Guide

Guide to Human Factors Integration

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Standard governance

Owner: Manager Human Factors, Asset Standards Authority
Authoriser: Director Safety, Quality, Environment and Risk, Asset Standards Authority
Approver: Executive Director, Asset Standards Authority on behalf of the ASA Configuration Control Board

Document history

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<tr>
<td>1.0</td>
<td>First issued 10 March 2014.</td>
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<tr>
<td>2.0</td>
<td>Issued 22 August 2014. Contents significantly expanded.</td>
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Preface

The Asset Standards Authority (ASA) is a key strategic branch of Transport for NSW (TfNSW). As the network design and standards authority for NSW Transport Assets, as specified in the ASA Charter, the ASA identifies, selects, develops, publishes, maintains and controls a suite of requirements documents on behalf of TfNSW, the asset owner.

The ASA deploys TfNSW requirements for asset and safety assurance by creating and managing TfNSW's governance models, documents and processes. To achieve this, the ASA focuses on four primary tasks:

- publishing and managing TfNSW's process and requirements documents including TfNSW plans, standards, manuals and guides
- deploying TfNSW's Authorised Engineering Organisation (AEO) framework
- continuously improving TfNSW’s Asset Management Framework
- collaborating with the Transport cluster and industry through open engagement

The AEO framework authorises engineering organisations to supply and provide asset related products and services to TfNSW. It works to assure the safety, quality and fitness for purpose of those products and services over the asset's whole-of-life. AEOs are expected to demonstrate how they have applied the requirements of ASA documents, including TfNSW plans, standards and guides, when delivering assets and related services for TfNSW.

Compliance with ASA requirements by itself is not sufficient to ensure satisfactory outcomes for NSW Transport Assets. The ASA expects that professional judgement be used by competent personnel when using ASA requirements to produce those outcomes.

About this document

This guide provides enhanced support, in relation to human factors integration (HFI), to organisations including Authorised Engineering Organisations (AEOs), prospective AEOs and other organisations undertaking works for TfNSW, in their application of T MU HF 00001 ST Human Factors Integration - General Requirements.

This document provides guidance on the following:

- the discipline of human factors (HF)
- human factors integration process requirements
- common human factors topics

Meeting these needs will optimise overall system performance through the systematic consideration of human capabilities and limitations within the design process.

ASA has adopted RISSB guideline Integration of Human Factors in engineering design.
While RISSB guideline *Integration of Human Factors in engineering design* is specific for the Australian rail industry, TfNSW has adopted this HFI guide as being relevant to all modes of transport and the guide is to be read and implemented as such. This ensures that human factors are incorporated into the engineering design processes for all modes of transport and across the entire life cycle of the asset.

All references to 'rail' in RISSB guideline *Integration of Human Factors in engineering design* are to be read as being applicable to all modes of transport.

This guide is the fourth issue, adopting the 2018 RISSB guideline *Integration of Human Factors in engineering design*. 

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1. Introduction

This document provides guidance to organisations, including Authorised Engineering Organisations (AEOs), on implementing the requirements for managing human factors (HF) relevant to the provision of engineering services to Transport for NSW (TfNSW).

The aim of the human factors integration (HFI) process is to ensure the human-system interactions contribute to optimise system performance, and identify and mitigate risk. This approach is in line with the principles of systems engineering, of which HF is a recognised discipline.

Adequate integration of HF supports the multi-disciplinary systems engineering approach to all phases of an asset's life cycle. Incorporating HF principles from early concept phase will help better establish the context for use and HF issues, addressing them during the acquire phase, to ensure the delivered asset is fit for purpose. HF considers the humans in the system and provides a method to systematically ensure that the interaction between the humans and the system are safe, efficient and effective while delivering the desired system performance.

The benefits of considering HF in the engineering design process are not limited to safety. HF also provides valuable benefits in developing a system that is both efficient and effective with regards operations and maintenance. Considering HF is essential if a system is to meet its intended performance levels, and to be able to deliver the expected benefits to customers.

Supporting evidence of HF methods implemented and demonstrating HF integration in safety risk management activities will provide an important contribution to the overall safety assurance argument in most cases.

To achieve these benefits, it is important to consider HF early in the asset life cycle starting with feasibility, optioneering, conceptualising, and continuing with HF considerations through the full design process.

2. Purpose

This document provides guidance to organisations on how to integrate HF activities into the engineering design activities and services that they provide to TfNSW. This guide is a companion document to the standard T MU HF 00001 ST Human Factors Integration - General Requirements.

The objective of this document is to ensure that HF considerations form an integral part of the specification, design, and development process, rather than being seen as an add-on, a review or as an afterthought following completion of the design and development activity.

The intent of this guidance is to promote the value of HF to an equal level with other disciplines that should be considered within design. The Asset Standards Authority's intent is to ensure that engineering design decisions are properly informed by adequate information about human-
related issues, and that decisions relating to design alternatives or assessments consider HF data to provide the optimal design solution for the whole asset life cycle.

2.1. Scope

This document provides guidance on HFI primarily for the following stages of the asset life cycle:

- feasibility
- concept
- design

However, most of the concepts and principles described are equally applicable to the following stages of the life cycle:

- fabrication, manufacturing, and construction
- installation
- integration, test, and commission
- asset operations and maintenance
- decommission and disposal

Although this document does not specifically cover these activities, there are benefits that an organisation conducting them can realise by applying a HFI process to their day-to-day business.

The Asset Standards Authority (ASA) HF interest is assurance of the useability and ease of operations and maintenance of a delivered asset including the validation and verification of the HF requirements. These activities are relevant whether providing new or altered assets, including commercial off the shelf (COTS) and 'like-for-like', all of which require HF consideration. Therefore, the following are details regarding scope:

- Within the scope of this document is provision of guidance on the use of HF principles and knowledge to ensure that the asset is designed and delivered such that it can be operated and maintained safely, effectively, and efficiently.
- Beyond the scope of this document is the application of HF principles and knowledge to the organisation of the day-to-day operation or maintenance of assets following its handover to the operating and maintenance entities.
- The inclusion of HF data is also beyond the scope of this document. There are many reputable sources of data and an organisation should identify sources of data that are applicable to the specific project and issue that is being addressed.
2.2. **Application**

The ASA intends this guide to be used by organisations, including potential and existing AEOs, undertaking work for TfNSW, and by suppliers for engineering projects relating to all modes of transport. It applies to managing HF issues that may affect system performance, and therefore ultimately may influence the operations and maintenance of the delivered asset.

This guide is intended for use by managers, designers, and engineers engaged to provide new or altered assets to TfNSW. However, HF consideration should also be included in like-for-like replacement projects, to avoid repeating past mistakes or reintroducing the same problems.

Other ASA documents that may be useful to read in conjunction with this guide include but are not limited to the following:

- **T MU HF 00001 ST Human Factors Integration - General Requirements**
  This describes the requirements for HFI for TfNSW projects.

- **T MU MD 20001 ST System Safety Standard for New or Altered Assets**

- **T MU AM 06006 ST System Engineering Standard**

- **T MU AM 06006 GU Guide to Systems Engineering**

While RISSB guideline *Integration of Human Factors in engineering design* is specific for the Australian rail industry, this TfNSW HFI guide is relevant to all modes of transport and is to be read as such. All references to 'rail' in the RISSB guideline *Integration of Human Factors in engineering design* are to be read as being applicable to all modes of transport.

3. **Reference documents**

Reference documents are as per Section 1.5 of RISSB guideline *Integration of Human Factors in engineering design*.

*Note: Other standards such as ISO standards or Australian standards may be applicable.*

4. **Terms and definitions**

All terms and definitions contained in Section 1.4 of the RISSB guideline *Integration of Human Factors in engineering design* are relevant in the application of this guide.

The following additional terms and definitions apply in this document:

- **AEO** Authorised Engineering Organisation
- **CCB** configuration control board
ISA independent safety assessor; an independent ISA AEO with the competency to provide rigorous oversight of safety processes, and assert an opinion of the safety of the new or altered asset

TfNSW Transport for New South Wales

TNAC Transport Network Assurance Committee

5. Application of RISSB guideline

The following sections of the RISSB guideline *Human Factors Integration in engineering design* apply:

- Section 2
- Section 3
- Section 4
- Appendix A
- Appendix B
- Appendix C
- Appendix D
- Appendix E
- Appendix F

All references to 'rail' in the RISSB guideline are to be read as being applicable to all modes of transport.
## Appendix A  Guide to HF CCB/TNAC inputs

Table 1 provides guidance of HF input into configuration control board (CCB) and Transport Network Assurance Committee (TNAC) gates.

### Table 1 – Guide to HF inputs to CCB/TNAC

<table>
<thead>
<tr>
<th>Gate definition</th>
<th>TfNSW TNAC Gate 0</th>
<th>TfNSW TNAC Gate 1</th>
<th>**Other CCB Gate 2</th>
<th>**Other CCB Gate 3</th>
<th>**Other CCB Gate 4</th>
<th>TfNSW/**other TNAC Gate 5</th>
<th>TfNSW TNAC Gate 6</th>
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<tr>
<td><strong>Potential HF input</strong></td>
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<tr>
<td>Stakeholders identified / consulted</td>
<td>Defines purpose of change and initial business requirements</td>
<td>Ready to progress to preliminary design</td>
<td>Ready to progress from preliminary design to final design</td>
<td>Detailed design complete. Ready to progress to testing</td>
<td>Ready to progress to testing</td>
<td>Prior to commissioning and handover of asset</td>
<td>Asset review. Annual review to demonstrate assets are being appropriate managed</td>
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<td>Operational Integration</td>
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<td>Operator / maintainer HF activities as required</td>
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Notes:

* Required for more significant configuration changes.

** For example, TfNSW Infrastructure & Services CCB or Sydney Trains CCB.