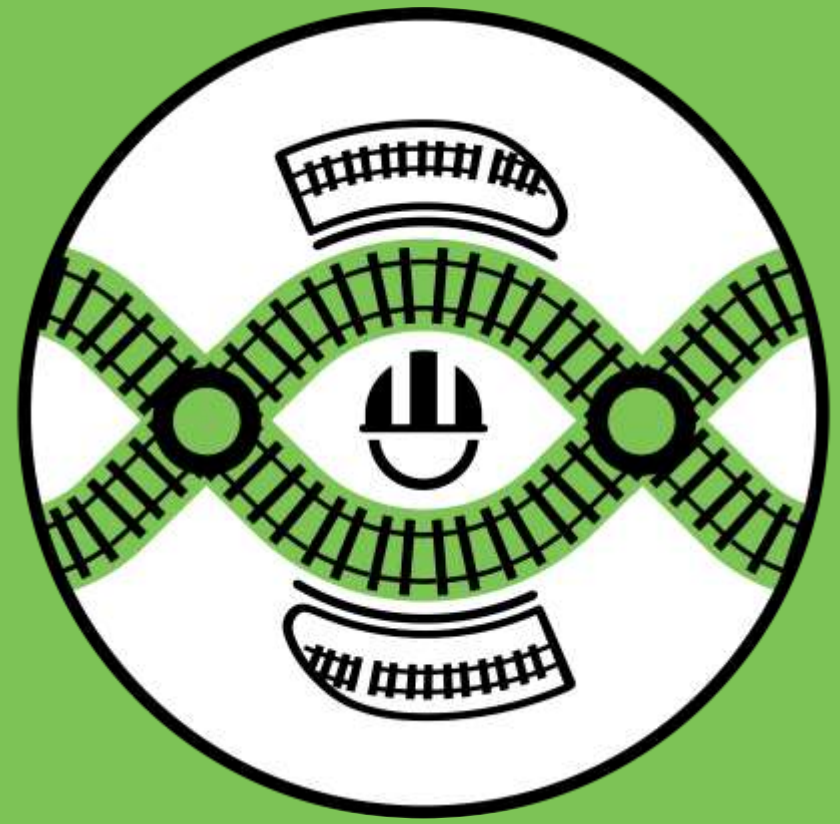
RailEI Technical Seminar
Current Crossing Issues and Maintenance Solutions



Steve OBrien Principal Engineer S&C

18th March 2026

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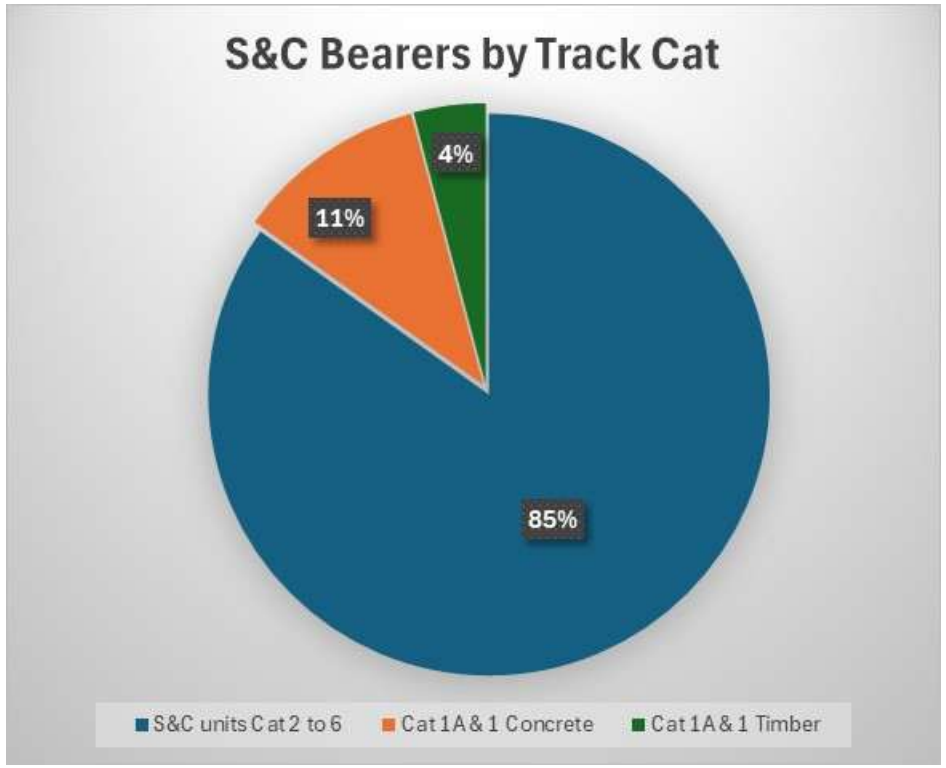
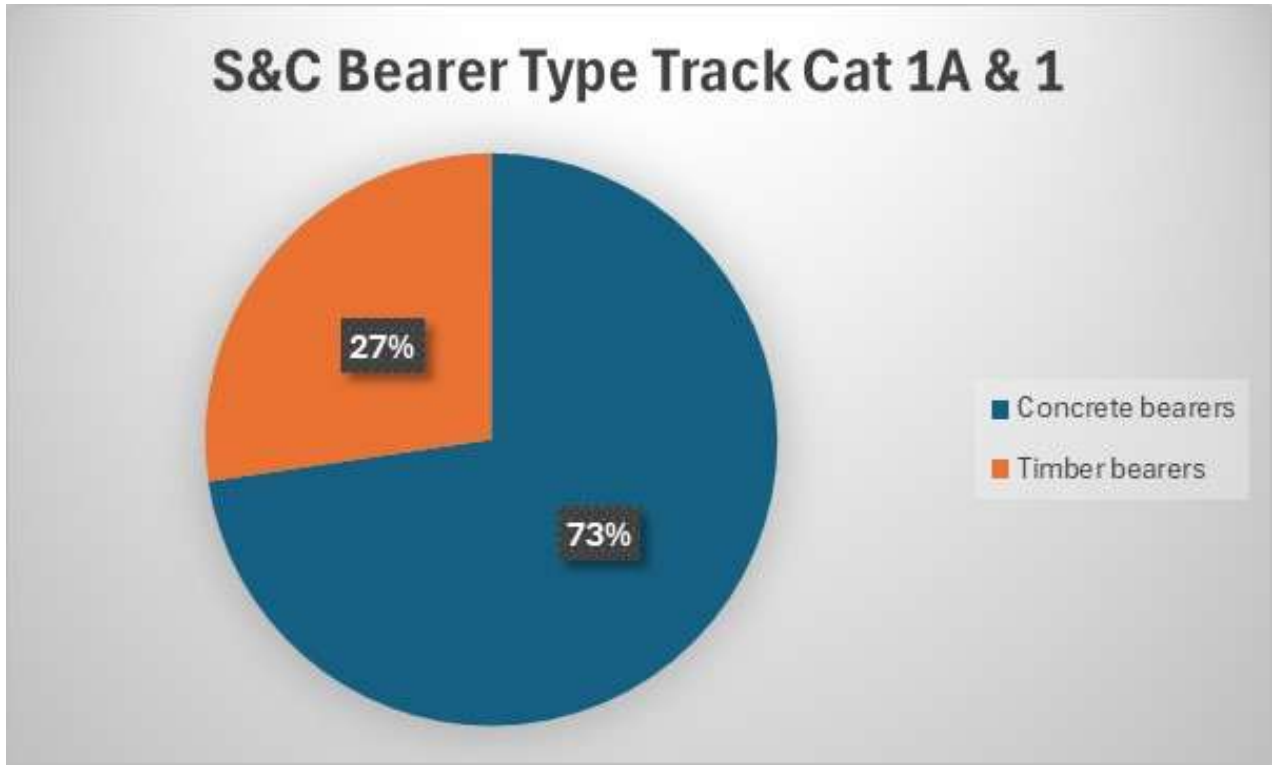
Modern High-Speed S&C

S&C Track Statistics





There are 21,524 S&C units on Network Rails infrastructure
15% of all S&C is on track category 1A & 1
32% of all S&C use concrete bearers of which 21% are modular
68% of all S&C use timber bearers
Less than 1% are on slabtrack
Source (Insight)

Why Inspect Crossings

Crossing are inspected to ensure the safety and efficiency of train operations is maintained. Regular inspections help identify potential issues that if left unactioned could compromise safety

Well maintained crossings ensure that trains can move smoothly and efficiently across the rail network, reducing delays and improving overall reliability of the rail service.

What Can Go Wrong

Common Crossing Issues due to Voiding S&C

Common Crossing Issues due to Voiding S&C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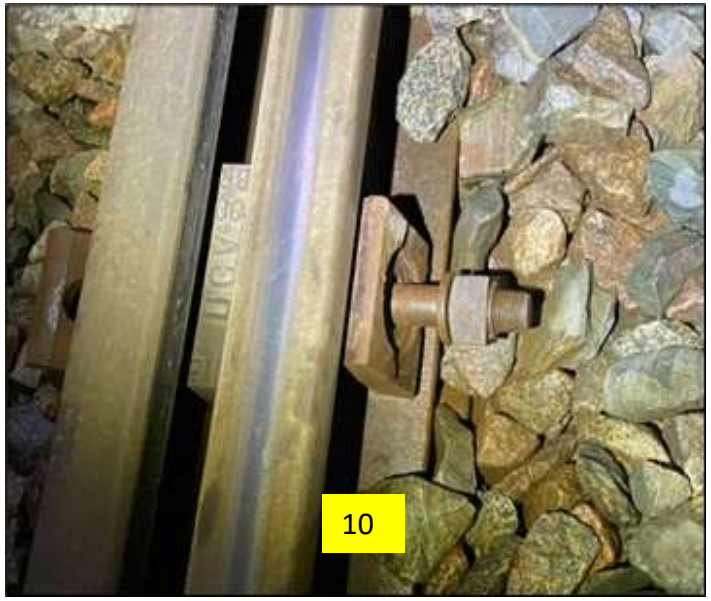
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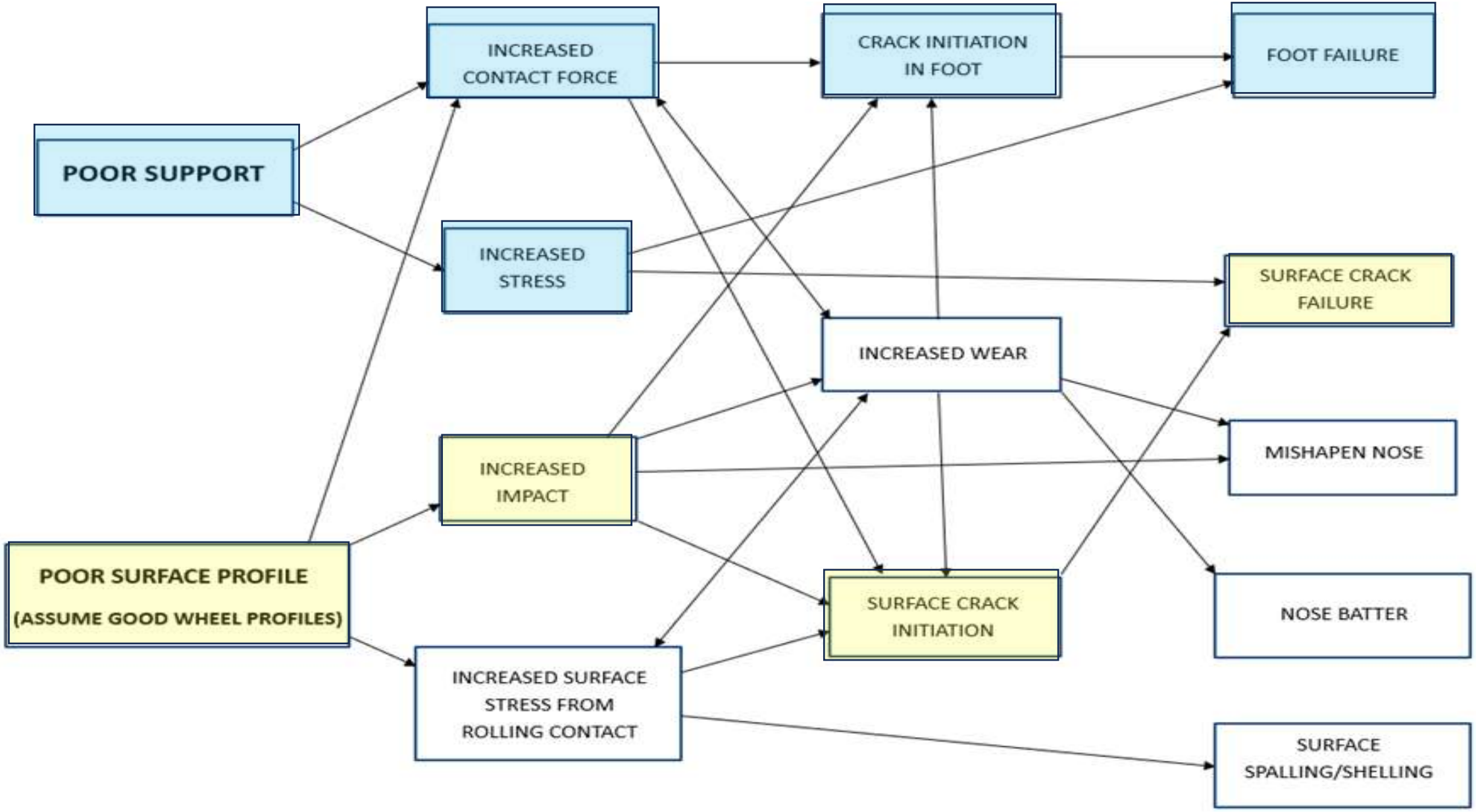
Leeds University Poor Support and Profile Map

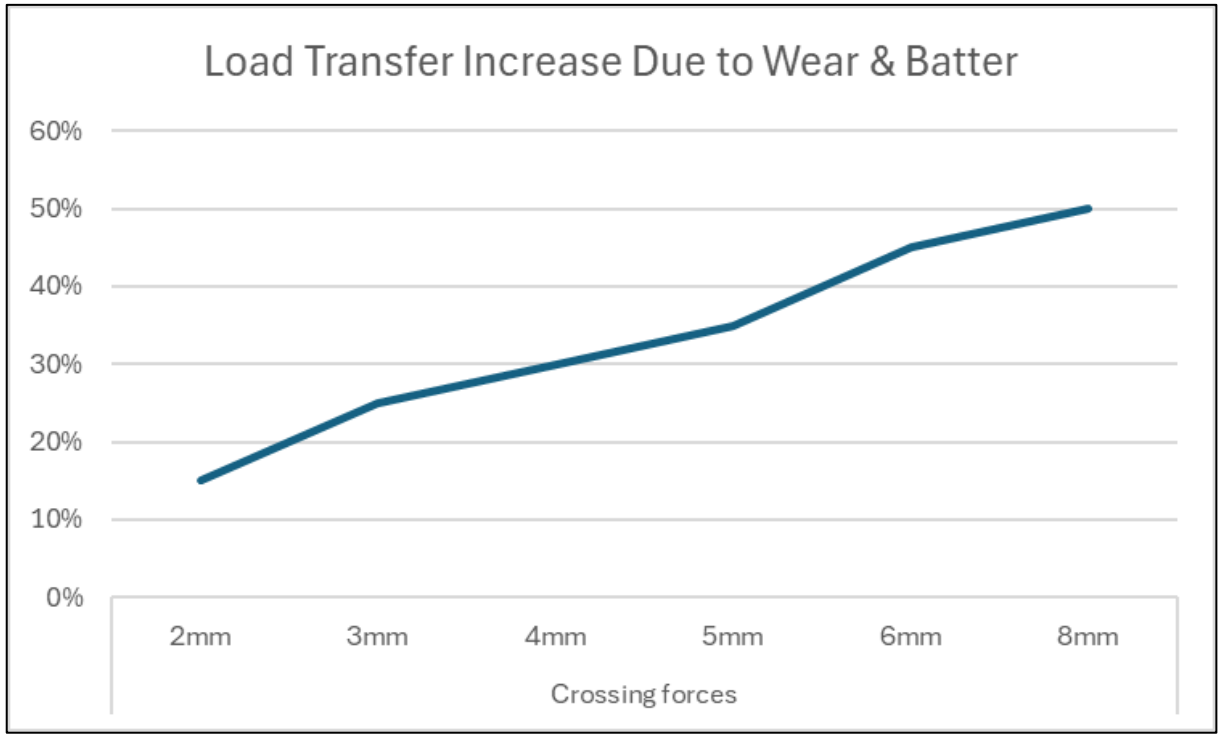


Wear and Batter defects

Wear on crossings over 2mm increases the impact forces and accelerates degradation of the support condition.

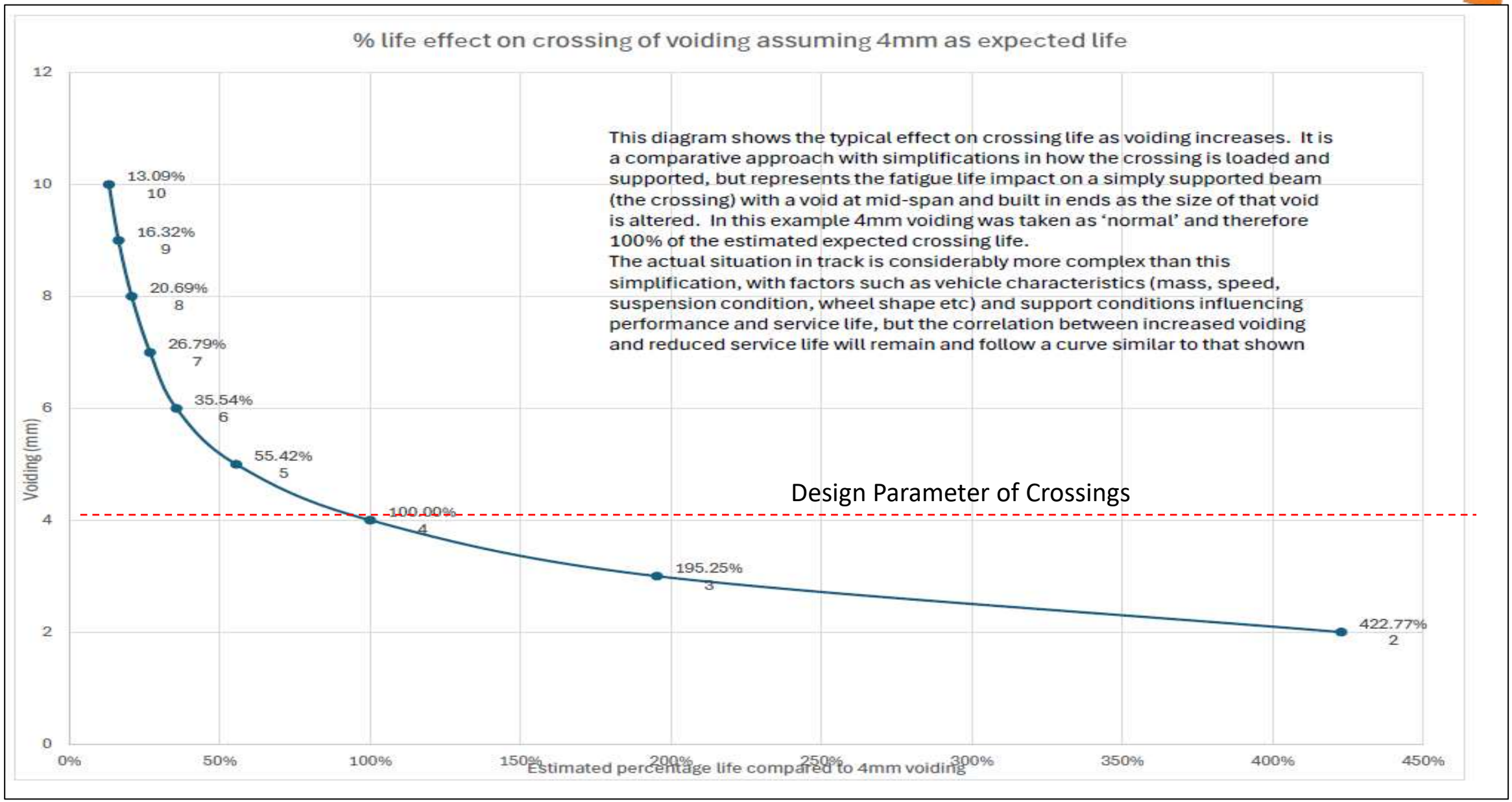
Manufactures guidance and university modelling align to 2mm wear as the upper limit prior to irreversible fatigue being introduced.

Crossing load transfer increases by 15% at 2mm, 25% at 3mm and 30% at 4mm. Above 4mm the crossing load transfer can increase by up to 50%.



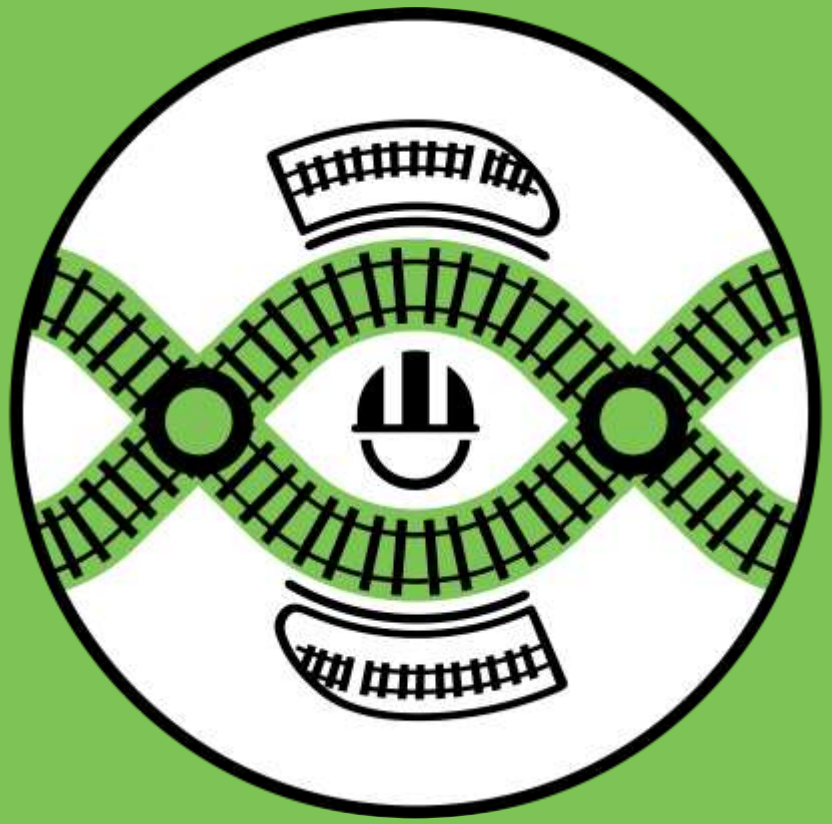
Unintended Consequence Wear & Batter

Voiding (Fatigue) Chart



Unintended Consequence of Voiding

Standards NR/L2/TRK/1054



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NR/L2/TRK/1054 version 7

OFFICIAL

Ref:	NR/L2/TRK/1054
Issue:	7
Date:	06 December 2025
Compliance date:	07 March 2026

Level 2

Manual

Inspection and maintenance procedures for crossings in track

Approvals

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Standards and Controls Management Team

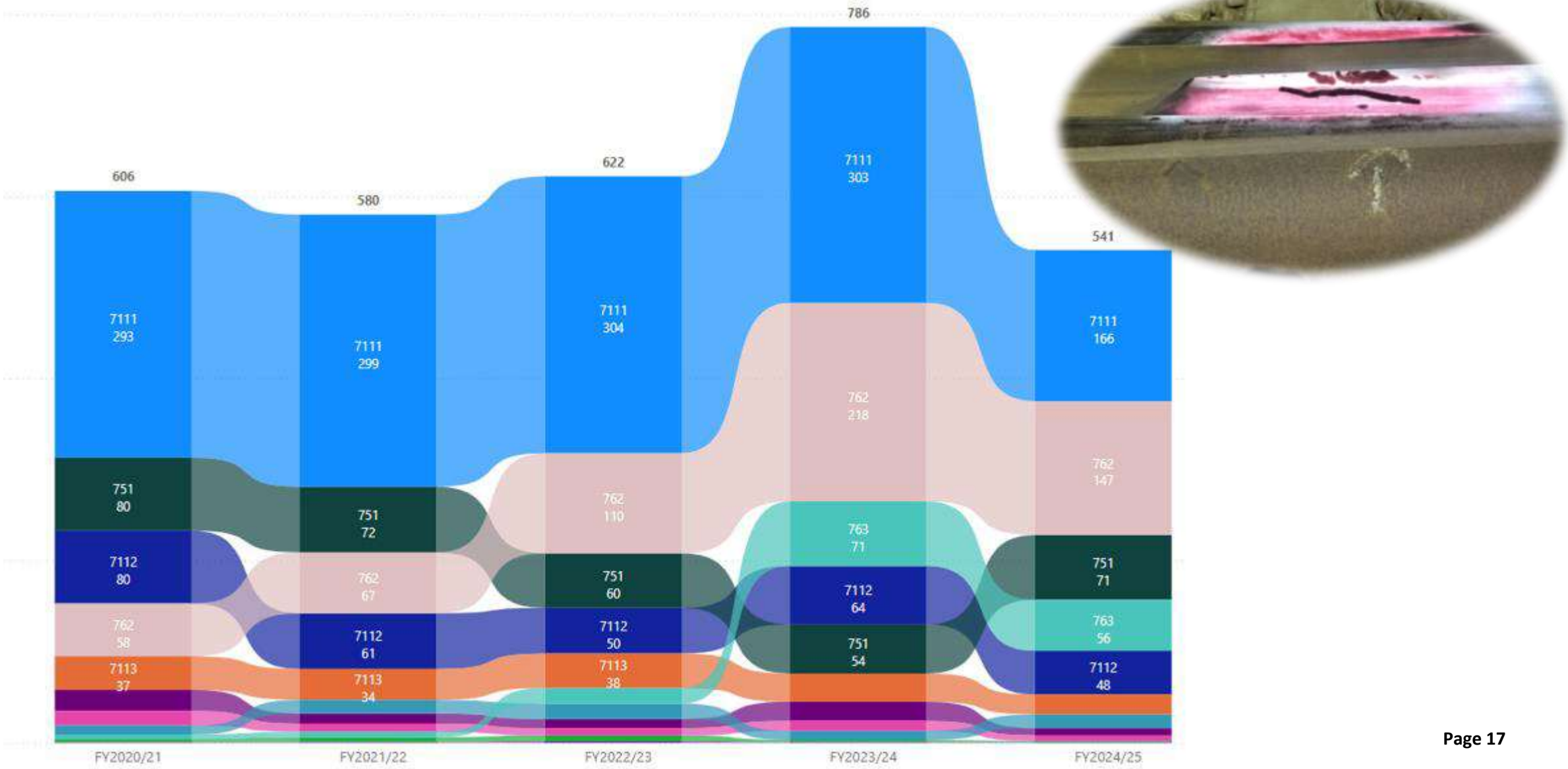
Published and issued by Network Rail, Waterloo General Office, London SE1 8SW.

NetworkRail

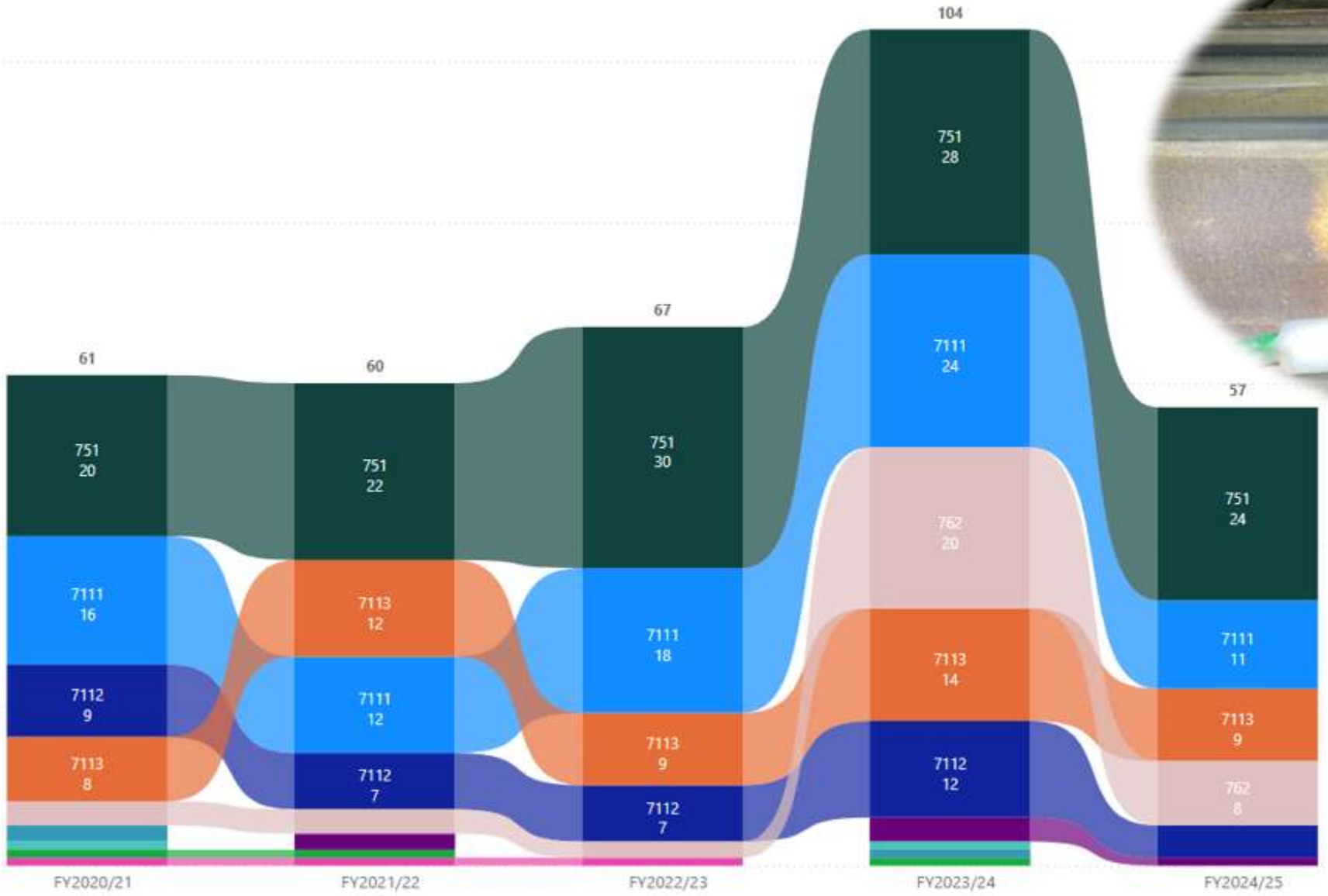
1054 Training Update

Crossing Failures
Categorising Crossing Defects

Crack type defects



Service affecting failure crack types



Modified Crossing Patterns

NR/L2/TRK/1054 Appendix D Continuous Foot Design

Scallop radius design pre-2019

Continuous foot design post 2019

Pre-May 2019 – Foot flange has discontinuities in between bearers which can lead to stress raisers and early propagation of cracks emanating from the foot

Post May 2019 – New pattern with a continuous foot flange where the scallop radius has been removed providing greater resistance to cracks emanating from the foot.

Table 17 Foot flange design

NR/L2/TRK/1054 Appendix E Explosive Depth Hardening (EDH)

Non- Explosive Depth Hardened (EDH)

Explosive Depth Hardened (EDH)

Non-EDH crossings from new have a surface hardening of 240 Brinell to 280 Brinel

EDH is a method using plastic explosives to accelerate hardening of the steel prior to installation.
EDH is used to reduce wear and batter and the hardening of the surface transmits to a depth of 25mm
EDH crossings from new have a surface hardening of 321 Brinell to 360 Brinell

Table 18 EDH Markings on Cast Crossings

NR/L2/TRK/1054 Appendix F Crossing Rib Design

Shallow depth ribs

Full depth ribs

Pre-May 2019 - The internal structure varies by manufacturer, but all contain core pockets and ribs in various configurations where the ribs are upturned 15 degrees into the casting.

Post May 2019 –The internal structure varies by manufacturer, but all contain core pockets and ribs in various configurations where the ribs are at the same depth as the casting.

Table 19 Crossing ribs design

NR/L2/TRK/1054 Appendix G Crossing Core Pockets

Straight core pockets

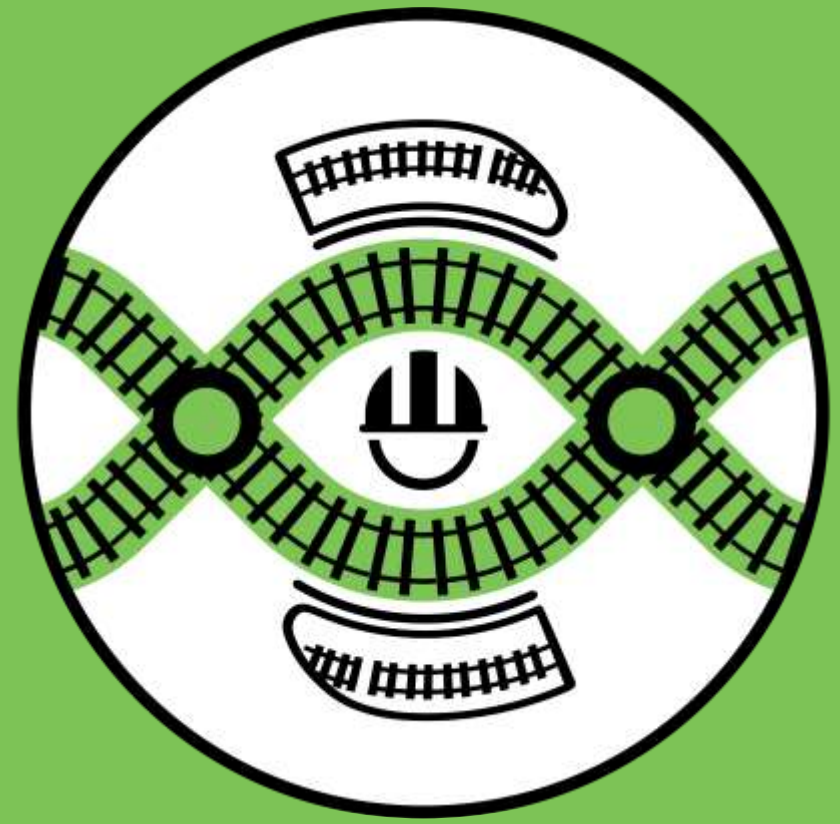
Staggered core pockets

Table 20 Crossing core pockets

The traditional design pre-May 2019 had consistent shape core pockets which allowed areas of stress to increase and propagation of cracks

Post May 2019 – The outer pockets have been made shorter than the middle pocket. The longitudinal rib helped to distribute the stress experienced from under the running surface and the crossing foot. Staggering the core pockets moves and alleviates a degree of the outer stress concentration.

Good Practice Guide for Crossing Awareness, Maintenance & Inspections



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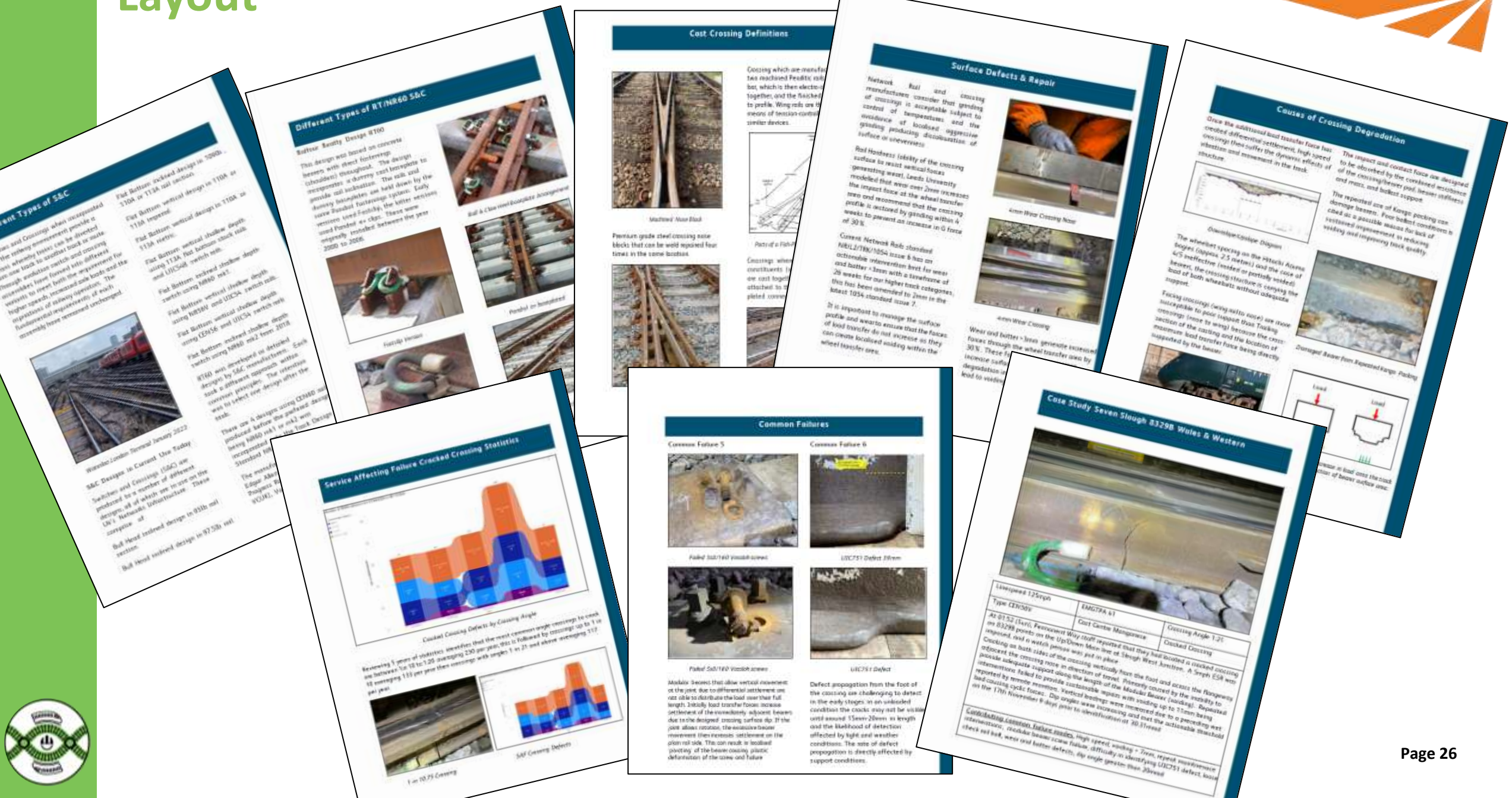
Blue Book Good Practice Guide

This Good Practice Guide has been written in the format of the original guidance books created by Railtrack & Network Rail as part of the Civil Engineering Conference series between 2000 and 2011.

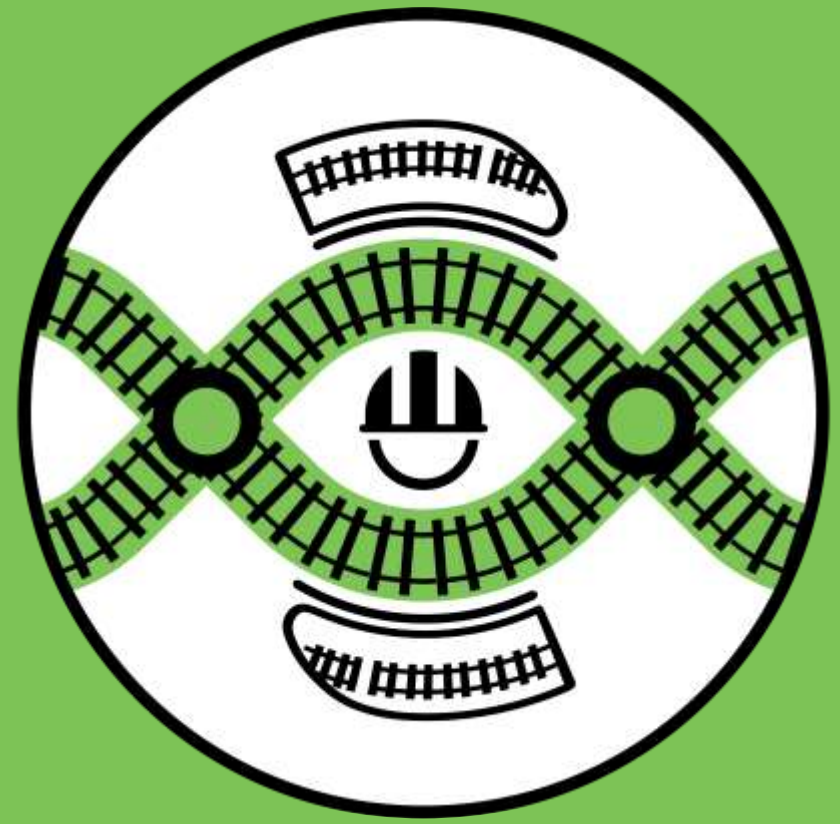
The Good Practice Guide is less wordy, focusing on the end user with graphs, photographs and illustrations to aid learning.

The blue book will be released following the update the 1054 Standard.

Layout


Different Types of RT/NR60 S&C
Cost Crossing Definitions
Surface Defects & Repair
Causes of Crossing Degradation
Service Affecting Failure Cracked Crossing Statistics
Common Failures
Case Study Seven Slough 83298 Wales & Western

Current & Future Technology



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Current & future technology

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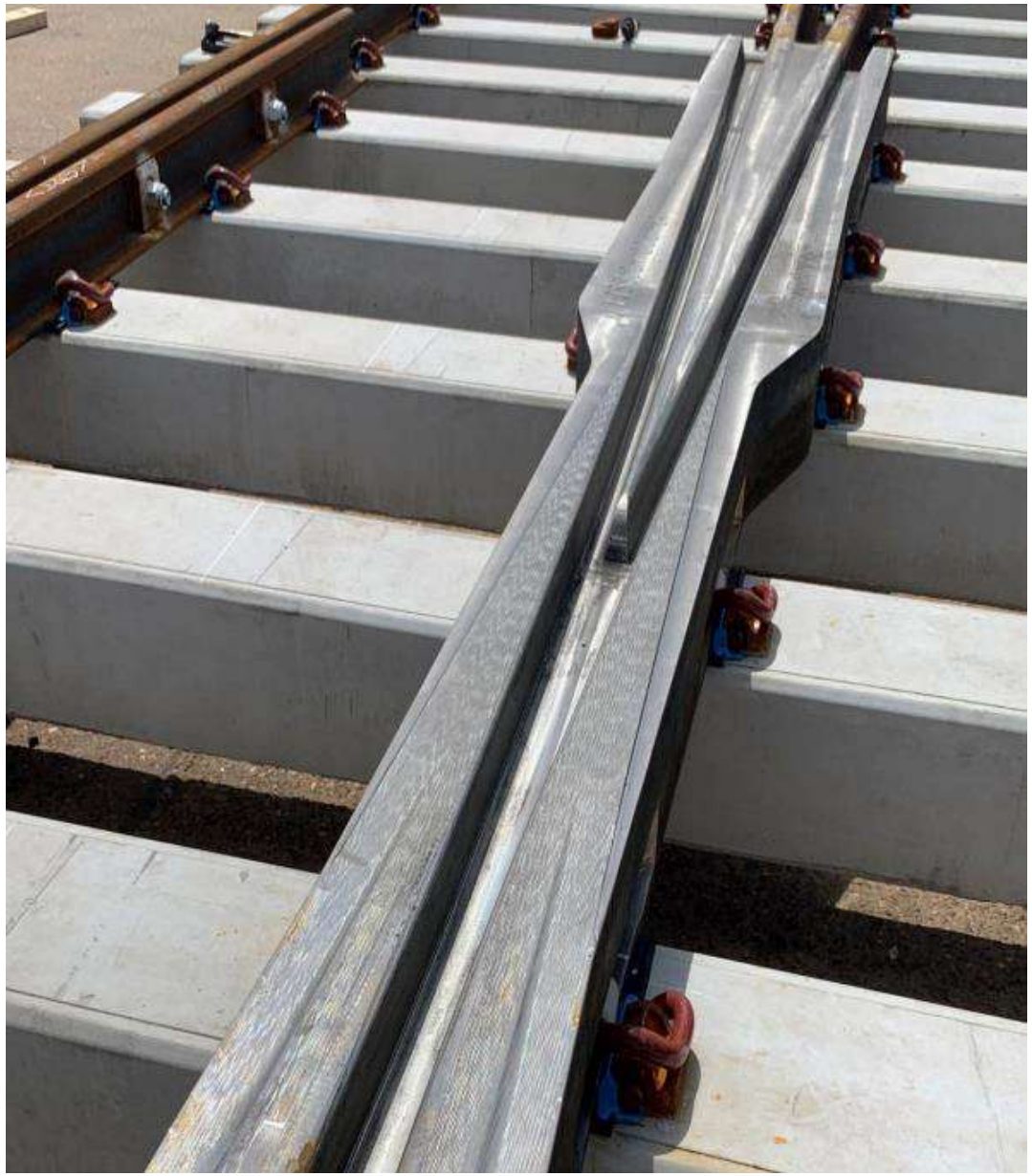

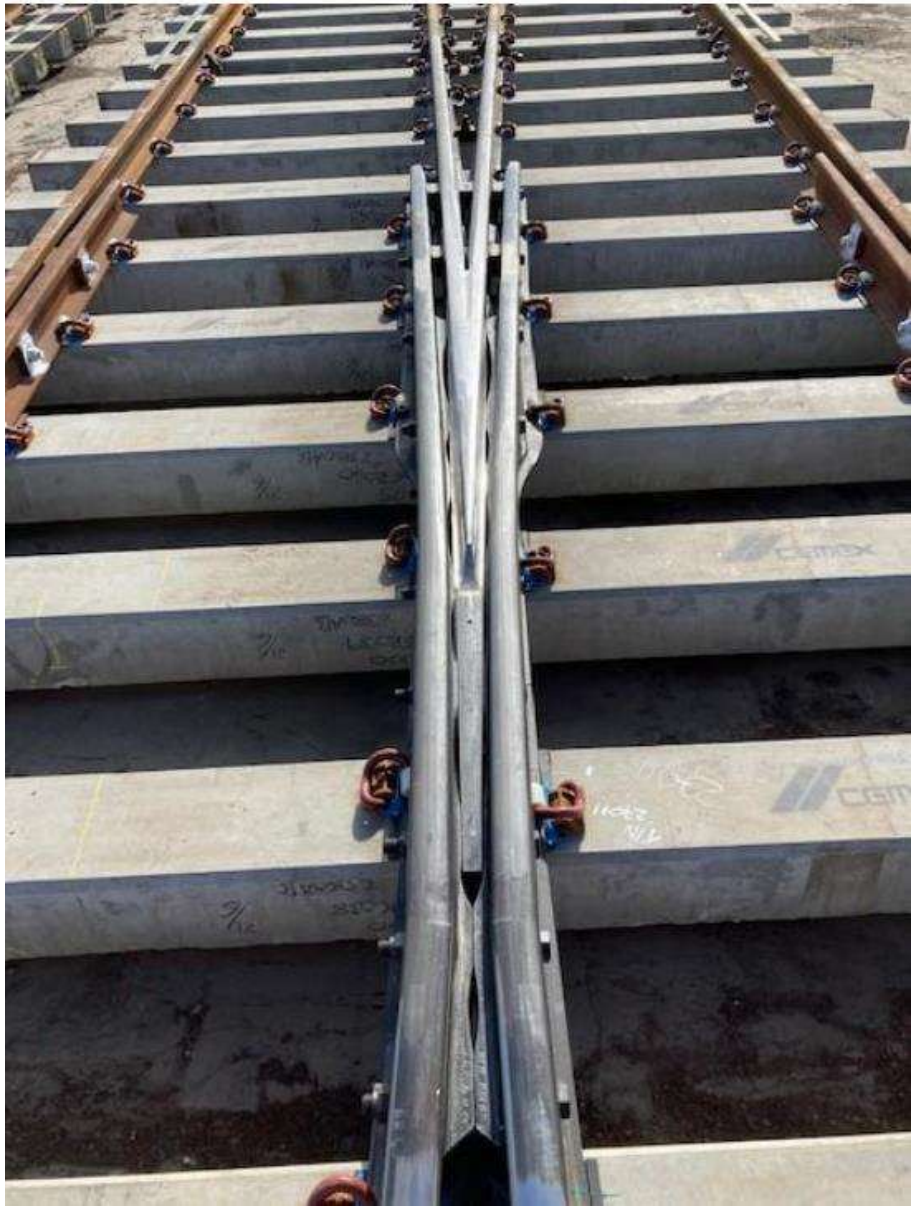

Current & future technology

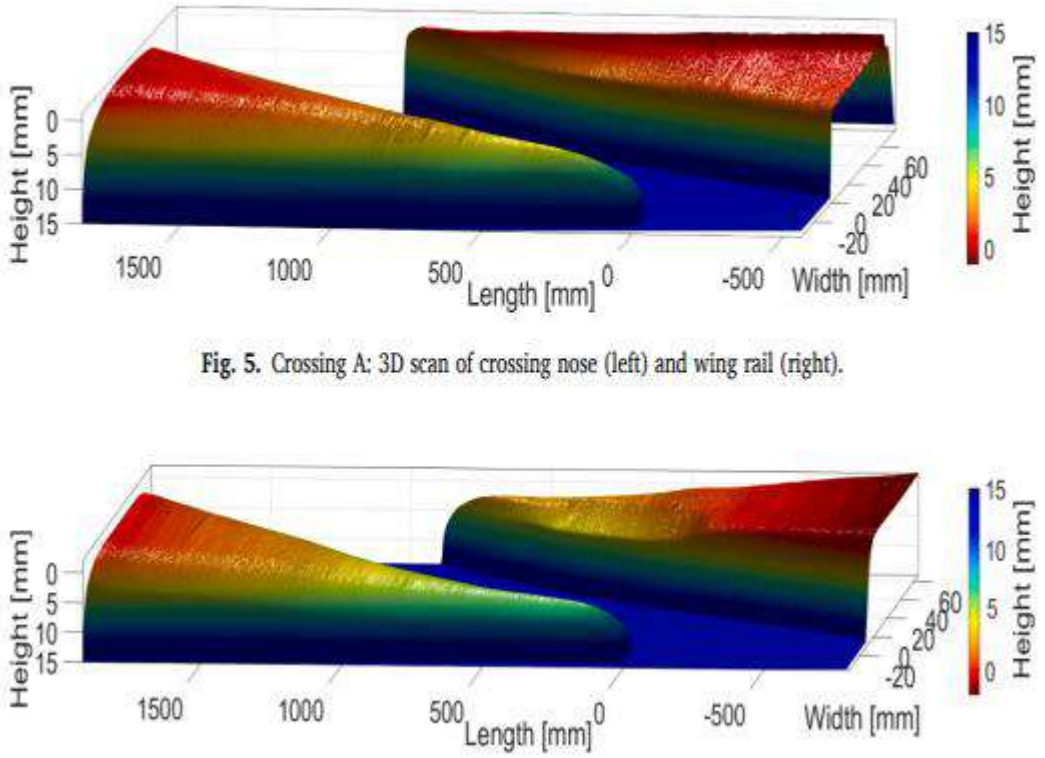

Fig. 5. Crossing A: 3D scan of crossing nose (left) and wing rail (right).

Thank you

Steve OBrien

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