Safety Human Factors Information

Prepared by WG-16 Worker Safety

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Task Shift Worker Fatigue - From Working Patterns and Overtime

Fatigue refers to the issues that arise from excessive working time or poorly designed shift patterns or insufficient sleep.

Fatigue is a state of mental or physical weariness. It results in slower reactions, a reduced ability to process information, memory lapses, absent-minded slips, 'losing the picture' and lack of attention.

Fatigue can lead to errors and accidents, ill-health and injury, and reduced productivity. It is often a cause of incidents or accidents that involve significant loss or injury.

What can cause fatigue?

The main factors causing fatigue include:

- Inadequate sleep;
  - 'acute', for example, having 3 hours less sleep than normal; or
  - 'cumulative' for example having 1 hour less sleep than normal over each of several days
  - poor quality of sleep, irrespective of cause e.g. from frequent interruptions, illness or disorder such as sleep apnoea [1].
- Prolonged or intensive exertion;
- Poorly-designed shift patterns (length, rotation, start times);
- Excessive overtime;
- Environmental conditions such as excessive heat, humidity, noise;
- Inadequate rest breaks during work; and
- Insufficient food and water.

What are the main effects of fatigue?

Compared with their normal state, a fatigued person can:

- Find it hard to: concentrate, make clear decisions or take in and act on information;
- Have more frequent lapses of attention or memory;
- React more slowly (for example to alarms or hazards arising in the workplace);Make more errors;
- Occasionally fall asleep at work, momentarily or for several minutes;
- Have less motivation or interest in their work; and
- Be irritable.

[1] **Sleep apnoea**; this is a specific sleep disorder characterized by pauses in breathing during sleep. Individuals with sleep apnoea are rarely aware of having difficulty breathing, even upon awakening and can become conditioned to the daytime sleepiness and fatigue associated with the resultant significant levels of sleep disturbance.

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Learning more about shift workers' fatigue.

If the answer to any of the questions below is 'no', then you need to take action

Policy	
Is there a policy (agreement, framework, etc.) that specifically addresses shift patterns, working hours, overtime and guards against fatigue?	☐
• Does the policy demonstrate commitment to the management of this issue?	☐
• Have shift workers been involved in the development and review of the policy?	☐
• Is the input of associated health protection advisors such as health and safety teams, company doctor, worker safety or union representatives also collected and considered?	☐
• Does the policy state how risks arising from fatigue related to hours of work and shift work should be assessed and controlled?	☐
• Does the policy identify who it affects, and outline the responsibilities of management, supervisors and shift workers?	☐
• Does the policy outline the requirements for medical health checks for shift workers?	☐
• Is there a periodic review and update of the policy?	☐
Assessment	
Has there been any consideration of hours of work and shift systems and their effect on shift workers?	☐
• Did this specifically assess the risk of fatigue in safety critical tasks and roles?	☐
• Is this risk assessment repeated or reviewed at specific intervals?	☐
• Does the shift pattern conform to good practice?	☐
• Have the underlying causes of fatigue been examined?	☐
• Is there an effective classification and recording system for working hours?	☐
• Are the causes of exceeding defined hours recorded, categorized and assessed?	☐
• Does the assessment show which measures are effective for managing fatigue and which are not?	☐
• Have shift workers, supervisors, managers and associated health protection advisors been consulted in finding ways of avoiding and managing fatigue?	☐
Control	
Has the business set limits for the number of hours and the type of shift patterns for various groups (operators, drivers)?	☐
• What are the consequences if these limits are exceeded?	☐
• Are there arrangements for the maximum amount of agreed overtime?	☐
• Is any overtime spread equally over all workers and shifts (and how is this managed)?	☐
• Is shift swapping allowed and if so, how is it monitored and controlled?	☐
• Are the consequences of shift workers taking second jobs when off-shift considered and monitored?	☐
• Has the opinion of the shift workers on the shift pattern been obtained?	☐
Monitoring	☐
• Is there a system of recording working hours, overtime, and on-call working?	☐

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- Is there a robust, effective system for ensuring that the monitoring system triggers changes in staffing levels and workload should the need arise? ☐
- Is the monitoring on an individual level? ☐

What can we do about it?

What should your company do about it?

Management and shift workers should be aware of some key facts about fatigue:

- Fatigue reduces alertness, increases reaction time, increases memory problems and irritability. The effects are similar to those of alcohol.
- Denial - people can find it difficult to realise or admit that they are fatigued.
- Length of sleep – it is recommended that everyone has minimum 7-9 hours' sleep per day, although individual needs vary. [6]
- Chronic fatigue can harm health (e.g. colds, flu, diabetes, asthma, digestive or heart problems) [7][8]
- Individual differences - the above affect different people in different ways.
- Natural circadian rhythms (the body clock) make human errors more likely between midnight and 6am and to a lesser extent between 2pm and 4pm, irrespective of the shift being worked. [7]
    - Critical tasks and decision making should not be planned at these times.
- More errors are made between the 2nd and 4th hours of any shift [7] – this can be considered when planning work routines.
- Adaptation – even for an experienced shift worker on planned shifts, it takes a few days to adapt to a new shift routine. Shift swapping should therefore be carefully monitored.
- 'Forward rotating' shifts, that is mornings to afternoons to nights, are easier for the body to adapt to. [2][5]
- Night workers are particularly at risk of fatigue because their day sleep is often lighter, shorter and more easily disturbed because of daytime noise and a natural reluctance to sleep during daylight. [8]
- Persons with certain lifestyles or sedentary occupations, including drivers, may be at risk from sleep apnoea, and that the sleep disturbance it causes can cause fatigue. Companies can raise awareness through training and offer programmes that help workers to identify if they are at risk from sleep apnoea and how to manage that condition.

What can managers do about it?

Management should assess and take steps to control all risks to the health and safety of their employees; this includes assessing working time arrangements.

Risk assessment should consider the following:

- Night working and changing from one shift to another, for example, nights to days);
- Length of shift including any overtime (avoid > 14 to 16 hours) [2];
- Assess the shift pattern using the Fatigue risk calculator. [5];
- Length and quality of rest breaks during the shift;
- Recovery periods between shifts and the amount and quality of sleep taken;

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- Resource planning, to provide availability and to ensure that cover for training, illness and holidays has minimal disruption on individual shifts;
- Type of work - try to schedule safety critical tasks, tedious work or work that needs close concentration to avoid known high error periods;
- Bio-rhythms (working with or against your 'body clock');
- The environment - mainly temperature and lighting – and effect on drowsiness;
- Medical fitness and individual preferences of people for shift work;
- Training and raising awareness among shift workers, and their families, supervisors and managers on the signs and problems of fatigue and also its interaction with sleep patterns, nutrition and effects on social life [1];
- Monitoring of employees for signs of fatigue, particularly on safety critical work; and
- Examining accident and incident investigations for recognition of fatigue as a cause.

Some good practice guidance on shift pattern design

Night shifts

- Restrict number of consecutive night shifts (to 4 maximum if possible);
- Allow at least 2 days off following night shift; and
- Avoid keeping workers on permanent night shifts.

Shift length

- If 12-hour shifts are worked, then if possible no overtime should be worked in addition;
- Total working time (normal shift + overtime) should if possible not exceed 12 hours total; and
- Avoid long working "weeks" (more than 50 hours).

Rest periods

- If possible, allow minimum of 12 hours between shifts and avoid 'quick return' of 8 hours. (Rest period between shifts should permit sufficient time for commuting, meals and sleep); and
- Plan some weekends off, advisably at least every 3 weeks to facilitate social/family interactions.

Manage procedures

- Rotate shifts quickly (e.g. every 2-3 days) as the internal body clock does not adapt and sleep loss can be quickly recovered. Avoid weekly or fortnightly rotating shift schedules; and
- Use forward rotation (morning/afternoon/night) for preference.

Social considerations

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

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- Allow some individual choice, for example on night shifts, where possible to accommodate “morning” people, night people (larks/owls) and those with family commitments; and
- Keep the timing of shifts regular and predictable but also allow employees to have some flexibility to choose their own work schedule.

References

Unless otherwise specified the latest edition shall apply.

[1] *Fatigue*, Human Factors Briefing Notes No 5, Energy Institute. https://www.energyinst.org

[2] *Fatigue,* HSE Human Factors Briefing Note No 10, Health and Safety Executive. https://www.hse.gov.uk

[3] *HSE Human Factors Inspectors Toolkit*, Health and Safety Executive. https://www.hse.gov.uk

[4] *Reducing Error and Influencing Behaviour*, HSG48.Health and Safety Executive, HSE Books ISBN 978-0-7176-2452-2. https://www.hse.gov.uk

[5] *The development of a fatigue / risk index for shift workers*, RR446, Health and Safety Executive. www.hse.gov.uk

[6] *National Sleep Foundation’s sleep time duration recommendations: methodology and results summary*, Sleep Health 1 (2015) 40–43, Journal of the National Sleep Foundation. https://www.sleephealthjournal.org

[7] *Managing fatigue using a fatigue risk management plan (FRMP)*, Energy Institute, ISBN: 9780852936757. https://www.energyinst.org

[8] *Managing Shift Work*, HSG 256, Health and Safety Executive. https://www.hse.gov.uk

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