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Standard number	AS 7706
Version year	2026
Standard name	Interface with Points
Standing Committee	Train Control Systems
Development group member organisations	Sigtech Solutions Australia, Central Queensland University, SYSTRA ANZ, WSP Australia Pty Ltd, Engineering Institute of Technology (EIT), Talbot Advisory Services Pty Ltd
Review type	Targeted Review
First published	AS 7706:2017
ISBN	TBD
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Development draft history

Draft version	Draft date	Notes
0	1/06/2025	Initial version generated from the most recently published version of the document
1	30/03/2026	Draft updated to include DG feedback
2	17/04/2026	Draft updated to include DG feedback
3	20/04/2026	Peer Review
4	01/05/2026	Quality Assurance

Preface

This Standard was prepared by the Interface with Points Development Group, overseen by the ARISO Train Control Systems Standing Committee.

Objective

The objective of this Standard is to provide the Australian rail industry with a set of requirements to be used to define the interfaces with points and crossing systems and control the risks associated with points and crossing systems.

The Standard is intended to:

(a) specify the interfaces with points, including:
  (i) safety functions;
  (ii) interface with track;
  (iii) interface with track support;
  (iv) interface with personnel;
  (v) interface with traction power system; and
  (vi) interface to other track and signal equipment.

(b) provide a uniform basis for compliance with the Rail Safety National Law; and

(c) be able to cover differing rail operations across Australia.

Technical changes from previous editions of this document include:

(d) the review of technical requirements for the interface of points and crossing systems; and

(e) a review of definitions, normative and informative references.

Compliance

There are four types of provisions contained within Australian Standards developed by ARISO:

(a) Requirements.

(b) Recommendations.

(c) Permissions.

(d) Constraints.

Requirements – it is mandatory to follow all requirements to claim full compliance with the Standard. Requirements are identified within the text by the term ‘shall’.

Recommendations – do not mention or exclude other possibilities but do offer the one that is preferred. Recommendations are identified within the text by the term ‘should’.

Recommendations recognize that there could be limitations to the universal application of the control, i.e. the identified control is not able to be applied, or other controls are more appropriate or better.

Permissions – conveys consent by providing an allowable option. Permissions are identified within the text by the term ‘may’.

Constraints – provided by an external source such as legislation. Constraints are identified within the text by the term ‘must’.

For compliance purposes, where a recommended control is not applied as written in the standard it could be incumbent on the adopter of the standard to demonstrate their actual method of controlling the risk as part of their WHS or Rail Safety National Law obligations. Similarly, it could also be incumbent

on an adopter of the standard to demonstrate their method of controlling the risk to contracting entities or interfacing organisations where the risk may be shared.

ARISO products identify known hazards relevant to the railway industry. Appendix A provides a non-exhaustive list of hazards relevant to the scope of this document.

Appendices in ARISO Standards may be designated either “normative” or “informative”. A "normative" appendix is an integral part of a Standard and compliance with it is a requirement, whereas an "informative" appendix is only for information and guidance.

Commentary

Commentary *C Preface*

This Standard includes a commentary on some of the clauses. The commentary directly follows the relevant clause, is designated by ‘C’ preceding the clause number and is printed in italics in a box. The commentary is for information and guidance and does not form part of the Standard.

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Section 1 Scope and general

1.1 Scope

This document defines the minimum interface requirements for points and crossings systems and aligns with the performance standards applied by rail infrastructure managers (RIMs) which are based on local experience and good engineering practice. It is not intended to replace, override or supersede the performance standards, requirements or arrangements established by individual RIMs as set out in their points and crossings standards, codes, guidelines and procedures.

This document is applicable to all configurations of moveable track, Examples of these are:

(a) points or switch assemblies;

(b) V crossing – swingnose;

(c) catch point;

(d) K crossing – switchable; and

(e) slip – single or double.

1.2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document:

- AS 7716:2017, *Signalling Testing Processes*
- AS 7717:2016, *Signal Testing & Commissioning*

NOTE:

Documents for informative purposes are listed in a Bibliography at the back of the Standard.

1.3 Defined terms and abbreviations

For the purposes of this document, the following terms and definitions apply:

1.3.1
actuator
mechanism used to move the switch blades to the required position

1.3.2
authorized command
command issued to a points and crossing system to change its state, which has been validated by the controlling system or operator as meeting all required safety and operating conditions

1.3.3
catch point
set of points designed to prevent unauthorized access to a section of track by prior intentional derailment of rail traffic

1.3.4
detector
device for proving that points are correctly set before the signalling system can authorize passage of a train over the points

1.3.5
in-bearer
specific type of bearer that is used in a points and crossing system to house the point operating equipment. this eliminates the point operating equipment being located in a bay between bearers

1.3.6
local operation
operation of the points and crossing system performed at the site using locally provided controls

Note 1 to entry: Lever frames and local controls panel allow for local operation.

1.3.7
switch lock
mechanism used to lock the switch blades in the required position

1.3.8
manual operation
operation of the points and crossing system by direct human intervention without the use of normal powered or remote control

Note 1 to entry: Manual operation is typically used during failure, maintenance, or degraded operating conditions.

Note 2 to entry: Examples of manual operation include the use of hand cranks and local operating levers.

1.3.9
modular replaceable unit
any unit that is designed to be replaced as a complete unit in the field

1.3.10
normal position
position in which the points and crossing system is designated to normally lie

1.3.11
nose
cast or machined point (nose) of a crossing, located at or near the point of rail intersection

1.3.12
points and crossing system
system of components which permit rail traffic to travel on a converging or diverging route at the same level

1.3.13
rail fasteners
devices for holding rail to sleepers or to a base plate, which is in turn held to the sleeper

Note 1 to entry:

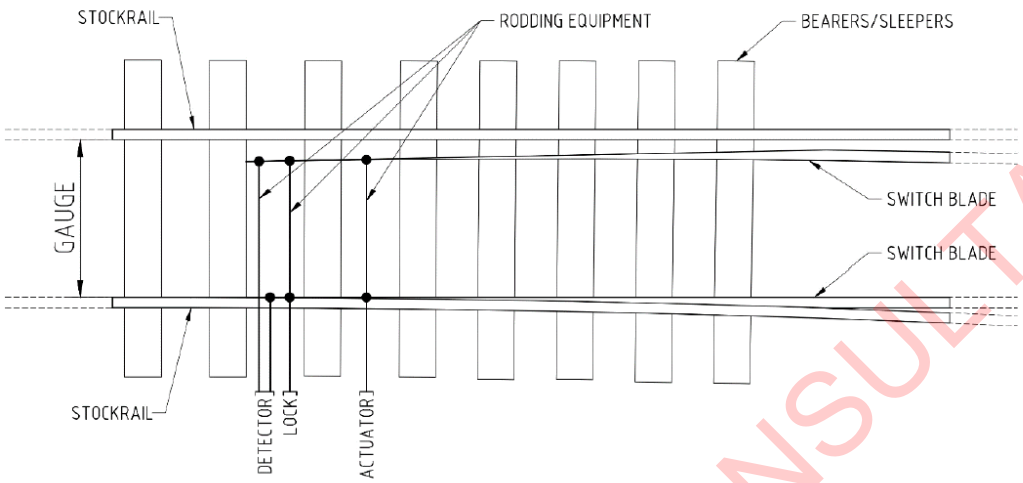

Figure 1 Points and Crossing System

1.3.14
points operating equipment
point machine or lever, actuator, rodding, detectors, brackets and fastenings that control and facilitate the movement of switch blades

1.3.15
reverse position
opposite position to normal

1.3.16
sleeper
bearers used to hold the rail in place at the correct gauge and to transmit loads through the ballast to the formation

1.3.17
switch blade
movable tapered track rail, the point of which is designed to fit against the stock rail

Note 1 to entry: The pointed end of the switch rail (i.e. switch blade) is referred to as the toe and the other end, the pivot end, as the heel.

1.3.18
tampability
characteristic of railway track that enables mechanical tamping to effectively compact ballast beneath sleepers, allowing track geometry to be restored and maintained within acceptable limits

1.3.19
toe
machine end of a switch at which the turning out movement commences

1.3.20
track circuit
circuit that supports both current and audio communications through the rails and used to detect the presence of trains

Note 1 to entry: Track circuits are used in the operation and control of points and signalling equipment.

1.3.21
track support
medium that transmits the vertical, longitudinal and lateral forces from the track to the formation

1.3.22
trailable
characteristic of points and crossing systems that allows a trailing movement to pass through when the points are set against that movement, such that derailment is avoided and any resulting damage is within acceptable limits

1.3.23
trail-proof
points and crossings systems designed to protect against permanent damage when a trailing movement against the intended move occurs through the points

1.3.24
V crossing
crossing that comprises a nose (crossing point) and two wing rails

Note 1 to entry:

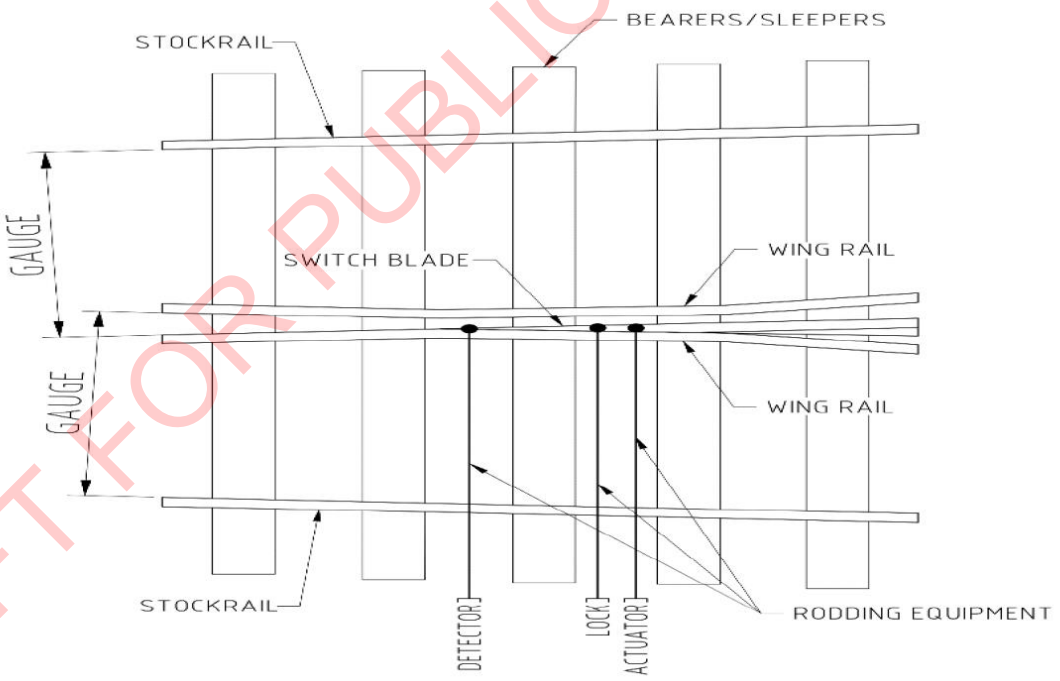

Figure 2 V crossing (a.k.a. swingnose)

General rail industry terms and definitions are maintained in the ARISO Glossary. Refer to:
https://www.ariso.org.au/glossary/

Section 2 Primary requirements

2.1 Points and crossing systems description

Points and crossings systems shall be designed and arranged to permit rail traffic to travel over converging or diverging routes at the same level.

The points and crossing system can be defined in terms of five (5) major components:

(a) Track – Providing the structure along which rail traffic travels and by which it is guided.

(b) Track Support – Providing the interface between the track and the formation.

(c) Actuator – Providing the necessary movement to the switch blades to permit the track to be set for the required route.

(d) Lock – Providing means to secure the switch blades in the route position selected.

(e) Detector – Providing the necessary feedback on the position of the switch blades to indicate they are in the correct position to allow rail traffic to be safely routed through the points and crossing system.

2.2 Safety functions

Points and crossing systems shall be designed and installed to provide the following safety functions:

(a) Guiding and supporting rail traffic as part of the track system and withstanding their mass and speed.

(b) Moving the switch blades to the position required by the operator.

(c) Locking the switch blades relative to the stock rails or wing rails so that they do not move unless commanded.

(d) Providing accurate indication that the switch blades is secured within the safe limits for the passage of rail traffic.

(e) Not change position during the passage of rail traffic.

(f) Prevention of conflicting commands, so that normal and reverse operations cannot occur simultaneously under any mode of operation, including interlocked and manual control.

2.3 Sequence

The operation of points and crossings shall achieve the correct and verified position of the switch blades and follow the applicable sequence of operation for the means of actuation.

The sequence of operation of points or crossings can vary between means of actuation. In general, the sequence should be as follows:

(a) Unlock the switch blades.

(b) Move the switch blades.

(c) Lock the switch blades.

The correct position of the switch blades shall be achieved and verified, noting that unlocking and locking of switch blades is not always required as part of the operating sequence. In yards and sidings for unsignalled routes, points and crossings systems can operate without unlocking and locking of the switch blades.

2.4 Interruptions to sequence

The points and crossing system shall be designed so that movement of the switch blades can be stopped, reversed, or obstructed at any stage in the sequence of operation without exceeding the defined damage threshold and without degradation of the specified performance metrics of the system, the track, or the track support.

Commentary C2.4

Damage threshold refers to the limit at which permanent deformation, fracture, loss of function, or non-compliance with design tolerances may occur in any component of the points and crossing system or its supporting infrastructure.

Performance metrics describe the functional and geometric criteria used to assess system integrity and operability. These may include switch blade alignment, actuation force and travel, locking and detection performance, and the ability of the system to remain within defined tolerances and serviceability limits following an obstruction event.

2.5 Switch actuator

The actuator shall provide consistent force and movement to configure the switch blades to the position required for the intended route. It shall achieve and maintain that position under all specified operating conditions, without exceeding the defined damage threshold and while maintaining the specified performance metrics of the points and crossing system.

Commentary *C2.5-1*

For the purposes of this requirement, consistent means delivery of force and movement in a repeatable and predictable manner without unacceptable variation affecting switch blade positioning, timing, or detection.

Commentary *C2.5-2*

Performance metrics describe the functional and geometric criteria used to assess system integrity and operability. These may include actuation force capability, stroke and travel consistency, switch blade positioning and alignment, locking and detection performance, and the ability to maintain compliance with defined tolerances and serviceability requirements over time.

2.6 Switch position detection

For points and crossings that rely on detection for safe operation, switch position detectors shall verify the position of the switch blade or blades relative to the associated stock or wing rails. This confirms that the points are correctly set and secured for the intended route before rail traffic proceeds.

The switch position detector shall:

(a) monitor the position of the switch blades relative to the stock or wing rails and indicate a safe position only when the blades are within specified tolerance of the fully closed and locked position; and

(b) not indicate as safe for the passage of rail traffic in the intended route unless the distance between the switch blades and stock rails or wing rails on the closed side at the toe of switch is within the tolerances as prescribed by the RIM.

There shall be no common-mode failure between the switch position detector and the actuator that could cause a correct switch blade position to be indicated when the actuator has not moved the switch blades to the required position.

The detection system, particularly the interface with the switch blades, shall be designed to prevent false indications resulting from rotation or deformation of the switch blades, or from incorrect fitment between the switch blades and the stock rail.

2.7 Switch lock

Where points and crossings systems are required to be locked for the safe passage of rail traffic, the switch lock shall hold the switch blades in the position required for the intended route such that movement is prevented under all specified operational loads and conditions, and the blades remain within specified positional tolerances without loss of locking integrity. The switch lock shall:

(a) always constrain the switch blades relative to the stock rails or wing rails when in the required position, unless commanded to unlock by an authorized command;

(b) remain effective during all normal operating conditions or power failure conditions unless commanded to unlock by an authorized command; and

(c) not engage unless the distance between the switch blade and stockrail or wing rail is within the tolerances as prescribed by the RIM.

There shall be no single failure mode which could cause the locking function to fail whilst maintaining locked detection.

2.8 Switch lock detection

Where fitted, locking mechanisms shall be detected as either locked or unlocked.

Confirmation of the switch lock shall not be possible unless the lock is fully engaged in accordance with the tolerances prescribed by the RIM.

2.9 Trailable crossing systems

Where a points and crossings system is trailable, it shall allow movement from the normal to the reverse position through the passage of rail traffic in the trailing direction.

The points and crossing system shall maintain all movable track components (e.g., switch blades) in the correct position during the passage of rail traffic in the facing direction.

Trailable points and crossing systems shall have the capability to restore the switch blades to the normal position following the passage of rail traffic in the trailing direction.

Trailable points without a facing point lock shall maintain sufficient closing force to hold the switch blades in the normal position and be effective during facing movements at speeds up to the maximum approved facing speed for which the points are designed.

Trail-proof points shall be installed where protection is required against permanent damage arising from a trailing movement contrary to the intended movement or route.

Trail-proof points shall not be required to restore the switch blades to the normal position following a trailing movement.

Section 3 Interface to track

3.1 Connections to switch and stockrail

Connections to the switch blades and stock rails or wing rails shall be designed to accommodate longitudinal, vertical and lateral track movements, as described in Clause 3.6.

Structural integrity of all connections shall be assessed with regard to:

(a) the actuator design and characteristics;

(b) permissible drive forces;

(c) operating equipment configuration; and

(d) connection methods (e.g., pins, bolts).

These factors shall ensure that failures affecting critical safety and operational functions remain within defined safety integrity, reliability, and performance limits under normal and reasonably foreseeable fault conditions, as specified by the RIM. The stock rail, switch blade and rodding arrangement shall include adjustment features that allow maintenance personnel to set and maintain the points and crossing system in accordance with operational and maintenance requirements.

The design of all connections shall address the rail operating environment, including vibration, impact loads, track maintenance activities, environmental conditions, and the geographical location of the system

3.2 Connections to the sleepers or slab track

Fastenings shall be used to secure rails to sleepers or slab track. Fastenings shall comprise clips, screws or spikes, in combination with pads and/or sleeper plates.

Fastenings shall limit longitudinal movement of the rails relative to the sleepers or slab track to within the tolerances prescribed by the RIM.

Fastenings shall limit lateral movement between rails (i.e. track gauge) to within the tolerances prescribed by the RIM.

Where sleepers or bearers are used to support points operating equipment (e.g., in-bearer systems), their position relative to the switch rails and stock rails shall be maintained within tolerances prescribed by the RIM.

Where required, bearers and/or fastening assemblies shall:

(a) provide electrical insulation between running rails;

(b) enable correct operation of track circuits; and

(c) prevent unintended current leakage.

3.3 Track gauge

The track gauge and associated tolerances across the full extent of the points and crossing system, including the adjoining plain line track, shall comply with the relevant infrastructure standards applicable to the track structure.

3.4 Flangeway clearance

When the points and crossing system is in either the normal or reverse position, the open switch blade shall provide the specified minimum flange clearance throughout its entire length.

When the points and crossing system is in either the normal or reverse position, the open switch blade shall provide an adequate gap for wheel flanges throughout its entire length.

The design of points and crossing systems shall provide adequate flangeway clearances to accommodate the wheel flanges of all rail vehicles authorized to operate over the route.

The design shall account for the cumulative effects of applicable tolerances, including:

(a) track gauge;
(b) switch blade fit;
(c) general wear;
(d) installation tolerances;
(e) wheel back-to-back tolerances; and
(f) flange wear and operational movement.

The minimum flangeway clearance prescribed by the RIM shall be maintained throughout the full extent of the points and crossing system.

Where necessary, supplementary drives and/or supplementary detection shall be installed to achieve and assure compliance with this requirement.

3.5 Checkrail clearance

Check rails shall be provided to prevent the risk of rail traffic wheels taking the wrong path at open-throat crossings.

Check rails shall be positioned to provide a parallel flangeway sufficient to allow the passage of rail traffic wheels while providing effective lateral support to the back of the wheel flange.

At swing nose crossings, switch blade gap tolerances, detection and locking arrangements shall be compatible with the range of wheel flange profiles authorized for operation. Including worn conditions, to ensure safe guidance of rail traffic through the points and crossing system.

3.6 Accommodation of track movement

The points and crossing system shall be designed to accommodate static and dynamic longitudinal movement of the switch blades, stock rails and/or wing rails up to the maximum limits prescribed by the RIM.

The points and crossing system shall be designed to accommodate vertical movement of the switch blades, stock rails and/or wing rails up to the maximum limits prescribed by the RIM, including movement induced by train loading and operational deflection.

The points and crossing system shall be designed to accommodate lateral movement of the switch blades, stock rails and/or wing rails up to the maximum limits prescribed by the RIM, including dynamic lateral movement caused by rail traffic, without compromising fit, detection, locking or safe operation.

3.7 Switch and stockrail fit

Switch blades and stock rails or wing rails shall be designed and manufactured to ensure correct fit, within tolerances prescribed by the RIM, along the entire transition from the switch blade to the running rail when in the closed position.

The design of the switch blades and stock rails or wing rails shall also consider the characteristics of the actuator, including permissible drive forces and locking arrangements, particularly vertical loading applied to the switch blades, to maintain correct fit throughout points or crossing operation.

The interface between the switch blades and stock rails or wing rails should be designed to minimize the risk of rail twist, longitudinal displacement between the switch blade and stock rail (creep) and lifting of the switch blade under normal operating conditions.

To mitigate the risk of switch blade twist, additional mechanical measures should be provided to ensure correct fit and ongoing stability of the switch blades.

3.8 Lifting of switch blade

Track and point operating equipment shall be designed to prevent switch blades from lifting into the wheel path during the passage of rail traffic by limiting vertical displacement to within defined tolerances under all specified loading and operating conditions, with additional mechanical measures provided where required. Structure gauge clearance

The points and crossings system shall be designed and configured to ensure that all components, including rail, switch blades, crossings, operating equipment, fastenings, and associated fittings, do not infringe the structure gauge as prescribed by the RIM under all operating conditions.

The design of points and crossings systems shall include consideration of normal and reverse positions, dynamic movement during operation, applicable construction and wear tolerances, thermal effects and maintenance conditions, to ensure safe and unobstructed passage of rail traffic.

3.9 Permissible drive forces

The force applied by the actuator shall be limited so that, in the presence of any obstruction with a dimension equal to or greater than the maximum detection distance on the closed side, elastic deformation of the switch blade or blades does not occur.

Under these conditions, the switch position detector shall not indicate a safe condition unless the switch blade or blades are within the detection tolerances specified in Clause 2.6.

Section 4 Interface to track support

4.1 Track support stability

The points and crossing system shall be designed and installed with a suitable track support system, this includes items such as the following:

(a) Formation.

(b) Ballast.

(c) Sleepers.

(d) Slab track.

(e) Drainage.

Whether alone or in combination, the track support system shall be designed to maintain the vertical and horizontal alignment of the track within the construction and operational tolerances prescribed by the RIM.

Commentary *C4.1*

A suitable track support system is one that provides adequate strength, stiffness, stability, and durability to support the points and crossing system under all specified operating conditions. This includes maintaining track geometry, distributing loads to the formation, resisting vertical and lateral movement, and ensuring the ongoing performance of switch and crossing components within defined tolerances over the design life.

4.2 Track support tampability

The points and crossing system should be designed to minimize, as far as practicable, interference to mechanized ballast consolidation maintenance process (e.g., tamping, ballast cleaners and regulators).

The points and crossings system should be capable of accommodating the use of mechanized ballast consolidation maintenance machines without requiring removal of components or risking damage to the system.

Section 5 Interface with personnel

5.1 General

The points and crossings system shall be designed to comply with all applicable legislative, regulatory and statutory requirements relating to construction, operation and maintenance.

The points and crossing system shall be designed such that hazards to personnel undertaking installation, testing, commissioning, inspection, maintenance, local operation, manual operation, and decommissioning are identified and controlled, and residual risks are reduced to a level that complies with defined safety acceptance criteria. The design of the points and crossings system shall support performance across its full life cycle, from installation to decommissioning, such that risks to personnel, rolling stock, and infrastructure do not exceed defined safety acceptance criteria under normal and reasonably foreseeable conditions. The system shall reliably perform its intended functions within performance metrics and tolerances over its design life. These activities shall be facilitated in a manner that ensures interactions with personnel do not compromise compliance with the requirements of this document.

Human performance factors and limitations shall be considered in the design of the points and crossings system to support the safe execution of activities across the system life cycle, from installation through to decommissioning.

Comprehensive training, appropriate to the specific points and crossings system, shall be provided to personnel to support the safe execution of activities across the system life cycle, from installation through to decommissioning.

5.2 Installation and renewal

Installation of the points and crossing system shall be undertaken in accordance with designs authorized for use by the RIM.

Where applicable, the design shall incorporate provisions for safe lifting without damage to the equipment or risk to personnel, such as the inclusion of lifting points or hand-holds.

Lifting provisions should enable components of the points and crossing system to be safely manipulated on site with minimal manual effort. Any items requiring special handling equipment shall be clearly identified in the relevant documentation (i.e. installation or maintenance manuals), including details of the equipment and tools required.

Installation procedures shall be designed to minimize risks associated with:

(a) electrocution;
(b) pinch points;
(c) tripping hazards;
(d) slipping hazards, including those arising from oil or lubricant spills; and
(e) equipment damage.

The points and crossing system shall be designed to minimize the risk of incorrect assembly and be supported by clear assembly drawings, instructions and/or manuals.

During planning for switch and stock rail replacement, preference should be given to full-set replacements rather than piecemeal replacement of individual components.

The design of the points and crossing system should provide for the alignment at installation to be clearly defined and recorded, enabling subsequent maintenance activities to replicate the original design configuration.

Where there is a period between completion of installation and the commencement of testing and commissioning, the points and crossings system shall be capable of being placed in a condition that is safe for the passage of rail traffic. The methods and procedures for achieving this shall be prescribed by the RIM.

5.3 Testing and commissioning

Test and commissioning requirements shall be implemented in accordance with the requirements of AS 7716:2017 and AS 7717:2016.

Where practical, the points and crossings system should be assembled and tested at an off-site facility prior to installation on site.

Care should be taken to minimize testing procedures, which involve the risk of electrocution, pinch points or tripping.

Prior to entrance into service, the points and crossing system components shall be tested for compliance with the requirements as prescribed by the RIM.

As a minimum, these requirements shall include:

(a) test and acceptance that the actuator complies with the requirements in Clause 2.5;

(b) test and acceptance that the detection (if fitted), complies with the requirements in Clause 2.6;

(c) test and acceptance that the lock (if fitted), complies with the requirements in Clause 2.7 and Clause 2.8;

(d) test and acceptance that the track gauge complies with the requirements in Clause 3.3;

(e) test and acceptance that the flangeway clearance complies with the requirements in Clause 3.4;

(f) test and acceptance that the checkrail clearance complies with the requirements in Clause 3.5; and

(g) where required, test and acceptance that the trailability complies with the requirements in Clause 2.9.

5.4 Inspection and maintenance

The points and crossings system shall be designed to accommodate commonly used track maintenance methods

The design of the points and crossing system should not inhibit or restrict the application of condition monitoring systems.

The design of the points and crossing system should consider eliminating or minimising the need for routine maintenance, this can include the use of rollers or other design features that reduce lubrication requirements.

Elements of the system, including in-bearer systems, that require scheduled inspection or maintenance shall be accessible.

The mass of modular, replaceable units within the points and crossing system should, where practicable, be limited to 15 kg or less. Where this is not achievable, provision shall be made for suitable lifting attachments, and safe work instructions are to be provided.

Maintenance procedures shall be designed to minimize risks associated with electrocution, pinch points and tripping hazards.

Sufficient clearances shall be provided to enable safe and efficient inspection and maintenance of the points and crossing system.

Examples of maintenance activities that the points and crossing system shall accommodate are:

(a) mechanized ballast consolidation (e.g., tamping machines, ballast cleaners and regulators);

(b) rail grinding;

(c) electric arc, flash butt and alumino-thermic welding; and

(d) points lubrication.

5.5 Local/manual operation

Where required by the RIM, the points and crossings system shall allow local or manual operation when normal operation is not possible and shall be operable by a single person at the point or crossing to the required position (e.g., normal or reverse).

Where local/manual operation is enabled, safety controls shall be implemented to manage the hazards associated with rail traffic approaching points under local/manual control.

Where reasonably practicable, the control and operational equipment for the local/manual operation shall be positioned so that:

(a) access to the local control equipment can be gained without exposure to the hazards of passing rail traffic or exposed electrical conductors beyond safe limits;

(b) it can be operated from a position of safety;

(c) the operator can observe the point or crossing whilst undertaking the local/manual operation; and

(d) the method of operation shall be such that there is no exposure to potential injury to the operator.

Within these constraints, the control equipment, including local releasing locks, shall be situated as close as to the point or crossing as practicable.

Consideration shall be given to human performance and human limitations when designing the local/manual operating equipment.

Where designed to be locked, the points and crossing system shall have provision to secure and lock the switch blades in the intended position.

The design of the points and crossing system shall not preclude the temporary attachment of manual locking equipment such as point clips and spikes.

The points and crossing system shall be fitted with signage that uniquely identifies each point or crossing end.

5.6 Decommissioning/removal

Standards and procedures shall be established and maintained by the RIM for the decommissioning, and if required, removal and disposal of the points and crossing system. The Standards shall, where appropriate, make provision for the following aspects:

(a) Maintaining the safe railway operations during and/or after decommissioning and/or removal and/or disposal.

(b) Ensuring that any decommissioned equipment remaining in track is clearly identified as such and is securely locked to prevent movement.

(c) Eliminating, as far as practicable, any public hazard associated with the decommissioned equipment, in both temporary and permanent conditions.

(d) Ensuring that the decommissioned equipment, if remaining in track, is inspected at the intervals as prescribed by the RIM.

(e) The assessment of signalling equipment to ensure that it is appropriately managed at the time of decommissioning.

Section 6 Interface with traction power systems

The points and crossing system shall be designed so that stray current leakage does not exceed the limits prescribed by the RIM under all operating and fault conditions, as verified by measurement using approved test methods. The design of the points and crossing system shall not prevent attachment to the track, or to equipment forming part of the traction power system, such as bonding cables and rail-to-earth insulation.

Where applicable, the points and crossing system shall be designed to ensure there is geometric compatibility with the overhead wire system as prescribed by the RIM.

Section 7 Interface to other track and signal equipment

7.1 Insulation requirements for track circuits

Where points and crossings systems are installed in track-circuited territory, electrical insulation between the running rails shall be provided and maintained in accordance with the requirements prescribed by the RIM.

This shall include insulation arrangements associated with rails, fastenings, switch blades, crossings, operating equipment and any other conductive components, so as not to compromise the correct operation, reliability or integrity of the track circuit under all operating and maintenance conditions.

7.2 Interface with track vacancy detection equipment

The points and crossing system shall accommodate methods of track vacancy detection such as axle counters and track circuits.

Any part of the points and crossing system shall not be able to interfere with track vacancy detection equipment in any way that could cause a false clear indication.

The design of the points and crossing system should consider co-ordinating the design of features such as insulated rail joints and bonding provisions, so they can be manufactured at the factory. This will reduce hazards from on-site installation.

7.3 Interface with other signalling and track equipment

The design of the points and crossing system shall not prevent attachment to the track of equipment that forms part of other signalling and track equipment interfaces.

Examples of other interfaces that the points and crossing system shall accommodate are:

(a) automatic warning system (AWS);
(b) train protection warning system (TPWS);
(c) automatic train protection (ATP);
(d) ETCS/ERTMS equipment such as balises;
(e) point machine;
(f) independent detector;
(g) rail lubricators;
(h) dragging equipment detectors; and
(i) cable containment.

7.4 Condition monitoring devices

Condition monitoring devices and equipment shall be considered as interfaces with the points and crossing system. The design, installation, operation and maintenance of such devices shall not adversely affect the safe movement, detection, locking or structural integrity of the points and crossing system. They shall also not impede inspection, maintenance or manual operation activities.

Provision for condition monitoring devices shall account for mechanical, electrical and environmental interfaces throughout the service life of the system.

Appendix A Hazard Register (Informative)

The following hazards have been sourced from the ARISO hazard register.

Hazard number	Hazard
6.2	Excessive noise
6.2.1	Track Failure and or Design Failure
6.2.1.2	Wheel impact
6.4	Operational hazards
6.4.1	Derailment and or Collision, Human Error, Track Failure and or Design Failure
6.4.1.2	Wheel impact
6.4.1.4	Harm to persons
6.5	Harm to persons
6.5.1	Derailment or Collision, Human Error, Track Failure, Design Failure, Organisational SMS Failure and or Environmental Impact
6.5.1.5	Trips and falls
6.5.1.7	Manual handling
6.5.1.9	Electric shock
6.5.1.16	Rotating and moving parts
6.5.1.17	The large mass, shape or size of objects
6.5.1.19	Poor lifting technique
6.5.1.20	Excessive lifting movement range
6.6	Harm to track & civil infrastructure by rolling stock
6.6.1	Derailment or Collision, Human Error, Health Failure and or Design Failure
6.6.1.3	Hitting a wayside structure
6.6.1.4	Derailment
6.6.1.5	Operational failure
6.6.1.6	Track failure
6.6.1.11	Wheel flange striking switches, check rails & crossings and axle counters
6.6.1.12	Wheels climbing rail heads
6.6.1.13	Hollow wheels and false flanges striking turnout components
6.8	Harm to Track & Civil infrastructure during construction
6.8.1	Human Error, Health Failure and or Organizational SMS Failure

Hazard number	Hazard
6.8.1.4	Damage by plant and equipment
6.8.1.5	Derailment
6.8.1.24	Track components
6.8.1.25	Insufficient ballast packing
6.8.1.27	Materials damage by mis handling
6.8.1.28	Assemblies and materials not being installed correctly
6.8.1.30	Insufficient consolidation
6.9	Harm to Track & Civil infrastructure during operation and maintenance
6.9.1	Human Error, Track Obstructions, Health Failure, Design Failure, Organisational SMS Failure, Security Breaches and or Environmental Impact
6.9.1.4	Harm to track & civil infrastructure by rolling stock
6.1	Path infringement
6.10.1.19	Derailment
6.14	Derailment
6.14.1	Collision, Human Error, Track Failure, Track Obstructions, Health and or Design Failure
6.14.1.2	Track failure
6.14.1.3	Track irregularity
6.14.1.4	Derailment at turnouts
6.14.1.27	Turnouts being operated incorrectly
6.14.1.28	Turnouts being faulty
6.15	Track failure
6.15.1	Derailment or Collision, Human Error, Track Obstructions, Health and or Design Failure
6.15.1.1	Track failure
6.15.1.3	Gauge spread
6.15.1.17	Failed, missing or inadequate rail supports causing gauge spread
6.15.1.63	Poor lateral track restraint
6.15.1.65	Rail fastenings being insufficiently tight
6.16	Objects on track
6.16.1	Human Error, Security Breaches, Loads not Secure and or Vandalism
6.16.1.12	Wayside structures
6.18	Falls

Hazard number	Hazard
6.18.1	Derailment or Collision, Track Failure, Track Obstructions, Health Failure, Design Failure and or Loads Not Secure
6.22	Persons being crushed
6.22.1	Derailment or Collision, Human Error, Track Failure, Track Obstructions, Health Failure, Design Failures, Security Breaches, Loads not Secure, and or Vandalism
6.22.1.1	Objects being lifted
6.22.1.5	Rotating machinery
6.22.1.7	Body parts being pinched in mechanisms
6.28	Track & civil infrastructure design failure
6.28.1	Human Error and or Organizational SMS Failure
6.28.1.5	Work not being completed as per design specifications
6.28.1.6	Sub-standard execution of construction tasks.
6.28.1.7	Commissioning exercises failing to detect unacceptable risk situations
9.6	Field equipment and or enclosures failures (Design)
9.6.1	Human Error, Health Failure, Organisational SMS Failure, Environment Failure, Security Breach and Vandalism.
9.6.1.1	Equipment not operating as intended and/or equipment failure
9.6.1.3	Equipment not interfacing with existing equipment/design
9.6.1.4	Equipment not operating as intended
9.8	Points and or release failure (Design)
9.8.1	Human Error, Track Obstruction, Health Failure, Organisational SMS Failure, Environment Failure, Security Breach, and Vandalism.
9.8.1.1	Points detection being inconclusive or incorrect (e.g., N&R showing together or normal showing for reverse and reverse for normal (consistent through set))
9.8.1.3	Positions of point machines for manual operation or maintenance access
9.8.1.5	Point layout being too complex for manual working in degraded mode
9.8.1.6	Lack of supplementary detection and back drive when it is needed, to assure switch position along the length. (Derailment hazard (includes swing nose))
9.8.1.7	Persons being hit by hand cranks while disconnecting EOL key
9.8.1.8	Ability to release points or ground frame using unauthorized keys
9.21	Points and or release failure (Construction)
9.21.1	Design Failure, Human Error, Track Obstruction, Health Failure, Organisational SMS Failure, Environment Failure, Security Breach, and Vandalism.

Hazard number	Hazard
9.21.1.1	Points being open outside tolerance when detected as normal or reverse
9.21.1.2	Points not moving from normal to reverse
9.21.1.3	Manual handling of points equipment to get to sites leading to physical injury or damage to equipment
9.21.1.4	injury caused by manual operation of point machines
9.21.1.5	Cables crossing tracks leading to trip hazards or electrical failure
9.21.1.6	Equipment being at risk of damage by track machines (e.g., tamper)
9.3	Points and or release failure (Test and Commission)
9.30.1	Derailment / Collision, Design Failure, Human Error, Track Failure, Track Obstructions, Health Failure, Organisational SMS Failure, Environment Failure, Security Breach, Train loads not secure, Vandalism and or Threat.
9.30.1.1	Body parts being caught between switch and stock, or in machine mechanisms whilst testing points on power
9.30.1.2	Electrical shocks hazard testing circuits
9.30.1.3	Slips, trips and falls over mechanical parts
9.30.1.4	Points not operating properly due to lack of thorough testing, causing derailment
9.30.1.5	Points installed and tested in isolation but not commissioned into the system (i.e. not visible to signaller) and being incorrectly positioned or moved by intervention, prior to handing control back to traffic)
9.30.1.6	Points parts being installed and left potentially free to move by not being positioned correctly and secured or not being secured
9.30.1.7	The ability to release points using a key needing to be allowed or authorized.
9.38	Field equipment and or enclosure failure (Operations)
9.38.1	Derailment / Collision, Design Failure, Human Error, Track Failure, Track Obstructions, Health Failure, Organisational SMS Failure, Environment Failure, Security Breach, Train loads not secure, Vandalism and or Threat.
9.38.1.3	Signal equipment struck by train or part of train (including load)
9.39	Level crossing failure (Operations)
9.39.1	Derailment / Collision, Design Failure, Human Error, Track Failure, Track Obstructions, Health Failure, Organisational SMS Failure, Environment Failure, Security Breach, Train loads not secure, Vandalism and or Threat.
9.4	Points and or release failure (Operations)
9.40.1	Derailment / Collision, Design Failure, Human Error, Track Failure, Track Obstructions, Health Failure, Organisational SMS Failure, Environment Failure, Security Breach, Train loads not secure, Vandalism and or Threat

Hazard number	Hazard
9.40.1.2	Points operating to the incorrect lay, under emergency and/or manual operation, leading to derailment or run-through
9.48	Field equipment and or enclosures failure (Maintenance)
9.48.1	Design Failure, Human Error, Organisational SMS Failure, Environment Failure, Security Breach and Vandalism.
9.48.1.2	Signal equipment sharp edge or similar OHS issue
9.49	Level crossing failure (Maintenance)
9.49.1	Design Failure, Human Error, Organisational SMS Failure, Environment Failure, Security Breach and Vandalism.
9.5	Points and or release failure (Maintenance)
9.50.1	Design Failure, Human Error, Organisational SMS Failure, Environment Failure, Security Breach and Vandalism.
9.50.1.1	Points blades remain open with Detection made and FPL (facing point lock) locked - wrong side failure - leading to accidents
9.50.1.2	Points failure leading to right side failure
9.6	Points and or release failure (De-commission)
9.60.1	Derailment / Collision, Design Failure, Human Error, Track Failure, Environment Failure, Security Breach, Vandalism and or Threat.
9.60.1.2	Decommissioned equipment not being managed until it is removed resulting in accidents -Unsecured turnout switch blades

Bibliography (Informative)

The following referenced documents are used by this Standard for information only:

- AS 1085.21:2020, *Railway track material Part 21: Turnouts, switches and crossings*
- AS 7635:2023, *Track Geometry*
- AS 7638:2013, *Railway Earthworks*
- AS 7642:2022, *Railway Infrastructure – Turnouts and Other Special Trackworks*
- AS 7643:2018, *Track Stability*