

Inspection of Points and Crossings: Procedure

ETE-03-01

Applicability

ARTC Network Wide SMS

Publication Requirement

Internal / External

Primary Source

ARTC NSW Standards LEP 01, ETE-03-02

Document Status

Version #	Date Reviewed	Prepared by	Reviewed by	Endorsed	Approved
2.2	07 Feb 20	Standards	Stakeholders	Manager Standards	A/General Manager Technical Standards 04/03/2020

Amendment Record

Amendment Version #	Date Reviewed	Clause	Description of Amendment
2.0	07 Jan 14		Consolidation of ETE-03-01 (v1.1), and ETE-03-02 into 1 document for application Network wide. Inclusion of additional inspection information for Swing-Nose crossings and tangential turnouts.
2.1	07 Apr 17	All	Rebrand General update and rewrite following review of P&C inspection scope and methods.
2.2	07 Feb 20	6 & 7	Change to clause 7, to include electronic forms on the Asset Management System as an appropriate way to record the results of a detailed inspection of points and crossings. Also added definition of rail play.

© Australian Rail Track Corporation Limited (ARTC)

Disclaimer

This document has been prepared by ARTC for internal use and may not be relied on by any other party without ARTC's prior written consent. Use of this document shall be subject to the terms of the relevant contract with ARTC.

ARTC and its employees shall have no liability to unauthorised users of the information for any loss, damage, cost or expense incurred or arising by reason of an unauthorised user using or relying upon the information in this document, whether caused by error, negligence, omission or misrepresentation in this document.

This document is uncontrolled when printed.

Authorised users of this document should visit ARTC's intranet or extranet (www.artc.com.au) to access the latest version of this document.

Table of Contents

Table of Contents	2
1 Introduction.....	4
1.1 Background	4
1.2 Purpose	5
1.3 Scope	5
1.4 Procedure Owner	5
1.5 Responsibilities	5
1.6 Subordinate Documents.....	5
1.7 Reference Documents	6
1.8 Tools and Equipment	6
1.9 Definitions.....	6
2 P&C General Inspection	6
2.1 General.....	7
2.2 Points area	7
2.3 Crossing area	7
3 P&C Detailed Inspection	8
3.1 Detailed Inspection of Points.....	8
3.2 Detailed Inspection of Housed Points	10
3.3 Detailed Inspection of Fixed Crossings and Checkrails.....	10
3.4 Detailed Inspection of Swing Nose Crossings	11
3.4.1 <i>General</i>	11
3.4.2 <i>PRE crossings</i>	12
3.4.3 <i>VAE crossings</i>	12
3.4.4 <i>Martinus crossings</i>	13
3.4.5 <i>Vossloh Cogifer crossings</i>	13
3.5 Additional Aspects of Tangential Turnouts	13
3.5.1 <i>PRE turnouts</i>	13
3.5.2 <i>TKL turnouts</i>	13
3.5.3 <i>Vossloh Cogifer turnouts</i>	13
3.5.4 <i>VAE Turnouts</i>	13
3.5.5 <i>Martinus Turnouts</i>	14

4 Catchpoints, Diamonds, and Slips14

5 Dual Gauge P&C14

6 Track Geometry14

7 Recording and Assessment15

8 Attachments.....16

8.1 Figures16

8.2 Photos16

Mandatory requirements also exist in other documents.

Where alternative interpretations occur, the Manager Standards shall be informed so the ambiguity can be removed. Pending removal of the ambiguity the interpretation with the safest outcome shall be adopted.

1 Introduction

1.1 Background

The variety of Points and Crossing (P&C) equipment in use on the ARTC railway network is wide. Each type of P&C assembly from each manufacturer has different components, different arrangements, and different fastening systems. It is not practical in this procedure to identify the peculiarities of each component, arrangement, and fastener, supplied by all P&C manufacturers.

For information about spare parts, and the assembly and disassembly of specific equipment the original equipment manufacturer (OEM) operating and maintenance manuals, and plans, should be referenced.

The function of all P&C assemblies is common, i.e. to provide a safe, smooth, and low friction pathway for the transition of rolling stock from one track to another track, under given operating parameters. The purpose of P&C track inspection is;

- To ensure safety by checking on the integrity of the various components, their fit and function together to provide safe passage.
- To ensure there are no obstacles to smooth passage including obstructions, impacts to switch tips and crossing noses, and track geometry.
- To ensure low friction by checking that there is not abnormal wear and tear on rails and other components.
- To identify defective components and characteristics or accelerating condition deterioration so that maintenance interventions can be planned.

The ARTC Signalling standards prescribe signalling inspections for certain aspects of interlocked P&C operating mechanisms. These aspects are not included in the ARTC Track and Civil Code of Practice (CoP) and routine scheduled inspections. However when a signalling defect or condition of concern is observed during a Track & Civil P&C inspection it shall be reported to the signalling maintainer and protective action taken if appropriate. These aspects include:

- Switch open throw dimension
- Open switch rail throat dimension
- Closed switch rail toe/stock rail gap dimension
- The 'fit' of the switches relative to the stock rails
- Spreader bar and drive rod condition, fastenings, and lubrication
- Switch slide plate lubrication

The Signalling Technical Maintenance Plan requires operation of the points during scheduled inspections to observe switch movement, and switch/stock rail fit.

1.2 Purpose

The purpose of this procedure is to provide guidance on the performance of General and Detailed inspection tasks for Points and Crossing (P&C) assemblies including:

- Turnouts
- Catchpoints
- Diamonds
- Slips

1.3 Scope

The scope of General, and Detailed inspection of P&C assemblies is detailed in CoP Section 3 as well as the default responses for defects found.

The minimum frequency of routine scheduled General and Detailed inspection of P&C assemblies is detailed in the CoP and *ETE-00-03 Civil Technical Maintenance Plan (TMP)*.

Additional inspection scope or increased frequencies may be authorised by local maintenance management in response to identified infrastructure condition or accelerated deterioration rates.

In the event of any discrepancy between the OEM documentation and ARTC standards regarding inspection tasks and frequencies, and defect responses, the ARTC standards take precedence.

The inspection of the operation of manually operated (non-interlocked) points is included in the Track & Civil P&C general and detailed inspections including: Thornley levers; Ball levers; Throw-over levers; and similar mechanisms.

1.4 Procedure Owner

The Manager Standards is the Procedure Owner and is the initial point of contact for all queries relating to this procedure.

1.5 Responsibilities

The Track Inspector (see section 1.9 Definitions) is responsible for the completion and reporting of General and Detailed P&C inspections in compliance with this procedure and the CoP.

The Area Manager (or equivalent) is responsible for the scheduling of inspections in compliance with the TMP, supervising the inspection performance and management of defects found.

The Corridor Manager (or equivalent) is responsible for oversight of the inspection process and for the adequate resourcing of the Area Manager (or equivalent) with personnel, skills, tools and equipment.

1.6 Subordinate Documents

The following documents are subordinate to this procedure:

- Form ETE0301F-01 Turnout Detailed Inspection
- Form ETE0301F-01a Turnout Detailed Inspection – Housed Points
- Form ETE0301F-02 Diamond Detailed Inspection
- Form ETE0301F-03 Swing Nose Crossing Detailed Inspection

- Form ETE0301F-04 Manual Recording of Gauge, Play, and Superelevation in Points & Crossings
- Form ETE0301F-05 Dual Gauge Turnout Inspection - Detailed

1.7 Reference Documents

The following documents reference, or are referenced by, this procedure:

- ARTC Track and Civil Code of Practice, Section 3
- ETE-00-03 Track and Civil Technical Maintenance Plan

1.8 Tools and Equipment

The standard tools, calibrated as required, used in the measurement of required dimensions associated with P&C detailed inspection are:

- Tape Measure
- Steel Rule
- Vernier Calipers
- Combination board

Other tools and gauges, e.g. Switch Tip Profile Go/NoGo Gauge, may be used at the discretion of the Area Manager (or equivalent).

1.9 Definitions

The following terms and acronyms are used within this document:

Term or acronym	Description
ARTC	Australian Rail Track Corporation Ltd.
CoP	ARTC Track and Civil Code of Practice
OEM	Original Equipment Manufacturer
P&C	Points and Crossing assemblies
Track Inspector	A person with required competencies to undertake routine General and Detailed P&C inspections
T&C	Track and Civil
TMP	Track and Civil Technical Maintenance Plan

2 P&C General Inspection

The P&C General inspection is a visual walking inspection with measurements taken where appropriate to confirm a track defect. Interlocked points do not need to be thrown (operated) to perform a General inspection unless a defect is suspected or when necessary to observe otherwise hidden equipment.

Defects found are reported on the Defects Found Report Form EGP1001F-01 and are to be managed in accordance with the ARTC T&C CoP Section 3.3 Inspection and Assessment.

Track Inspectors should keep a lookout for defects and conditions that may affect the integrity of the track structure or ability to guide rolling stock correctly, including the following components or aspects identified in the CoP:

2.1 General

- Damage to any component that does not allow it to perform its intended function including switch operating equipment
- Track geometry defects
- Wheel marks which indicate incorrect wheel/rail interaction
- Broken rails including: crossings; switch blades; stock, check, and closure rails
- Rail creep
- Rail pulling including at the point and splice rails of fabricated crossings
- Rail condition including visual rail and weld defects and rail wear
- Rail joint condition including bolts
- Bearer condition
- Ballast condition and profile

2.2 Points area

- Gauge at the toe of the switch rail
- Switch/Stock rail fit and wear including gauge face angle
- Rolling Contact Fatigue (RCF), premature lipping, or metal flow.
- Alignment of switch rails
- Fit and condition of switch stops
- Switch rail toe and rail head damage
- Switch support on chairs and baseplates
- Heel/Creep block condition
- Rail chair and baseplate condition
- Damaged, missing, or ineffective fastenings
- Hand operated lever operation

2.3 Crossing area

- Gauge at nose
- Checkrail effectiveness
- Wear on the crossing nose and wing rails
- Rolling Contact Fatigue (RCF), premature lipping, or metal flow.
- Flangeway clearances, obstructions, and depth

- Crossing nose condition and wear
- Crossing cracks
- Broken or cracked crossing spacer blocks and bolts
- Condition of check rails, spacers, and bolts
- Swing nose crossing bearing on slide plates
- Swing nose rails and rail stops, including rail stop clearance
- Swing nose fit against wing rail
- Damaged, missing, or ineffective fastenings
- Condition of baseplates and chairs

3 P&C Detailed Inspection

The items that should be inspected during scheduled Detailed inspections are as described for the General inspection above. A Detailed inspection of P&C requires both visual inspection and measurement of specific dimensions or aspects detailed in the CoP with results recorded on the appropriate report form (see Section 7).

Defects found are reported on the Defects Found Report Form EGP1001F-01 and are managed in accordance with the ARTC T&C CoP Section 3.3 Inspection and Assessment.

Interlocked points do not need to be thrown (operated) to perform a Detailed inspection unless a defect is suspected or when necessary to observe otherwise hidden equipment.

3.1 Detailed Inspection of Points

- On manually controlled points (Thornley levers, ball levers, throw-over levers), the tension of the switch operating lever should be checked by inserting a 400mm bar between the stockrail and switch at a point just beyond separation of the switch and stockrail. The bar should be levered against the switch in an attempt to prise it open. The control lever should produce enough tension to make it difficult to open the switch. If the switch opens easily there will be insufficient tension available to keep the switch closed under traffic. If this is the case, the condition must be noted on the inspection form and the appropriate action taken immediately. Both switches must be tested in this manner. (See Photo 1).
- The track gauge at the switch tip is to be measured and recorded.
- The point of the switch tips (toes) should be smooth and sharp, not blunt or chipped. The condition and profile of the switch tip is to be observed and any abnormal conditions measured and/or reported.
 - The switch height on non-tangential, non-undercut switches should be ≥ 13 mm below the running surface of the stock rail. Tangential asymmetric or undercut switches should not sit high of the machined section of stock rail.
 - The exposed width of non-tangential switch tips at point of first wheel contact should be ≤ 4 mm. Any signs of wheel impact on the switch tip are to be reported. (Note that a straight edge is needed to measure the exposed switch tip width where joggled stock rails and heavy duty switches are used.)

- The switch tip face slope should be $\leq 18^\circ$ to the vertical (or the perpendicular to the plane of the bearer for superelevated track) which cannot be determined by eye or using simple tools. Any suspected flat switch tip face ($\geq 26^\circ$) should be reported for further assessment.
- Rolling contact fatigue (RCF) cracking and other surface defects on the gauge face of the switch blade can lead to sections of the rail head breaking out. See Photos 2 & 3. RCF and other surface defects shall be reported. Switch blade damage deeper than 19mm from the stock rail running surface and >100mm in length is to be measured and reported.
- Check for wear and metal flow on the stock rails and switch rails, particularly any “lipping” that may prevent the switch closing completely. See Photo 4.
- Check for any evidence of stock rail creep at the switches e.g. shiny marks in front of switch or on chairs, or points out of square. Any creep is to be reported.
- The bearing of the switch on the slide plates is to be observed and reported where defective. This is particularly important for undercut switches in 50kg and 60 kg non-tangential and tangential turnouts due to the angle of the undercut. More than 1-1.5mm vertical clearance between the switch and plate at the "A" or "B" timber can lead to lock and/or detection failures since the switch will move sideways as well as down under load and may not always drive to a consistent position against the stock rail. Uneven bearing on plates through the length of the switch, in particular on the longer switches, leads to high frictional loads, scoring on those few plates on which the switch is bearing, and failure of the switch to lay correctly up to the stock rail. Since there will be lateral movement when the switch is under load, detection failures can result.
- The condition of the rail braces and stock rail chairs is to be observed and any cracked or broken/ineffective noted, particularly clusters of 2 or more consecutive.
- The condition of the switch bearing stops is to be observed and any cracked or broken/ineffective noted, particularly clusters of 2 or more consecutive.
- The condition of the pivot heel blocks, or fixed heel blocks (including stress transfer blocks and creep control blocks where fitted) is to be observed and recorded if cracked, broken but still effective, or missing/broken and not effective. Report any pumping of pivot heels. In flexible switches and tangential turnouts the heel block (including stress transfer blocks and creep control blocks where fitted) bolts need to be tight. Tighten and/or report any loose or ineffective bolts.
- The condition of the bearers and fastenings is to be observed and any ineffective noted, particularly clusters of 2 or more consecutive. Ineffective bearers either do not support the vertical loads or do not restrain the rails laterally or longitudinally.
- Check all bolts and other fasteners and record loose, broken or missing items. Check any screw spike fastenings including double helix spring washers which are not effective unless fully depressed. Check condition and security of any insulators and resilient pads.
- Inspect closely any similar flexure turnouts where the outside rail (nominally the 'high rail') is the stock rail and can be subjected to accelerated curve wear. Check the condition of the switch, the stock rail and the switch tip height, width and angle.

3.2 Detailed Inspection of Housed Points

Housed points refer to the use of heavy duty switches and joggled stock rails where a special housing is provided to act as a check rail. Where housed points are provided the switch/stock rail aspects are to be inspected as in 3.1 above. The housing is to be examined in the following manner using a housed points clearance gauge, ruler, or tape measure as appropriate. See Figure and Photos 7, 8, 9,10 and 11)

All dimensional measurements taken are to be managed in accordance with the T&C CoP Section 3.3 Inspection and Assessment.

- Flangeway clearances must be checked on the housing check rail, at a point 400mm in front of the nose of the switch, and at points 400mm and 2m behind the nose of the switch. If any slack is detected when the gauge is inserted, the actual clearance is to be measured and recorded on the inspection form.
- The height of the housing above the stock rail is checked by placing the gauge across the running surface of the stock rail and observing the height of the upper surface of the housing in relation to the gauge. If the housing is found to be above the level of the gauge, the amount of additional height is to be recorded on the inspection form.
- The clearance between the underside of the housing and the top of the switch is to be checked by inserting the gauge turned on its flat side between the housing and the switch. The switch must be in the open position when this check is being made. Clearance should be checked at various points along the length of the switch. If the gauge cannot be inserted, the clearance is insufficient and is to be noted on the inspection form.
- The flare at the leading and trailing ends of the check rail and housing are to be checked. This is done by measuring the clearance between the checking faces of the check rail/housing and the stock rail/switch. The dimensions should be checked with a tape measure. The actual clearances are to be recorded on the inspection form.

3.3 Detailed Inspection of Fixed Crossings and Checkrails

All dimensional measurements and observations taken are to be recorded on the inspection form and managed in accordance with the T&C CoP Section 3.3 Inspection and Assessment.

- Gauge at the crossing nose for both the mainline and the turnout road is to be measured and recorded.
- The 'check rail effectiveness' dimension at crossings must be checked for both the mainline and the turnout road. Measure the distance from the 'checking face' of the check rail to the 'gauge face' of the crossing nose. Any wheel contact with the crossing nose is a reportable condition and could indicate an out of tolerance check rail effectiveness dimension caused by wear on the check rail or broken check rail bolts. The effectiveness measurement is to be made at the Practical Point of the crossing. (See Figure 2)
- The check rail flangeway width (clearance) is to be measured for both the mainline and the turnout road. (See Photo 6).
- Vertical wear on the wing rails is to be measured and recorded. (See Photo 5).
- If the nose of the crossing is broken the width of the break is to be measured and recorded. See Figure 3.

- The condition of the bearers and fastenings is to be inspected including the condition and security of any insulators, resilient pads, and screw spike fastenings. The double helix spring washers are not effective unless fully depressed. Report any ineffective bearers as well as any clusters of 2 or more ineffective bearers.
- Cracks in cast crossings are to be noted and classed as follows:
 - “Cracked: non critical” means cracks longitudinally or vertically that may eventually cause a crossing to need repair.
 - “Cracked: critical” means cracks longitudinally or vertically that may lead to a piece of crossing eventually lifting or breaking out and affecting the running surface integrity.
 - “Cracked: fully” (not affecting the running surface)” means a crack that runs the full section of the crossing such that the crossing is in two pieces, all fastenings are secure and does not impact on the running surface.
 - “Cracked: fully (affecting the running surface)” means a crack that runs the full section of the crossing such that the crossing is in two pieces and fastening are not secure or the break affects running surface integrity.
- Rail Bound Manganese inserts (in RBM crossings) are to be checked for wear, creep, cracking, and surface defects.
- Crossing spacer blocks are to be visually checked and reported when broken, cracked, or ineffective.
- Crossing bolts should be checked and any loose, missing, or ineffective reported as a defect.
- Check rail bolts should be checked and the number missing or ineffective in each check rail recorded.

3.4 Detailed Inspection of Swing Nose Crossings

The observations and measurements detailed in 3.3 above, to the extent they are valid for swing nose crossing assemblies shall be performed and recorded on ETE0301F-01 Detailed Turnout Inspection Form in conjunction with the detailed inspection of the points. Additional requirements for swing nose crossings are detailed below and recorded on ETF0301F-03 Detailed Swing Nose Crossing Inspection Form.

3.4.1 General

- The point of the swing nose tip should be smooth and sharp, not blunt or chipped. The condition and profile of the swing nose tip is to be observed and any abnormal conditions measured and/or reported.
 - The swing nose tip height should be $\geq 13\text{mm}$ below the running surface of the wing rail.
 - The width of swing nose tip should be $\leq 4\text{mm}$. Any signs of wheel impact on the tip are to be reported.
 - The swing nose tip face slope should be $\leq 18^\circ$ to the vertical (or the perpendicular to the plane of the bearer for superelevated track) which cannot be determined by eye or using simple tools. Any suspected flat swing nose tip face ($\geq 26^\circ$) should be reported for further assessment.

- Gauge at the crossing nose, for the direction the points are set, is to be measured and recorded.
- Check that the swing nose is free of built up ballast and other materials.
- Check the bearing of the crossing nose rails on the crossing plates. If there is clearance between the crossing plate and the rails, the geometry needs to be adjusted.
- Check for wear on the wing rail, point rail, and splice rail (and tongue rail in PRE), particularly wear that could cause a gap between the swing nose tip and the wing rail in either the normal or reverse position. (see Photo 10)
- Check for rail head overflow on the gauge face of the wing rail/point rail transition which could prevent the nose closing properly. Remove overflow >1mm.
- Check for rolling contact fatigue defects (surface checking/cracks, spalls, scale, or squats) on wing rail, point rail, and splice rail (and tongue rail in PRE).
- Check all bolts and fasteners and report defects.

3.4.2 PRE crossings

- Check huck bolts at: F chock, crossing plate, rail brace to rail stop; wing rail A, B, and E chocks; point rail heel block; wing rail/splice rail C and D heel blocks. Report loose or broken huck bolts.
- Check crossing plates and rail brace brackets for cracking and report any found.
- Check the fit of rail stops which are attached to the wing rails for the length of the point rail and tongue rail. There should be no clearance between the web of the point rail and tongue rail and the rail stops in the closed position. If clearance exists between the rail web and rail stops the cause should be investigated and corrected.
- Check the tongue rail/splice rail sliding joint connection plates and fastenings.

See Photo 7 for a typical PRE swingnose crossing and component labels.

3.4.3 VAE crossings

- Check the point rail/splice rail sliding joint connection bolts, castellated nuts, dished washers, and disc springs are fitted and tight. Check castellated nut split pins for wear. If the clearance of the sliding joint has altered there is a loss of pre-load on the joint fasteners. Check safety clamp fasteners. Report findings.
- Check fastening condition. The majority of fastenings are bolts and nuts. If they are loose or broken they should be tightened or replaced. Wing rail, point rail and splice rail K clips and wing rail braces are fastened to the crossing frame with T-bolts, nuts and double helix spring washers that may break or become loose. Wing rail braces are fastened to the wing rail with countersunk bolts that may shear off or become loose.
- Check the heel block/anti creep block for evidence of loose or broken huck bolts.
- Check the fit of rail stops which are attached to the crossing frame for the length of the point rail and splice rails. There should be no clearance between the web of the point rail and splice rail and the rail stops in the closed position. If clearance exists between the rail web and rail stops the cause should be investigated and corrected.

- Check for loose splice rail to point rail switch stops.
- Check for loose or broken wing rail brace to crossing frame fasteners.
- Check the crossing frame and anti-creep brackets for evidence of cracking in the webs, switch plate rail seats, and other loaded sections. Report any cracking found.

See Photo 8 for a typical VAE swingnose crossing and component labels.

3.4.4 Martinus crossings

- Martinus crossings may have configurations similar to either PRE or VAE crossings depending on the installed product e.g. extended wing rails or crossing frame; sliding joint between crossing rails or in a splice joint in the diverge road. The appropriate inspection tasks from 3.4.1, 3.4.2, and 3.4.3 above should be completed.

See Photo 9 for typical Martinus swingnose crossing and component labels.

3.4.5 Vossloh Cogifer crossings

- Check that the swing nose is completely applied against the wing rail of the cradle and check the play between the web of the swing nose and the stops which are bolted to the wing rail.

3.5 Additional Aspects of Tangential Turnouts

In addition to the inspection tasks included in sections 3.1 and 3.3 the following special items of inspection apply to tangential turnouts:

3.5.1 PRE turnouts

- Check for broken slide baseplate jaws or broken slide tables and report defects
- Check for detached or worn slide baseplate end stops.

3.5.2 TKL turnouts

- TKL use the "Schwihag System" of inner stockrail bracing clips and special elevated slide tables. Check that all clip legs are fitted to their corresponding thrust abutments. Report defects found.

3.5.3 Vossloh Cogifer turnouts

- Check the check rail support and check rail fastening screw spikes, pandrol clips and check rail bolts, for tightness and damage.
- Check the IBAV is securely located in its housing and the latter is correctly located against the foot of the stock rail at each of the switch rail slide chairs.

3.5.4 VAE Turnouts

- Check switch inside fastening system pins and keys for damage or breakage.
- Check gauge between guardrail and crossing just behind nose and past the knee of the wing rail. Report measurements.

3.5.5 Martinus Turnouts

- Check the fit and effectiveness of the spring clip components for securing the stock rail inner foot to the switch slide chair. (Note that a mounting lever is needed to assemble and disassemble the spring clip fastening.)

4 Catchpoints, Diamonds, and Slips

The aspects to be measured/observed and recorded during detailed inspections of catchpoints, diamonds, and slips are the same as those detailed above in sections 3.1 and 3.3 for points, crossings, and checkrails, as appropriate. See Figures 4 and 5 for diamond and slip layouts and standard numbering of components and measurements. In addition, for catchpoints, the condition and security of the throw-off rail, derail block, and landing area are to be checked and reported.

For diamonds, where there is poor alignment it may be necessary to measure all side and diagonal dimensions for comparison to design. 'K' Crossings have running and checking surfaces. Special attention is needed to check the alignment of the V assembly checking face and checking wing rail face with a stringline or straightedge where alignment is poor.

When carrying out the inspection of insulated rail joints in the fully checked area of a diamond crossover it is necessary to ensure that the chock between the rails has not worn through the end post. Where there is external evidence of wear, such as squeezed end post, worn or bent bolts, loose plates or loose bolts the joint should be pulled apart to check the condition of the end post.

5 Dual Gauge P&C

The aspects to be measured/observed and recorded during detailed inspections of dual gauge turnouts, dual gauge separations, and dual gauge diamonds are the same as those detailed above in sections 3.1 and 3.3 and 4 for points, crossings, and check rails, as appropriate, given the added complexity of the switch, crossing, and checking arrangements.

6 Track Geometry

Gauge must be measured at the switch toes and crossing noses as in sections 3.1 and 3.3 during the detailed inspection. Otherwise, except for high risk locations, the track geometry should be assessed visually and measurements should be made when a visual assessment suggests that geometry defects requiring a maintenance response are present.

Points and Crossings configurations that are deemed high risk or points and crossings at high risk locations shall have manual measurements recorded during detailed inspection using form *ETE0301F-04 Manual Recording of Gauge, Play, and Superelevation in Turnouts, Diamonds and Slips*. Such locations could include:

- Crossovers between tracks which are not co-planar and which have different rail levels or different grades.
- A turnout road (diverging track) out of a superelevated mainline turnout.

Rail play is defined as any potential movement of the rail across the sleeper or bearers (usually timber) and, in particular, movement which will make the track gauge widen under load. This is added to the static gauge measurement to accurately reflect the track gauge under loaded conditions.

7 Recording and Assessment

For consistency in inspections and measurements it is recommended to pop mark or white paint locations where measurements are to be taken. These locations should be allocated station numbers.

The results of the detailed inspection of points and crossings may be recorded either electronically utilising the electronic forms on the Asset Management System or manually on the appropriate ARTC standard forms available on the ARTC Extranet site as follows:

- Form ETE0301F-01 for Turnouts and Catchpoints
- Form ETE0301F-01 plus form ETE0301F-01a for Turnouts with housed points
- Form ETE0301F-02 for Diamonds
- Form ETE0301F-02 for Single Slips plus form ETE0301F-01 (relevant sections only) for each pair of switches S1/S2 and S3/S4.
- Form ETE0301F-02 for Double Slips plus form ETE0301F-01 (relevant sections only) for each pair of switches S1/S2, S3/S4, S5/S6, and S7/S8.
- Form ETE0301F-01 (relevant sections only) plus form ETE0301F-03 for Swing Nose crossings.
- Form ETE0301F-04 Recording of gauge, play and superelevation (at high risk locations See section 6)
- Form ETE0301F-05 for Dual Gauge Turnouts and Dual Gauge Separations
- Form ETE0301F-02 for the standard gauge components of Dual Gauge Diamonds plus the relevant sections of ETE0301F-05 for the dual gauge components.

Form EGP1001F-01 Defects Found Report Form for all defects found.

Ideally the assessment of the detailed inspection observations and measurements would be carried out by the person undertaking the inspection, if that person is appropriately qualified and experienced, at the time of the inspection. If the inspecting person is not competent to conduct the assessment then a suitably competent person is to conduct the assessment based on the report form, discussion with the inspecting person, and personal inspection if appropriate.

The previous 2 detailed inspection reports as well as the current report for each P&C assembly should be retained for assessment of degradation rates.

The assessment and response to defects found is to be in accordance with the ARTC T&C CoP Section 3 Clause 3.3.5.

8 Attachments

8.1 Figures

Figure 1 Use of Housed Switch and Check Rail Clearance Gauge

Figure 2 Measuring Check Rail Effectiveness.

Figure 3 Measuring Crossing Nose Breaks

Figure 4 Diamond Crossing Nose and Dimension Identification

Figure 5 Slip Crossing and Switch Identification

8.2 Photos

Photo 1 Checking Spring Lever Tension (manual operated points)

Photo 2 RCF Cracking on Head of Tangential Switch Blade

Photo 3 Switch Rail Head Damage Resulting from RCF Cracking

Photo 4 Damaged Stock Rail

Photo 5 Worn Crossing

Photo 6 Measuring Flangeway Clearance

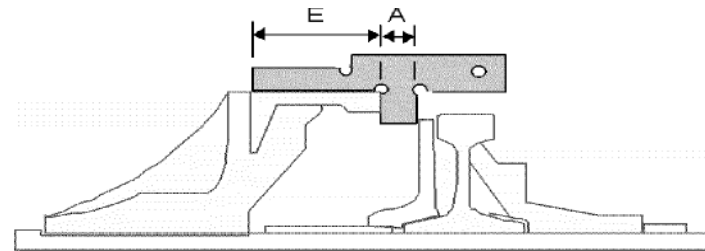
Photo 7 Typical PRE Swingnose Crossing

Photo 8 Typical VAE Swingnose Crossing

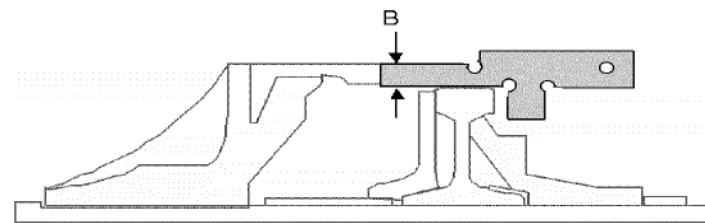
Photo 9 Typical Martinus Swingnose Crossings

Photo 10 Straight edge on running face with SNX in the normal position

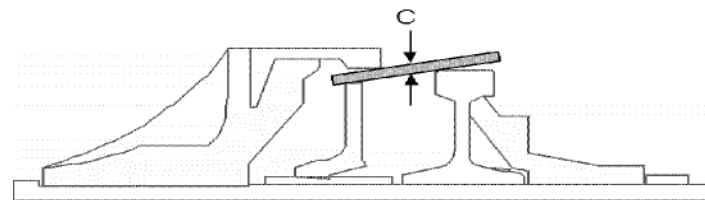
Figure 1 - Use of Housed Switch and Check Rail Clearance Gauge



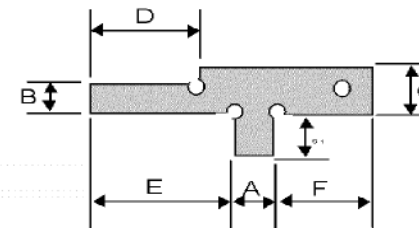
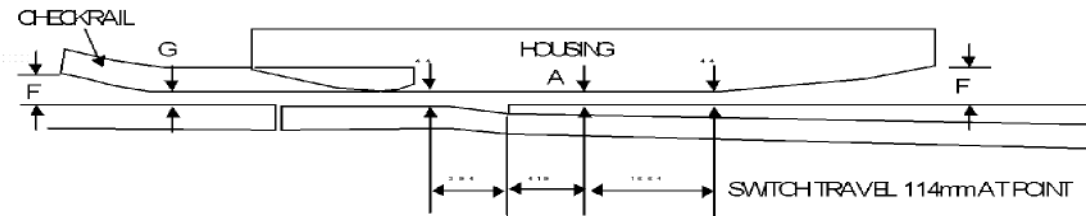
Check with Gauge for new Housing Width and Flange Clearance



Check with Gauge for height of Housing above Rail Level



Check with Gauge for Switch Clearance



Gauge - from Mild Steel 3mm thick

REFERENCE

- A: 44mm flangeway clearance 419mm back from point of switch
- B: Top of new housing 25mm above Stockrail
- C: 3mm minimum clearance between underside of housing and switch 419mm back from point of switch
- D: 114mm of switch travel
- E: 152mm width of new housing
- F: 102mm flare at end of housing and end of checkrail
- G: 44mm checkrail flangeway

Standard Housed Switches & Checkrails Clearance Gauge

Figure 2 – Measuring Check Rail Effectiveness

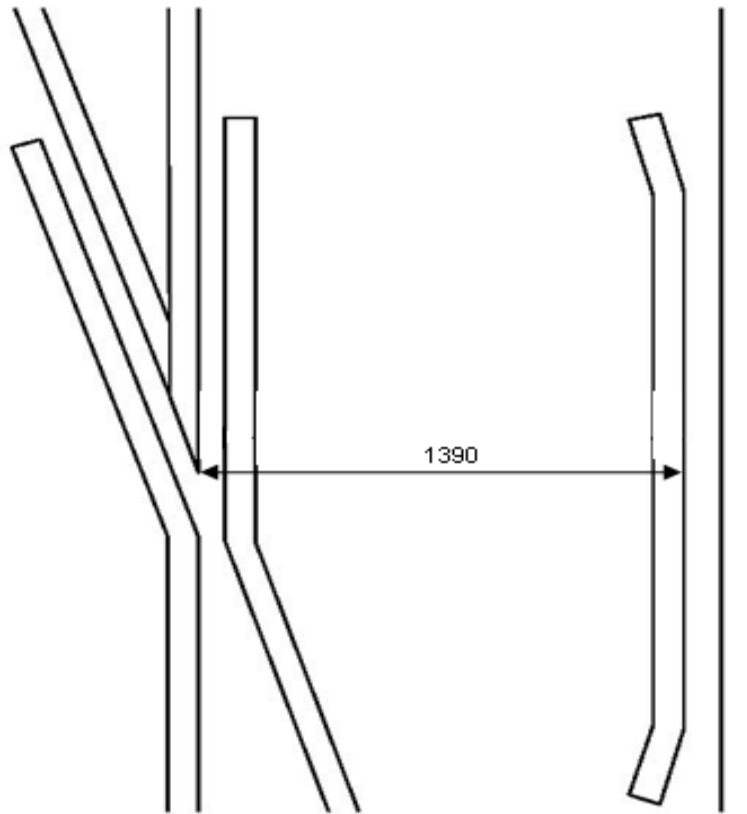
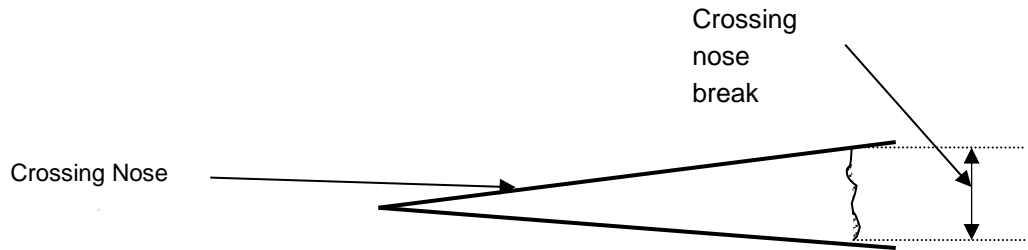


Figure 3 – Measuring Crossing Nose Breaks

PLAN



ELEVATION

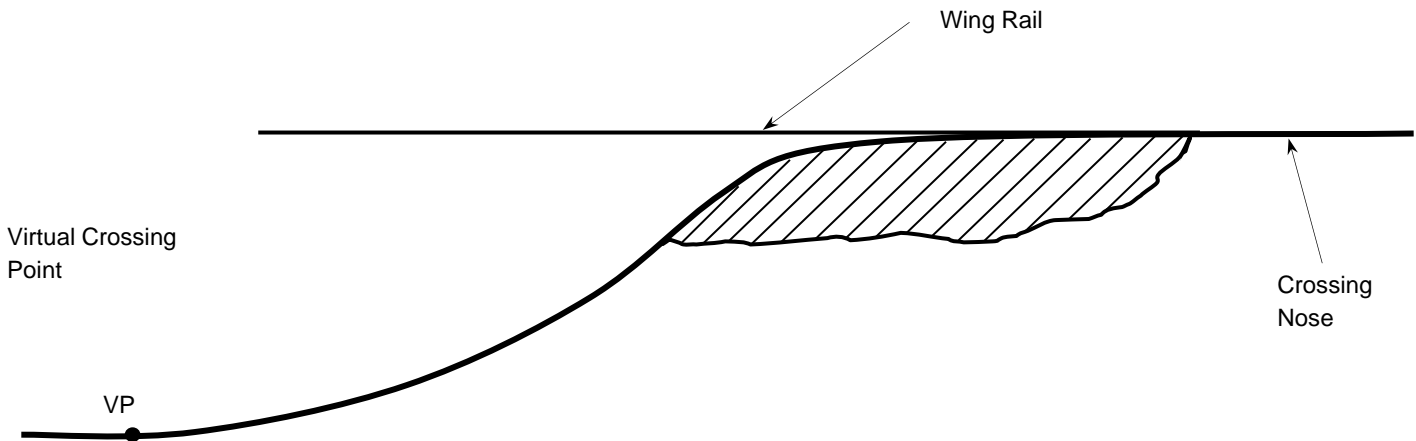


Figure 4- Diamond Crossing Nose and Dimension Identification

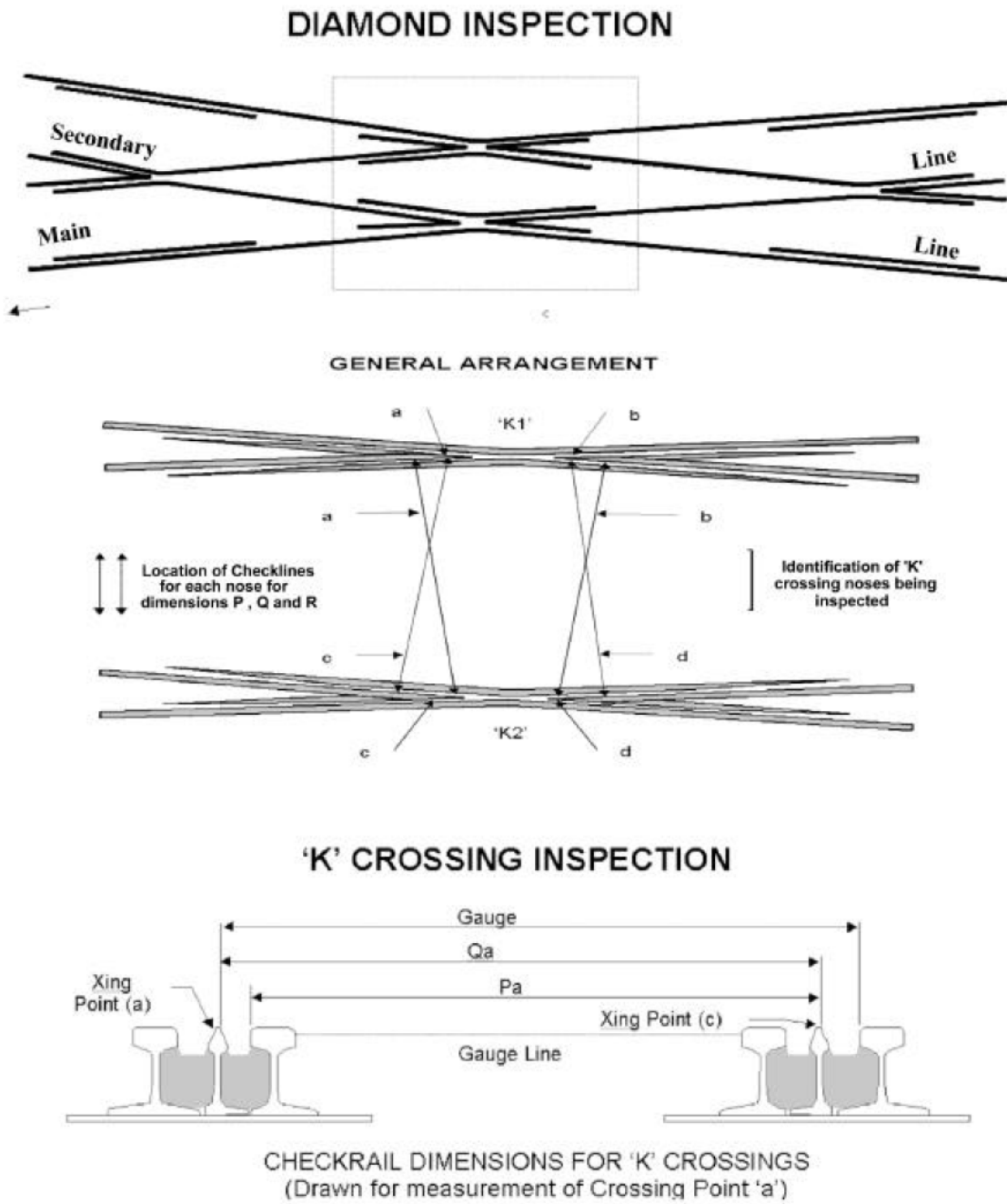


Figure 5 - Slip Crossing and Switch Identification

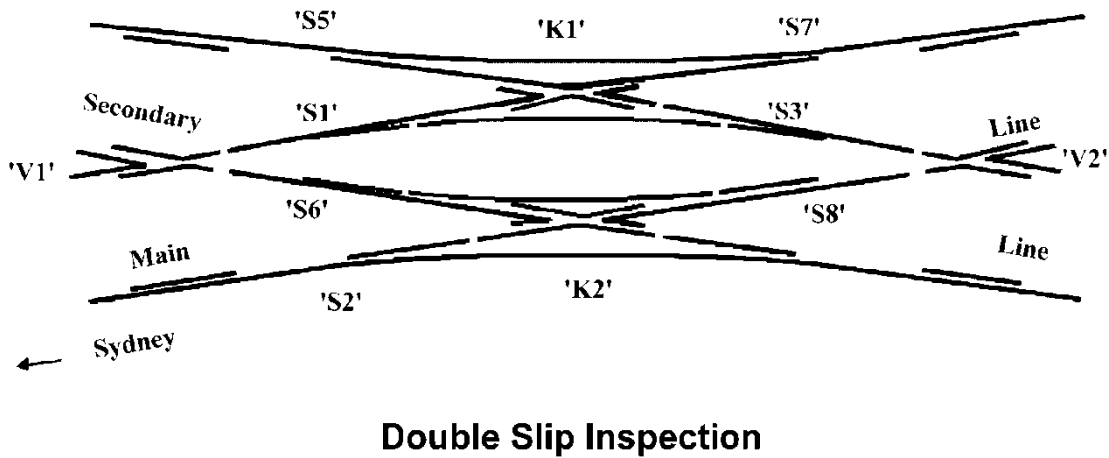
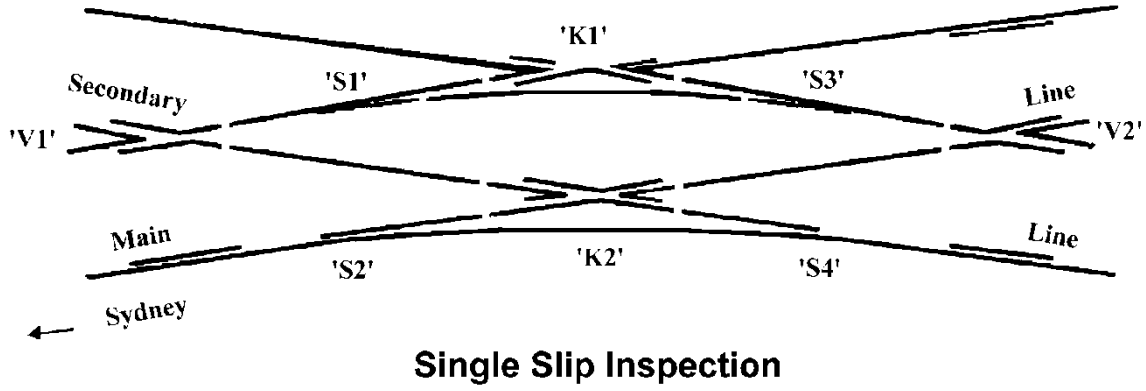


Photo 1 Checking Spring Lever Tension (manual operated points)



Photo 2 RCF Cracking on Head of Tangential Switch Blade



Photo 3 Switch Rail Head Damage Resulting from RCF Cracking



Photo 4 Damaged Stock Rail



Photo 5 Worn Crossing



Photo 6 Measuring Flangeway Clearance



Photo 7 Typical PRE Swingnose Crossing

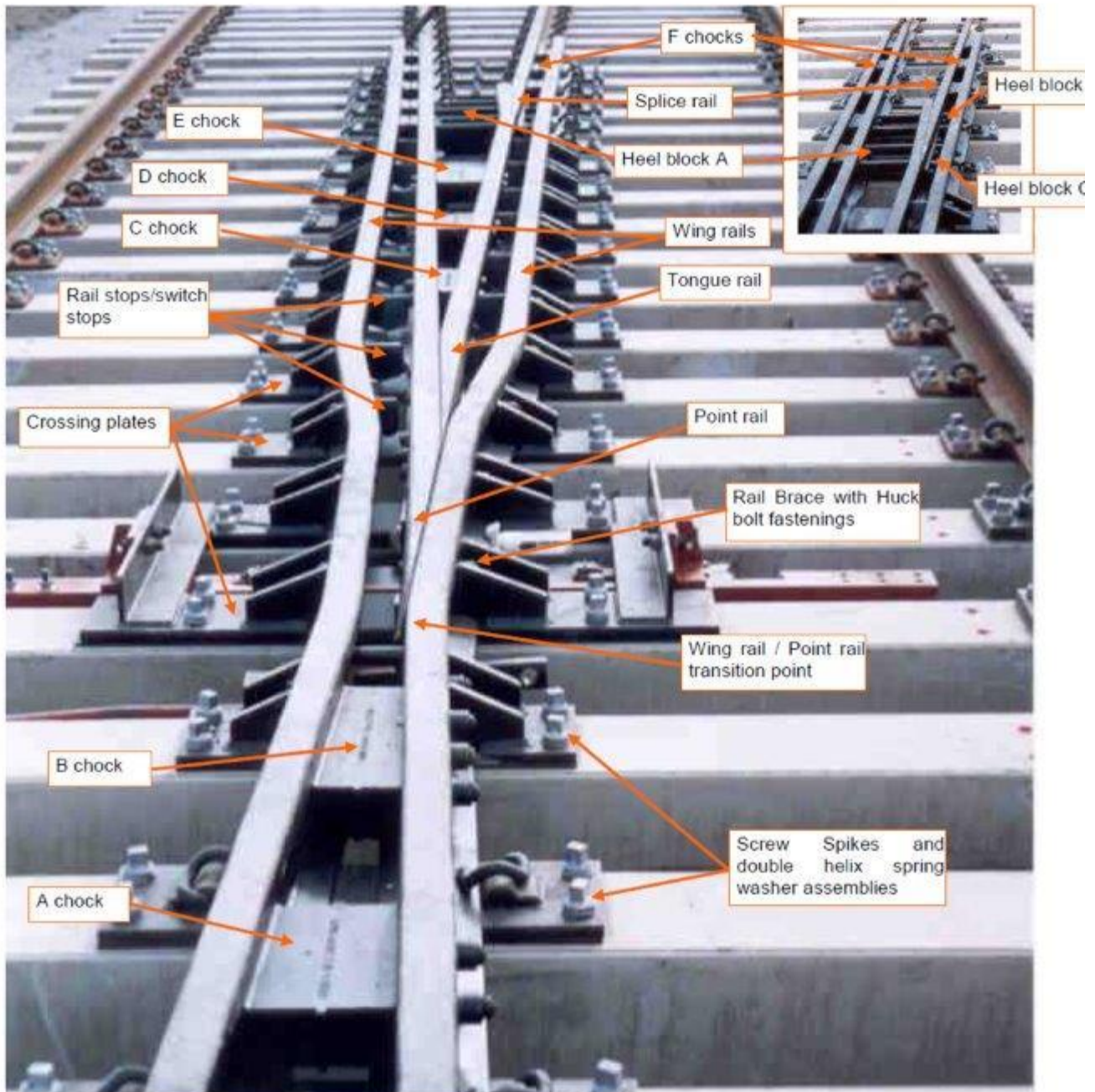


Photo 8 Typical VAE Swingnose Crossing



Photo 9 Typical Martinus Swingnose Crossings

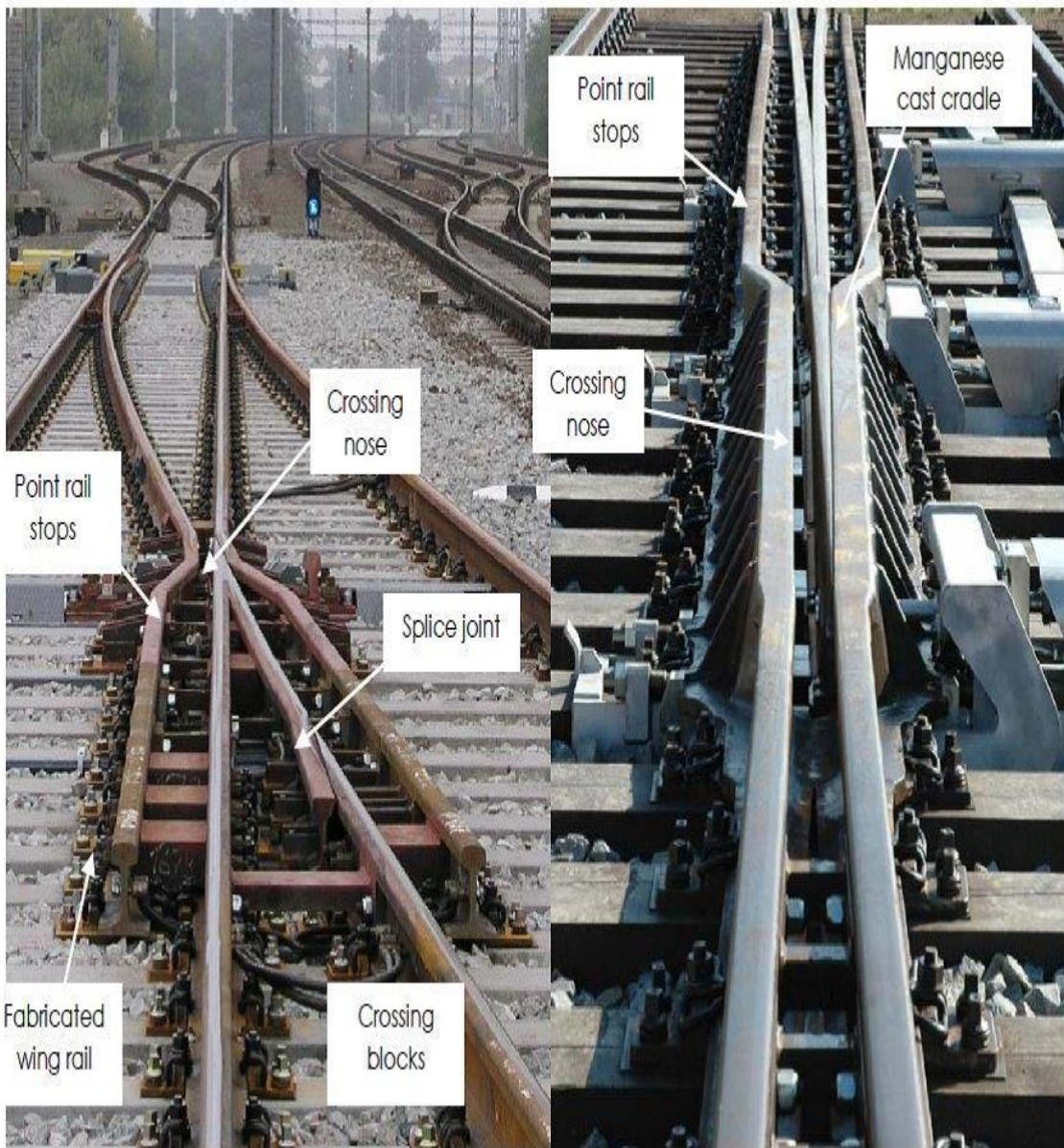


Photo 10 Straight edge on running face with SNX in the normal position

