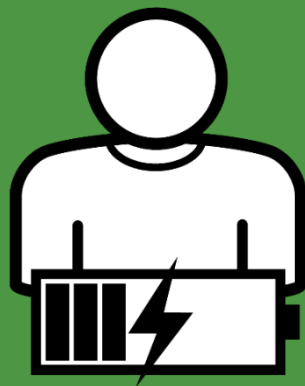


Fatigue Reduction: How to use the Fatigue and Risk Index Tool (FRI) in Excel



Introduction

This document explains how to use the FRI tool from a practical point of view. For information on what the FRI tool is and what the fatigue and risk indexes mean, please take the Fatigue Risk Management Technical Briefing on the [Network Rail eLearning platform](#).

Important information:

The FRI should not be used on its own to consider a roster or selection of rosters

The tool doesn't consider individual factors that may impact fatigue, including:

- The quality and length of sleep between shifts.
- Individual differences or personal circumstances.
- If rest breaks or sleep opportunities have been used effectively.
- How the individual will commute to work (e.g. did they sleep on the train, or did they drive in?)

These factors should be considered when reviewing the roster, to help determine the impact they might have on fatigue risk.

FRI index scores: The Network Rail Fatigue Risk Management Standard

The Fatigue Risk Management Standard (NR/L2/OHS/003) contains a list of trigger conditions. When someone exceeds a trigger condition, there are specific fatigue risk management actions that need to happen.

These are the trigger conditions that relate to FRI scores.

- Fatigue index should be no more than **35 for day shifts**
- Fatigue index should be no more than **45 for night shifts**
- Risk index scores should not be above **1.6**

The majority of working patterns within Network Rail produce fatigue scores of less than 30-35 for day shifts and 40-45 for night shifts.

These scores reflect what is known to be achievable by the majority of rail companies, rather than 'good practice' in managing fatigue.

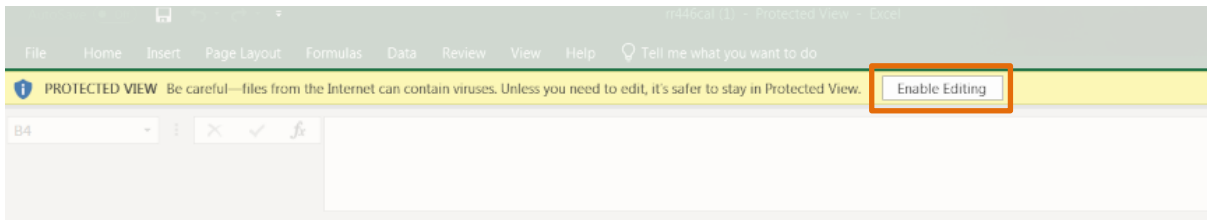
Always aim to reduce scores to as low a value as reasonably practicable, not just to a level where they comply to the standard.

You should use the FRI tool...

- When developing a new roster, making changes to a roster or comparing rosters.
- Following an incident, or during an investigation, to assess the actual hours worked leading up to an event.
- To assess an individual or group using actual worked data, such as submitted timesheets, to establish fatigue risk when changing a roster or authorising overtime.

Using the FRI tool in Excel

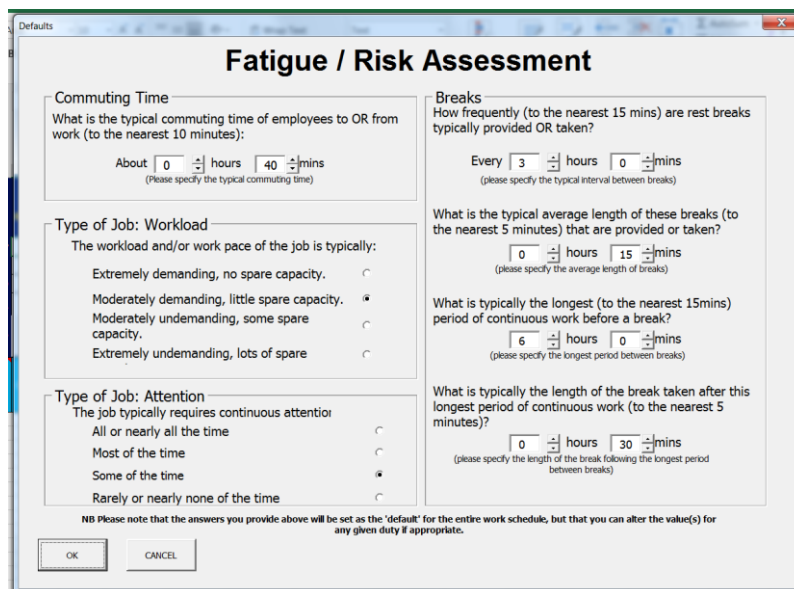
1. You can access the FRI tool, created by HSE, [on the Fatigue Reduction SharePoint site](#). You can save it so you can access it easily next time you need it.
2. The document will open in 'Protected view'. You need to click 'Enable Editing' in the yellow bar for the tool to work, the button will then change to say 'Enable content'. Click it again.



3. The 'defaults' page will then appear. This contains information about factors that can influence how fatigued someone feels. You can leave these defaults as they are or alter them depending on the people you are looking at and the work they are doing.

If you're looking at a roster that covers a whole team, you can either set the defaults as an average for all the people the roster will cover, or as the 'worst-case' scenario values. Just make sure you bear this in mind when you are interpreting the outcome data.

Once you're happy with the defaults, click on OK and it will take you to the main spreadsheet.



Fatigue / Risk Assessment

Commuting Time
What is the typical commuting time of employees to OR from work (to the nearest 10 minutes):
About hours mins
(Please specify the typical commuting time)

Type of Job: Workload
The workload and/or work pace of the job is typically:
 Extremely demanding, no spare capacity.
 Moderately demanding, little spare capacity.
 Moderately undemanding, some spare capacity.
 Extremely undemanding, lots of spare

Type of Job: Attention
The job typically requires continuous attention:
 All or nearly all the time
 Most of the time
 Some of the time
 Rarely or nearly none of the time

Breaks
How frequently (to the nearest 15 mins) are rest breaks typically provided OR taken?
Every hours mins
(please specify the typical interval between breaks)

What is the typical average length of these breaks (to the nearest 5 minutes) that are provided or taken?
 hours mins
(please specify the average length of breaks)

What is typically the longest (to the nearest 15mins) period of continuous work before a break?
 hours mins
(please specify the longest period between breaks)

What is typically the length of the break taken after this longest period of continuous work (to the nearest 5 minutes)?
 hours mins
(please specify the length of the break following the longest period between breaks)

NB Please note that the answers you provide above will be set as the 'default' for the entire work schedule, but that you can alter the value(s) for any given duty if appropriate.

OK CANCEL

Note: If one person has much longer commute than their colleagues who are on the same roster, their role is more demanding or they have a medical condition that could cause them to become fatigued more quickly, an individual assessment for them would be a good idea.

- When entering your roster data, the columns you will be using are the first three on the left ('Day', 'On Duty' and 'Off Duty'). The rest of the columns will calculate automatically.

You should enter data for 2 weeks prior to the start of the roster being tested and right up to the first day back after a rest period.

You only need to enter data for days worked, but rest days still need to be accounted for. You do this by skipping rest days in the running total in the 'Day' column. For example, if you're testing someone who has worked 4-day shifts, had 3 days off, then worked 4-night shifts, the data you enter will look like this:

Date	30.09.19		<input type="checkbox"/> Display charts © Crown Copyright Version 2.3						
Mode	Fatigue	Defaults	Reset Index	Calculate Index					
Day	On Duty	Off Duty	Job type / breaks	Commuting Time	Duty Length	Rest Length	Average duty per day	Cumulative component	Duty timing component
1	06:00	14:00	Default	Default					
2	06:00	14:00	Default	Default					
3	06:00	14:00	Default	Default					
4	06:00	14:00	Default	Default					
8	22:00	06:00	Default	Default					
9	22:00	06:00	Default	Default					
10	22:00	06:00	Default	Default					
11	22:00	06:00	Default	Default					

Note how the day number skips from 4 to 8, as days 5,6 and 7 were rest days.

- Once you're happy with the data you've entered, click the 'Calculate Index' button. All other boxes will be populated.

Fatigue Index Calculator											
Read the manual before using! Go to http://www.hse.gov.uk/RESEARCH/rrpdf/rr446g.pdf						Assessor					
Company						<input type="checkbox"/> Display schedule					
Location											
Shift ID											
Date											
Mode	Fatigue	Defaults	Reset Index	Calculate Index							
Day	On Duty	Off Duty	Job type / breaks	Commuting Time	Duty Length	Rest Length	Average duty per day	Cumulative component	Duty timing component	Job type / Breaks component	Fatigue Index
1	06:00	14:00	Default	Default							
2	06:00	14:00	Default	Default							
3	06:00	14:00	Default	Default							
4	06:00	14:00	Default	Default							
8	22:00	02:00	Default	Default							
9	22:00	02:00	Default	Default							
10	22:00	02:00	Default	Default							
11	22:00	02:00	Default	Default							

Click here to calculate the fatigue index



6. You can switch between viewing the risk index and fatigue index by clicking the button next to 'Mode'.

When this button says "Fatigue", the table is showing the fatigue index. Click it to switch to the risk index view.

Day	On Duty	Off Duty	Job type / breaks	Commuting Time	Duty Length	Rest Length	Average duty per day	Cumulative component	Duty timing component	Job type / Breaks component	Fatigue Index
1	06:00	14:00	Default	Default	8h	Fully Rested	8h	0.1	1.0	1.6	2.6
2	06:00	14:00	Default	Default	8h	16h	8h	2.4	1.0	1.6	4.9
3	06:00	14:00	Default	Default	8h	16h	8h	6.2	1.0	1.6	8.6
4	06:00	14:00	Default	Default	8h	16h	8h	10.0	1.0	1.6	12.3
8	22:00	02:00	Default	Default	4h	4d 8h	4h	0.1	3.6	3.5	7.2
9	22:00	02:00	Default	Default	4h	20h	4h	1.2	3.6	3.5	8.1
10	22:00	02:00	Default	Default	4h	20h	4h	3.3	3.6	3.5	10.1
11	22:00	02:00	Default	Default	4h	20h	4h	5.8	3.6	3.5	12.4

When this button says "Risk", the table is showing the risk index. Click it to switch back to the fatigue index.

Day	On Duty	Off Duty	Job type / breaks	Commuting Time	Duty Length	Rest Length	Average duty per day	Cumulative component	Duty timing component	Job type / Breaks component	Risk Index
1	06:00	14:00	Default	Default	8h	Fully Rested	8h	0.89	0.72	1.05	0.67
2	06:00	14:00	Default	Default	8h	16h	8h	0.94	0.72	1.05	0.71
3	06:00	14:00	Default	Default	8h	16h	8h	0.99	0.72	1.05	0.75
4	06:00	14:00	Default	Default	8h	16h	8h	1.04	0.72	1.05	0.79
8	22:00	02:00	Default	Default	4h	4d 8h	4h	0.89	0.86	1.05	0.80
9	22:00	02:00	Default	Default	4h	20h	4h	1.00	0.86	1.05	0.90
10	22:00	02:00	Default	Default	4h	20h	4h	1.12	0.86	1.05	1.00
11	22:00	02:00	Default	Default	4h	20h	4h	1.23	0.86	1.05	1.10

You can change the defaults for individual shifts by right clicking the blue 'Default' cell to the right of the shift that needs adjusting. Once you've done this, make sure you click the 'Calculate Index' button to update the risk and fatigue index values; if you don't click this, the values will not update.

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Day	On Duty	Off Duty	Job type / breaks	Commuting Time	Duty Length	Rest Length	Average duty per day	Cumulative component	Duty timing component	Job type / Breaks component	Fatigue Index
1	06:00	14:00	Default	Default	8h	Fully Rested	8h	0.1	1.0	1.6	2.6
2	06:00	14:00	Default	Default	8h	16h	8h	2.4	1.0	1.6	4.9
3	06:00	14:00	Default	Default	8h	16h	8h	6.2	1.0	1.6	8.6
4	06:00	14:00	Default	Default	8h	16h	8h	10.0	1.0	1.6	12.3
8	22:00	06:00	Default	Default	8h	4d 8h	4h 27m	0.1	10.6	16.2	26.9
9	22:00	06:00	Default	Default	8h	16h	4h 48m	3.1	10.6	16.2	29.1
10	22:00	06:00	Default	Default	8h	16h	5h 5m	8.4	10.6	16.2	33.0
11	22:00	06:00	Default	Default	8h	16h	5h 20m	13.1	10.6	16.2	36.4

Interpretation

The Excel FRI tool is designed to highlight rostering practices that are likely to lead to increased fatigue risk. These will show up in bold if they occur anywhere in the roster.

Risk Index Calculator

Read the manual before using! Go to <http://www.hse.gov.uk/RESEARCH/rpdf/rr446g.pdf>

Company							Assessor						
Location							<input type="checkbox"/> Display schedule						
Shift ID							<input type="checkbox"/> Display charts						
Date							© Crown Copyright 2005						
Mode	Risk	Defaults	Reset Index	Calculate Index	Version 2.3						About		
Day	On Duty	Off Duty	Job type / breaks	Commuting Time	Duty Length	Rest Length	Average duty per day	Cumulative component	Duty timing component	Job type / Breaks component	Risk Index		
1	06:00	14:00	Default	Default	8h	Fully Rested	8h	0.89	0.72	1.05	0.67		
2	06:00	22:00	Default	Default	16h	16h	12h	0.94	1.32	1.05	1.30		
3	06:00	14:00	Default	Default	8h	8h	10h 40m	1.05	0.72	1.05	0.79		
4	06:00	14:00	Default	Default	8h	16h	10h	1.10	0.72	1.05	0.83		

The main things to look out for are:

- What are the fatigue and Risk values? Remember, you should always aim to reduce scores to as low a value as reasonably practicable, not just to a level where they comply to the standard.
- The number of consecutive shifts, especially if:
 - They involve more than seven 8-hour shifts or four 12-hour shifts in a row
 - They are longer in length (10 or 12-hour shifts)
 - Involve a lot of nights
 - Have less opportunity for breaks within them
- The impact of factors like travel time and workload
- How often are high fatigue and risk index values occurring, and is there variation over the roster? Consider the distribution of rest days amongst of high fatigue duties.
- The number of rest days and how they are distributed across the roster; particularly following blocks of night shifts. Good practice is two full nights' sleep after a block of nights.
- Are any of the other Fatigue Risk Management standard triggers being exceeded?
- Reduce the incidence of single days off, especially where surrounding shifts are associated with higher fatigue scores, or where rest days begin on the same day as a duty finishes (e.g. finishing a night duty at 0800).
- If you're making a change to a roster, do you know the actual hours the team or individual has worked previously? These might differ significantly to what was originally planned.
- How are shift rotations handled? Best practice is to rotate forward, not backward.