OFFICE OF RAIL REGULATION

Managing fatigue in safety critical work

Railways and Other Guided Transport Systems (Safety) Regulations 2006

July 2006

Published by the Office of Rail Regulation

Contents

This guidance is issued by the Office of Rail Regulation. Following the guidance is not compulsory and you are free to take other action. But if you do follow the guidance you will normally be doing enough to comply with the law. Health and safety inspectors seek to secure compliance with the law and may refer to this guidance as illustrating good practice.

1. Introduction

1.1 This guidance is aimed at those who have control of safety critical work. Controllers, managers and supervisors need to ensure that workers do not undertake safety critical work if they are, or could become, so fatigued that health or safety could be significantly affected.

1.2 This guidance relates to regulation 25 of the Railways and Other Guided Transport Systems (Safety) Regulations 2006 (the Regulations). It sets out a series of stages that a controller of safety critical work should follow based on good practice in managing fatigue risks. Arrangements for complying with regulation 25 should be reviewed where there is reason to doubt the effectiveness of those arrangements.

1.3 Separate guidance is available on the Railways and Other Guided Transport Systems (Safety) Regulations 2006 on the Office of Rail Regulation (ORR) website at: www.rail-reg.gov.uk/upload/pdf/283.pdf

Regulation 25: Fatigue

1.4 Regulation 25 of the Regulations states that:

(1) Every controller of safety critical work shall have in place arrangements to ensure, so far as is reasonably practicable, that a safety critical worker under his management, supervision or control does not carry out safety critical work in circumstances where he is so fatigued or where he would be liable to become so fatigued that his health or safety or the health or safety of other persons on a transport system could be significantly affected.

(2) The arrangements in paragraph (1) shall be reviewed by the controller of safety critical work where he has reason to doubt the effectiveness of those arrangements.

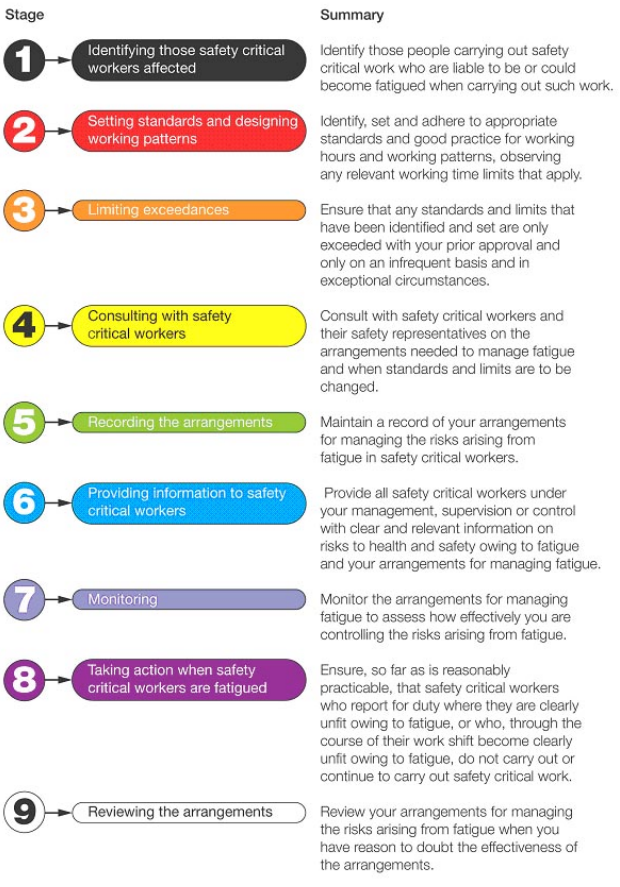
1.5 Safety critical work can be undertaken on a transport system at any time during the day or night, in sometimes difficult circumstances and at times with demanding work schedules. The potential for fatigue should therefore be foreseeable in such circumstances. If adequate measures are not taken to control any resulting fatigue, it can in turn lead to human error and give rise to significant risks to people on the transport system. Fatigue has been identified

as a causal factor in incidents on transport systems and can lead to reduced vigilance and alertness, increased errors, impaired decision making and a general deterioration in mood and motivation. Causes of fatigue are not limited to the effects of working for too long or the nature of the work, but could also include the effects of receiving too little rest.

1.6 When reading this guidance, controllers of safety critical work need to consider the requirements of the Working Time Regulations 1998 (as amended) (WTR). While the WTR place maximum limits on the amount of time an employer can ask an employee to work, the provisions of the WTR are not in themselves sufficient to prevent safety critical workers from working when they are so fatigued, or liable to become so fatigued, that their health or safety or the health or safety of other people on a transport system could be significantly affected.

1.7 The controller of safety critical work should establish effective arrangements for managing the risks arising from fatigue in safety critical workers. This process should include the following stages:

Figure 1: Summary outline of the nine stages



2. Stages

Stage 1: Identifying those safety critical workers affected

2.1 Controllers of safety critical work need to identify those people carrying out safety critical work who are liable to be fatigued, or become fatigued, when carrying out such work.

2.2 In identifying such people, controllers of safety critical work should take into account any relevant significant findings of risk assessments that have been:

- carried out by transport operators in accordance with regulation 19 of the Regulations; and
- conducted in accordance with the Management of Health and Safety at Work Regulations 1999.

Stage 2: Setting standards and designing working patterns

2.3 Controllers of safety critical work should identify, set and adhere to appropriate standards for working hours and working patterns, observing any relevant working time limits that apply.

2.4 The standards and limits set should take into account recognised national industry good practice standards, limits and guidance applying to railways and other guided transport systems. Any local arrangements on rostering and working hours should be compatible with the standards and limits that have been identified and set.

2.5 In the absence of relevant recognised national industry standards and limits, the standards and limits that the controller of safety critical work sets should, so far as is reasonably practicable, take into account foreseeable causes of fatigue, including:

- job design;
- the workload and the working environment;
- the shift system in operation;

- shift exchange;
- control of overtime;
- on-call working;
- the frequency of breaks;
- recovery time during periods of duty; and
- the nature and duration of any time spent travelling.

2.6 Limits for hours worked and working patterns for safety critical workers are appropriate for:

- the maximum length of any work shift or **period of duty**;
- the minimum rest interval between any **periods of duty**;
- the maximum number of hours to be worked in any seven day period;
- the minimum frequency of rest days;
- the maximum number of consecutive **day shifts**;
- the maximum number of consecutive **night shifts** and **early-morning shifts**; and
- the maximum period of time between breaks, including breaks for meals.

2.7 Working patterns can be designed to:

- minimise the build up of fatigue by restricting the number of consecutive **night** or **early-morning shifts**;
- allow fatigue to dissipate by ensuring adequate rest between shifts and between blocks of shifts; and
- minimise sleep disturbance.

2.8 Planned work patterns may vary when workers are on call or when unplanned overtime needs to be worked, e.g. as a result of worker shortages or sickness. These features also need to be managed to minimise the risks from fatigue.

2.9 The controller of safety critical work should consider the questions below when designing work patterns:

- Overall, is the proposed working time pattern likely to increase the risk of accidents arising from fatigue?
- Does the proposed working time pattern have any particular feature that could give rise to fatigue risks?

2.10 In answering these questions, there are five aspects of the working time pattern that are relevant to the question of fatigue. These are discussed in paragraphs 19-30.

Length of periods of duty

2.11 There is evidence that human performance deteriorates significantly when people have been at work for more than 12 hours. Controllers of safety critical work should consider whether any shift (including overtime) for safety critical workers could exceed that length, and the nature of the work that workers could be carrying out after the twelfth hour. Below 12 hours the extent to which fatigue occurs may depend on other aspects of the working time pattern, such as the adequacy of breaks taken during the shift and the length of interval since the previous duty (as well as other factors such as the nature of the work and the working environment). Even shifts of eight hours or less can be fatiguing if the work is very intense or demands continuous concentration, or there are inadequate breaks.

Intervals between duties

2.12 The daily rest interval for safety critical workers needs to be adequate to enable them to return to work rested after a full sleep. A feature of some shift work patterns is the occasional short rest interval of perhaps only eight hours. This is not an ideal rest interval, but if there is no other option it is important to ensure that other daily rest intervals in the shift pattern are of adequate length and that breaks during the shift after the short interval are adequate.

2.13 Arrangements whereby workers occasionally stay overnight in specially provided accommodation near to the workplace, where they can obtain the maximum sleep in the time available, may reduce the likelihood of fatigue.

2.14 There is evidence that time spent travelling to and from work does not provide rest in the same way as time spent at home. It is important to monitor long travelling times to and from work and consider how this can reduce the opportunity for daily rest and so increase the risk of fatigue. Where a large proportion of a group of safety critical workers have long travelling times, this ought to be taken into account when considering changes to working time patterns.

Recovery time

2.15 There is clear evidence about the value of rest days in enabling workers to 'recharge their batteries' and to maintain their work performance. The planning of rest day arrangements for safety critical workers needs to take account of the length of shifts and daily rest intervals. The frequency of rest days and the length of the recovery time are both relevant. Workers may benefit from regular (at least fortnightly) recovery periods of at least 48 hours. These are particularly important for shift workers, especially those working nights as shortened or interrupted sleep over a period can result in them spending part of their rest day sleeping.

Shift work

2.16 It is the nature of the railway business that some safety critical workers work rotating shifts, and that these may include night work. Workers may have difficulty in adjusting to varying sleep patterns, or to daytime sleep; this is an effect of the internal 'body clock' regulating sleep and wakefulness, which corresponds to the natural cycle of night and day. It may also be difficult to find the right conditions at home for daytime sleep. As a result, there may be a reduction in the quantity and quality of sleep, and the effects can build up over a period. On average, a person may lose two hours sleep for each night shift worked. The resulting fatigue that safety critical workers may experience is likely to be most noticeable on the night **or** early-morning shift, and to be more marked the more monotonous or repetitive the task. While people prefer to work more consecutive shifts in order to take a block of days off afterwards, this needs to be balanced with the risk of higher levels of fatigue from the greater number of shifts worked.

2.17 Research shows that a shift pattern that changes about once a week is likely to be more difficult to adjust to than a more rapidly or more slowly changing one. Current thinking suggests that starting a shift later than the previous one

(forward rotation) may be less of a problem than starting a shift earlier than the last one (backward rotation). Some shift patterns can result in a short daily rest interval of perhaps only eight hours; a pattern including such a short interval would be particularly unfavourable for safety critical workers.

2.18 For safety critical workers who are on call, or whose starting time frequently varies with very little notice given, the uncertainty makes it difficult to plan suitable sleep time and fatigue is more likely as a result. A particular example is drivers on a 'spare turn', who can have large variations (up to four hours) in their duty start time. If consecutive duty start times vary by so much, then fatigue is highly likely to be a problem. As far as possible, shift start times and on call duties should be planned to avoid variations of more than two hours. Where this is not possible then additional control measures, such as additional rest breaks within a period of duty or a shorter shift length, should be considered if reasonably practicable. A series of consecutive rostered duties with large variations in start times should be avoided.

Time of day

2.19 The risk of fatigue-related accidents is related to the time of the day. The worst time of day is in the early morning from midnight to 6 am, with a lesser problem in the middle of the afternoon from 2 pm to 6 pm. The main problem in the management of shift work is to cover the night-time hours when alertness is naturally low. People who work in the late night or early morning often feel sleepy and fatigued during their shift. This occurs because their internal 'body clock' is telling them they should be asleep. Night workers also have to sleep during the day and their day sleep can often be of a poorer quality. Early-morning shift workers have to wake up very early and can have a reduced length of sleep. It may be practicable to plan safety critical work to avoid these times when alertness is low. Other control measures should include planned rest breaks, working in pairs, encouraging workers to stand up and move around, and changes to the working environment such as higher levels of lighting and lower ambient temperatures.

Identify factors that may affect the onset of fatigue

2.20 Controllers of safety critical work should be aware of factors affecting the onset of fatigue, and design tasks and the working environment to maximise alertness so far as is reasonably practicable.

2.21 A number of factors may affect the onset of fatigue, including the nature of the work itself. Tasks that require sustained vigilance, or where the employee may have low levels of workload, may be more susceptible to fatigue. For example, driving the same route a number of times in the same shift is a factor that will influence fatigue. The working environment (including low lighting levels, high temperature, and quiet conditions) may also increase fatigue and feelings of drowsiness, particularly for sedentary tasks.

2.22 HSE carried out a series of inspections on fatigue management of train drivers and identified the following factors that might affect the onset of fatigue:

- repetitive routes;
- long night turns;
- insufficient rest before starting a **night shift** after working an **early shift**;
- high vacancy levels;
- very short turnaround time provided;
- poor timing of meal breaks in early shifts;
- variations in start time of spare turns; and
- not including training days within roster.

Provide adequate rest breaks before and within a period of duty

2.23 Controllers of safety critical work should not allow workers to undertake safety critical work if they have not had sufficient rest before starting a period of duty.

2.24 Controllers of safety critical work should make arrangements for workers to take breaks during periods of duty, except where the work provides natural opportunities for relaxation or reduced vigilance. The length and timing of breaks should be appropriate to the nature of the work and the length of time spent on duty. Wherever reasonably practicable, safety critical workers who work at a workstation (e.g. in a driver's cab or signal box) should be given the opportunity to spend breaks away from the workstation.

2.25 The timing of breaks is important. General advice for tasks which require continuous sustained attention, with no natural breaks in the task and where a lapse in attention can lead to safety implications, is for a regular 10-15 minute break every two hours during the day and every hour during the night. An alternative is to rotate workers around different tasks, providing that not all tasks require similar sustained attention. It is unlikely that the majority of safety critical tasks in the transport system would be of this extreme nature. For driving tasks, good practice would be to plan a short break about every three hours. It is better to plan regular breaks throughout a shift rather than have a break very near the start of the shift followed by another right at the end of the shift.

2.26 The 'quality' of breaks is also important. A food and drink preparation area, a quiet rest area at a suitable temperature and with suitable seating, and the facility to talk to colleagues and to take a walk are positive points. In the case of safety critical workers on night shift, the facility to take a short nap during a break can be especially beneficial. Naps of no more than 10 minutes are advisable if safety critical tasks are to be resumed within 20 minutes of waking. This is to avoid any grogginess on waking from a nap.

Summary of features of work patterns

2.27 Features of work patterns to consider are summarised in Table 1. The table provides guidance in the right-hand column on when to review controls in place to manage the risks from fatigue. These are given as good practice suggestions and should not be taken as being the only reasons for a review of controls.

Table 1: Features of work patterns

Feature	**Options**	**Think about:**	**Review fatigue management controls when:**
Timing of shift start	Day, evening, night, early or late	**Night** and **early shifts** can cause reduced sleep and fatigue.	**Night** and very **early shifts** start between 20:00 and 05:00 and if they last for more than 8 hours.
Length of shift	8, 10, 12 hours or **split shift**	Shorter shifts can cause less fatigue for **night** and **early shifts**. The risk of accidents rises after 12 hours on shift. Long **split shifts** are a problem area.	A planned shift extends beyond 12 hours, or overtime is worked before or immediately after any planned shift, or a **split shift** extends beyond 12 hours (including the long break within the shift).

Feature	Options	Think about:	Review fatigue management controls when:
Weekly work-rest ratio	Number of workdays to rest days	Minimise the number of consecutive **night shifts** and **early shifts** worked and allow two rest days after a block of such shifts.	The number of consecutive **night shifts** or very **early shifts** exceeds four in a rotating shift pattern or six when working a permanent shift pattern. The number of consecutive day shifts exceeds 12. Only one day's rest is planned after any number of night shifts or very early turns.
	Overtime workdays	After overtime, ensure sufficient time for sleep, travelling, and meal breaks before the start of the next shift.	Regular planned or unplanned overtime is being worked or overtime is unevenly distributed among staff.
	Weekend working	Plan some free weekends.	
Shift rotation	Permanent shift times (no rotation)	Individuals may have a preference for working permanent shift times. This can avoid problems with shift exchange and improve work–life balance. Rapid rotation or slow rotation is easier to adjust to than a shift pattern that rotates about once a week.	The direction of shift rotation varies between shifts. For example a person works two nights, three early shifts, and then two more nights – the shift start times are first advancing forwards and then being put backwards.
	Rotating speed	Rotating speed refers to the number of workdays before a shift change. Rapid rotation is two days per shift type; slow rotation is 21 days per shift.	
	Direction of rotation	Clockwise rotation from day to evening to **night shift** is usually preferable to counter-clockwise change from day to night to evening.	
Predictability	Emergency or **on call** duty	All these can affect any other part of the work pattern and will impact on levels of workers fatigue.	Spare turns or unplanned **on-call** shifts have a start time that varies by more than 2 hours, or late notice is given of additional or altered duties. For example, a person is told at 10 am that they are requested to work an evening **on-call** shift. A rest period of less than 8 hours has occurred because of **on call** or emergency working. Planned work, together with overtime and unplanned on-call work, builds up to a working week of 72 hours, or more than 240 hours over a 28 day period.
	Unplanned overtime	Restrict unplanned work and allow workers adequate rest before their next planned shift. If workers have been awake for more than 17 hours then their performance is likely to have more errors.	
	'Spare' turns with late notice/variable start time	Plan spare duties so that workers know start times in advance.	

Stage 3: Limiting exceedances

2.28 Controllers of safety critical work should ensure that any standards and limits that have been identified and set are only exceeded with their prior approval, on an infrequent basis, and in exceptional circumstances.

2.29 'Infrequent and exceptional circumstances' relates to situations where extended working is necessary to avoid or reduce risks to the health and safety of people on a transport system or significant disruption to services, and it is not reasonably practicable to take alternative steps. Such circumstances would include extreme weather conditions, equipment failure, or an accident or other serious incident. By their nature these circumstances will be unplanned and unforeseeable.

2.30 Where it can be foreseen that the limits are likely to be exceeded more than occasionally, e.g. where hours of work are already close to the limits, controllers of safety critical work should plan accordingly and make any necessary contingency provision to ensure that the limits are not exceeded, except on a very infrequent basis. Planned training or safety briefings for safety critical workers should not be a reason for exceeding the standards or limits. Neither should, for example, the existence of long-standing job vacancies, a block of maintenance work extending over a few days (e.g. plant shut down or blockade working) training delays or planned organisational changes that affect the numbers of safety critical workers. All of these should be foreseeable circumstances. In any case suitable action should be taken.

2.31 In exceptional circumstances where extended working is necessary, all reasonable steps should be taken to relieve safety critical workers who have worked in excess of any limits as soon as possible and to ensure that they have sufficient time to be fully rested before their next period of duty.

Stage 4: Consulting with safety critical workers

2.32 Controllers of safety critical work should consult with safety critical workers and their safety representatives on the arrangements needed to manage fatigue and when standards and limits are to be changed.

2.33 Following consultation, controllers of safety critical work should take account of the views and experiences of the safety critical workers affected, as expressed either directly or through their safety representatives.

Stage 5: Recording the arrangements

2.34 Controllers of safety critical work should maintain a record of their arrangements for managing the risks arising from fatigue in safety critical workers.

2.35 Those arrangements should be incorporated into the safety management system for those controllers of safety critical work who are subject to Part 2 of the Regulations.

2.36 For those controllers of safety critical work who are not subject to Part 2 of the Regulations, the arrangements should be incorporated into their health and safety arrangements required by the Management of Health and Safety at Work Regulations 1999.

Stage 6: Providing information to safety critical workers

2.37 Controllers of safety critical work should provide all safety critical workers under their management, supervision or control with clear and relevant information on risks to health or safety due to fatigue, and on their arrangements for managing fatigue.

2.38 Workers have a duty under Section 7 of the Health and Safety at Work etc Act 1974 to take reasonable care of their own health and safety and that of others who may be affected by their activities at work. This duty implies that they should take steps to understand the risk factors in their work (such as causes of fatigue), comply with safety rules and procedures and ensure that they do not put anyone at risk as they carry out their duties.

2.39 Safety critical workers should be made aware of their role and the requirements on them in meeting the arrangements for managing fatigue. They should be aware of the impact of their activities on the safety of the transport system and the influence that their alertness and fatigue can have on that safety when performing safety critical tasks.

2.40 Safety critical workers should be made aware of the standards and limits that apply to the work they are to undertake and the nature of those exceptional circumstances in which the limits can be exceeded with prior approval.

2.41 Safety critical workers should be made aware of the procedures to be followed if they consider that there are circumstances, such as significant life

events or medical conditions, that may cause them to either be or become so fatigued that health and safety could be significantly affected.

Stage 7: Monitoring

2.42 Controllers of safety critical work should monitor the arrangements for managing fatigue to assess how effectively they are controlling the risks arising from fatigue.

2.43 The actual hours worked should be monitored. This should include any periods of overtime (whether planned or unplanned) and any periods of non-safety critical work that could have a bearing on the safety critical worker's fatigue and ability to undertake the safety critical work. The work patterns undertaken by safety critical workers should be monitored against the standards and limits that the controller of safety critical work has identified and set.

2.44 Where standards and limits have been exceeded, the reasons for the **exceedance** should be identified and suitable measures should be taken to reduce the risks arising from fatigue and to prevent the exceedance reoccurring.

2.45 Excessive overtime levels that could have a bearing on the safety critical worker's fatigue and ability to undertake safety critical work should be monitored and controlled.

2.46 The nature and duration of time spent travelling should be monitored and, so far as is reasonably practicable, controlled when it could have a bearing on the person's fatigue and ability to undertake safety critical work.

Stage 8: Taking action when safety critical workers are fatigued

2.47 Controllers of safety critical work should ensure, so far as is reasonably practicable, that safety critical workers who report for duty where they are clearly unfit due to fatigue, or who, through the course of their work shift become clearly unfit owing to fatigue, do not carry out or continue to carry out safety critical work.

2.48 The reason(s) why the safety critical worker is or has become fatigued should be established, so far as is reasonably practicable.

2.49 In the event of a safety critical worker being so unfit, appropriate control measures (such as providing sufficient rest) should be applied before the safety critical worker commences or recommences safety critical work.

Stage 9: Reviewing the arrangements

2.50 Controllers of safety critical work should review their arrangements for managing the risks arising from fatigue when they have reason to doubt the effectiveness of the arrangements.

2.51 A review should be undertaken where:

- there has been a significant change in circumstances, such as job design, workload, or organisational changes;
- there are plans to **change the existing working patterns** and **existing limits**;
- there is a change in relevant recognised good practice standards, and limits for managing fatigue in the railways and other guided transport systems;
- fatigue has been identified as a causal factor in an incident investigation which gives reason to doubt the effectiveness of the arrangements;
- monitoring has shown that standards and limits are being exceeded on a regular basis;
- long-term sickness, a significant number of unfilled job vacancies or industrial action results in frequent **exceedances**;
- there is a significant incidence of safety critical workers being stopped from carrying out safety critical work due to being unfit because of fatigue; or
- there is any other reason to doubt the effectiveness of the arrangements.

2.52 So far as is reasonably practicable, controllers of safety critical work should act upon recommendations from reviews related to fatigue.

3. Definitions

3.1 In this guidance:

Change to existing working patterns refers to the working pattern of people undertaking safety critical work, and includes:

- increases in daily or weekly hours of work, increases in the number of consecutive shifts worked before a complete day's rest is taken, reductions in the length or frequency of intervals before (and breaks during) **periods of duty**, or changes in the timing of breaks taken during **periods of duty**;
- changes in shift patterns, such as a change from **fixed shifts** to **rotating shifts**, a change in the frequency with which shifts rotate, increased variability in start and finish times, or the introduction of a **split-shift** system; or
- other changes in the organisation of working time that may affect performance, such as an increase in the amount of time spent carrying out safety critical work (as opposed to other activities) or in the amount of time spent carrying out safety critical work requiring continuous vigilance (as opposed to other types of safety critical work);

Exceedance means exceeding or other non-compliance with a standard or limit.

Existing limits means:

- for operations already in existence, the limits already established in that operation; and
- for new operations, limits that do not exceed the limits applying to people carrying out the same or similar work in comparable established operations;

Fixed shifts means that safety critical workers work the same shift on a permanent basis.

Rotating shifts means that safety critical workers work a pattern of changing shifts.

On call means waiting to respond to an emergency call out or answering a query from people working in the field.

Day or **early-morning shift** means a shift that usually starts around 05:00 to 08:00 and ends around 14:00 to 18:00.

Night shift means a shift that usually starts around 22:00 to 02:00 and ends around 05:00 to 08:00.

Split shift means one duty period that has two distinct work periods separated by a long break.

Period of duty means a period of duty, which consists wholly, or partly, of safety critical work as defined in regulation 23 of the Regulations, including overtime and meal or rest breaks. Where a **split-shift** system is in operation, the total length of time between the start of the first and the end of the last part of that **split shift** counts as one **period of duty** for the purpose of this guidance.

3.2 The definitions in this guidance and related expressions shall be construed accordingly. Other defined terms are detailed in the Regulations.

4. Further information

Human performance, shift work and fatigue

Reducing error and influencing behaviour, HSG48 (Second edition) HSE Books 1999 ISBN 0 7176 2452 8.

Monk TH and Folkard S, *Making shiftwork tolerable*, Taylor and Francis 1992 ISBN 0850668220.

Moore-Ede M, *The 24-hour society: The risks, costs and challenges of a world that never stops*, Piatkus Books 1993 ISBN 0749912553.

Risk assessment methods for shift work and fatigue

Validation and development of a method for assessing the risks arising from mental fatigue, CRR254 HSE Books 1999 ISBN 0 7176 1729 7 (also available on the HSE website at: http://www.hse.gov.uk/research/crr_pdf/1999/crr99254.pdf).

Management of health and safety

Successful health and safety management, HSG65 (Second edition) HSE Books 1997 ISBN 0 7176 1276 7.

Management of health and safety at work: Management of Health and Safety at Work Regulations 1999: Approved Code of Practice and guidance, L21 (Second edition) HSE Books 2000 ISBN 0 7176 2488 9.

Railway Safety Principles and Guidance Part 3 Section A: Developing and maintaining staff competence, HSG197 HSE Books 2002 ISBN 0 7176 1732 7

Working Time Regulations

Your guide to the Working Time Regulations, URN No: 06/1237A and 06/1237B; DTI 2006 (available from DTI's publications orderline Tel: 0870 150 2500 and on the DTI website at: http://www.dti.gov.uk/employment/employment-legislation/employment-guidance/page28978.html *and*

http://www.dti.gov.uk/employment/employment-legislation/employment-guidance/page28979.html

Railway Safety and Standards Board (RSSB)

Further information on safety critical work can be obtained from the RSSB website (http://www.rssb.co.uk/).

Fatigue index

Spencer MB, Robertson KA and Folkard S *The development of a fatigue/risk index for shiftworkers*. Research report 446 (2006). HSE Books (also available on HSE website at http://www.hse.gov.uk/research/rrhtm/rr446.htm).

Railway Industry Advisory Committee (RIAC)

Further information on fatigue and shift patterns can be obtained from http://www.rail-reg.gov.uk/server/show/nav.1174.

Relevant professional societies

Professional societies whose membership includes experts in human performance, fatigue, shift work and human reliability include:

- The British Psychological Society, St Andrews House, 48 Princess Road East, Leicester LE1 7DR.
- The Ergonomics Society, Elms Court, Elms Glove, Loughborough, LE11 1RG.
- Society of Occupational Medicine, 6 St Andrew's Place, Regent's Park, London NW1 4LB.