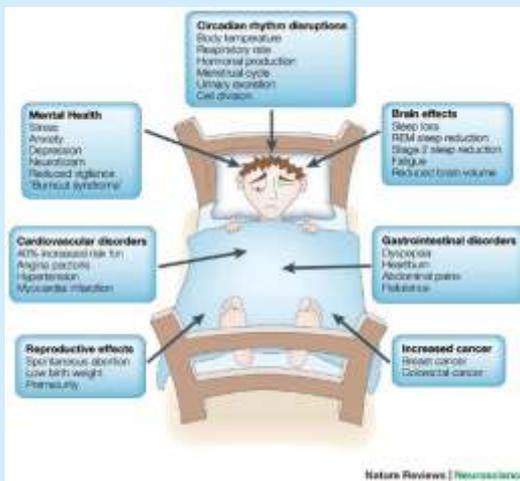
caffeinated drinks to get awoken often aggravated digestive complaints [6].

**Psychiatric disturbances & Depression:** These mainly are triggered or worsened by irregular sleeping patterns and cumulative fatigue. Many published reports on working hours cite stress as a problem but such reports all commonly lack scientific rigour, acquiring these data from self-administered questionnaires and case reports. The increasing use of validated questionnaires such as the General Health Questionnaire (GHQ) and, more specifically, the standard Shift Work Index (SSI) developed by Barton and Folkard has improved the researchers' ability to characterise and measure the effects of shift work on mental health [7].

**Cardio Vascular Disorders:** A recent review of the data suggests that shift workers have a 40% increase in risk. Causal mechanisms are not well defined but contributing factors include disruption of circadian rhythm, disturbed socio temporal patterns and social support, stress, smoking, poor diet, and lack of exercise. The health outcomes are mainly angina pectoris, hypertension, and myocardial infarction [8].

**Reproductive Effects:** There is increasing evidence to suggest that shift work and particularly night work, may present special risks to women of child bearing age [4]. The causative factors probably include disruption of the menstrual cycle and increased stress from the conflicts created by night work on family life. Specific health outcomes linked to shift work include increased risk of spontaneous abortion, low birth weight, and prematurity. The evidence for subfertility is less convincing [9].

**Age:** Shift workers may become intolerant of their work schedules when they reach their 40s and 50s, despite having done shift work successfully for many years. Older employees may also find it more difficult to switch from 8-hour to 12-hour shifts. Medicines for medical conditions: The effectiveness of certain medicines follows the body clock so reversal of the sleep/wake pattern can interfere with the treatment of some diseases [6].



**Fig. 3: Health Effects in the night shift workers. (Source [10])**

### ON-THE-JOB FATIGUE

The number of hours worked increases the level of tiredness and is more noticeable during the second half of a shift, especially between two and six in the morning. A high level of sleepiness when awake is another common problem experienced with sleep loss. While working many shift workers actually fall asleep. These 'micro sleeps' may last from seconds to three minutes and some shift workers may not be aware that they have nodded off. It is difficult for employees to maintain concentration due to increased feelings of fatigue and sleepiness at work. This has implications for workplace safety. Judgement is impaired and response time slowed. The effects of alcohol and sleep loss on work performance was shown in a recent Australian study, where shift workers who have had one sleepless night can be presented as a great workplace hazards as someone who has been drinking alcohol [2].

### Impact on family and social life due to night shift

Family and Social life factors can have immense impact on a shift worker's physical and mental health. Workers who don't have sufficient time to interact with their families and friends because of shift working and the need to rest in between may feel deprived and isolated, leading to moodiness and negativity. This can affect their relationships both at home and at work [8]. On the other hand, some workers will try to maintain a normal family and social life, but as a result not sleep sufficiently and end up fatigued. Thus there is a fine balance to be struck between these competing demands. Major impact in this area is due to design of shift patterns (e.g. 8 hour

versus 12 hour, 2 daytime shifts not involving a night shift, no shift working at weekends, etc.) [11]

## LABOUR LAWS FOR NIGHT SHIFT

### Labour legislation pertaining to employees working on night shifts

Working hours between 7:00 p. m. to 6:00 a.m. are generally referring night shifts to. There are provisions containing restricting work during night for women in India, legislations like the Plantation Labour Act, 1951, Factories Act, 1948, State Shops and Establishments Act, etc. contained

### Prohibition of Night Work

- Section 66(1)(b) of the Factories Act, 1948 states that no woman shall be required or allowed to work in any factory except between the hours of 6 a.m. and 7 p.m. [12]. (After much debate, the ban has been lifted in majority of industries. For instance, the Factories Act, 1948, which initially banned women from working in night shifts, now liberalized women to work at their desired timing. It was argued that provisions for safety of women should be implemented such as provision of transportation until the doorstep of their residence rather than their ban at work during those hours.).
- Section 25 of the Beedi and Cigar Workers (Conditions of Employment) Act, 1966 stipulates that no woman shall be required or allowed to work in any industrial premise except between 6 a.m. and 7 p.m. [13].
- Section 46(1)(b) of the Mines Act, 1952 prohibits employment of women in any mine above ground except between the hours of 6 a.m. and 7 p.m. [14].
- According to shops and establishment act no women shall be required or allowed to work in any establishment after 9:30 p.m.

In IT industry provision of women employees working after 8 p. m. is allowed provided transportation till door step and other security measures for women employees are adhered.

### Measures to protect women working in night shifts

**The following measures should be taken at the workplace with the intervention of human resources department:**

- Special arrangements should be made for protection of female employees working before 6 a.m. and 8:30 p.m. including transportation.
- Female employees should be provided job jointly or in a group.
- Every vehicle transporting women employees to be issued special pass.
- Every company should provide a security guard with the vehicle for women employee.
- Security guard or a colleague to accompany the driver in the cab, if a woman staff working in a night shift is either the first to be picked or last to be dropped.
- GPS based monitoring of cabs with panic buttons.
- SMS alerts or information systems to be installed.
- Employers should collect the identification documents from drivers, security guards and casual staff.
- 24 x 7 operational CCTV at vital locations or places such as entry/exit, common passages etc.
- Installation of electronic doors allowing access to work area only to authorized employees.
- High security fencing to discourage human trespassing in factory/ office premises/ campuses.
- Separate and secure toilets for women close to their work station.

- Compliance and audits, random checks to be done periodically including breathe analysis of cab drivers.
- Training of women staff on staying alert and better prepared.
- Self defence classes to be organized at the workplace or sponsored by the organization.
- Setting up of a sexual harassment committee reporting to the managing director or a senior member of the management and headed by a woman.
- Clearly displayed emergency contact numbers and a designated officer(s) available round the clock to be contacted in emergency [15].

## APPROACHES

### Managing shiftwork

Adapting to shiftwork is easy for some people while others never adjust. Exercise and a well-balanced diet will probably help any adjustment. Family understanding and cooperation can also reduce stress that seems to go with a shiftworker's lifestyle. If you do find it difficult to adjust to shiftwork, you should discuss the problem with your supervisor or manager occupational health nurse or doctor or counsellor or employee advisory service. They may be able to help you find a solution [5].

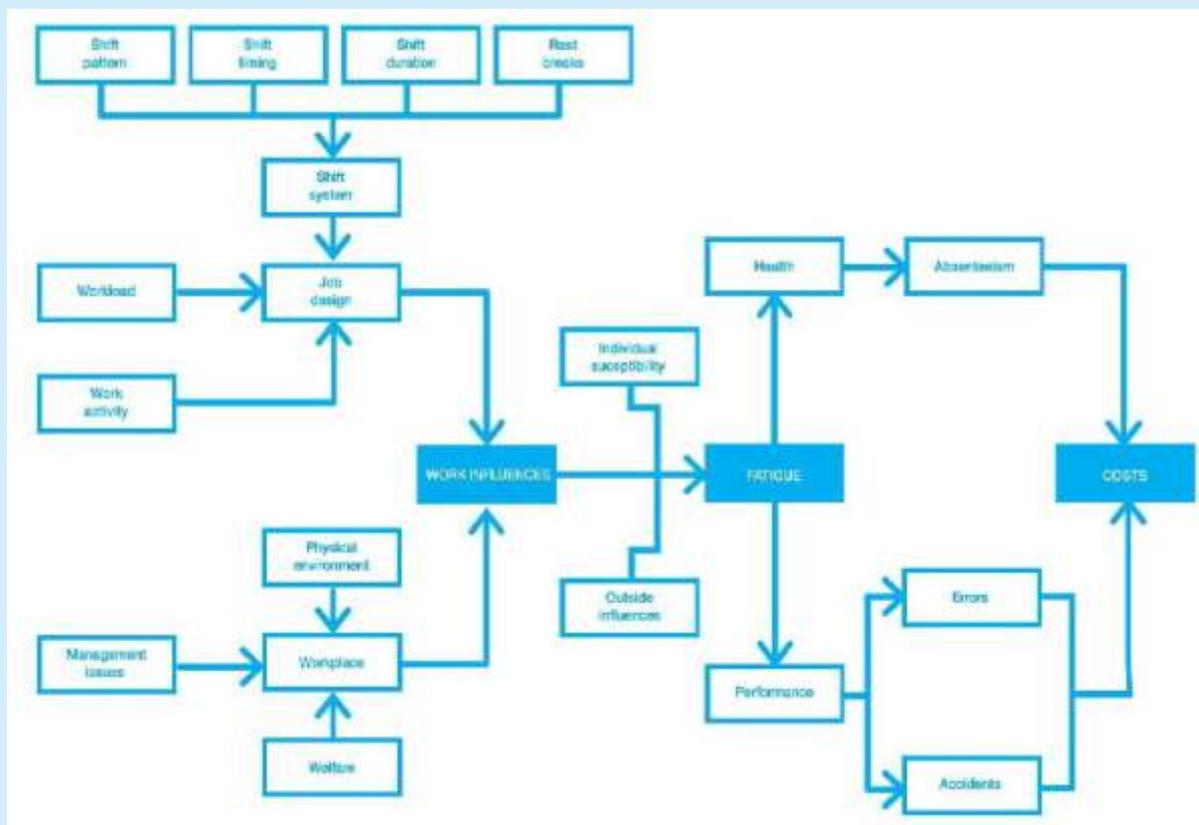


Fig. 4. Shift Work affecting various parameters resulting to errors and accidents (Source [17]).

There are several approaches the organization can take to help reduce the effects of shift work. There are also several important considerations for organizations.

**Shift Schedule Design:** Optimizing the design of the shift schedule is the most effective way of reducing the health and safety problems. Satisfaction with a particular shift system is the result of a complicated balancing act that is the best compromise for personal, psychological, social and medical concerns.

- **Length of the rotation period** (the number of days on any one shift before switching to the next shift). The optimum length of the rotation period has been disputed.
- **Direction of rotation of shifts.** It is recommended that shifts rotate forward from day to afternoon to night because circadian rhythms adjust better when moving ahead than back.
- **Start and Finish Times.** Early morning shifts are associated with shorter sleep and greater fatigue. It is advisable to avoid shift start times as early as 5 or 6 a.m. The social customs and desires of the specific work force should be considered as well as the availability of public transportation. The safety on the streets, in terms of crime and violence, is another consideration.
- **Length of rest between shifts.** It is recommended that a rest period of at least 24 hours occurs after each set of night shifts. The consecutive nights worked, the more rest time should be allowed before the next rotation occurs.
- **Alternative forms of organizing work schedules.** For example, extended work days of ten or twelve hours have been used. It has the advantage of fewer consecutive night shifts and longer blocks of time off. However, the additional fatigue from long work hours may also have adverse effects. The physical and

mental load of the task should be considered when selecting the length of a work shift. Exposure to chemical or physical agents should also be considered when selecting a shift system as well as ergonomic hazards [2].

## GUIDELINES

People who work shifts face many problems that others do not recognize. The difficulties stem from the change in eating, sleeping, and working patterns. The following guidelines can help people cope better.

### Diet and Eating Patterns

- Maintain regular eating patterns as much as possible. Balanced, varied meals are very important. Keep family meal times the same even though the work routine constantly changes. Family meals may need to be altered in content to suit the shift worker.
- Time meals carefully. Afternoon workers should have the main meal in the middle of the day instead of the middle of the work shift. Night workers should eat lightly throughout the shift and have a moderate breakfast. This way they should not get too hungry while sleeping during the day and digestive discomfort should be minimal.
- Pay careful attention to the type of food eaten. Drink lots of water and eat the usual balance of vegetables, fruit, lean meat, poultry, fish, dairy products, grains and bread. Eat crackers, nuts and fruit instead of pop and candy bars during work breaks. Reduce the intake of salt, caffeine, and alcohol. Avoid greasy foods, particularly at night.
- Avoid excessive use of antacids, tranquilizers and sleeping pills. It is healthier to watch what and when you eat, and use relaxation techniques to aid sleep.
- Relax during meals and allow time for digestion.
- Sleep on a set schedule to help establish a

routine and to make sleep during the day easier. Some people may prefer to get a full period of rest just before the next work shift (as it is with "normal day" work). Try different patterns of work and sleep to see which is best for you.

- Make sure that family and friends are aware of and considerate of the worker's sleep hours and needs. Ensure that the shift worker has a comfortable, dark, quiet place to sleep during the day. Air conditioning, a telephone answering machine, and good blinds on windows are recommended.
- Make time for quiet relaxation before bed to help get better sleep. Learn how to relax using muscle relaxation, breathing techniques and so on. Use mental imagery to block out unpleasant thoughts. If you still do not fall asleep after an hour, read a book or listen to quiet music on the radio for a while. If sleep still does not come, reschedule sleeping hours for later in the day. Limit commitments later in the day to allow for napping[2].

- **EXAMPLES of Incidents Attributed to Human Error During Nights or Night Shifts**
- **Three-Mile Island nuclear reactor [1979]**
- **Davis–Besse nuclear reactor at Oak Harbor, Ohio**
- **Racho Seco nuclear reactor near Sacramento, Calif**
- **Chernobyl nuclear plant [1986]**
- **Space shuttle *Challenger* accident[1986]**
- **Launch of the space shuttle *Columbia***
- **Bhopal Union Carbide tragedy [1984]**
- ***Exxon Valdez* accident[1989]**
- ***Estonia* ferry accident**
- **Peak incidence of single-vehicle motor accidents**
- **18% increase in human error incidents in afternoon shift relative to morning shift**
- **30% increase in human error incidents on night shift relative to morning shift [16]**

## REFERENCE

1. Health and Safety Authority, Ireland. <http://www.hsa.ie> [Last assessed on 07/05/2017]
2. OSH Fact Sheet on Rotational Shift work, Canadian Centre for Occupational Health and Safety (CCOHS), <https://www.ccohs.ca/oshanswers/ergonomics/shiftwrk.html> [Last assessed on 07/05/2017]
3. Thieman A. Work life balance: Night-shift workers at higher risk for weight gain, 2014. <http://www.leannthieman.com/work-life-balance-night-shift-workers-at-higher-risk-for-weight-gain/> [Last assessed on 07/05/2017]
4. Shift work guidance for employers, <https://workingwellsolutions.com/shift-work-guidance-for-employers/> [Last assessed on 07/05/2017]
5. How to Manage Shift work , Workcover NSW Health and Safety Guide, New South Wales Government, [http://www.safework.nsw.gov.au/\\_data/assets/pdf\\_file/0016/50065/how\\_to\\_manage\\_shiftwork\\_guide\\_0224.pdf](http://www.safework.nsw.gov.au/_data/assets/pdf_file/0016/50065/how_to_manage_shiftwork_guide_0224.pdf) [Last assessed on 07/05/2017]
6. Shiftwork How to devise an effective Roster, Wilson Disease, Workcover NSW Health and Safety Guide, New South Wales Government, , [http://www.ibrarian.net/navon/paper/HOW\\_TO\\_DEVISE\\_AN\\_EFFECTIVE\\_ROSTER.pdf?paperid=21979041](http://www.ibrarian.net/navon/paper/HOW_TO_DEVISE_AN_EFFECTIVE_ROSTER.pdf?paperid=21979041). [Last assessed on 07/05/2017]
7. Barton J, Spelton E, Totterdell P, et al. The standard shiftwork index: a battery of questionnaires for assessing shift work-related problems. *Work Stress*, 9:4-30, 1995.
8. Boggild H, Knuttson A. Shift work, risk factors and cardiovascular disease. *Scand J Work Environ Health* 25:85–99, 1999.
9. Spurgeon A. Working time, occupational health and safety. ILO, Geneva

10. Foster RG and Wulff K., The rhythm of rest and excess, Nature Review Neuroscience, 6: 407-414, 2005.
11. Guidance for Employers and Employees on Night and Shift Work The Health & Safety Authority page no: 7 [http://www.hsa.ie/eng/Publications\\_and\\_Forms/Publications/Healthcare\\_Sector/Night\\_and\\_Shift\\_Work\\_2012.pdf](http://www.hsa.ie/eng/Publications_and_Forms/Publications/Healthcare_Sector/Night_and_Shift_Work_2012.pdf) [Last assessed on 07/05/2017]
12. The Factories Act, 1948, Ministry of Labour and Employment, Govt of India
13. The Beedi and Cigar Workers (Conditions of Employment) Act, 1966, Govt of India
14. The Mines Act, 1952, Govt of India
15. Labour Laws for Night Shift, <https://spiritofhr.wordpress.com/labour-laws-for-night-shift/> [Last access on 07/05/2017]
16. Burgess, P. A. Optimal Shift Duration and Sequence: Recommended Approach for Short-Term Emergency Response Activations for Public Health and Emergency Management. American Journal of Public Health, 97(Suppl 1), S88–S92, 2007.
17. Managing shifwork, health & safety & guidance, <https://hse.gov.uk/pUbns/priced/hsb256.pcLf> [Last accessed on 0705/2017]

## EVENTS :

ENVIS-NIOH celebrated the “World Environment Day” on 5 June 2017 to raise an awareness in every citizen to understand their responsibility towards nature. The theme of this year's World Environment Day is to “Connect people to the Nature.”

On this occasion Dr. Sunil Kumar Scientist 'G', Shri P. B. Doctor, Scientist 'E', Dr. L. K. Sharma Scientist 'C' and ENVIS Co-coordinator planted tree saplings in the campus with a thought that we should leave a better place to live for our future generation.



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# Consequences of Shift Work:

- › Blood Sugar Imbalance and Diabetes
- › Inhibited Mental Performance
- › Increased Risk of Injury & Accidents
- › Hormone Imbalances
- › Weight Gain
- › Digestive Disorders
- › Depression
- › Anxiety
- › Chronic Fatigue



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**Background Picture Source:**

**Front:** <http://valleysleepcenter/5-sleep-solutions-for-shift-workers/>

**Back:** <https://drjockers.com/7-ways-prevent-shift-work-disorder/>