

AS 7717:2016



Signal Testing & Commissioning



Train Control Systems Standard



This Australian Standard® AS 7717 Signal Testing & Commissioning was prepared by a Rail Industry Safety and Standards Board (RISSB) Development Group consisting of representatives from the following organisations:

Metro Trains Melbourne

Queensland Rail

ARTC

JHG

AECOM

Brookfield Rail

Rio Tinto

The Standard was approved by the Development Group and the Train Control Systems Standing Committee in August, 2016. On September 15, 2016 the RISSB Board approved the Standard for release.

This Standard was issued for public consultation and was independently validated before being approved.

Development of the Standard was undertaken in accordance with RISSB's accredited process. As part of the approval process, the Standing Committee verified that proper process was followed in developing the Standard.

RISSB wishes to acknowledge the positive contribution of subject matter experts in the development of this Standard. Their efforts ranged from membership of the Development Group through to individuals providing comment on a draft of the Standard during the open review.

I commend this Standard to the Australasian rail industry as it represents industry good practice and has been developed through a rigorous process.



Paul Daly
Chief Executive Officer
Rail Industry Safety and Standards Board

Keeping Standards up-to-date

Australian Standards developed by RISSB are living documents that reflect progress in science, technology and systems. To maintain their currency, Australian Standards developed by RISSB are periodically reviewed, and new editions published when required. Between editions, amendments may be issued. Australian Standards developed by RISSB may also be withdrawn.

It is important that readers assure themselves they are using a current Australian Standard developed by RISSB, which should include any amendments that may have been issued since the Standard was published. Information about Australian Standards developed by RISSB, including amendments, can be found by visiting www.rissb.com.au.

RISSB welcomes suggestions for improvements, and asks readers to notify us immediately of any apparent inaccuracies or ambiguities. Members are encouraged to use the change request feature of the RISSB website at: <http://www.rissb.com.au/products/>. Otherwise, please contact us via email at info@rissb.com.au or write to Rail Industry Safety and Standards Board, PO Box 4271, Kingston ACT 2604, Australia.

AS 7717:2016

Signal Testing & Commissioning

Document details

First published as: AS 7717:2016

ISBN 978-1-76035-862-4

Published by SAI Global Limited under licence from the Rail Industry Safety and Standards Board,
PO Box 4271, Kingston ACT 2604, Australia

Copyright

© RISSB

All rights are reserved. No part of this work may be reproduced or copied in any form or by any means, electronic or mechanical, including photocopying, without the written permission of RISSB, unless otherwise permitted under the Copyright Act 1968.

Notice to users

This RISSB product has been developed using input from rail experts from across the rail industry and represents good practice for the industry. The reliance upon or manner of use of this RISSB product is the sole responsibility of the user who is to assess whether it meets their organisation's operational environment and risk profile.

Document control

Document identification

Designation / Title

AS 7717:2016 Signal Testing & Commissioning

Document history

Publication Version	Effective Date	Reason for and Extent of Change(s)
2016	September 15, 2016	First Published

Approval

Name	Date
Rail Industry Safety and Standards Board	15/09/2016

Contents

1	Introduction.....	10
1.1	Purpose	10
1.2	Scope	10
1.3	Justification.....	12
1.4	Compliance.....	12
1.5	Referenced documents.....	13
1.5.1	Normative references.....	13
1.6	Definitions.....	13
2	Principles of testing and commissioning	18
2.1	General.....	18
2.2	Risk management and SFAIRP	19
2.3	Verification & validation.....	19
2.4	Objective of inspection and testing.....	20
2.5	Testing principles.....	20
2.6	Types of inspection and test	21
2.7	Minimum necessary inspection and testing.....	22
2.8	Communication protocols for inspection and testing	22
2.9	Certification records	23
2.10	Common documentation.....	23
2.11	Defining testing activities - Test specifications	24
2.12	Quality assurance	25
2.13	Witness.....	25
2.14	Single identifiable point of responsibility.....	26
2.15	Independence of testing personnel	26
2.16	Inspection and testing requirements	27
3	Roles and responsibilities	28
3.1	General.....	28
3.2	Allocation of roles	28
3.3	Appointment of testing personnel.....	29
3.4	Roles related to inspection, testing and commissioning	29
4	Scope of testing and commissioning.....	30
4.1	General.....	30
4.2	Signalling equipment to be inspected and tested	31
4.3	Inspection and testing geographical boundaries	32
4.4	Inspection and testing activities.....	33
4.5	Alterations and new interfaces	34
5	Testing and commissioning strategy.....	34
5.1	General.....	34
5.2	Content of testing strategy	35

6	Interface management.....	36
6.1	General.....	36
6.2	Interface coordination plan.....	36
6.3	Interfacing with existing systems.....	37
6.4	Testing alongside operational equipment.....	38
6.5	Interfaces outside commissioning boundaries.....	38
6.6	De-commissioning and disposal.....	38
6.7	Operational requirements.....	38
6.8	Interface documentation requirements for associated train control and telecommunications systems.....	38
7	Testing and commissioning plans and work packages	39
7.1	General.....	39
7.2	Test plans	39
7.3	Testing and commissioning plans and work packages.....	40
7.3.1	Planning inspection, testing and commissioning activities.....	40
7.4	Inspection and testing overview	41
7.5	Inspection and testing outline plan	42
7.5.1	System/apparatus	43
7.5.2	Activity	43
7.5.3	Certified by	43
7.5.4	Certification documents	44
7.5.5	Standards and procedures.....	44
7.5.6	Time	44
7.6	Inspection and testing detailed plan	44
7.6.1	Installation work package structure	46
7.7	Commissioning plan.....	47
7.7.1	General requirements	47
7.7.2	Operational requirements.....	48
7.7.3	Testing and certification	48
7.8	Commissioning work package	48
7.8.1	Section 1 – Preparation	48
7.8.2	Commissioning program	49
7.8.3	Section 2 – Implementation.....	51
7.8.4	Section 3 – Evaluation	52
7.9	Handover package.....	53
8	Off-site testing	53
8.1	General.....	53
8.2	Standards applicable	54
8.3	Independence	54
8.4	Pre-site testing of CBI and control systems data.....	54
8.4.1	General.....	54
8.4.2	Test Equipment and Software.....	54

8.4.3	Pre-Site Design Checking and Function Testing	55
8.4.4	Pre-Site / Simulation Testing.....	55
8.4.5	Simulator Testing	55
8.4.6	Configuration Management and Version Control.....	56
8.4.7	Control Centre - Site Testing Precautions	56
8.4.8	On site testing of CBI	56
8.4.9	Testing Alterations to a Working Installation.....	57
8.4.10	Pre-commissioning Testing of CBI Alterations	57
8.5	Equipment assembled and wired off-site.....	57
8.5.1	Pre-site testing of assembled equipment	57
8.5.2	Pre-site Certification Testing	58
9	Installation inspection and testing	59
9.1	General.....	59
9.2	Extent and rigour of the testing process	59
9.3	Order of inspection and testing	59
9.4	Phases of the testing process	59
9.5	Error reporting and test logs.....	61
9.6	Disconnections	62
9.6.1	Identification of disconnections	62
9.6.2	Verification of disconnections.....	62
9.6.3	Situations where equipment cannot be restored to service	62
9.7	Cleanliness of work areas.....	62
9.8	Installation inspection and testing status certificate	62
10	Commissioning readiness review	63
10.1	General.....	63
10.2	Requirements	63
10.2.1	Pre-Commissioning Conference and Meeting	63
10.3	Logistics and maintenance support items	64
11	De-commissioning	65
11.1	Decommissioning and Disposal	65
11.2	Standards and procedures.....	65
11.3	Responsibility.....	66
11.4	Redundant equipment.....	66
11.5	Redundant traction bonding.....	66
11.6	Standalone decommissioning of redundant equipment	67
12	Commissioning and handover	67
12.1	General.....	67
12.1.1	Function testing and Validation	67
12.1.2	Testing and commissioning of works	67
12.1.3	Notification of the works.....	67
12.1.4	Operational requirements.....	67

12.1.5	Liaison with Network Controller.....	68
12.1.6	Booking Out of Use.....	68
12.1.7	Commissioning Activities	68
12.1.8	Progress Reporting	69
12.1.9	Items Previously Tested and Certified.....	69
12.2	Finalisation of commissioning & handover	69
12.2.1	General.....	69
12.2.2	Commissioning Certificate	70
12.2.3	Entry into Service.....	70
12.2.4	Delegation of Authority.....	71
12.2.5	Monitoring and other Measures.....	71
12.2.6	Trial Running	71
12.2.7	Security.....	71
12.3	Project completion	71
12.3.1	Equipment removal	71
12.3.2	Plan revision & issue.....	71
12.3.3	Permanent testing record.....	71
12.3.4	Asset register.....	72
12.3.5	Project acceptance	72
13	Defects and non-conformances.....	72
13.1	Test logs	72
13.2	Error rectification.....	72
13.3	Re-entry into service	73
13.4	Outstanding actions	73
13.5	Concessions	73
14	Documentation and records.....	73
14.1	Management of records (General)	73
14.2	Design documents and data	73
14.2.1	Design documents for hard-wired circuits	74
14.2.2	Design documents for application data	74
14.3	Inspection and test records	75
14.3.1	Management of test records	75
14.3.2	Test records for application data	76
14.3.3	Test records for hard-wired circuits	76
14.3.4	Operational configuration / adjustment records	77
14.4	Records of technical approvals	77
15	Modifications and design changes.....	78
15.1	General.....	78
15.1.1	Installation discrepancies identified in testing.....	78
15.1.2	Design errors or shortcomings identified in testing	78
15.1.3	Design errors or shortcomings identified in commissioning	78

16	Temporary wiring, pre-wiring and stageworks.....	79
16.1	General.....	79
16.2	Temporary wiring standards.....	79
16.3	Planning for stage work	80
16.4	Identification and labelling of alteration wiring	81
16.5	Temporary wiring	82
16.5.1	Control and Removal of Temporary Wiring	82
16.5.2	Temporary Stagework Wiring.....	82
16.6	Stagework.....	82
16.7	Enabling works	83
16.8	Pre-commissioning	83
17	Minor works and alterations	84
17.1	Minor changes	84
17.2	Test planning	84
17.2.1	Testing following minor changes and renewals	84
17.3	Minor works	84
17.3.1	General.....	84
17.3.2	Test requirements for minor changes.....	85
18	Personnel and competency	85
18.1	General.....	85
18.1.1	Resources for testing and commissioning.....	85
18.2	Staffing levels	85
18.2.1	Avoidance of undue pressure during testing	85
18.3	Competency of organisations.....	85
18.4	Competency of individuals	86
18.5	Staffing	86
18.5.1	Competence	86
18.5.2	Briefing of staff involved in testing and commissioning.....	86
19	Test methods and procedures	87
19.1	General.....	87
19.2	Verification tests - electromechanical systems	87
19.2.1	Detailed circuit tests.....	87
19.2.2	Cable tests.....	87
19.2.3	Apparatus tests.....	87
19.3	Function tests - electromechanical systems.....	88
19.4	Validation tests - electromechanical systems.....	88
19.5	Verification tests – processor based systems.....	88
19.5.1	Verification - static testing	88
19.6	Verification of the application logic - Processor based systems - Function test to control tables.....	89
19.6.1	Verification - Dynamic Testing	90

19.6.2	Verification of the Integrated System	90
19.7	Validation of the application logic - processor based systems.....	90
19.8	Test copies of designs	91
19.8.1	Configuration control of design documents and data.....	91
20	Monitoring and test equipment.....	92
20.1	General.....	92
20.1.1	Testing Equipment.....	92
20.2	Use of monitoring and test products.....	92
20.2.1	Introduction.....	92
20.2.2	The connection of test or monitoring equipment - products of operational system 92	
20.2.3	Integrity of connection arrangements	92

Appendix Contents

Appendix A	Hazard register items.....	94
Appendix B	T&C test plans	105

Signal Testing & Commissioning
Preview

1 Introduction

1.1 Purpose

This Standard is intended to provide a common framework for Rail Transport Operators (RTOs) to plan and execute the inspection, testing and commissioning of new and altered signalling infrastructure.

The concepts within this Standard are intended to be applied throughout any railway signalling project, both in the context of a railway signalling and control system project, and during the operating life of the system.

This Standard defines what is to be done to effectively plan, execute and finalise the testing and commissioning activities, but does not detail the methods by which those requirements may be fulfilled

The companion standard AS 7716 Signals Testing Process defines the processes, detailed test procedures, and the performance requirements for equipment and installations which constitute the signalling and train control system.

1.2 Scope

This Standard is intended to be applied to railway signalling works and to specify the following –

- (a) the minimum sufficient inspection & testing requirements to assure the safety of the system;
- (b) appropriate test procedures to ensure consistency in testing and results;
- (c) minimum documentation necessary to ensure a comprehensive record of test results, to demonstrate the safety of the system;
- (d) appropriate processes to plan the inspection and testing to ensure that all necessary testing is completed, including unexpected changes and events;
- (e) appropriate processes for managing the testing activities, to ensure that they are completed in a timely manner without waste of resources;
- (f) processes for the orderly handover of commissioned system to the responsible operator;
- (g) processes for ensuring that inspection testing work is performed by persons having the necessary competency and authorisation.

This document covers the testing of –

- (a) the application logic that is applied in conjunction with technology-based product as a part of signalling and operational telecommunications systems;
- (b) the safety requirements of a system where these are implemented by means of application logic or other engineering details;
- (c) products, insofar as they are correctly installed and operating in accordance with the relevant specifications and engineering details.