TS 04976:1.0
T MU HF 00001 GU
Guide

Guide to Human Factors Integration

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Document information

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Discipline: Human factors

Document history

Revision	Effective date	Summary of changes
1.0		First issued 10 March 2014.
2.0		Issued 22 August 2014. Contents significantly expanded.
3.0		Third issue. Template updated.
4.0		Fourth issue – adoption of RISSB guideline *Integration of Human Factors in engineering design*
1.0	18/08/2025	Renumbered as TS 04976:1.0. Version number recommenced in line with new designation. Re-templated and minor revision.

Preface

This guide is the first issue as TS 04976. It supersedes T MU HF 00001 GU *Guide to Human Factors Integration – Version 4.0*.

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 TS 04978.

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 aim of the 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.

The intent of this document is to promote the value of HF to an equal level with other disciplines that should be considered within design. This 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.

This document provides guidance to organisations, including TAOs, on implementing the requirements for managing HF relevant to the provision of engineering services to TfNSW.

This document provides enhanced support, in relation to HFI, to organisations including TAOs, prospective TAOs and other organisations undertaking works for TfNSW, in their application of TS 04978.

This document provides guidance on the following:

- the discipline of HF
- HFI process requirements
- common topics.

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

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.

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.

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.

TfNSW 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 should 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.

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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 an HFI process to their day-to-day business.

TfNSW's 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 scope of this document includes 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.

The application of HF principles and knowledge to the organisation of the day-to-day operation or maintenance of assets following the handover of assets to the operating and maintenance entities is outside of the scope of this document.

There are many reputable sources of HF data and an organisation should identify sources of data that are applicable to the specific project and issue that is being addressed.

2 Application

TfNSW intends this document to be used by organisations, including potential and existing TAOs, 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 document 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 Transport standards that may be useful to read in conjunction with this document include but are not limited to the following:

- TS 04978 (this describes the requirements for HFI for TfNSW projects)
- TS 04981
- TS 01471
- TS 01462.

While the 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.

3 Referenced documents

The following documents are cited in the text. For dated references, only the cited edition applies. For undated references, the latest edition of the referenced document applies.

Transport for NSW standards

TS 01462 (T MU AM 06006 GU) *Systems Engineering*

TS 01471 (T MU AM 06006 ST) *Systems Engineering*

TS 04978 *Human Factors Integration – General Requirements*

TS 04981 *System Safety Standard for New or Altered Assets*

Other referenced documents

RISSB, 2018, *Integration of Human Factors in engineering design*, version 1.0

4 Terms, definitions and abbreviations

The following terms, definitions and abbreviations apply in this document.

asset as defined in the RISSB guideline *Integration of Human Factors in engineering design*

CCB configuration control board

HF human factors; as defined in the RISSB guideline *Integration of Human Factors in engineering design*

HFI human factors integration; as defined in the RISSB guideline *Integration of Human Factors in engineering design*

IPE NAC Infrastructure and Place and Engineering Network Assurance Committee

like-for-like as defined in the RISSB guideline *Integration of Human Factors in engineering design*

maintainer as defined in the RISSB guideline *Integration of Human Factors in engineering design*

new or altered assets as defined in the RISSB guideline *Integration of Human Factors in engineering design*

operational integration as defined in the RISSB guideline *Integration of Human Factors in engineering design*

operator as defined in the RISSB guideline *Integration of Human Factors in engineering design*

RAMS as defined in the RISSB guideline *Integration of Human Factors in engineering design*

system as defined in the RISSB guideline *Integration of Human Factors in engineering design*

TAO technically assured organisation

TfNSW Transport for NSW

5 Application of RISSB guideline

The following sections of the RISSB guideline Human Factors Integration in engineering design should be applied to all TfNSW projects:

- 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 should be read as being applicable to all modes of transport.

Appendix A Guide to HF CCB/IPE NAC inputs

Table 1 provides guidance of HF input into CCB and IPE NAC gates.

Table 1 – Guide to HF inputs to CCB/IPE NAC

	TfNSW IPE NAC Gate 0	TfNSW IPE NAC Gate 1	Other CCB (Note 1) Gate 2	Other CCB (Note 1) Gate 3	Other CCB (Note 1) Gate 4	TfNSW/other IPE NAC (Note 1) Gate 5	TfNSW IPE NAC Gate 6
Gate definition	Defines purpose of change and initial business requirements	Ready to progress to preliminary design	Ready to progress from preliminary design to final design	Detailed design complete. Ready to progress to construction	Ready to progress to testing	Prior to commissioning and handover of asset	Asset review. Annual review to demonstrate assets are being appropriately managed
Potential HF input	Stakeholders identified / consulted	Stakeholders identified / consulted	Stakeholders identified / consulted	Stakeholders identified / consulted	Stakeholders identified / consulted	Stakeholders identified / consulted	Operator / maintainer HF activities as required
Potential HF input	RAMS	RAMS	RAMS	RAMS	RAMS	RAMS	Operator / maintainer HF activities as required
Potential HF input	Into hazard / HF issues log	Into hazard / HF issues log	Into hazard / HF issues log	Into hazard / HF issues log	Into hazard / HF issues log	Into hazard / HF issues log	Operator / maintainer HF activities as required
Potential HF input	Initial safety change assessment (ISCA)	Business requirements specification (BRS)	Safety argument	Safety argument	Safety argument	Safety argument	Operator / maintainer HF activities as required

	TfNSW IPE NAC Gate 0	**TfNSW IPE NAC Gate 1**	**Other CCB (Note 1) Gate 2**	**Other CCB (Note 1) Gate 3**	**Other CCB (Note 1) Gate 4**	**TfNSW/other IPE NAC (Note 1) Gate 5**	**TfNSW IPE NAC Gate 6**
Potential HF input	Concept of Operations	System requirements specification (SRS)	Design	Design assurance (HF Assurance Report (Note 2))	Testing of HF elements (Test plan)	Requirements met	Operator / maintainer HF activities as required
Potential HF input	N/A	Operations Concept	N/A	Operational and maintenance readiness	N/A	Operational and maintenance assurance	Operator / maintainer HF activities as required
Potential HF input	N/A	Operational Integration	Operational Integration	Operational Integration	Operational Integration	Operational Integration	Operator / maintainer HF activities as required
Potential HF input	Human factors planning	Human factors planning / HFIP (Note 2)	Updated HF planning / HFIP (Note 2)	Updated HF planning / HFIP (Note 2)	Updated HF planning / HFIP (Note 2)	Updated HF planning / HFIP (Note 2)	Operator / maintainer HF activities as required
Potential HF input	N/A	ISA (Note 2)	ISA (Note 2)	ISA (Note 2)	ISA (Note 2)	ISA (Note 2)	Operator / maintainer HF activities as required

Notes:

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

2. Required for more significant configuration changes.