

# Workload Assessment: (location)

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5	Theresa Clarke	Head of Ergonomics	Network Rail	Final	Feb 06
6	Emma Lowe	Senior Ergonomist	Network Rail	Final	Feb 06
7	Joe Smith	Project Manager	Network Rail	Final	Feb 06

## DOCUMENT CHANGE HISTORY

Issue	Date	Changes	Reason for Changes
Draft 01	Dec 05	Details added and amended regarding scope of control of signal box and proposed changes	Following review by Joe Smith
Draft 02	Jan06	New recommendation added regarding development of strategies for managing concentration	Following review by Emma Lowe

## **EXECUTIVE SUMMARY**

The Executive Summary is optional and is only required for more in depth assessments. It should briefly describe:

- The background to the work
- The objectives of the workload assessment
- An overview of the approach taken
- Key findings
- Recommendations

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## 1. INTRODUCTION

### 1.1 Background

This section should include details about:

- Who/what initiated the need for a workload assessment
- The aims and objectives for workload assessment

### 1.2 Operating Context

This section should provide the following information:

- Overview of signal box: its area of control and the type and method of signalling
- Staffing arrangements
- Service pattern
- State of the network at time of the workload assessment and whether it was a typical shift
- Photos of the signal box and/or layout of the panels/workstations may be appropriate

## 2. APPROACH

This section should provide:

- A definition of workload
- The workload tools chosen for the assessment and the rationale for their use.
- Details about how the workload assessment was undertaken:
  - Dates of site visits
  - Details of who was interviewed (if appropriate)

### ***Workload Definition***

As workload is generally a nebulous and emotive subject, it is recommended that providing a clarification of what the term means will improve reader's understanding of the concept of workload and place the report in the correct context.

It is suggested that the following paragraphs and diagram should be used.

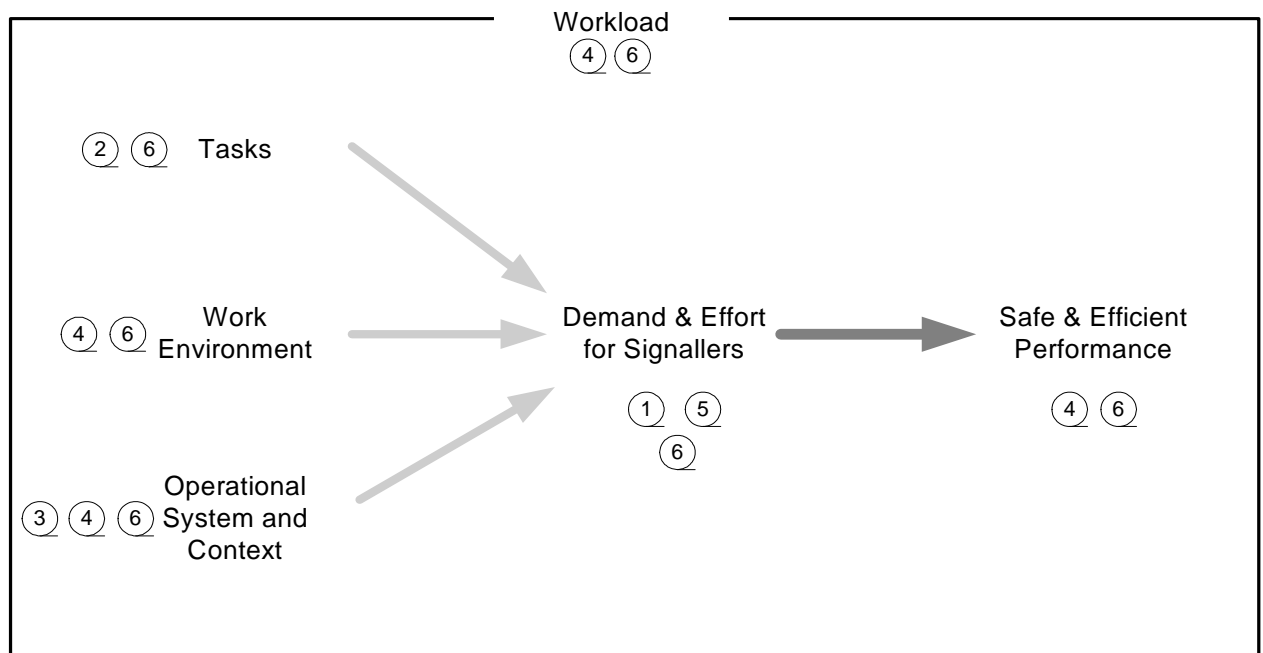
Workload can be described as the "interaction between the requirements of the task, the circumstances under which it is performance and the skills, perceptions and behaviours of the operators". Specifically in relation to signaller's it can be considered as:

- The number and combinations of tasks that a signaller has to complete
- How and where they have to complete them
- The urgency and accuracy with which activities have to be performed in order to ensure safety and organisational performance targets are met.

In addition, a signaller's own skill and experience of their work, in the context of the particular system they operate, will influence their opinion of their own workload.

The fact that workload is a combination of different factors means it is a multi-dimensional concept which therefore needs a range of different tools in order to ensure it is measured appropriately.

The diagram below highlights these key factors and how the different workload assessment tools measure the different workload dimensions.



Key

- |                                   |  |  |
|-----------------------------------|--|--|
| ① Integrated Workload Scale (IWS) | ③ Operational Demand Evaluation Checklist (ODEC) | ⑤ Adapted Subjective Workload Tool (ASWAT) |
| ② Activity Analysis Tool (AAT)    | ④ Workload Principles                            | ⑥ Workload Probe                           |

**Description of the workload tools applied**

This section should provide an explanation about the choice of tools used to undertake the assessment.

The table below can be used to indicate which tools were used and when the measurements were taken.

**Example**

<b>Tool</b>	<b>Aim</b>	<b>Measurements</b>
The Workload Principles	The Workload Principles Tool provides an assessment of the work system in relation to the degree to which it meets a number of ergonomics principles in order to contribute to a total understanding of signaller workload. Inadequacies of the ergonomics factors embedded in these principles will be likely to increase workload experienced by the signaller	Principle completed retrospectively based on data obtained from observations made during initial visit to signal box, interviews with signallers and the local line manager.
Integrated Workload Scale (IWS)	The IWS collects perceptions of signaller workload based on a nine-point scale. It is used to identify peaks and troughs in the effort and demand experienced by signallers when responding to dynamically changing work conditions.	IWS data collected during the following time: 07:00 – 08:00 11:00 – 12:00 This reflected peak and non peak times in the shift.
Operational Demand Evaluation Checklist (ODEC)	ODEC provides a systematic process to evaluate the entities within a signalling system, in order to represent the influence the overall system has on the signallers' workload.	Completed in conjunction with the Signalling Manager
Adapted Subjective Workload Analysis Tool (ASWAT)	ASWAT is a self report workload tool that assesses workload on three dimensions - time load, mental effort and pressure.	Not used as sufficient data about the workload issues was obtained from the AAT and the IWS ratings.
Activity Analysis (AAT) Tool	The Activity Analysis Tool (AAT) tool involves observing and recording signallers activities at certain times.	Activity analysis was performed in conjunction with the IWS ratings for:07:00 – 08:00 and 11:00 – 12:00.

**3. RESULTS****3.1 Workload Principles**

As this tool will have been used either at the start of a workload assessment, to help define the nature of the workload problem or at the end to help structure the final judgement about the findings obtained from observations and use of the other tools it is useful to start the Results section with the outputs from this part of the assessment.

The findings from the Workload Principles tools should be presented as a table detailing those principles that were not met and why. Sufficient evidence and justification for why the principle needs to be addressed must be provided.

It may also be useful or relevant to provide a summary or details of those principles that were met to demonstrate what factors did not appear to be having an impact on workload.

**Example**

Workload Principles	Assessors Comments
1. Signallers are able to maintain sufficient concentration to their tasks without undue distractions.	The timetable changes have created a situation whereby the signallers now have an extended period of monitoring which appears to be reduces their levels of alertness and making them prone to distraction so that they are unable to switch efficiently to the busy period of the timetable.
2. They are physically able to see and reach all the equipment that assists in monitoring, regulating and dealing with potential or actual conflicts	There is only one monitor screen for TRUST are therefore several staff sharing it which can inhibit consultation of train status information, particularly when under time pressure.
4. All situations avoid the signaller experiencing a conflict in demands that impact on their ability to maintain safety and performance	The timetable timings do not accommodate for the dispatch method and the subsequent delays, although small, cause platform clashes at the station. These clashes in turn create additional activities: increased routing to re-platform and additional communications so all those affected are aware of the re-platforming.
5.They have good communication channels to facilitate effective exchange of information.	Lack of reliable CSR equipment inhibits immediate communication with driver. The time then required to contact drivers impacts on time available for the signaller to act on information.  Radio used to communicate with station staff is of poor quality and messages are not always transmitted clearly
9. Equipment that impacts on the signaller's role is reliable and performs to assist signaller's tasks.	Buttons have broken off the new NX panel which increases difficulty in its use

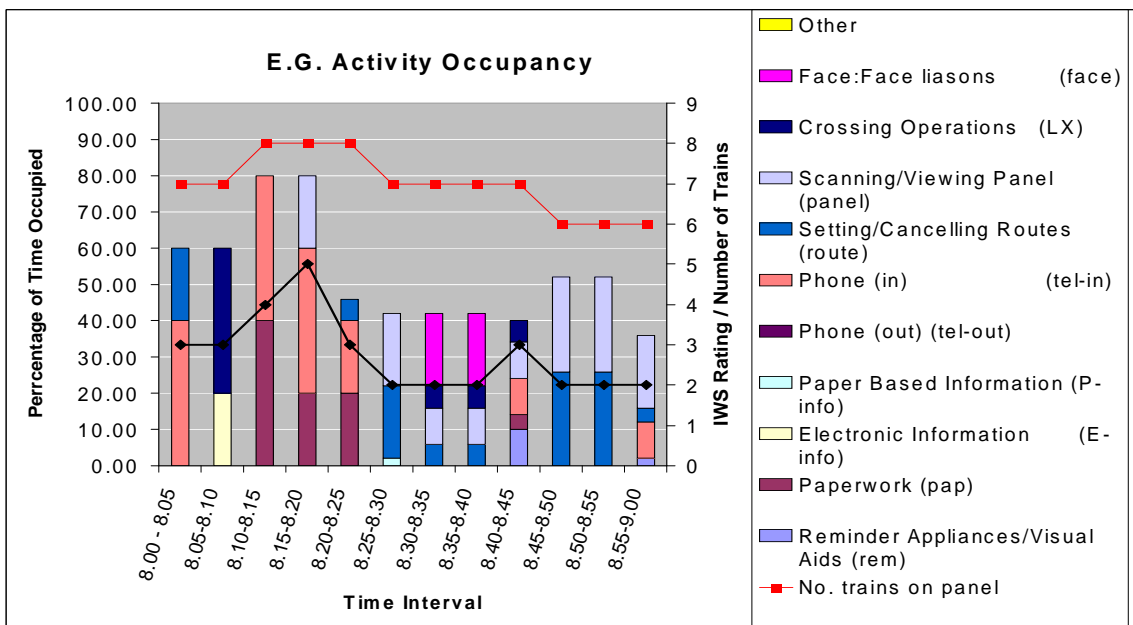
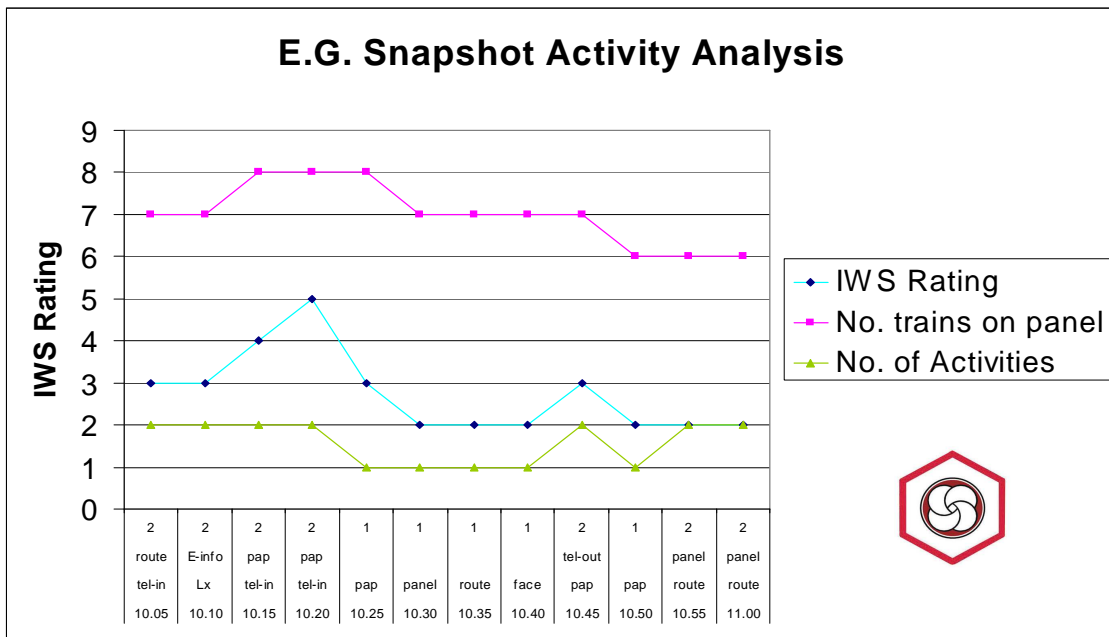
Principles 1-5 and 9 are primary principles and are essential for safety and performance. If they are not met then remedial action is required and recommendations should be made accordingly in the next section.

**3.2 Activity Analysis**

The graphs from the Activity Analysis tool should be presented in this section and should provide an illustration of how task duration, combination and number of trains may contribute to a signaller's perception of workload captured by the IWS rating.

Subject Matter Expert commentary or assessor observations should be used to provide some commentary about the activity analysis. In particular it should focus on the duration and combination of tasks that are associated with high IWS ratings or where, in the opinion of the subject matter expert, conflicts are being experienced and performance is being affected.

Graph 1: Snapshot Activity Analysis



Graph 2: Occupancy Activity Analysis

### 3.3 Integrated Workload Scale

As well as capturing IWS scores in conjunction with the Activity Analysis it may be necessary or useful to report them as a stand alone set of data. The information can be presented as per the table below. The mode rating (i.e., the most common IWS rating) should be reported as well as the highest and lowest ratings to give an indication of the range of ratings. Commentary about the ratings should be provided.

Scale	Rating	Description	Frequency	%
1	Not demanding	Work is not demanding at all	0	0
2	Minimal effort	Minimal effort required to keep on top of situation	2	7
3	Some Spare Time	Active with some spare time to complete less essential jobs	5	19
4	Moderate Effort	Work demanding but manageable with moderate effort	11	41
5	Moderate Pressure	Moderate pressure, work is manageable	6	22
6	Very Busy	Very busy but still able to do job	3	11
7	Extreme Effort	Extreme effort and concentration necessary to ensure that everything gets done	0	0
8	Struggling to keep up	Very high level of effort and demand, struggling to keep up with everything	0	0
9	Work too demanding	Work too demanding – complex or multiple problems to deal with and even with very high levels of effort it is unmanageable	0	0
-	Missed values	Usually interpreted as too high to respond	None	0

Table X: IWS Scores

### 3.4 Operational Demand Evaluation Checklist (ODEC)

A summary of the ODEC results should be reported providing an indication about the number of demand items in the checklist that scored “high”.

Further information should also be provided to explain these ratings in relation to workload and the implications of the high ratings to the questions being addressed by the workload assessment

A copy of the completed ODEC worksheet should be included as an Appendix.

**Example:**

The results of the ODEC tool (See Appendix X) indicate that (location) is a high operational demand signalling environment. 53.5% of the demand items in the checklist score 'High'. Items that contribute to this high score are:

- Regulating locations
- Point ends
- Differential line speeds
- Communications with depots, yards and sidings
- Level of traffic
- Incidents and occurrences

	High	Medium	Low
Score	23	12	8
Percentage	53.5%	27.9%	18.6%

**Table X: Summary of ODEC Scores**

Overall what this seems to suggest is that there is a significant regulating demand (as indicated by the number of regulating locations, the high number of trains, and the mix of traffic and speeds) which the signaller is having to manage in addition to a high level of communications with the depot at particular times of the day when trains are coming in and out for maintenance and service. The communications activities pull the signaller’s attention away from the regulating activity on the panel effectively creating a task conflict. This was supported by findings from the Probe and AAT.

**3.5 Adapted Subjective Workload Assessment Technique (ASWAT)**

It is useful to describe how this tool is scored in order to provide some background to the results. Depending on whether data has been collected from one signaller, a number of signallers, or from different points of time it may be useful to calculate the mode or frequency with which each scale descriptor was selected.

The table below can be used to capture the ASWAT data. Commentary will be required to explain the scores and put them in context.

**Example**

Workload Dimension	Signaller 1/ Time 1	Signaller 2/ Time 2	Signaller 3/ Time 3	Signaller 4/ Time 4
Time	2	3	2	1
Mental Effort	1	3	2	1
Pressure	1	3	1	2

**Table X: ASWAT Scores**

### **3.7 Additional observations**

If additional observations have been made during the workload assessment, these should be recorded in this section.

## **4. CONCLUSIONS**

The conclusions should describe the key findings from the workload assessment and address the questions set out in the introduction section of the report.

## **5. RECOMMENDATIONS**

Recommendations should be made to address any workload issues identified and/or to mitigate the consequences of a workload issues for signaller performance and well being.

As far as reasonably practicable within the scope of a workload assessment each recommendation should:

- Include one action
- Detail the desired deliverable/outcome
- Provide an indication of timescale for completion
- Identify the party or parties nominated to address the recommendation

Recommendations should also be cross referenced with the relevant paragraphs in the report which provide the justification for the recommendation.

## **6. APPENDICES**

Appendices should include details of the tools and/or the raw data applicable to the workload assessment.

The Appendices should also include details of assessors involved in the Assessment including details of relevant experience and qualifications.

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