Guidance on fatigue control options for first night shifts

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Contents

Introduction 1
Who is this guide for? 2
What is fatigue? 2
Individual or organisational responsibility? 3
Important information about the measures 4
Organisational control measures 4
  Shift length 4
  Management of journeys to and from work 6
  Napping during a night shift 6
  Exposure to bright light 7
  Breaks 8
  Workload 9
Individual countermeasures 10
  Napping or sleeping before the first night shift 10
  Caffeine and caffeinated drinks 12
  The importance of reporting fatigue concerns 14
Further information 15
Introduction

The railways are a 24/7 operation and it is a reality for those who work within the industry to work shifts. Many research studies and guidance documents have been written that give advice on how staff and organisations can prepare for night shifts. RSSB’s ‘Feeling Tired’ leaflet highlights ways to prepare for a night shift, stay alert during shifts, identify signs of drowsiness, and how to recover after a night shift.

As the first night shift requires a distinct change in an individual’s sleep pattern, it requires special attention. Before a first night shift, people’s body clocks are adapted to being asleep at night. During their first night on duty, they are required to stay awake during the night, when they may already been awake a long time. Being awake for around 17 hours impairs people in a similar way to having a blood alcohol level above the drink drive limit). The change to a night shift can be difficult and as a result there is a risk that people may make mistakes or even fall asleep. As yet there is no specific guidance to give information to staff and organisations about managing the first night shift.

RSSB has been asked by the rail industry, to produce some guidance for individuals and companies on managing risk related to first night shift fatigue. The information in this document is based on a range of information sources including academic research papers and industry guidance, and has been reviewed by fatigue experts.
Who is this guide for?

This guide has been developed for all of those responsible for managing the risks from fatigue associated with first night shifts. This includes, but is not limited to:

- Front line staff
- Safety managers
- Those responsible for the design of work schedules and fatigue risk management system (FRMS) implementation
- Occupational health
- Training departments

What is fatigue?

The ORR defines fatigue as: ‘a state of perceived weariness that can result from prolonged working, heavy workload, insufficient rest or inadequate sleep’ (2012). It can include both physical and mental fatigue. This research has focussed on mental fatigue in safety critical roles.
Individual or organisational responsibility?

Both individuals and organisations have a role in managing fatigue risk. The organisational control measures and individual countermeasures presented in this document have been divided into those that individuals can control and those that the organisation would need to take the lead on. Many organisational control measures will need significant commitment from individual workers for effective implementation. These measures are shown in Table 1 and explained in the following pages.

Table 1: Organisational and individual measures

<table>
<thead>
<tr>
<th>Organisational control measures</th>
<th>Individual countermeasures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shift length</td>
<td>Napping before shift</td>
</tr>
<tr>
<td>Management of journeys to and from work</td>
<td>Caffeine</td>
</tr>
<tr>
<td>Napping during the shift</td>
<td></td>
</tr>
<tr>
<td>Exposure to light</td>
<td></td>
</tr>
<tr>
<td>Breaks</td>
<td></td>
</tr>
<tr>
<td>Workload</td>
<td></td>
</tr>
</tbody>
</table>
Important information about the measures

The organisational control measures and individual countermeasures presented in this document do not claim to restore human performance. Rather they tend to slow down the deterioration in performance. People working their first night shift will still be impaired even with these measures in place, just not as impaired as people working their first night shift without any of these measures in place.

The effectiveness of these techniques will vary from person to person, and also from task to task. So it is critical to implement these measures in the context of a Fatigue Risk Management System, which will include measuring how effective they are in the specific work context and with specific individuals.

Organisational control measures

Shift length

Although there seems to be very little research that has addressed shift length specifically for first night shifts, long first night shifts can be detrimental because:

1. The longer a person is awake the more tired they may feel. A person waking at their usual waking time before a first night shift may have been awake too long to safely complete a night shift
unless they somehow get more sleep. (Someone waking at 0700 would have been awake 17 hours by midnight unless they get extra sleep.) But people whose body clock is adapted to sleeping at night are likely to find sleeping during the day difficult.

2. The first night shift in a sequence of nights has been reported to be the most fatiguing and night shifts are identified as the times when mistakes are more likely.

3. Longer shifts can impact on sleep after the first night. Some people may feel better sleeping during the night or very early hours of the morning. For people who have been used to sleeping at night, this is when their body clock is most likely to allow them to sleep.

4. Research suggests an increase in the risk of accidents and incidents after 8 hours of work. The shift start time and time of day that the shift is being undertaken also has a strong influence on levels of fatigue, particularly on nights.

Current rail industry guidance advises that night shifts should be no longer than 10 hours (and 8 hours if starting work before 05:00 hours). However, there is a strong case for limiting the duration of the first night shift to 8 hours due to the difficulties workers can have adapting their sleep patterns due to the effects of the internal body clock which corresponds to the normal cycle of night and day.

If shortening the first night shift is not possible it may be possible to maintain safety by putting in place other measures to manage risk such as extra breaks (see below).
Management of journeys to and from work

Long journeys to and from work are known to be a risk factor for fatigue. Although the research has found no studies looking at such journeys in relation to first nights, organisations should be aware of the potentially significant issues they may pose for first night shifts.

Employees travelling long distances to work before their first night shift may start their shift already tired from the journey. They may have been unable to prepare for their first night by napping or sleeping during the day. Organisations should manage the fatigue risk posed by long journeys to and from work not only between consecutive shifts, but also before the first in a series of shifts. This could be done by specifying a maximum distance or travel time which employees can live away from their regular place of work in employment contracts.

Napping during a night shift

Although the best cure for sleepiness is sleep, short naps while on shift have been shown to improve alertness enabling individuals to perform certain types of task better. However, some research suggests that performance can remain impaired, even after a nap, for some types of activities like error monitoring.

Rail organisations should consult with staff to consider whether it may be reasonably practicable in their operations to put in place policies, procedures, training or briefings, suitable facilities and locations for napping. However, some people find it difficult or impossible to nap, and that even for those people able to nap,
napping is often not possible on demand. Organisations should not place reliance on staff being able to nap to control risk from fatigue. Instead, for operations where napping offers an additional, reasonably practicable control measure, they should take reasonable steps to encourage and support those individuals able to make use of napping.

**How long?**

Napping for 20 minutes to 1 hour during the night shift has been found to improve alertness and performance. However people can be groggy when they wake up from naps, particularly naps longer than 20 minutes, so it is important to leave a period of about 15 minutes to recover from the nap and before carrying out safety critical activities.

**When?**

Studies have shown that napping before individuals start to feel tired is more effective than napping after they feel tired. Thus it is better for individuals to nap earlier in the night shift rather than later on.

**Exposure to bright light**

The most important factor in manipulating the circadian system (internal body clock) is exposure to and/or avoidance of bright light at specific times of the ‘biological night’.

It can take at least 4-5 days to fully adapt to being awake at night. But exposure to bright light (1000 lux or more) and, in particular, blue light, has been found to improve alertness and help people adapt to night work. This is because it can shift our internal sleep-
wake cycle to induce a delay in the time we go to bed and wake up.

But, for this reason, its use as a fatigue risk control measure is likely to be most suited to those working their first night shift in row of four or more consecutive nights. Fewer consecutive shifts than this and exposure to bright light as a means to help adapt to night work may well cause an individual difficulties when they need to readapt to sleeping at night.

When?

The timing of bright light should be carefully controlled. The precise timing of light exposure will depend on the timing of the night shift. As a general rule, bright light exposure in the late evening or early on in the night and avoidance of bright light in the early morning (eg. for staff not driving road vehicles, wearing dark or blue-blocking goggles during the morning journey home from work) can delay the body clock and improve adaption to night work.

Prolonged exposure to light before going to bed can delay and disrupt sleep. An important consideration is light that is emitted by devices with backlit screens, such as touchscreen phones and tablet devices. Prolonged use of such devices before going to bed should be avoided.

Breaks

Research suggests that people’s performance on a task tends to become worse the longer they go without a break. Also, the impairment seems to be more severe at night than it is during the day. Adequate rest breaks within a shift are essential to prevent the build up of fatigue and this is particularly important for individuals
on their first night shift who are still adapting to being awake at night.

**When and how often?**

With monotonous tasks and tasks requiring a lot of mental effort, breaks should be more frequent than on tasks that are easier to concentrate on. Night time studies highlight that hourly breaks are better for alertness compared to breaks every two or three hours. So the frequency and timing of the breaks should depend on what tasks people are doing, but for particularly monotonous tasks taking place at night, it may be sensible to consider a short break every 40 minutes or so.

**Workload**

Very monotonous tasks can increase fatigue levels. Where possible, long periods of repetitive, monotonous work should be avoided at night when fatigue risk is high. This risk also tends to be higher during the latter part of the night when people’s body clocks are at their lowest ebb and when many people are likely to feel most tired. Research suggests that in some organisations incident risk may peak near the beginning of the night. This might be because people recognise the risk of carrying out monotonous tasks during the latter part of the night, and alter their approach.

Organisations may be able to measure when the risk of certain incidents is highest for them during the night, and then consider redesigning those high risk tasks to make them less monotonous, or move them to a time when fatigue-related risk is lower. If this is not practical they may wish to put other risk controls in place.
Individual countermeasures

Napping or sleeping before the first night shift

When compared with not napping, taking a nap before the first night shift can lead to increased alertness, better mood, reduced sleepiness and improvements on many measures of performance including reaction times, memory and vigilance. It is unclear whether cognitive functions such as error monitoring are improved by napping.

Napping strategies are affected by three key factors about a person’s sleep. These factors influence how sleepy an individual will feel during their first night shift.

1. **How long you have been awake.** The longer you have been awake the sleepier you will feel. It is beneficial to have a sleep or a nap before the first night shift. Ideally, wake up as close to the start of the shift as possible, but avoid doing any safety critical tasks (including driving to work) in the first 20 minutes or so after waking up. Being awake for around 17 hours impairs people in a similar way to having a blood alcohol level above the drink drive limit.

2. **Sleep duration.** Naps of as little as 20 minutes taken on the afternoon of the first night shift can improve performance during the shift. In general the longer the nap or sleep, the better.

3. **Body clock.** One of the main problems with the first night shift is that people’s body clocks tend to be adapted to sleeping during
the night and this can make it difficult to stay. It can also be hard to sleep or nap during the day before the first night shift and this varies between people.

If this is difficult, it may be easier to nap in the early afternoon, during the ‘post-lunch dip’. If this also doesn’t work for you, try to get as much sleep as you can before and after your shift and supplement this by napping or resting during the day.

**How long?**

Studies have shown even short naps of 20 minutes to be effective, but in general the longer the nap the better. With naps longer than 20 minutes or so people start to experience grogginess when they wake up. This is called sleep inertia. If people have to carry out safety critical activities within 20 minutes of waking, they should limit their naps to 20 minutes or less.

**When?**

A nap taken before becoming tired is more effective than napping to recover from sleep loss. So, it is beneficial to take a nap before becoming tired; for example, on the afternoon before a night shift.

The timing of the nap does not make a large difference, though the protective effects of napping do wear off with time so waking as near as possible to the start of the shift is beneficial (taking into account sleep inertia, as mentioned above). Some people might find it difficult to nap in the late afternoon or early evening, and easier to nap in the post-lunch dip.
Caffeine and caffeinated drinks

Caffeine has different effects on different people, and is known to be harmful to health in large doses. It should not be seen as a long-term solution for managing the effects of sleepiness, but it can be helpful in temporarily alleviating some effects of sleepiness, depending on what task the person is doing. For example, it can help people stay awake, improve their reaction time and help with some types of memory tasks, but its effects on other types of task such as risk-taking judgement is less-well understood.

Caffeine is found in a range of foods, drinks and medical products. It is important to pay attention to how much caffeine is in the different products we consume. For example, some energy drinks that are high in sugar but low in caffeine are less effective against sleepiness than drinks that are high in caffeine.

How much?

In terms of health, the Food Standards Agency recommends that we have no more than 200mg of caffeine a day. This is equivalent to about two mugs, or four small cups, of coffee.

Some studies have looked at the effects on performance of roughly two to four cups of coffee. They have found that over the course of a night without sleep, people’s performance gets worse and people feel increasingly tired whether they have caffeine or not. However, on average, people who have caffeine do better than those who do not have caffeine. So, if people feel really tired on a first night once in a while, it may be useful to have some coffee. But companies should not rely on individuals controlling sleepiness with caffeine.
When?

There are a number of considerations in relation to the timing of caffeine intake, such as:

1. How long does the person need the effects of caffeine to last?

The individual’s sensitivity to caffeine plays a large role. Some studies have found that about 200mg of caffeine resulted in performance benefits which lasted about 5-7 hours. This was shorter for some people and longer for others.

2. When does the person need to be able to go to sleep?

Caffeine can disrupt sleep. Depending on the timing of their night shift, some people will find it easier to go to sleep soon after their shift is over, whereas others will be able to stay awake and have their long sleep later in the day. If people don’t sleep well later in the day and need to sleep as soon as possible after their shift ends, having caffeine late in the shift is likely to disrupt their sleep and potentially cause difficulty during their next shift (or rest day). Studies suggest not having caffeine within the last six hours before going to bed, but this is an average and the precise timing depends on people’s sensitivity to caffeine.

3. Is there an opportunity to have a nap?

Having caffeine and then having a short nap of 15-20 minutes can increase alertness and improve performance more than having caffeine alone. So if people have an opportunity to nap, they may want to have their cup of coffee just before.
The importance of reporting fatigue concerns

Employees share a responsibility to tackle the demands of first night shift fatigue. This includes reporting any fatigue-related concerns they may have associated with the work schedule and any sleep or health issue that may affect their fitness for duty. They should also inform their manager as soon as possible if they believe that they or a colleague are, or are likely to become, too tired to carry out their duties safely.
Further information

For further information please read other publications such as:

- Feeling tired leaflet
- Coping with shift work and fatigue
- Managing Rail Staff Fatigue
- Fatigue and its contribution to railway incidents
- Driving for Work: Managing Fatigue Risks A guide for Road Vehicle Drivers and their managers