



Signalling Design Process and Design Production Standard for Contractors

Engineering Standard

Rail Commissioner

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1. PURPOSE

This standard sets out mandatory requirements for the preparation, presentation and production of Signalling Design to ensure:

- Safe development and design of new and altered signalling systems impacting on DPTI controlled Infrastructure.
- Design details are prepared and presented consistently and without any ambiguities.
- Department of Planning, Transport and Infrastructure [DPTI] specified requirements are met and the design is fit for purpose.

2. SCOPE:

This Signalling design standard applies to all Contractors undertaking Signalling Design Works for DPTI, including:

- a) The design of safety critical signalling works applicable to the infrastructure
- b) The design of safety critical signalling systems on the Rail Corridor
- c) The design of software and data used in programmable safety critical signalling systems, and;
- d) The tools including software, used in safety critical design.

It applies from scheme conception to acceptance into service, or where applicable, to decommissioning and disposal.

3. REFERENCE DOCUMENTS:

- Signalling Principles and Practices for the Adelaide Metropolitan Passenger Rail Network:– PTS-AR-10-SG-STD-00000068
- Work Instruction:– Filling of Signalling, Electrical and Electronic Circuit drawings – WI-SP-1301
- Signal Sighting standard:– PTS-MS-10-SG-STD-00000033
- Management of Change – PR-RC-MC-009
- Assessment of Engineering Competence for Rail Safety Workers – PR-AM-GE-1170
- Type Approval for Railway Products:- AM4-DOC-000466
- Engineering Instruction – Rail Safety Worker Competency Assessment For Signalling Contractors Staff: SG4-DOC-002026
- Signals Competency Assessment Procedure for Installation, Testing and Commissioning:- AR-10-SG-PRC-00000054 *

- Procedures for the Numbering and Development of Drawing Documents:- PTS-MS-05-DC-PRC-00000008
- Drafting Standard for AutoCAD Drawings:- AM4-DOC-000364
- Rail Drawings Acceptance Procedure PR-AM-GE-1013
- Identification and Numbering of Technical Documents and Drawings:- FR-AM-GE-806 Design Decision Records Procedure:- PTS-MU-10-EG-PRC-00000016
- PTS-MS-05-AM-PRS-00000091 - Asset Management Technical Data Requirements for Project
- PTS-MU-10-EG-PRC-00000016 - Design Decision Records Procedure
- AM4-DOC-000940 - Asset Management Handover Requirements Standard
- Australian Standards applicable to the design if signalling systems
- International Standards applicable to the design if signalling systems
- RISSB Standards applicable to the design if signalling systems

* - This document has been superseded by SG4-DOC-002026

4. DEFINITIONS:

Acronym	Definition
ATP	Automatic Train Protection
AIR	Acceptance and Issue Record
ALDS	Application Logic Data Structure
AMG	Asset Management Group
AMPRN	Adelaide Metropolitan Passenger Rail Network
CAD	Computer Aided Drawing
CBI	Computer Based Interlocking
DPTI	Department of Planning, Transport and Infrastructure
ETCS	European Train Control System
IDR	Inter Disciplinary Review
ISO	International Standards Organisation
PTS	Public Transport Services
RAMS	Reliability, Availability, Maintainability ad Safety

RISSB	Rail Industry Safety & Standards Board
S&C	Signals & Communications
SID	Safety in Design
SFS	Signalling Function Specification
SME	Signal Maintenance Engineer
SSI	Solid State Interlocking
TCS	Train Control System
WI	Work Instruction

5. COMPETENCE AND RESPONSIBILITIES

5.1 Competence of Design Personnel

All work must be undertaken by or under the close direction of personnel who are competent to carry out such work, and who have been authorised to undertake the work. The necessary competency management systems shall be in place.

All personnel working on signalling design, installation and testing shall be competent to carry out such work and shall be approved by DPTI in accordance with:

- Engineering Instruction – Rail Safety Worker Competency Assessment for Signalling Contractor Staff – SG4-DOC-002026.
- Signals Competency Assessment Procedure for Installation, Testing and Commissioning:- AR-10-SG-PRC-00000054 *
- Assessment of Engineering Competence for Rail Safety Workers – PR-AM-GE-1170

5.2 Signal Design Responsibility

The Design Organisation producing the signal design shall:

- a) Be responsible for the provision and submission of all documents and drawings necessary for the satisfactory completion and performance of the Works under the Contract and this document
- b) Provide a safe, reliable and fit-for-purpose signalling design in accordance with the requirements set out in this Standard, the Signalling functional specification or scope of works, and as per Signalling Principles and Practices for the AMPRN.
- c) Ensure that all design work is subject to design check by a competent design checker who did not participate in the initial design. The Design Organisation must certify the design, attesting that the design is fit for purpose with particular reference to those matters listed in clause 10.2 prior to it being submitted for Independent Review under clause 5.3.

- d) Comply with the requirements, DPTI, Australian and International Standards as applicable, practices and procedures including those set out or referenced in this Standard, except as otherwise expressly approved in writing by the Signals and Control Systems Engineering Manager or his/her duly appointed Representative.
- e) Request details of DPTI's requirements in case of perceived ambiguity, or where there are any vital signalling designs which are not covered by DPTI standard practices in the Standards.
- f) Prepare and submit a proposed drawing practice for review and acceptance where no standard practices are provided by DPTI following a request.
- g) Prepare and submit proposed designs for a typical application for type approval review at an early stage where DPTI advises that no standard design exists.
- h) Research and collate all current and proposed work in or about the area of the Works and determining the status of these works and determining the basis upon which the new or altered design is to be based. This includes the formal incorporation or delay of projects to avoid conflicts in designs and the management of defining this position. Document this in a Design Engineering Management Plan and submit for approval prior to commencing detailed design.
- i) Produce and present documents and drawings in accordance with DPTI's documentation and drawing practices, including templates and formats, title blocks, numbering and naming conventions, symbols and nomenclature, indexing and version control practices, addition and deletion annotation practices, circuit book content arrangements and book binding practices. DPTI's standard practices are detailed in this Standard.
- j) Provide data in the required format, for changes that affect DPTI's train control system data sets.
- k) Provide configuration control of designs and drawings including the preparation of and delivery of all configuration documents and design drawings such that future corrections, additions, deletions, amendments or presentation changes can be readily made by others and are not dependent on any propriety process that is not an industry standard or an expensive conversion before the change can be made.
- l) Provide and maintain a register of all drawings and copies of drawings issued for the Works and work under the Contract, showing all identification details of each drawing issued e.g. drawing number and/or title, type of drawing, purpose of copy, version number and date, copy number, copy holder name and receipt acknowledgment, issue date, history and current status.
- m) Transmit all documents and drawings using standard Transmittal Forms detailing the issue, register the issue details and record and follow up receipt acknowledgments.
- n) Provide in the Contract Works Program for 28 days from date of receipt by the Signals and Control Systems Engineering Manager for consideration of submitted Review Copies/Modification Instruction Forms (including for any and all resubmissions), and inclusion of these periods in the Contract Works Program.
- o) Provide safe custody, security and control of any alterable replicas of DPTI masters of existing design documents and drawings provided to the Contractor for updating with amendments and changes due to the Works, and for integration of the design documentation and drawing work under the Contract with the existing documents and drawings.

- p) Provide new and altered final drawings so that they fit into DPTI's existing series of drawings to form an ordered, comprehensive, consistent and cohesive set in accordance with DPTI's standard documentation and drawing practices, including drawing registration numbering practices, without the necessity for any modification to the existing series of drawings that are not affected by the work under the Contract. If it is necessary for other existing drawings not directly affected by the Works to be renumbered or otherwise modified to achieve an ordered, consistent and cohesive set in accordance with DPTI's standard drawing practices, then those other drawings shall be considered included in the work under the Contract and shall be modified to comply with the requirements.
- q) A Signalling Documentation Plan shall be produced that shows the scope, input documents, the current status of the input documentation and analysis of the required works and their impact on the signalling documentation.
- r) A Signalling Design Engineering Management Plan shall be produced that shows the design scope, specific processes and documentation applicable to the project.

5.3 Independent Reviewer Responsibilities

The Design Organisation shall procure the Independent Review of any Design Package prior to it being submitted for review under the provisions of clause 7.

The Independent Reviewer shall be a competent Principles Engineer who is independent of the Design Organisation. The Independent Reviewer shall review the design with particular reference to those matters set out in Clause 10.3.

The Independent Reviewer shall certify the Independent Review to DPTI. The Certification may be unqualified, or qualified with the specific nature of any qualifications stated. The Independent Reviewer shall provide any records of the review to DPTI on request.

5.4 Design Engineering Management Plan

The Design Organisation will prepare and submit the Design Engineering Management Plan for the Works.

The Design Engineering Management Plan will define the design workflows, the Design Packages, the design interfaces, consistent with this and other DPTI standards, applicable to the individual project.

The Design Engineering Management Plan will be subject to review and acceptance by DPTI prior to commencement of the design.

The Design Engineering Management Plan shall include a programme detailing the work breakdown structure and milestone delivery dates for each functional element of the design and work package submissions.

6. DESIGN RECORDS

6.1 Signalling Scheme Development

The initial phases of a signalling scheme, associated with any new or altered signalling system, shall include the following, to a degree commensurate with the extent and type of work proposed:

6.1.1 Operational Specification

The project Operational Specification shall form the basis for any signal design. This requires identification of the operational facilities prerequisites and performance of the new signalling infrastructure subject of this design.

The Design Organisation will be required to produce and gain approval for this specification.

6.1.2 Option Selection

The project development stage may require the consideration of various options before a final option is selected and signalling functional specification can be developed. This requires identification of potential options, evaluation of the various options and selection of the most suitable solution with Signals Engineering and Rail Operations approval.

The Contractor shall provide all possible options to Signals Engineering for their review to finalise the best solution for the AMPRN.

The option selection process shall comply with DPTI document 'Design Decision Records Procedure; PTS-MU-10-EG-PRC-00000016'.

6.1.3 Signalling Functional Specification

The Signalling Functional Specification shall set out the signalling technical requirements necessary (or proposed) for the signalling scheme which delivers the requirements set out in the operational specification.

The purpose of the Signalling Functional Specification is to create a common understanding between the Signal Engineering, Rail Operation, Maintainers and Constructors on the scope of the new and altered signalling arrangements.

The Contractor shall develop a Signalling functional specification based on the requirements of DPTI, as defined in the Master Specification [D82], User Requirements, Option selection outcome, Designer Brief and Operational Requirements.

The process shall be commensurate with the size and complexity of the works proposed.

The Signalling functional specification shall be submitted to DPTI for acceptance.

6.1.4 Scheme Plan

Purpose of Scheme Plan is to outline all signalling arrangements to understand the proposed signalling for Rail Operation and Signal Engineering. A scheme plan shall be developed on the basis of final option selected and scope of works in parallel to signalling functional specification. The Scheme Plan may be omitted where no change to the existing signalling plan is proposed.

The scheme plan drafting shall comply with the requirements of DPTI 'Drafting Standard for AutoCAD Drawings'; AM4-DOC-000364.

The Scheme plan must be accepted by DPTI Signals Engineering before progressing further signal design deliverables.

6.1.5 Stage Scheme Plans

Where applicable, stage scheme plans shall be derived from the approved scheme plan before producing the engineering details, and, where required for approval, shall be submitted at a subsequent phase.

6.2 Master Signalling Plan

Once Scheme Plan and Signalling Functional Specification has been agreed and accepted by Signal Engineering and Rail Operations, the Design Organisation shall develop the Master Signalling Plan for the works.

The Master Signalling Plan must be accepted by DPTI Signals Engineering before progressing further signal design deliverables.

The Master Signalling Plan shall show the track layout with signalling equipment including interlocking boundaries to a scale of 1:2,500 or 1:1000 if required for clarity and legibility, or other scale where agreed with DPTI.

The requirements for the Master Signalling Plan are set out in AM4-DOC-000364 and as follows:

- Asset chainage,
- Gradient and curve information,
- Linespeed information,
- Equipment enclosures, including boundaries
- Signals, Points, Train Detection, ATP/ETCS, Level & Pedestrian Crossings
- Railway monuments, station platforms, bridges, and subways
- Level and Pedestrian Crossing holding and control approaches including warning times and distances
- Legend detailing symbol for all signalling assets

The signalling plan shall be drawn on a single line basis with additional information of track curves and gradient.

6.3 Systems Architecture

Systems architecture selects for technologies and defines technical interface standards and methods between signalled areas between interlocking types, between interlocking and controls systems, between interlocking and signalling field equipment.

This information must be documented in the architecture design documentation.

Systems Architecture shall be provided as a schematic representation in a DPTI compliant drawing format together with the Systems Architecture specification.

6.4 Control Tables

A control table is a formal tabulation of the signal, point and other controls associated with a signalling system, showing the interlocking and other dependencies between those controls.

Control tables shall always be read in conjunction with the scheme plan, or signalling plan (for record purposes). Their production shall use the information depicted on the plan, together with the associated table of signal routes.

An amendment to the Scheme or Master Signalling Plan may therefore necessitate amendments to the control tables.

6.5 Design Specification

Following scheme plan acceptance, before the commencement of the detailed design, a Design Specification shall be produced by the Design Organisation. The Design Specification shall describe the project works and include the signalling information that enables the Design Organisation to prepare and develop the design sufficiently for the construction, installation, testing and commissioning of the signalling scheme. The design specification shall be subject to acceptance by DPTI. It shall originate from the SFS.

6.6 Design Report

Any design artefact delivered for client review must be accompanied by a design report which sets out the information set out in section 11 of this document.

6.7 Safety in Design

The Design Organisation shall carry out SID processes, produce records of those processes, and implement the Safety Management Plan activities as required. The Design Organisation will participate in the DPTI's Management of Change Processes, providing evidence that the proposed design is suitable to be put into service.

6.8 Bonding Plan

This is a scale layout plan showing every signalling location, together with their identities, position and type of cases, interlocking boundaries, trackside functional module (TFM) identities, Object Controller identities and the area of signalling equipment that is controlled by each location. The plan is usually a sub-version of the Master Signalling or Scheme Plan.

The bonding plan is derived from information taken from the Master Signalling or Scheme Plan Civil, Structures and Track Plan/model by adding engineering details, not relevant to an operator but necessary for a designer to produce other detailed design information.

The bonding plan shall detail individual rails and position of insulated rail joints (IRJs), electrical separation joints (ESJ) together with track circuit feed and relay connections with polarities, cross bonds, structure bonds and impedance bonds as applicable and Signals, Points [N] position and non-track circuited areas.

The bonding plan shall detail the position of principal cable routes relative to the interlocking, and lineside equipment location cases and signalling & communication equipment rooms. The bonding plan shall also include any tail cable routes with all UTX, URX with number of conduits installed.

Cable running information is generally shown on the Bonding Plan; however, Cable Running Plans may need to be produced as a separate plan where there is space constraints on the associated Bonding Plan

6.9 Signalling Power Requirement

The Design Organisation will carry out and document Signal Power Calculations to validate the proposed Signal Power Design in the context of the power usage of the in-service railway adjacent to the Works.

Signal Power Distribution drawings shall be updated to take into account the new calculations.

6.10 Correlation

When undertaking alterations to existing signalling infrastructure there is a need to confirm that the infrastructure being amended is in accordance with the existing design records. A Correlation Check is required before any design works are carried out.

The extent of the correlation shall be commensurate with the accuracy of the existing records and the condition of the infrastructure.

Following the on-site correlation exercise, all anomalies, omissions and corrections shall be updated on the master copy, prior to commencement of the design.

6.11 Detailed Design Information

The circuit books detail the circuits in each location/relay rooms as depicted on the Bonding plan. The circuit books shall clearly identify the case in which each part of the depicted circuit, or equipment, is located. Circuit books shall comprise all applicable sheets, and shall include to:

- Index Sheet - listing in numeric order must include the plan number, the title and current revision as a minimum
- Location case or equipment Room Layout
- Equipment Rack Layout
- Power Supplies and Busbar analysis
- Relay Contact Analysis
- Train Detection Circuits
- Signal Circuits
- Point Circuits
- Level Crossing Circuits (where required)
- Miscellaneous Circuits and Interface Circuits
- Electronic System Details
- Indication circuits to TCS & local panel
- Typical circuits
- Data configuration and ALDS [where required]
- Data construct and raw data information

- Design, checking and testing tools

7. DESIGN ACCEPTANCE

All signalling design, stagework design and temporary design shall be produced and submitted to Signal Engineering for their review, comment and acceptance as mentioned below. Submission of any Design Package for Review under this section shall occur after Independent Review Certification has been received.

The overall Design shall be broken up into multiple design packages. In sum these design packages will cover the preliminary design and detailed design stages, as well as providing required ancillary information and system support documentation.

Each design package will be submitted for technical review. Comments from the technical review will be responded to with responses and changes accepted by DPTI.

Submissions of multiple design packages at once will occur following the general lifecycle development of the design.

The following stages are recognised for progressive review:

- Preliminary Design – Stage
- Detailed Design –Stage
- Final Design – Stage
- IFC Design – Design accepted

Each design stage is an iterative process until all comments raise at that particular stage are either closed or have an agreed outcome. Design cannot proceed to the next stage of design until this has been achieved

A review submission comprises completed design packages of the document types expected to be in evidence for an overall design at the level of maturity as expressed.

7.1 Preliminary Design - Stage

The “Preliminary design” stage will comprise submission of completed design packages which represent the preliminary design for the works. Documents comprising these design packages will be of the following types:

- Overall System Architecture including Communication Network
- Master Signalling Plan
- Bonding Plan
- Control Tables and Aspect Sequence Chart
- Headway Calculations
- Preliminary Signalling Power Calculations (where required)

- Location Case, Relay Room Layout
- Level Crossing Layout Plan
- Detailed Site Survey Drawings
- Signal Sighting forms
- Combined Service Plan
- Primary & Secondary Cable Containment Route
- Initial Asset List Skeleton
- Configuration management plan for signalling and communication system
- Design Report (should be with each design package)

7.2 Detail Design - Stage

The detailed design stage will comprise submission of completed design packages which represent the detailed design for the works. Documents comprising these design packages will be of the following types:

- Vital and Non-vital signalling circuits
- Circuit and Wiring details drawings
- Non-vital control system circuits
- Vital Signalling Interlocking data
- Non-Vital Train control system data
- ATP/ETCS data for trackside and on-board equipment
- Any mechanical drawings for any non-standard installation
- Train control system drawing for mimic layout/workstation layout
- Mechanical Drawing or Typical Drawings
- Power Supply Circuits and Power Loading Calculations
- Remote/Local Control Panel Layout
- RAMS Analysis, SiDR and IDR outcomes
- Operation and Maintenance Manual
- Design Report (should be with each design package at each stage)

7.3 Final Design - Stage

The Final design stage will comprise re-submission of completed design packages (preliminary and detail design types) following technical review and incorporating the changes agreed with the reviewers for close out of any issues. In addition, ancillary information and documentation will be provided. This will comprise documents of the following types:

- Operation and Maintenance Manual Design Report (should be with each design package)
- Final Asset List
- As in Service drawings.
- Signalling and TCS RAM Analysis and Spares Calculation (this is allocated to an appropriate design stage)

The following documents are required for CBI/SSI/ETCS (trackside/On-board) in addition as required.

1. Delivery of Validation Documents
2. Soak Test and testing of CBI/SSI/ETCS at Factory
3. Quality review/audits of data process development activities
4. Quality reviews/audits of all other activities
5. Production of Site specific data
6. Independent verification of Site specific data
7. Configuration Management activities
8. Factory Acceptance Testing of equipment
9. Site Acceptance Testing of equipment
10. On Site soak period for equipment
11. Testing of signalling operator interface to the CBI/SSI/ETCS system

7.4 IFC – Issued For Construction - Stage

The design shall be issued as IFC upon the acceptance by DPTI Signal Engineering Unit Manager or delegate.

8. DESIGN CERTIFICATION

8.1 Design Certification

The Design Organisation shall certify that each design deliverable has been designed, reviewed and verified in accordance with the requirements of the Design Specification, Scope of works and as per DPTI, Australian and International Standards as applicable in addition to industry best practices.

The Certification shall affirm that the design is fit for purpose taking particular account of the matters set out in clause 10.2.

The following Design Organisation authorities shall sign all signalling design:

Designer

Checker

Approver

8.2 Certification of Independent Review

All Design Packages shall be certified by an independent reviewer, who shall be independent of the Design Organisation, prior to acceptance review of the design by DPTI.

The certificate shall affirm that the design is fit for purpose taking account particularly of those matters set out in clause 10.3.

9. DESIGN CHECKING AND ACCEPTANCE PROCESS

The objective of signalling works is to effectively implement a safe, reliable, available and maintainable signalling installation that meets the functional requirements in accordance with the DPTI, Australian and International Standards as applicable and within the approved budget and timeline.

Signalling design packages must be prepared by the Design Organisation. Initially the design will be prepared by a competent Signal Designer, and checked within the Design Organisation by a competent Signal Checker, who will sign off the design as correct, before the design may be submitted for further processes such as:

- Independent Review;
- DPTI Acceptance Review;
- Construction;
- Testing (refer Testing and Commissioning Process).

The Signal Checker (an engineer independent of the initial signal design production) within the Design Organisation is required to sign off safety-related signalling designs as checked and correct before passing them to the approver, who shall also be suitably authorised as competent for sign-off as approved and for DPTI acceptance prior to issue.

The Third Party Independent Review will be carried out by a competent Principles Engineer independent of the Design Organisation. Comments raised will be subject to response and close out by the Design Organisation and will be subject to acceptance by DPTI Design Acceptor.

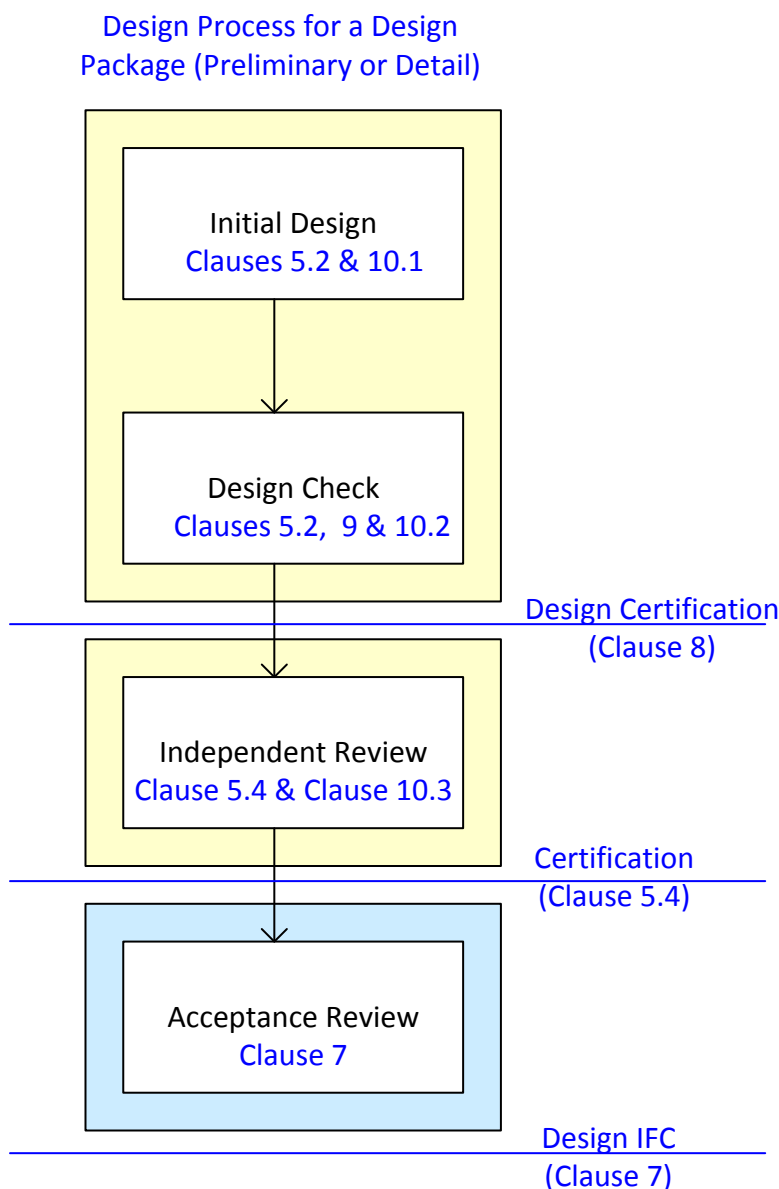
Design integrity testing to signalling principles and control table requirements shall be carried out according to the DPTI Testing and Commissioning Processes. Design Acceptance provided by DPTI will be subject to successful completion of all these Testing and Commissioning Processes prior to the design being placed into operational service.

Where the Testing and Commissioning Process or a requirement from a Closure List causes initiation of a process to alter the design, the design alteration will be carried out according to the design process as a Design Modification.

10. DESIGN ORGANISATION DESIGN PROCESS

The Signal Design Organisation shall have processes in place for the preparation of a complete set of production design details consistent with the Design Process. These processes will be documented in the Project Design Engineering Management Plan which will be subject to review and acceptance by DPTI.

The process flow from initial design through to acceptance and issue IFC shall be in accordance with the following diagram:



10.1 Production Process for drawings

Production of new design or alterations shall generally be undertaken on a copy of the source record.

There is no restriction on the creation of new source records for new work, as distinct from alterations to existing installation. All new source records shall have unique identity number provided by DPTI Asset management.

The drafting shall comply with the requirements of DPTI 'Drafting Standard for AutoCAD Drawings'; AM4-DOC-000364.

10.2 Verification and validation process (Design Check)

The Signal Design Checker, working with the Signal Designer, is required to adopt a systematic approach to the checking, design update, and re-checking processes, so as to ensure that the design objectives are achieved. No reliance may be placed on a third party independent review (if carried out under DPTI requirement), or any testing process revealing any residual errors.

The Design Check shall include consideration of the following (to the extent required by the scope of the Design):

- a) Signal principles are used;
- b) Any assumptions made are justified and recorded where required in the Design Report as well as in accordance with the requirements of ;
- c) Hazards are identified and the associated risks controlled;
- d) Calculations and/or functional safety analysis are performed and recorded where required by the Signal Designer;
- e) Appropriate check and/or error recording processes have been followed and necessary evidence has been produced.
- f) New work and interfaces are 100% in accordance with Design Specifications and Technical Interface Specifications;
- g) Existing installations are 100% checked in the relevant areas of Design altered and interface correctly with the unmodified portion of the installed signalling;
- h) Any new design methods used are fully checked at the design method level and documented in a form which allows incorporation into the permanent DPTI Signalling Documentation system as an inclusion in a design standard, an ALDS, or a design method (according to DPTI records).

The Signal Design Checker, working with the Signal Designer, is required to adopt a systematic approach to producing and maintaining documentary evidence of the checking and error reporting processes, any errors, anomalies or discrepancies found and corrections made. These records will be maintained in an auditable form. The methodology to be used shall be stated in the design specification and Design Engineering Management Plan. DPTI may request the checking/error documentation records to be provided by the Design Organisation.

10.3 Verification and validation process (Independent Review)

The Third Party Independent Review shall be rigorous and comprehensive and place no reliance on any testing process revealing any residual error.

Independent review shall include consideration of the following (to the extent required by the scope of the Design):

- i) Regulatory, legal and compliance with the State and National Law requirements
- j) Compliance with Contract, Master Specification and DPTI Standards
- k) Signal principles are used;
- l) Any assumptions made are justified and recorded where required in the Design Report as well as in accordance with the requirements of ;
- m) Hazards are identified and the associated risks controlled;
- n) Calculations and/or functional safety analysis are performed and recorded where required by the Signal Designer;
- o) Appropriate check and/or error recording processes have been followed and necessary evidence has been produced.
- p) Any new design methods used are fully checked at the design method level and documented in a form which allows incorporation into the permanent DPTI Signalling Documentation as an inclusion in a design standard, an ALDS, or a design method (according to DPTI requirements).

The Independent Reviewer is required to adopt a systematic approach to producing and maintaining documentary evidence of the review, and any errors, anomalies or discrepancies found. These records will be maintained in an auditable form. The methodology to be used shall be stated in the design specification and Design Engineering Management Plan. DPTI may request the review documentation records to be provided by the Independent Reviewer.

11. DESIGN REPORT

The Contractor shall prepare a Design Report for each Design Package to demonstrate that the requirements of the Design Specification have been incorporated into the Design Works Package. The Design Report shall include where applicable:

- a) The scope of the Works covered by the Design Report,
- b) A Compliance matrix demonstrating design compliance against the Design Specification and the Signalling Functional Specification,
- c) A list of all design deliverables and version status,
- d) Design studies undertaken to demonstrate compliance with the requirements of the Design Specification,
- e) Calculations including Braking Distance and Overlap,
- f) Calculations for Level Crossing Approaches
- g) Calculation for Signalling Power
- h) Documentation of Design Methods used;
- i) Type Approval for new or novel equipment

- j) Enabling, staging and sequencing information,
- k) Construction methodology;
- l) Review and confirmation that the works can be undertaken during scheduled possessions,
- m) Equipment schedules that identify long lead items or those affected by other interface parties,
- n) Equipment Authority approvals for design personnel used in the preparation of the design,
- o) Design input components,
- p) Identification of relevant and applicable DPTI, Australian and International Standards, codes and guidelines, including reference to the provisions and criteria and classification assumed within such documents,
- q) Interfaces and interface works including compliance with Interface Specifications.
- r) Staff competence with appropriate evidences as required by SG4-DOC-002026

The Design Report shall be updated and submitted as part of each Design Works Package submission.

12. MAINTENANCE OF RECORDS

12.1 Updating Records

The Design Organisation shall have a process in place for recording updates to design during the construction and commissioning phases. So as to simplify the modification process, source records that require updating shall not generally be updated prior to commencement of construction, unless prior approval is granted by DPTI.

Maintenance records on site shall be maintained up to date with the current state of the infrastructure at all times. When it is necessary to endorse a previous maintenance copy with a modification (or correction), or alteration in order to provide a temporary maintenance copy, this shall be replaced with a final record copy within an appropriate timescale. When source records are retained by the Contractor after commissioning, in order to create the final records, a security copy shall be supplied to the DPTI Asset Management Group.

All the Handover of final drawings and records shall be as per "Asset Management Handover Requirements Standard – AM4-DOC-000940.