

THE JOURNAL

JULY 2026 | VOLUME 144 | PART 3

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LIFE SPAN FOR DECADES**



RAILWAY ENGINEERING

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REFLECTING
OUR PURPOSE
SHAPING OUR FUTURE
INSPIRATION
SUPPORT
CONNECT
ADVANCE
PROGRESS
INSIGHT, RAILWAY ENGINEERING COMMUNITY
EXPERIENCES, PERSPECTIVES
IDENTITY
HERITAGE



THE JOURNAL

July 2026 | Volume 144 | Part 3

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CEng Members*	£215
Fellow	£165
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Application fee: Additional Membership EngTech £0 IEng £90 CEng £90
Engineering Council fee* EngTech £24.06 IEng £41.97 CEng £49.45

* If you are professionally registered through RailEI, we will collect your annual Engineering Council Registration fee along with your RailEI Membership fee and then pay the Engineering Council on your behalf. ** Includes the Engineering Council Registration entry fee.



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The cover image features the modernised Gosforth Depot, provided courtesy of Stadler Rail.

SUBMIT A JOURNAL ARTICLE

If you would like to share a project you've been working on within the Journal then please get in touch.



PRESENT A LUNCH & LEARN

If you would like to present a live Lunch & Learn session, please do let us know.



FROM THE CEO

A HECTIC SPRING – ON MANY FRONTS...

IT'S BEEN A VERY BUSY SPRING AT THE INSTITUTION – AND FOR OTHERS.

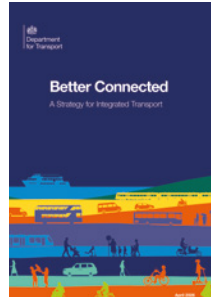
MEETING MEMBERS (AND POTENTIAL MEMBERS)

For RailEI, Spring concluded with participation at the Rail Live industry exhibition at the Long Marston Rail Innovation Centre, near Stratford-upon-Avon. The Institution was, as ever, pleased to welcome old friends and potential new Members at its stand, to provide information on RailEI activities, and to respond to increasing interest in Professional Registration at each of the three levels we offer. Rail Live was preceded by the Institution's Annual General Meeting held in the 'railway city' of York, at which we welcomed Cathal Mangan, Chief Civil Engineer of Irish Rail, as our latest President. The second Section Representatives' workshop of the year, also held in York, generated a wealth of ideas as to how the Institution can support its Members (and attract new ones) through local, national, and international activity.

Following Member consultation at and around RailEI's March seminar in Manchester, Spring has also seen much work on new Institution branding to replace the interim version introduced in February. The new branding will be launched a little later this year and, as well as including a new logo, I'm pleased to report that it makes sensible provision for ongoing reference to our PWI heritage.

FOCUS ON LIGHT RAIL

RailEI facilitated a Network Rail track engineering conference in early May, a week before presenting our Light Rail seminar, Making City Rail Travel More Sustainable, in Leeds. The first light rail event held since that in Nottingham in 2024, it was great to gain a window on the energy and enthusiasm that's being directed into the development of urban light rail schemes in West Yorkshire and Teesside and to build our partnership with UK TRAM. Presentations on vehicle-infrastructure interaction, wheel-rail interfaces from a tram-train perspective, and developments in DC electrification took the seminar back to serious engineering and system interface topics. The presentation of a newly developed low-profile pre-cast track form using Ultra-High Performance Concrete illustrated the opportunities for heavy rail to capitalise on light rail innovation.



INTEGRATED TRANSPORT – THE UK GOVERNMENT VIEW

As if to prepare the ground for the RailEI seminar, in April the UK Government issued Better Connected - A Strategy for Integrated Transport¹, its policy document prepared following the extensive consultation held in

early 2025. Majoring on the provision of integrated urban transport the Government has established 8 priorities:

- Empowering regional and local government
- Aligning transport provision and development
- Optimising decision-making and appraisal
- Simplifying payments and information
- Providing safe and dependable journeys
- Making travel accessible and affordable
- Creating healthier communities, and
- Championing data and technology.

It's notable that these priorities are strongly aligned with those put forward by RailEI (as the PWI) in its detailed February 2025 response to the Government's consultation.

Given the range of political and economic challenges currently facing the UK and its Government, domestic transport - and railways in particular - might have been expected to drop some way down the agenda. But against expectation, Spring 2026 has seen two further Government announcements, unfortunately, not quite so positive for railway transport and railway engineering.



BOOM AND BUST – OR NOT?

The first was in response to the Transport Select Committee's (TSC's) report Rail investment pipelines: ending boom and bust² published in February. The TSC's report noted the malign influence of stop-start investment on business confidence and project costs, in turn undermining

the industry's ability to safeguard high-skill jobs and apprenticeships, and to address acute skills shortages. Whilst (happily) Government's response to the report³ confirmed its support for the TSC's main recommendations,

1 <https://assets.publishing.service.gov.uk/media/69de12cb961ff0ba6bff8de9/dft-better-connected-a-strategy-for-integrated-transport.pdf>

2 <https://committees.parliament.uk/publications/51518/documents/285761/default/>

3 <https://publications.parliament.uk/pa/cm5901/cmselect/cmtrans/1852/report.html#heading-1>

despite overwhelming real-world evidence from the infrastructure engineering supply chain, and particularly from those specialising in electrification work, Government simply rejected the Select Committee's conclusion that rail investment has been subject to systemic 'boom and bust' (other than in the field of rolling stock manufacture). The TSC chair registered disappointment that Government would not recognise the evidence of boom-and-bust cycles presented throughout the inquiry.

WHITHER ELECTRIFICATION?

Where does that currently leave the UK-based electrification supply industry? Some installation work continues as part of the Scottish Government's rolling programme, and smaller scale installations are anticipated in connection with Network Rail's Transpennine Route Upgrade - in advance of major work in the early 2030s. Further electrification of the Dublin area suburban network is planned though the start date for site work is, as yet, difficult to establish.

In the longer term the position appears a little more positive with partial electrification of East West Rail envisaged by 2036, HS2 starting to deliver electrification systems by the end of this decade, and Midlands Rail Hub to complete (with some electrification) by 2032. Light rail schemes in Leeds and Teesside, as and when they proceed, will also involve significant electrification.

In the meantime however, the lack of site work in the next two or three 'lean years' will mean loss of skilled people as they move to other countries or industries to get work, a reduction in technical education and training as recruitment stalls, companies moving out of the market, plant previously delivering UK work being moved to other markets, fewer opportunities to trial new developments in materials and equipment, and loss of knowledge and experience as people move or retire.



RAILWAY INDUSTRY ASSOCIATION AND RAILWAY ENGINEERING INSTITUTION IN (WIRING!) HARNESS

With the Railway Industry Association (RIA), RailEI is continuing to promote the benefits of a programme of railway electrification together

with the work the industry has done to reduce costs. RIA recently published its Electrification Cost Challenge 2.0⁴ report, setting out how a programme-based approach to electrification could reduce infrastructure delivery costs by around a third compared to several recent projects. RIA has also hosted a conference in York showcasing research, co-funded with RailEI, which conclusively endorses the case for further electrification of freight routes. The research identifies viable solutions for replacing diesel powered locomotives on a range of haulage duties while dispelling the myth that battery-powered locomotives will remove the need for future electrification.

4 <https://www.riagb.org.uk/common/Uploaded%20files/Publications/Electrification%20Cost%20Challenge%202.0.pdf>

THE LONG TREK TO HS2

The second Government announcement sets the strategic framework for delivery of HS2 between London, Birmingham, and the Handsacre Junction link with the existing West Coast Main Line. Based on an initial project review⁵ led by HS2 Chief Executive Mark Wild, the section of route between Old Oak Common and Birmingham Curzon Street is anticipated to start carrying commercial traffic at some point between May 2036 and October 2039, some 10 to 13 years hence.

The full route between Euston and Handsacre Junction near Tamworth, is forecast to open at some point between May 2040 and December 2043. Whilst publication of Mark's full HS2 'reset' review is not anticipated before the end of 2026, the timescales for full completion of the route (where earthworks and structures are both now around 70% complete) make for interesting comparison with HS1's overall 9-year construction programme.

ARTIFICIAL INTELLIGENCE – WITH SOME CAUTION

Readers following the rapid development of Artificial Intelligence technology may have noted recent news that Anthropic's Claude Mythos AI model has proved so capable of autonomously discovering critical software vulnerabilities that Anthropic has created Project Glasswing, a defensive arrangement that gives major software industry partners access to it to find, patch, and secure core code before vulnerabilities can be exploited maliciously. Whilst at least initially peripheral to railway transport and engineering, such developments highlight the potential vulnerability of software, including that used in machine learning applications – the latter incapable of validation by the conventional (pre-AI) regimes applied to the development of safety critical railway software.

Much faith is currently being placed in machine learning as a tool to create asset inspection regimes that are both more accurate and more reliable than predecessor human-based regimes. Work to date in the fields of track, electrification, and earthworks management indicate that such dependable regimes are indeed a perfectly feasible (and economic) proposition. As the industry reaches a point where near total reliance can be placed on such techniques, it would be wise to consider the companion risks of malicious software manipulation and system non-availability. A boringly reliable railway isn't one that's shut because the software is suspect...

AND A SOMBRE NOTE TO CONCLUDE

The tragic train collision at Elstow on 19 June is another reminder that safety in our railway industry depends on engineering systems *and* human beings. RAIB continues its investigation and the industry will work hard to act on its conclusions. Doubtless the thoughts of Institution Members and staff are with all those affected.

I wish you all a safe and enjoyable Summer and hope you join me in looking forward to the fascinating programme of Institution activities planned for the Autumn.



STEPHEN BARBER
CEO
stephen.barber@railei.org

5 <https://www.hs2.org.uk/what-is-hs2/hs2-project-update/>

A FAREWELL LETTER FROM YOUR PRESIDENT

All too soon, my year as President draws to a close. Everyone told me it would go quickly—and they were absolutely right. It feels only a short time ago that I stood at the AGM, listening to Mona reflect on her experience and stepping into the role myself.

It has been an incredibly rewarding and memorable year—one that has reinforced my belief in the strength, diversity, and future potential of our railway engineering community, particularly as we navigate increasing complexity and change.

It has been both an honour and a privilege to represent the Institution at such a pivotal moment, with the transition from PWI to RailEI. Being able to say I have been both the last President of the PWI and the first of RailEI is something I am immensely proud of. I would also like to take this opportunity to extend a sincere thank you to all the Board and staff who proactively visited Sections, engaged with Members, and worked so effectively behind the scenes to support and progress the proposed name change. Their commitment, energy, and dedication have been instrumental in getting us to this point. I have also had the privilege of working alongside such a passionate, supportive, and committed community.

IT HAS BEEN BOTH AN HONOUR AND A PRIVILEGE TO REPRESENT THE INSTITUTION AT SUCH A PIVOTAL MOMENT, WITH THE TRANSITION FROM PWI TO RailEI.

Reflecting on the year, several themes stand out which, for me, define both the progress we have made and the opportunities ahead. These centre around the name change and what that means for inclusivity across our railway engineering community. Alongside this, themes of innovation, collaboration, systems thinking, the broader railway landscape—including the development of Great British Railways—and the continued development of skills across our profession have all been central.

Throughout the year, I have had the opportunity to engage with Members across the UK and beyond—at technical seminars, Section meetings, and industry events. I would like to thank all the Sections that were so welcoming, supportive, and genuinely engaged in discussions around innovation and what that means for us all. I am also particularly grateful for the flexibility many Sections showed in accommodating diary changes. One of the realities of this role is balancing competing demands—from the Presidency to the day job and home life—and I truly appreciate the understanding and support shown throughout the year.

The questions and conversations at each event demonstrated the pride, enthusiasm, and depth of expertise across our Membership. From those at the start of their careers to experienced leaders shaping the future of our industry, the Institution continues to bring together a diverse and highly capable community.

Under my theme, **Shaping Rail's Future: Innovation, Change and Skills**, my focus has been on emphasising the scale of change we are facing. The formation of Great British Railways, the wider technology landscape—including the rapid evolution of AI—and the impact of inflation on our industry mean that we can no longer deliver the same outcomes in the same way, with the same resources.

Railway engineering is at a crossroads. We face rising demands for capacity, safety, decarbonisation, and affordability—at the same time as budgets tighten and costs increase. Meeting these challenges will require fresh thinking, new skills, and a willingness to evolve.

Innovation has been a central thread throughout the year—not just in the development of new ideas, but in their practical application. It is not about technology alone. As an industry, we must focus on how we move from innovation to implementation, ensuring that new technologies and approaches deliver tangible benefits to the railway.

If you are already shaping the future—keep going. If you have an idea—bring it forward. If you can mentor, inspire, or encourage someone into rail—please do. Because the future of railway engineering will not be delivered by one institution, one person, or one technology. It requires all of us.



RailEI INNOVATION COMPETITION:
**PRACTICAL INNOVATION
FOR TODAY'S RAILWAY**



THE IDEA

What one idea could make a tangible difference to today's railway?



THE FORMAT

6-10 clear, simple slides, focused on implementation.



THE ENTRANTS

All disciplines and all career stages welcome.



THE WINNERS

Journal publication, top entries showcased, and industry visibility.

A key focus throughout my presidency has been reinforcing the importance of a whole-system approach. The railway is, fundamentally, a system of systems—where infrastructure, technology, and people are interconnected. Recognising and managing those interfaces is essential if we are to deliver a safe, reliable, and high-performing railway. This thinking has also underpinned the rationale for our transition from PWI to RailEI—moving beyond a perception of focus on a single discipline, and instead better reflecting the full breadth of railway engineering and the integrated system we are all part of.

Alongside this, I have placed significant emphasis on strengthening collaboration across the wider engineering and rail community. This has included working more closely with organisations such as the Institution of Mechanical Engineers (IMechE) and the Institution of Railway Signal Engineers (IRSE), alongside engagement with industry bodies including the Railway Industry Association (RIA), the Women's Engineering Society (WES), and Equal Engineers. These discussions have reinforced a shared ambition—to better connect our disciplines, align our efforts, and enable more effective collaboration across the industry.

Equally, the importance of skills and capability remains fundamental. As the railway evolves, so too must our people. The Institution has a critical role to play in supporting professional development, promoting diversity, and ensuring the next generation of engineers is equipped to meet future challenges. I would encourage all Members to continue supporting this through mentoring, Professional Registration, and active engagement with the Institution.

I have also supported the continued evolution of the Institution, including the proposed name change. This has generated valuable and constructive discussion across our Membership. It is clear there is a strong commitment to ensuring that the Institution reflects the full breadth of railway engineering and continues to provide an inclusive home for all disciplines.

As I reflect on the year, one theme stands out clearly—the need to move innovation beyond discussion and into application. Across the many conversations I have had, there is no shortage of ideas within our industry. The challenge is creating the space to capture them, share them, and give them visibility.

With this in mind, and in collaboration with Cathal as incoming President, we will be introducing a RailEI Innovation Competition.

The aim is to create a simple, accessible platform for individuals across the railway engineering community to put forward **practical, implementable ideas**—focused on making a tangible difference to how we design, maintain, and operate the railway.

Submissions will take the form of short, slide-based entries and will be open to all disciplines and career stages. At its core sits a simple question:

'WHAT IS ONE IDEA THAT COULD MAKE A TANGIBLE DIFFERENCE TO TODAY'S RAILWAY?'

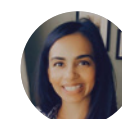
Selected entries will be shared through the Institution, including publication and wider visibility, helping to showcase innovation from across our community.

This is intended as a starting point—an initiative that can grow and evolve over time under future leadership, with input from Members and the wider industry. I am particularly pleased to be taking this forward with Cathal and look forward to seeing how it develops in the year ahead.

The challenges facing our industry are complex, but the future of railway engineering will be shaped not by any one discipline, but by how effectively we work together as a connected and collaborative community.

I now pass the baton to Cathal Mangan as President 2026/27 and wish him every success. I look forward to working closely with him over the coming year.

It has been a privilege to serve, and I look forward to continuing to support the Institution in the years ahead.



CHRISMA JAIN
PRESIDENT (2025-2026)
president@railei.org

OUR NEXT CHAPTER: BRINGING RailEI TO LIFE

#OurNextChapter: THE NEXT PHASE

Following the successful Member vote and the extensive engagement that has taken place over the past year, we are now entering the final stages of developing the Railway Engineering Institution (RailEI) brand. Throughout this journey, Members have played a central role in shaping the direction of the Institution. From sharing inspiration and ideas, to providing feedback on colour palettes, mood boards and visual concepts, your input has helped guide the decisions we have made.

WE ARE PLEASED TO SHARE THAT THE EXECUTIVE TEAM AND BOARD HAVE NOW APPROVED A LOGO AND COLOUR PALETTE FOR RailEI.

In recent weeks, our Section Committees were given an exclusive early preview of the new identity, providing an opportunity to share the direction of travel and gather initial reactions ahead of the wider launch. The response has been extremely encouraging and reinforces our confidence that the new identity successfully balances professionalism, inclusivity and heritage. Our focus is now on finalising how the brand is applied across our communications, digital platforms, publications, events, Membership

materials and wider touchpoints. This stage is about ensuring the new identity is not only visually distinctive, but practical, consistent and representative of the railway engineering community we serve. You will start to see the new brand rolled out after the summer, with the full identity revealed in the October edition of The Journal. The new brand represents far more than a logo. It is a visual expression of who we are as an Institution today: a modern, professional and inclusive home for everyone involved in railway engineering, whilst remaining firmly rooted in the heritage and values that have shaped us for over 140 years.



THANK YOU TO EVERYONE WHO HAS SHARED FEEDBACK, IDEAS AND INSPIRATION. YOUR INPUT IS DIRECTLY SHAPING THE FUTURE OF THE INSTITUTION.



JADE DOVER
MARKETING MANAGER
jade.dover@railei.org

SUPPORTING MEMBERS THROUGH DIGITAL TRANSFORMATION

Alongside the development of the RailEI brand, we continue to invest in the digital services and resources that support our Members.

Last year saw the successful integration of our new Customer Relationship Management (CRM) system, helping us deliver more personalised communications, improved member services and stronger engagement across the Institution.

We are now turning to the next stage of that journey, with a focus on strengthening the value of Membership and ensuring our website and digital platforms provide the best possible member experience.

As part of this work, we have been reviewing how Members discover, access and engage with technical knowledge across the Institution. The RailEI Knowledge Hub has grown significantly over recent years and now contains more than 1,000 technical papers, presentations, webinar recordings and learning resources spanning multiple railway engineering disciplines.

To support the continued development of this valuable resource, and in line with many other professional engineering institutions, access to the

Knowledge Hub will become an exclusive Member benefit this summer. For Members, very little will change. Members will continue to enjoy full access to the Knowledge Hub and all of its resources, simply by logging in using their existing credentials.

RailEI will continue to provide free and open access to a wide range of opportunities for the railway community, including our annual programme of Lunch and Learns and Section meetings, which together offer more than 200 hours of CPD each year. Dedicated technical discipline pages will also continue to feature selected free-to-access resources across a breadth of railway engineering disciplines.

This change forms part of a wider programme of digital improvements designed to strengthen the value of Membership, support future investment in technical knowledge sharing and create a more connected digital experience across the Institution.

As we look ahead, we will continue exploring how our website can better support Members throughout their careers, helping them access relevant content, connect with the wider community and make the most of the knowledge, opportunities and support available through RailEI.

SHOWCASING RAILWAY ENGINEERING IN ACTION

One of the most exciting aspects of developing the RailEI brand has been the opportunity to showcase the people, projects and engineering achievements that make up our community.

Over recent months, Members, Corporate Members and industry partners have generously shared photographs from across the railway. These images are helping us build a growing visual library that better reflects the breadth of railway engineering today, from track and electrification through to digital systems, infrastructure, operations and emerging technologies.

We would like to extend our sincere thanks to everyone who has contributed images so far. Your support is helping us create a more

authentic representation of the railway engineering profession and the people behind it.

You may already have noticed some of these photographs appearing within The Journal and other RailEI communications, with contributors always acknowledged.

As we continue building the RailEI image library, we would welcome further submissions from across the community. Whether you are working on a major project, delivering innovation, maintaining critical infrastructure or developing the next generation of railway engineers, we would love to help tell your story.

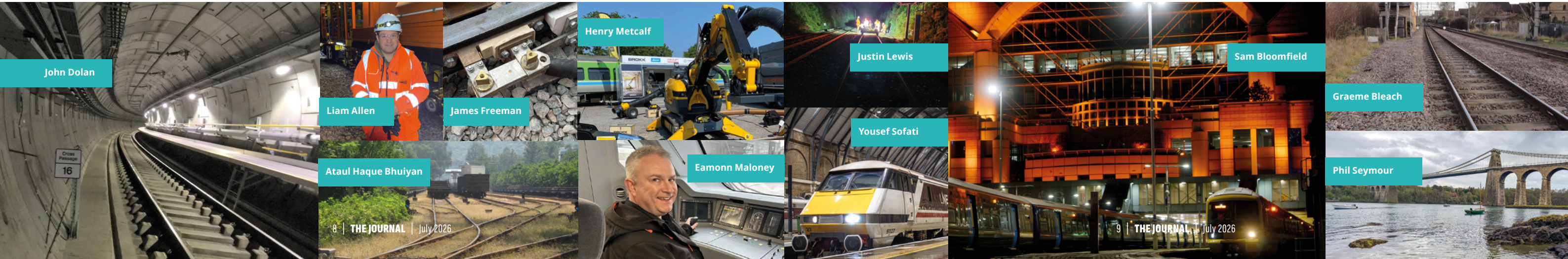
Scan the QR code opposite to submit your photographs and help us showcase railway engineering in action across RailEI publications, marketing materials and digital channels.

Together, we are not only creating a new brand. We are building a stronger, more visible and more connected Institution that reflects the people, expertise and achievements at the heart of railway engineering.



SCAN TO
SUBMIT
PHOTOS

RailEI MEMBERS' PHOTO LIBRARY: GALLERY | RailEI MEMBERS' PHOTO LIBRARY: GALLERY | RailEI MEMBERS' PHOTO LIBRARY: GALLERY | RailEI MEMBERS' PHOTO LIBRARY: GALLERY | RailEI MEMBERS' PHOTO LIBRARY: GALLERY | RailEI MEMBERS' PHOTO LIBRARY: GALLERY





DR BRIAN COUNTER
TECHNICAL DIRECTOR
technicaldirector@railei.org

NOW WE HAVE HAD THE FIRST FULL 6 MONTHS OF RailEI IT IS CLEAR THAT THE RAIL INDUSTRY AND THOSE WHO WORK IN IT HAVE WELCOMED THE CLARITY AND THE TECHNICAL FOCUS THAT THE NEW NAME BRINGS.

We have seen an increase in those wanting to become Members, get involved in the Institution and be professionally registered, as well as interest from industry stakeholders.

There has been an upsurge in the technical interest with the name change and an enhanced recognition that the railway is a system of inter-dependent disciplines. I attended a number of national events at the Royal Academy of Engineering involving other Professional Engineering Institutions (PEIs) and it was clear they were pleased with the clarity of the new name and recognised the contribution of the PWI in playing its part as a licensed body in Engineering. It is important to play our part in the development of future engineering education and careers, and it was good to see a real focus on what the country needs to aim for in 2050.

It is a clear focus for us to ensure that the RailEI Technical Education provision is fit for purpose for the engineers of the future. I am pleased with the work the teams are doing to ensure relevance, innovation and modern delivery. To align with the requirements of the Engineering Council, we are ensuring that all courses prioritise safety of both staff and passengers. We are also embedding aspects of sustainability into our courses including the influences of climate change. I am delighted that we have been able to secure the services of an increased number of experienced railway engineering experts for our courses, many of whom are working in the industry and significantly enhance our goal of knowledge transfer across the railway industry.

LINKED EVENTS AND TECHNICAL ACTIVITY

The Network Rail TME conference on 7 May in Birmingham was jointly organised by the RailEI team and was a tribute to our Membership drive that most TMEs are Members and encouraging Professional Registration.

The technical content was very relevant to what we teach on our courses and the relevance of inspection standards and data management. It was also great to see the Network Rail graduates that attended the Track Engineering Diploma in the last 10 years are now in TME, ATME or other senior track positions.

The RailEI Light Rail Seminar on 14 May was held at a great new venue, the Royal Armouries Museum in Leeds and was a great success. The content was a mixture of strategic light rail options and technical detail. It was good to see a wide range of suppliers exhibiting and many new attendees who appeared to value the enhanced involvement in Light Rail.

We were pleased to have a stand and participate in the International Structures Repair Conference from 8-11 June at the Royal Society of Edinburgh, now we are RailEI there is a growing interest from railway structures engineers who want to understand more about track, electrification and other railway

assets. RailEI was delighted to be hosted by Mike Forde FRailEI, the conference chair and Edna Forde, the conference organiser. We are preparing for our involvement in the Railway Engineering Conference in June 2027.

Hopefully many existing and new RailEI Members will attend our next seminar event which will focus on Electrification on 10 September at another new location in Liverpool.

Please make sure you engage in our Lunch and Learn sessions every other Tuesday 12:30-13:30, details on the website.

PEOPLE

As part of the Edinburgh conference, RailEI's Brian Parkinson hosted a delegation from Hong Kong MTR in conjunction with Derrick Chan from Network Rail Scotland. They have challenging structures and track interfaces and are keen to learn from UK railway experiences. Winson Tse is well known to us as he is the General Manager MTR Infrastructure and has sent many of his staff on our virtual Track Engineering Diploma courses. He is also the Chairman of the China Hong Kong Railway Institution (formerly PWI).

It is good to see RailEI student Members getting involved in RailEI activities where they can learn from industrial organisations and



Figure 1: Hong Kong MTR Delegation on a site visit around Waverley Station.



Figure 2: Winson Tse presenting a gift from Hong Kong to the Lord Provost of Edinburgh Robert Aldridge.



Figure 3: Dr Mark Taylor, Cameron McPhee from Napier and Dr Brian Counter at RailEI stand.

two came from Napier University in Edinburgh. Dr Mark Taylor RailEI Edinburgh secretary helped us organise the stand.

PROFESSIONAL REGISTRATION

We are ahead of target this year for all grades which is a great reflection on the industry and the benefits of being MRailEI. I am still promoting the Experiential Learning route for both IEng and CEng levels to delegates on our Technical Education Courses.

The next phase of degree apprentices combining with IEng is progressing for London South Bank University and I have been pleased to carry out more reviewer training.

It is important that candidates recognise the importance of the E2 competence - safety and particularly the requirements of CDM which applies for maintenance as well as projects and renewals. We have been working on revised guidance which will be available shortly.

RailEI TECHNICAL EDUCATION AND TRAINING

As we complete the first half of 2026, we will have delivered 26 courses at Derby, Milton Keynes, Newcastle and online. We were pleased that over 120 Network Rail Graduates participated in our Track and Electrification Engineering Diploma courses. The Irish Rail courses are continuing well and the new Irish P&C (Points and Crossings course) prepared by Andy Franklin is due for delivery in July. The updated Advanced Track Technician Course has had great reviews thanks to the work led by Ben Haines in conjunction with other lecturers. This is a partnership with Network Rail's Andy Bull and is a key element of STO training for a new generation.

We have also just launched the third Advanced S&C Systems Engineering course with a good number from Network Rail



Figure 4: Molly Dalton and Ben Haines opening the Module 2 on the Advanced Track Technician Course at Derby Conference Centre.

Western, and thanks go to the dedication of our expert lecturing team which now includes S&T Engineer Simon Ockwell-Rolph.

TECHNICAL AND SAFETY

The last few months have been a challenging time for railway staff and system safety in the UK especially with the high temperatures in May and June. The major one being the tragic fatal train collision at Elstow near Bedford. Two other incidents involving rail trolleys and equipment left on the line after engineering work and hit by trains are also under investigation by RAIB. We have a regular update from Jonathan Graham of the RAIB at the RailEI quarterly Technical Board involving our Corporate Members. This is an opportunity for issues to be discussed and advice disseminated across the industry.

There was also a very technically interesting RAIB report on speeding over Trowell junctions in Nottinghamshire in May.

At these junctions, the train was routed over five sets of points for a diverging route which had a permitted speed of 30 mph (48 km/h). The train traversed the first set of points at 70 mph (112 km/h) and was still travelling at 45 mph (72 km/h) when it reached the last set of points. The signals on the approach to the junctions were displaying the correct indications for the diverging route.

The train's speed over the junctions caused it to lurch sideways. This led to some passengers being thrown from their seats and others falling to the floor, resulting in a number of minor injuries. The train did not derail during the incident. Investigations are continuing as to the cause but from a technical track design perspective it was an interesting test of safety parameters usually associated with cant deficiency limits.

Finally, thanks go to Jamie Kelly of the Volker Rail Light Rail Metro team for sharing a technical achievement on the Sheffield Supertram. They succeeded in installing a replacement complex single lead and diamond crossing interacting with a highway junction at a street in Sheffield City. Not only was the track design and track geometry complex but the highway alignment required challenging level designs for drainage. This was achieved alongside difficult site conditions and abnormally high rail temperatures (over 46 degrees Celsius) which affected the welding of the grooved rail.

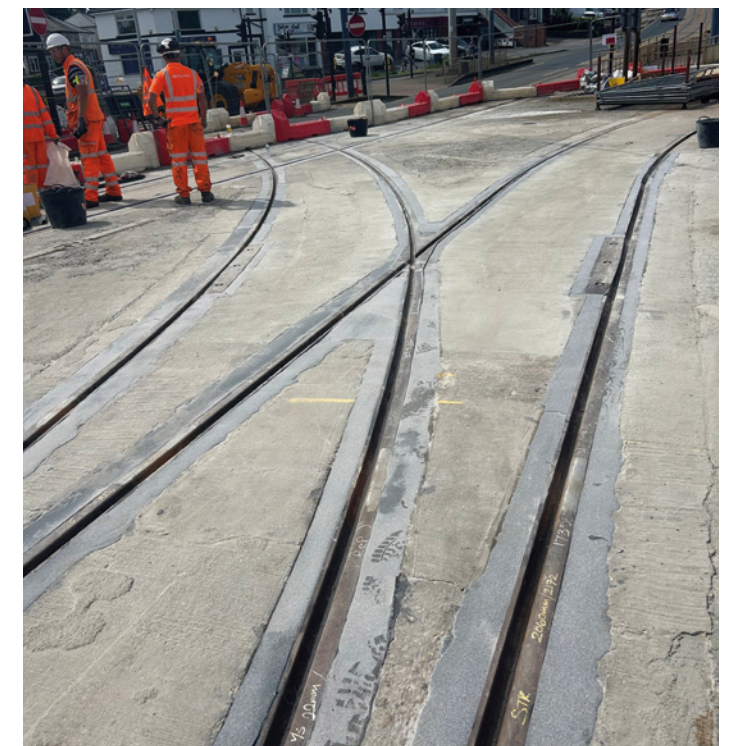


Figure 5: Sheffield Supertram crossing (Photo courtesy of Jamie Kelly).



Alex Reynolds is an Incorporated Member of the Railway Engineering Institution with 12 years' experience in track design and engineering. He is a Network Rail approved Contractors Responsible Engineer (CRE) and is currently working as the design lead on numerous major multidisciplinary projects within the UK.



Ryan Suddaby is a former design consultancy Associate Technical Director with 25 years' experience managing the delivery of track design engineering within large multi-disciplinary schemes in both the UK and Australia. He currently acts as Track Project Engineer within Network Rail's ASPRO team in the Eastern Region and the North West Route, via Mace Consult.



Nagarjun is an OLE Associate Technical Director with over 19 years' experience in the rail industry, specialising in the design and delivery of 25kV AC, 2x25kV AC, and 1500V DC electrification systems. He has worked on major rail projects across the UK, India, Malaysia, and Ethiopia, covering feasibility, planning, and implementation design, and currently acts as CRE and OLE Technical Lead for the York office with extensive experience across Rail and industry design standards.



Dr Mohammad Safari Baghsorkhi is a Chartered Engineer and International Professional Engineer (IntPE) with over 20 years' experience in civil and railway engineering across industry and academia. He is Technical Director and Head of Track for England and Wales at Arcadis, leading the track discipline on major multidisciplinary rail projects. A Network Rail approved CRE and Project Engineer (PE), he is also a Fellow of the Railway Engineering Institution and supports Professional Registration reviews and interviews.

WINNER OF THE RAIL BUSINESS AWARDS 2024 INFRASTRUCTURE PROJECT & STATION EXCELLENCE CATEGORY

GOSFORTH DEPOT REMODELLING: MODERNISING A CENTURY-OLD MAINTENANCE FACILITY



With sincere thanks to Arcadis Consulting for providing images and kindly granting us permission to use them. All images provided courtesy of Arcadis Consulting unless otherwise credited.

1. INTRODUCTION

As part of a wider Nexus network investment programme between 2010 and 2021, the Tyne and Wear Metro network underwent significant renewal works, including track renewals and upgrades to power and associated structures. As part of this programme, Stadler Rail was awarded a £362 million contract to supply and maintain forty-six new Class 555 metro vehicles. The introduction of the new fleet required the provision of a modern maintenance facility capable of supporting revised maintenance, inspection and stabling requirements.

As part of the bidding and procurement process, Stadler was required to deliver a new £70 million maintenance depot on the existing Gosforth site (pictured, **Figures 1**). VolkerFitzpatrick was appointed as the Principal Contractor for construction of the new facility, with Arcadis appointed as the Principal Designer responsible for the multidisciplinary permanent way and systems design.

The new depot was required to be delivered within the constrained footprint of the existing Gosforth Depot while maintaining operational capability for the legacy Class 599 fleet for the majority of the construction period. This introduced significant geometric, spatial and operational challenges, particularly in relation to permanent way layout, switches and crossings, overhead line electrification and construction staging.

This paper presents the permanent way and overhead line electrification (OLE) elements of the Gosforth Depot Remodelling project. It describes the development of the depot layout and infrastructure from concept design through staged construction and commissioning, focusing on the design decisions that enabled continuous depot operation within a complex, live railway environment.

2. SITE LOCATION AND OPERATIONAL CONTEXT

Gosforth Depot is located to the north of Newcastle upon Tyne on the Tyne and Wear Metro network, within a constrained 'Y'-shaped junction between the routes serving Regent Centre, Longbenton and South Gosforth stations (**Figures 2** and **3**). The 12-acre site has been in continuous use as a railway maintenance facility for around a century.

Initially constructed in the 1920s, the depot supported successive generations of Metro rolling stock and, from the 1980s, served the

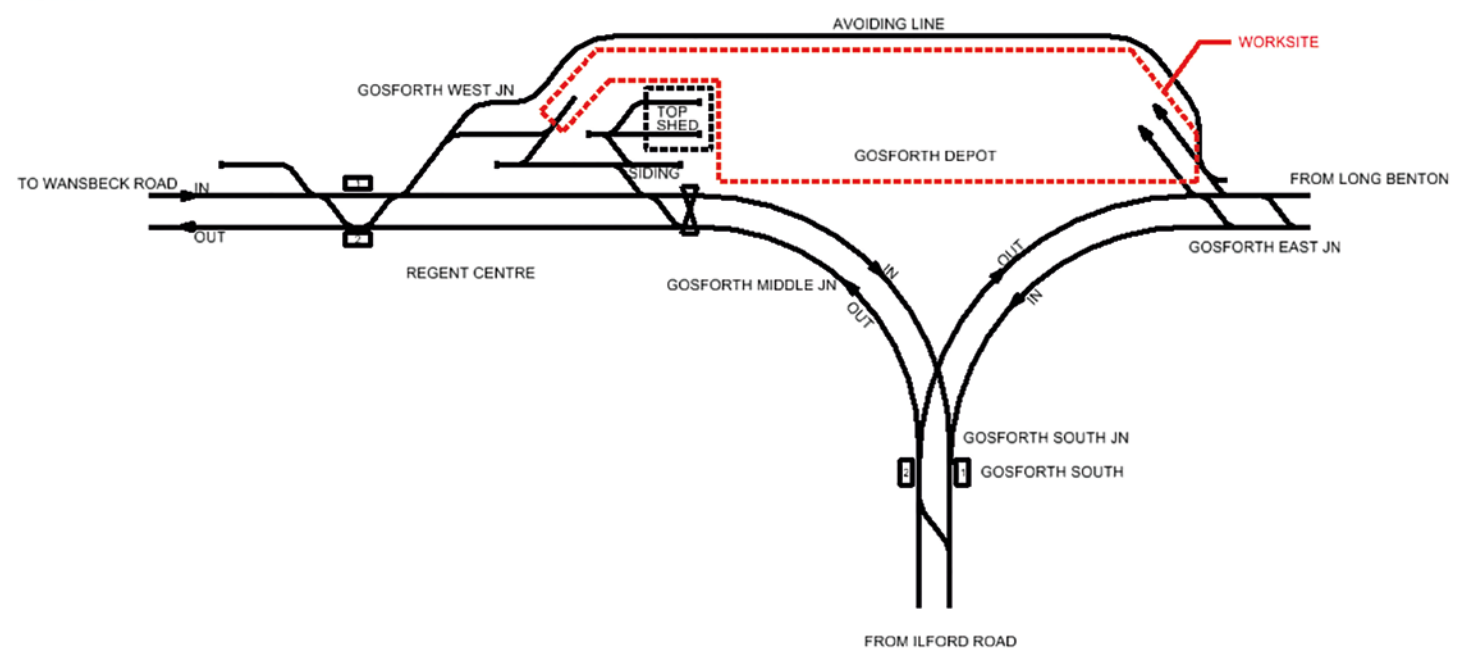


Figure 2: Line diagram showing Gosforth Depot location within the Tyne and Wear Metro network.



Figure 3: Google Earth aerial image showing the depot site and surrounding junction context.

Class 599 fleet. Over time, the infrastructure was incrementally modified to accommodate evolving operational and maintenance requirements. However, by the start of the project, both the depot facilities and the legacy rolling stock were approaching the end of their service lives, necessitating comprehensive modernisation to support the introduction of the new fleet.

3. PROJECT SCOPE AND FUNCTIONAL REQUIREMENTS

The remit of the Gosforth Depot Remodelling project was to deliver a fit-for-purpose maintenance facility bespoke to the new Stadler Class 555 metro vehicles, while remaining semi-operational and capable of servicing the legacy fleet during its gradual replacement. The new depot was required to incorporate a range of specialist facilities, including a carriage wash machine (CWM), automated vehicle inspection system (AVIS), wheel lathe, underframe cleaning (UFC) facility, and a main facilities building capable of supporting both light and heavy maintenance activities. In addition, the final layout was required to provide stabling capacity for up to forty-six Stadler Class 555 vehicles.

The project scope also included replacement of all existing overhead line electrification (OLE) structures, wiring and switching equipment within the depot limits, together with the provision of new electrified

tracks throughout the depot. All new and retained tracks were required to be electrified at 1500 V d.c. using a double-insulated OLE system suitable for depot environments.

Permanent way design was required to satisfy Stadler vehicle requirements for minimum horizontal radii, maximum gradients and operational clearances, while complying with Nexus permanent way standards, which are predominantly, though not exclusively, based on Network Rail standards [1,2,3]. OLE design was developed in accordance with Stadler requirements and Tyne and Wear Metro electrification and traction power standards [4].

4. EXISTING INFRASTRUCTURE AND CONSTRAINTS

Approaching the depot from the west via the reception and wash line, the track layout fanned out into eighteen sidings. Thirteen of these served the main maintenance shed, while a further five sidings located to the south of the shed provided fuelling and general stabling. At the eastern end of the site, all depot roads converged to form dual reception and departure lines connecting back to the operational network. The depot was dominated by the existing maintenance building and associated facilities, including offices, a signalling control centre, paint shop and stores, which occupied approximately 3.5 acres, representing around 37 per cent of the 12-acre site.

Reflecting the long operational history of Gosforth Depot, permanent way componentry varied significantly across the sidings as a consequence of periodic renewals and maintenance undertaken over several decades. Rail assets comprised a mixture of bullhead and flat-bottom rail sections of differing ages and wear. Correspondingly, sleeper arrangements included both timber and concrete units, with bullhead chair systems used where appropriate. Within the maintenance shed, track support configurations differed according to operational function, with rails either directly fixed to the floor slab via baseplates or supported on pedestals or pit walls to facilitate specific maintenance activities.

The depot layout comprised a total of twenty-nine turnouts, including a combination of bullhead and flat-bottom AV and BV units. At the western end of the depot fan, an equal-split tandem turnout formed part of the layout, while a bullhead scissors crossover was installed at the eastern end on the tightly curved arrival and departure lines.

ABSTRACT

The renewal of railway maintenance depots presents distinct engineering challenges, particularly where modern operational, safety and electrification requirements must be delivered within constrained brownfield sites while maintaining live operations. Gosforth Depot, located on the Tyne and Wear Metro network, required comprehensive remodelling to support the introduction of a new fleet of Stadler Class 555 metro vehicles, while continuing to service the legacy Class 599 fleet throughout construction.

This paper presents the permanent way and overhead line electrification (OLE) elements of the Gosforth Depot Remodelling project, following the full lifecycle from design development through staged construction and commissioning. Emphasis is placed on resolving geometric and spatial constraints, the selection of appropriate track forms and switches and crossings, the development of a depot specific 1500 V d.c. double insulated OLE system, and the integration of temporary and permanent works to maintain operational continuity. The lessons identified are applicable to similar depot renewal projects undertaken within constrained operational environments.



Figure 4: View facing west between existing depot road 18 and 19 highlighting the southern embankment.

These arrangements introduced geometric complexity and influenced both design development and construction staging.

To the north of the depot, a bi-directional avoiding line provided an operational route allowing trains to bypass the depot, enabling services from the west, including the Newcastle Airport branch, to operate directly to the east and vice versa without the need for reversal at South Gosforth station.

The Tyne and Wear Metro system is electrified at 1500 V d.c. using a proprietary system design dating back to its introduction in 1980. Across the wider network, the overhead line electrification (OLE) system utilises a combination of simple auto-tensioned and fixed-termination arrangements. Within Gosforth Depot, the existing OLE was subdivided into multiple independently isolatable electrical sections, with sectioning controlled from the Central Gosforth control room. Depot electrification comprised predominantly single-insulated, tramway-type equipment utilising multi-track span wire arrangements, with all OLE structures bonded to the traction negative return rail.

5. DESIGN CONSTRAINTS AND CHALLENGES

Like all brownfield rail infrastructure projects, the remodelling of Gosforth Depot was subject to a range of site-specific design constraints. In this case, the constrained site geometry, the requirement to maintain depot operations, and the need to accommodate potential future network enhancements presented particular challenges during design development.

As part of the project remit, provision was required to safeguard space for the future dualling of the northern avoiding line, intended to increase traffic capacity to the Newcastle Airport branch. Although the design of the dualling alignment and associated junction alterations lay outside the project scope, an understanding of its interface with the depot was required. A feasibility study was therefore undertaken to inform the setting-out of the northern perimeter fence line and protect future enhancement opportunities.

Retention of the existing wash and reception road as the primary western access point for depot movements imposed a critical vertical alignment constraint. The legacy reception line fell at a gradient of approximately 1:65 from west to east. Extending this gradient through the western fan would have placed a vertical curve within the long bearers of the turnouts, which was not considered acceptable. Raising the overall depot level by approximately 1.2 m to eliminate

the gradient was discounted at an early stage due to the significant volume of fill required across the 12-acre site, the consequential impact on programme and cost, and the need for extensive junction works at Gosforth East. Instead, the spacing between turnout units at the start of the fan was adjusted to allow a change in gradient, flattening the profile to approximately 1:139 and relocating the vertical curve outside critical bearer zones, while maximising flat track length ahead of the wheel lathe building slab.

To the south of the western reception road, differences between the falling depot gradient and the relatively flat adjacent main line and top shed tracks resulted in a level differential. This required a retaining wall and embankment extending along the southern boundary of the site, containing high-voltage services identified during buried services assessments (**Figure 4**).

At the eastern end of the depot, the avoiding line rejoined the running lines near a pedestrian footbridge, immediately upstream of existing traps and turnout long bearers associated with Gosforth East Junction. To maintain signalling functionality, the turnout position could not be altered, requiring any new arrival and departure tracks to be geometrically tied in ahead of this interface.

The positioning of key operational facilities, including the main facilities building, wheel lathe, carriage wash, AVIS and underframe cleaning facility, was considered prior to detailed alignment development. An internal highway was aligned along the base of the southern embankment, corresponding broadly with the alignment of Roads 18 and 19, enabling efficient deliveries and staff access without the need to cross live depot lines. These locations were treated as fixed points, requiring close coordination between disciplines to ensure functional and geometric compatibility.

OLE design was similarly influenced by operational constraints. Depot roads were grouped into electrical sections, typically comprising pairs or groups of three or four roads, divided into east and west zones. Each road within the central depot sections retained an individual feed, while the fan arrangements were configured to allow alternative feeding scenarios. This rationalised sectioning strategy improved isolating safety, maintained access to switches, and allowed the majority of the depot to remain operational during isolations.

Finally, construction logistics imposed additional constraints. The depot's location within a three-junction 'Y' formation, combined with a heavily urbanised surrounding environment, limited access for large deliveries. Narrow, predominantly single-lane access roads, often constrained by on-street parking, and proximity to schools along Christon Road necessitated careful management of material quantities and vehicle movements, with minimising the use of heavy wagons identified as a key priority.

6. DESIGN DEVELOPMENT AND FINAL LAYOUT

6.1 Site Layout Development and Building Integration

With the key site constraints understood, the tender design was developed using the site topographical survey and progressed through coordinated discussions with the design disciplines, construction team and client. This process was undertaken to refine the locations of the main facilities building (MFB), underframe cleaning facility (UFC), carriage wash (including plant room) and wheel lathe.

To support the project remit and construction staging strategy, the location of the MFB was carefully selected to allow continued operation of the existing Class 599 fleet, which at this stage in its service life required ongoing maintenance. The final MFB location, situated in the south-east corner of the site, enabled construction to proceed by clearing a large area of predominantly plain-line track and a limited portion of the existing shed, while maintaining operation within the remainder of the facility. This location fixed the positions and track centres of the four service roads within the MFB, comprising two light-maintenance roads and two heavy-maintenance roads.

Using the MFB road layout, together with the associated access road and car park, the remaining depot tracks were set out to provide appropriate clearances for walkways and operational activities such as front-end cleaning and driver inspection. With four final berths provided within the shed, the balance of stabling demand was accommodated within the remaining sidings.

6.2 Horizontal Geometry and Turnout Strategy

To connect the depot sidings while maximising usable track length, NR56 full-depth BV8 turnouts with CEN56 rail were initially selected during early feasibility stages. These units were considered appropriate due to their compact geometry as identified in NR/L3/TRK/2049/Mod1, supporting procurement and maintenance considerations [1]. As layout development progressed, it became apparent that a back-to-back single-turnout arrangement would significantly constrain stabling capacity.

Following discussions with the installation contractor and with Stadler and Nexus, a revised turnout strategy was adopted incorporating type-three tandem turnouts and one single AV switch, which was incorporated at detailed design stage. The final layout comprised twenty-seven point ends, including three type-two tandems and twenty-three single turnouts. All turnouts were power-operated and controlled via the depot signalling system, with no manual points provided.

To further maximise space on parallel straights, and reflecting the low-speed depot operating environment, a minimum horizontal radius of 125 m was adopted, with zero cant throughout. Where virtual transitions were required, rates of cant-deficiency change remained well below typical limits. Although tighter curvature was accepted where necessary, radii were maximised wherever practicable. In locations where radii below 201 m were unavoidable, gauge widening was applied to mitigate rail wear and reduce the potential for increased noise, recognising the proximity of residential and commercial properties.

No lateral resistance plates were provided on curves below 201 m, consistent with NR/L2/TRK/2102 [5]. Their omission was considered proportionate given the low depot line speeds, lighter vehicle weights and use of jointed track, while also reducing maintenance and installation complexity.

The completed horizontal layout provided seventeen sidings serving a carriage wash, two light-maintenance roads (Sidings 10 and 11), two heavy-maintenance roads (Sidings 12 and 13), two stabling roads for Nexus maintenance wagons and one wheel lathe, meeting the project berthing requirements. The eastern approach arrangement is shown in **Figure 5**.

6.3 Vertical Alignment Strategy

The vertical alignment strategy differed from typical main-line practice. Rather than progressing from one end of the site, the design adopted a central datum with an extended flat grade aligned as closely as possible to existing track levels, thereby minimising cut and fill across the 12-acre site. Even modest vertical adjustments across the site would have required significant import of material, with consequences for cost, programme and construction traffic through surrounding residential areas and nearby schools.

At the western end, the retained wash slab imposed a controlling vertical constraint, as it was required to remain operational throughout construction to support the existing fleet. The existing reception-line gradient of approximately 1:65 could not be maintained through the western fan without introducing vertical curvature within turnout long bearers. To avoid this, a grade change was introduced between turnout units, flattening the gradient and relocating the vertical curve outside critical bearer zones. For the routes serving Sidings 5–9 and the MFB lines (Sidings 10–14), the steeper gradient was retained to maximise the extent of flat track through the main stabling areas.

6.4 Track Form and Componentry

As alignment development progressed, close coordination with other disciplines enabled iterative refinement to accommodate signalling equipment, walkways, lighting, depot protection systems and AVIS interfaces. Once these positions were agreed, the alignment was frozen and detailed track componentry was developed.

Switches and crossings throughout the depot utilised NR56 turnout units with CEN56 rail continued through the main stabling areas for consistency. In plain-line areas, G44 concrete sleepers were initially proposed; however, following embodied carbon assessment and procurement discussions with the installation contractor, these were replaced with F27 and F40 concrete sleepers. This change delivered embodied-carbon and cost benefits while also reducing training requirements associated with the fastening system, representing a value-engineering outcome within the project.

Track within the stabling areas was delivered predominantly as jointed track. Adoption of continuous welded rail was considered



Figure 5: Eastern approach showing, from right to left, Sidings 1 to 17 (Image courtesy of Stadler Rail).

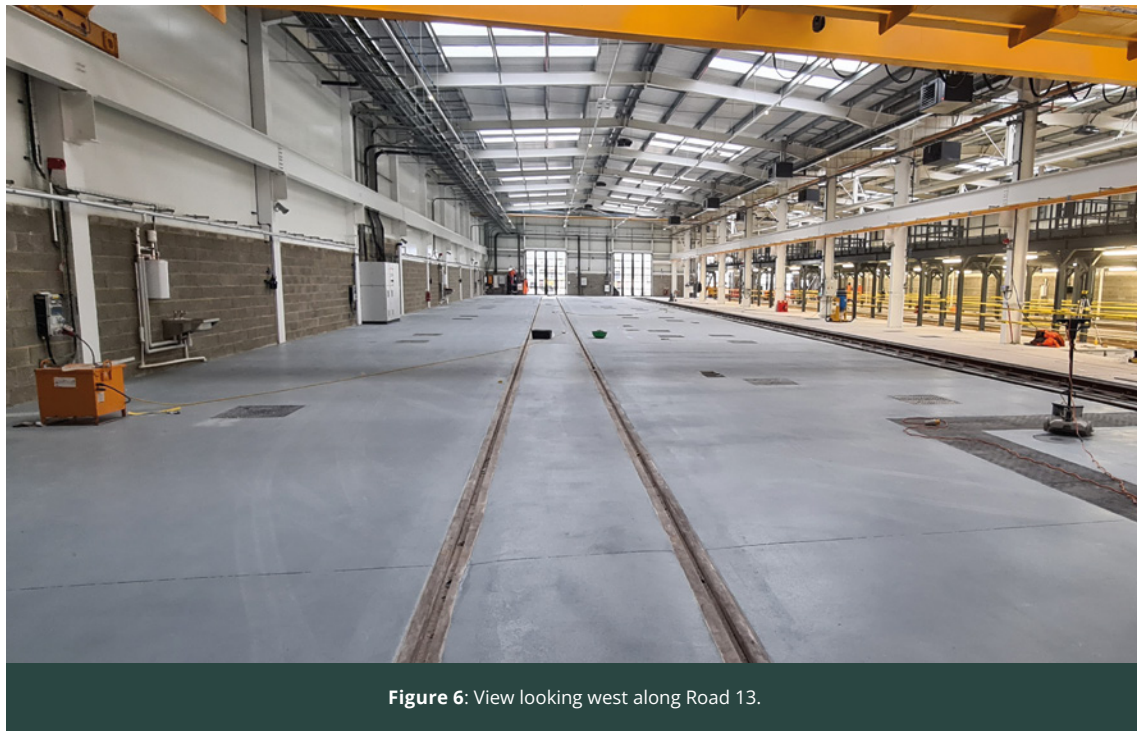


Figure 6: View looking west along Road 13.

disproportionate within the depot context, particularly given the low line speeds and geometric constraints. Use of CWR would have required increased minimum curvature (approximately 250 m rather than 125 m) and strengthened S&C units, increasing cost and lead times.

Within buildings, track support arrangements varied by function. Direct-fix track was adopted as the default solution and tailored to maintenance requirements. In the apron areas of the MFB and wheel lathe, rail was embedded within the concrete slab to allow vehicle and equipment movements. For the light-maintenance roads (Sidings 10 and 11), pedestal-supported track was provided, requiring transition to CEN60 rail to reduce deflection over the 1.5 m pedestal spacing.

On the heavy-maintenance roads, Siding 12 comprised a pit road with rail directly fixed to the cast pit walls, transitioning to embedded track through the MFB and storage areas to allow axle delivery by articulated vehicles. Siding 13 was embedded throughout (Figure 6), with both roads maintaining CEN56 rail continuity to the external ballasted track.

6.5 Overhead Line Electrification Design

The final OLE design was developed to support staged construction and commissioning. Works included the demolition and removal of more than 100 existing OLE structures across 20 roads, together with installation of over 100 new foundations and structures serving 17 new tracks. Nineteen new conductor runs were installed, totalling approximately 6.3 km.

Foundations for the new OLE structures comprised CHS tubular pile foundations, with earthed masts supporting double-insulated cantilevers. Standard UK Master Series 610 mm steel piles were used across the site, allocated using the ORE method in accordance with NR/L2/CIV/074 [6].

The Siemens SICAT LD OLE system was selected for compatibility with Nexus requirements for 1500 V d.c. operation and double insulation [7]. The system was used throughout the depot for most registrations, including aluminium and GRP cantilevers, multitrack cantilevers and headspans. Interfaces with existing single-insulated main-line structures were achieved in accordance with Nexus standards, with existing wiring modified where necessary and Furrer + Frey FL200 cantilevers installed on retained masts where headspans previously served both depot and running-line wiring.

Double-insulated OLE was provided on all new depot structures to mitigate stray-current risk, using insulated registration arms or contact-wire clips in addition to insulation within cantilever frames or cross-spans,

thereby minimising the live electrical envelope. Contact-wire height was increased to a nominal 5.6 m throughout the depot to improve clearances for operatives at driver-access platforms and above walkways. All feeder and section isolators within the depot were replaced with LC Switchgear manual units to align with Nexus network practice. Where required, bespoke OLE supports were designed to integrate with new facilities, including a dangle support within the carriage-wash building and a wall-mounted cantilever on the MFB to provide temporary registration for Stabling Road 9 prior to demolition of the existing building.

7. CONSTRUCTION STAGING AND IMPLEMENTATION

7.1 Staging Objectives and Constraints

As identified during the design development stage, completion of the final layout shifted the project focus to the integration of demolition and construction activities within a live operational depot environment. The staging strategy was required to maintain operational capacity throughout delivery, including provision of a minimum of 35 operational berths and continuous OLE electrification, while enabling progressive removal of the legacy depot and construction of the new facilities. Given programme duration and operational dependency, the primary staging objective was to release sufficient space to construct the new Main Facilities Building (MFB) at the earliest opportunity.

The previously agreed location of the MFB defined the extent to which existing depot infrastructure could be removed during early stages. While the existing berthing plan was retained wherever practicable, temporary berthing arrangements were accepted as necessary at individual stages. Throughout the works, a continuous internal through-route was maintained within the depot, together with the ability for trains to enter and exit the site at both the west and east ends.

7.2 Stage 1 – Initial Demolition and MFB Enabling Works

The Stage 1 demolition limits were established by overlaying the footprint of the new MFB onto the existing depot plan. Safe working zones of 10 m to the north wall and 20 m to the west wall of the new building were agreed with the installation contractor, defining the initial extent of demolition. This resulted in removal of the south-east corner of the existing shed. Working from south to north across the site was identified as the most effective sequencing approach, maintaining construction access while keeping the depot operational. Importantly, the existing signalling room located within the northern office area remained in service until completion of the new MFB.

Track removal during Stage 1 included complete removal of Roads 16–20 and partial removal of Roads 9–15 at the eastern end, together with the removal of twelve existing turnout units. Temporary weatherproofing was installed to exposed sections of the retained building to protect maintenance activities. Following clearance of track, structures and foundations within the Stage 1 area, construction commenced on the MFB foundations and superstructure, together with Stabling Roads 14–17, four new turnout units, and the wheel lathe foundations and structure. These new tracks were temporarily tied into the existing alignment to maintain stabling capacity through subsequent stages.



Figure 7: Bespoke temporary “biscuit” foundation used during staged construction.

Stage 1 also included removal of OLE structures and wiring over Roads 16–20 and partial removal over Roads 9–15 at the eastern end. Remaining wire runs for Roads 9–15 were terminated on bespoke temporary “biscuit” foundations designed to preserve the existing concrete floor and reduce construction complexity (Figure 7). These foundations were subsequently reused as temporary anchor arrangements in later stages. Four new roads were installed south of the retained building and west of the new MFB.

7.3 Stage 2 – Western Fan Reconstruction

With construction of the MFB and wheel lathe progressing, demolition activities shifted to the western end of the depot. Stage 2 comprised removal of the remaining sections of the existing building over Roads 12–15, together with associated foundations. Temporary weatherproofing was relocated to the new building edge. External tracks serving Roads 12–15, five turnout units and the existing fuelling road were removed from the western fan.

This stage included one of only two disruptive possessions undertaken during the project. During this possession, the existing equal-split tandem turnout was removed and replaced with the final tandem arrangement, together with new ballast and final connections to tracks installed during Stage 1. Additional works comprised installation of one turnout and partial installation of Roads 10–13 up to 20 m from the MFB face to provide safe working clearances. Due to proximity between the final Road 10 alignment and the retained temporary wall, Road 11 was installed in a temporary offset position, providing transit clearance while

maintaining weatherproofing. This arrangement was adopted to increase staging capacity during the following demolition phase.

To maintain depot operations, OLE removal works during Stage 2 were split into four smaller sub-stages. This approach permitted installation of the new western tandem S&C unit within a single possession, while Roads 12–15 were progressively removed and re-electrified with new OLE equipment.

7.4 Stage 3 – Central Depot Reconstruction and Interface Management

Completion of Stage 2 enabled continuation of works at the western end during Stage 3. Civil works progressed on the MFB and UFC, while remaining legacy infrastructure was removed and new stabling tracks and OLE installed. This stage included demolition of the remaining building sections over Roads 9–11, removal of the associated plain line and three turnout units, followed by installation of three new turnout units and installation of Roads 9 and 10. Road 11 was slewed into its final position following removal of building foundations.

Road 9 represented the first installation of a final-state through road. However, to maintain construction access for subsequent phases, the track was not installed end-to-end. Instead, close coordination with the OLE team defined installation limits, with track constructed to the final isolation point required for operational power demands. A temporary OLE anchoring arrangement was developed to allow termination of the contact wire on the shortened alignment.

During Stage 3, interaction between retained depot infrastructure and new works became more critical. In particular, existing signalling location cases required for operation of the western fan on the northern side of the depot conflicted with the proposed turnout route towards the wash. To retain these assets in-situ, the turnout was temporarily omitted and replaced with plain line constructed to final horizontal and vertical alignment, allowing train movements to continue while maintaining clearances to signalling equipment (Figure 8).

7.5 Design Change and Eastern End Reconfiguration

The approved-in-principle (AiP) final design originally proposed a crossover at the eastern end to serve a single arrivals and departures road. The staging strategy incorporated this arrangement through multiple phases to minimise disruption to eastbound services. During Stage 3, however, Arcadis was instructed to revise the layout to provide separate arrival and departure lines.

The revised layout and vertical alignment were developed rapidly, with multiple staging options reviewed in consultation with the



Figure 8: Proximity of retained depot infrastructure during Stage 3 of construction.



Figure 9: View facing west on Road 8 during early Stage 5 of construction.

construction team and depot operator. While all options minimised disruption to eastbound services, several introduced unacceptable impacts to OLE, signalling and depot security, together with increased cost. A single extended possession was therefore adopted as the least disruptive and most cost-effective solution.

7.6 Stage 4 – Eastern Blockade and Operational Transition

Stage 4 was implemented as a 72-hour blockade comprising removal of three turnout units, the existing scissors crossover, short sections of plain line and associated OLE equipment. Following clearance, the revised arrival and departure tracks were installed, together with three new turnout units and final connections to Roads 9, 10 and 11. Completion of this stage established these roads as the first fully operational through routes within the new depot configuration.

This milestone marked a significant operational transition, with all depot activities relocated into the new MFB, including maintenance of the legacy fleet, depot signalling and associated functions, enabling planning for full decommissioning of the old depot during Stage 5.

Concurrent OLE works removed electrification over Roads 2–8 and the eastern shed, together with the existing arrivals/departures roads and diamond crossing. New OLE was installed over Roads 10 and 11, and Road 9 was extended to connect east and west ends north of the MFB.

7.7 Stage 5 – Decommissioning and Completion

Stage 5 represented the final phase of depot transformation. With operations fully transferred to the new facility, the remaining signalling room, office buildings, stores, paint shop, and stabling Roads 2–7 were demolished, together with the final sections of the old MFB structure. Track removal included seven turnout units and two crossovers (Figure 9).

Following the largest demolition phase, the final construction phase delivered

the remaining depot infrastructure without reliance on existing assets. Works included installation of nine turnout units and one tandem, including replacement of the turnout omitted during Stage 3 due to signalling conflicts. Roads 1–8 were installed to complete the stabling layout, enabling construction of the final major civil structures, including the carriage wash and wash-plant buildings along the Road 1 access route.

OLE works during Stage 5 were split into three sub-stages to maintain depot operability. Remaining OLE assets over Roads 6–8 and the washer bypass were removed, followed by installation of new OLE over Roads 5–8 and subsequently Roads 1–9. New span-wire supports for the carriage wash were installed during this phase.

Final track installation enabled decommissioning of the existing wash facility and completion of the permanent way works. Following approximately four years from feasibility design to commissioning, the project delivered a fully operational modern

maintenance depot, subsequently recognised at the 2024 Rail Business Awards for Infrastructure Project and Station Excellence.

8. CONCLUSIONS

The Gosforth Depot Remodelling project demonstrates that comprehensive renewal of a major rail maintenance facility can be delivered successfully within a constrained brownfield site while maintaining live operations throughout construction. The project required careful consideration of permanent way geometry, overhead line electrification, building interfaces and construction staging, all of which were intrinsically linked and could not be addressed in isolation.

A key outcome of the project was the early identification and management of fixed constraints, including retained gradients, legacy signalling interfaces, operational access routes and future network safeguarding requirements. Addressing these issues at feasibility and optioneering stages allowed design decisions to be tested against both operational and construction requirements, reducing risk as the project progressed into detailed design and implementation.

The integration of permanent and temporary works was central to maintaining depot functionality during delivery. Geometry decisions, track form selection and OLE sectioning were developed with staging explicitly in mind, enabling safe transitions between interim and final configurations. This approach avoided the need for extensive rework and supported the progressive transfer of operations into new infrastructure as it became available.

Close multidisciplinary coordination throughout design development proved essential. Alignment development was informed not only by permanent way and OLE requirements, but also by signalling, depot protection systems, maintenance processes, access arrangements and construction logistics. This collaborative approach ensured that the final layout was operationally efficient, maintainable and deliverable within the constraints of the site.

From an electrification perspective, adoption of a depot-specific double-insulated OLE system, combined with rationalised electrical sectioning and bespoke support arrangements, enhanced safety and operational flexibility while supporting staged commissioning. Permanent way solutions similarly balanced performance and maintainability, with component choices informed by geometric constraints, life-cycle considerations and constructibility within a live depot environment.

Overall, the project highlights the importance of treating depot remodelling as a system-level engineering challenge rather than a series of disconnected asset renewals. The approach adopted at Gosforth – from early feasibility through detailed design, staged construction and commissioning – provides transferable lessons for the delivery of similar depot renewal schemes, particularly where operational continuity, spatial constraints and complex interfaces must be managed concurrently.

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Industry Award Recognition

The Gosforth Depot project has been entered into numerous industry awards. It has been recognised as follows:

- Rail Business Awards - Infrastructure Project and Station Excellence: Winner
- Rail Business Awards - Supplier & Contractor Excellence: Shortlisted
- CIHT awards - Infrastructure award: Highly Commended
- Construction News Awards - Regeneration Project of the Year: Shortlisted
- Global Light Rail Awards – Vision of the Year: Shortlisted
- National Transport Awards: Shortlisted
- National Rail Awards – Infrastructure achievement of the year: Shortlisted.



New trains, prepared for the next day (Image courtesy of Stadler Rail).

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Luke has supported projects across the UK in the past 21 years, from maintenance and monitoring through to major schemes including the 2012 Olympic construction, the Edinburgh Tram and Thameslink developments. He has worked in Contractor and Designer roles prior to joining a Client organisation. He is passionate about promoting Ground Engineering and supporting future engineering Geologists, as the geohazards associated with the changing climate continue to require new and innovative ways of working.

THE REMEDIATION OF HARLESDEN EMBANKMENT: MANAGEMENT OF A DEEP-SEATED ROTATIONAL FAILURE WITHIN A LIVE RAILWAY CORRIDOR

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ABSTRACT

Harlesden Embankment, located on the West Coast Main Line approximately 6.5 miles north of London Euston, represents one of the most complex geotechnical risk management challenges encountered on a live UK railway. Constrained between two operational railway corridors and intersected by historic masonry structures, the embankment exhibited progressive deterioration culminating in the identification of a deep-seated rotational landslip. This paper presents the investigation, risk management, design development, and delivery of a long-term remediation scheme, highlighting the importance of iterative ground modelling, monitoring-led decision-making, and collaborative multidisciplinary engineering.



Figure 1: Location plan showing Harlesden Embankment on the West Coast Main Line, including proximity to the adjacent freight route and intersection bridge.



Figure 2: Evidence of deep-seated movement at the embankment toe, including distortion of OLE and signalling assets and historic repairs to the bridge wingwall.

INTRODUCTION AND INITIAL TRIGGER

Harlesden Embankment is located on the West Coast Main Line (WCML), approximately 6.5 miles north of London Euston, where the railway is carried on a Victorian era embankment adjacent to a parallel freight corridor and intersected by a masonry intersection bridge (Figure 1).

In November 2018, concerns were raised by the Route Track team regarding an increased rate of deterioration in track geometry on the 120 mph main line. Initial desk-based review suggested seasonal shrink-swell behaviour within reworked London Clay, a common mechanism across the southern railway network. However, subsequent site observations indicated a more complex and potentially safety-critical issue.

SITE OBSERVATIONS AND GROUND MODEL REFINEMENT

Detailed site inspection identified a range of distress features inconsistent with superficial seasonal movement. These included loss of ballast shoulder, reduction in embankment crest level, and localised distortion to a brick-lined under-track crossing chamber.

At the embankment toe, several permanent way-adjacent assets exhibited clear signs of progressive ground movement (Figure 2):

Observed deformation included leaning OLE masts, inclined signalling structures, rotated telecommunications infrastructure, and historic stitch repairs to the masonry wingwall. Collectively, these features indicated a deep-seated failure mechanism extending beneath the wingwall and mobilising the embankment toe.

Material Name	Color	Unit Weight (kN/m ³)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Ru
Embankment		18	Mohr-Coulomb	1	20	None	0.25
Weathered London Clay		18	Mohr-Coulomb	1	20	None	0.25
London Clay		19	Mohr-Coulomb	1	20	None	0.25
Residual Strength Clay		19	Mohr-Coulomb	1	13	None	0.3
Wall		24	Infinite strength			None	0

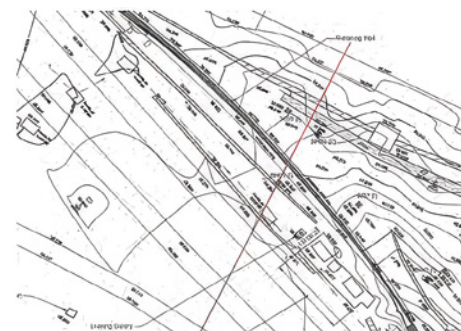


Figure 3: Conceptual ground model illustrating the inferred deep-seated rotational failure mechanism beneath the embankment and bridge wingwall.

FAILURE MECHANISM INTERPRETATION

The developing pattern of damage led to refinement of the site ground model. The embankment geometry, historic construction phases, and asset responses suggested a slow-moving but progressive rotational landslip within London Clay, bypassing the wingwall foundation and generating heave pressures at the toe. The landslip being observed and causing movements to permanent way and adjacent assets was transecting the boundary between embankment soils and the underlying natural ground. The depth of failure was such that it was located below the foundation of the wingwall (Figure 3).

This revised interpretation marked a key transition point in the project, prompting escalation from a serviceability concern to a potential derailment risk requiring enhanced monitoring and intervention planning.

MONITORING AND RISK MANAGEMENT

In order to quantify movement rate and depth, a new borehole with inclinometer (BH01) was installed at the embankment toe. Monitoring data rapidly confirmed the presence of a defined shear surface at depth, consistent with the conceptual mechanism (Figure 4).

Based on this evidence, a structured risk management framework was implemented, incorporating enhanced track surveillance, remote deformation monitoring, and defined intervention trigger levels linked to an Emergency Action Plan.

OPTIONEERING AND DESIGN DEVELOPMENT

Following confirmation of the failure mechanism, eleven remediation options were considered, ranging from ground improvement techniques to embedded retaining structures. Each option was assessed against key constraints including asset protection, buildability, long-term performance, and continuity of rail operations.

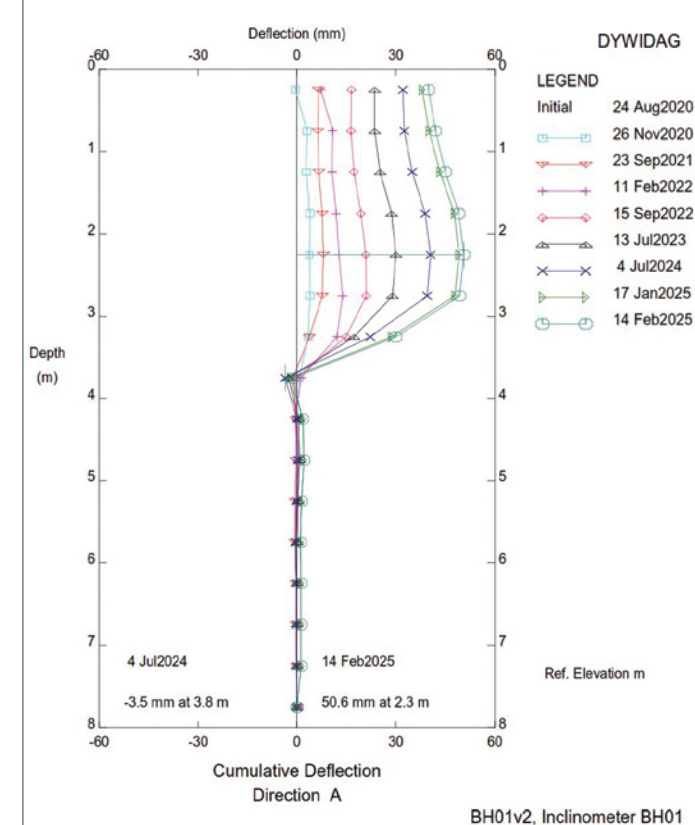


Figure 4: Inclinometer monitoring confirming deep-seated rotational movement and informing escalation from serviceability concern to safety-critical risk.

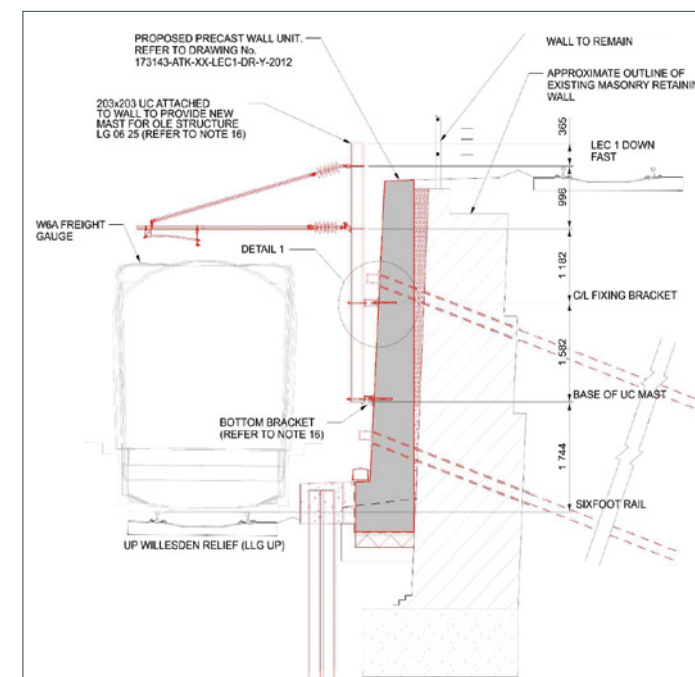


Figure 5: Selected remediation solution comprising an embedded sheetpile wall and replacement retaining structure to stabilise the embankment and protect operational assets.

The preferred solution comprised an embedded retaining wall system combined with renewal of the existing wingwall structure, providing both geotechnical stabilisation and structural asset resilience (Figure 5).

CONSTRUCTION AND DELIVERY

The scheme was delivered under highly constrained conditions, beneath live passenger and freight railway operations. Construction access was achieved through a combination of temporary land agreements and carefully sequenced possessions, allowing the WCML to remain operational throughout the majority of the works (Figure 6).

Instrumentation and monitoring were maintained throughout construction, benchmarked against long-term historic datasets to ensure movements remained within predicted bounds.

OUTCOMES AND LESSONS LEARNED

Harlesden Embankment has been transformed from a high-risk geotechnical concern into a resilient asset supporting one of the UK's busiest rail corridors. The project demonstrates the value of early escalation, evidence-led decision-making, and close collaboration across engineering disciplines (Figure 7).

ACKNOWLEDGEMENTS

The successful delivery of the Harlesden Embankment remediation reflects the collective efforts of route asset managers, geotechnical engineers, designers, contractors, and operations teams across Network Rail and its supply chain.



Figure 6: Construction of the toe retaining wall under live railway conditions, illustrating spatial and operational constraints.



Figure 7: The completed solution.



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Dr. Nikolaos Baimpas
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Dr. Nikolaos Baimpas is the Director of Train – Rail Infrastructure Solutions (T-RIS) and an expert in Overhead Contact System (OCS) to pantograph dynamic interface performance.

His extensive experience in electrification encompasses the design of complex systems using the proprietary Dynamic Rail System Simulation (D-RSS) tool, as well as infrastructure construction assurance through static wire geometry and dynamic interface assessments. Having supported numerous testing campaigns, Dr. Baimpas is now focused on developing data-driven alternatives to full-scale pantograph testing, championing a "get-it-right-first-time" approach to solve one of the most significant technical and economic challenges in modern rail electrification.

THE ELECTRIFICATION SERIES: INTEGRATION ACROSS ALL AREAS OF THE RAIL INDUSTRY

MIDLAND MAINLINE OLE125 RENEWALS PROJECT: EXTENDING LEGACY OVERHEAD INFRASTRUCTURE LIFE SPAN FOR DECADES

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ABSTRACT:

The OLE125 programme on Midland Main Line (MML) set out to raise the permitted line speed of the legacy Mark 3B overhead line equipment (OLE) to 125mph for new electric rolling stock introduced in July 2025. The project adopted a minimum-viable-product strategy, targeting specifically system elements that govern pantograph–catenary dynamic interface performance. In 2020, SPL Powerlines UK introduced a revised "MK3B-05-AT-S" configuration, with dynamic behaviour assessed using T-RIS D-RSS modelling. Following basic system and allocation design, construction began in September 2023 to adjust system tensions and undertake re-droppering and re-grading where required. Progressive, evidence-led assurance was applied to verify construction tolerances, while pre-existing geometric exceedances and contact-wire wear were addressed opportunistically during the works. The enhanced construction-assurance methodology provided a clear line of sight from modelling to field validation, enabling Entry into Service (EIS) on a span-by-span basis with demonstrated compliance to performance targets within each run. This targeted renewals approach extends the useful life of the legacy OLE, delivers 125mph capability without full system replacement, and establishes a repeatable method for similar upgrades on legacy Overhead Contact System (OCS) assets.

Keywords: overhead line equipment (OLE), pantograph–catenary dynamics, Mark 3B, renewals, assurance, Midland Main Line, 125mph.

BACKGROUND

The OLE 125 Renewals electrification infrastructure programme set out to increase capacity on the Midland Mainline (MML) route. The outputs enable one additional Long Distance High Speed (LDHS) train path per hour between London St Pancras and Kettering in each direction. Enabling two of these trains to run in electric traction between St Pancras and Corby, and capacity for three non-electric freight services between Bedford and Kettering per hour in each direction.

The new Overhead Line Equipment (OLE) infrastructure introduced on the MML North of Bedford has a permissible line speed of a

maximum of 125mph. The South of Bedford section outlined in **Figure 1** consists of OLE varying in age, the oldest installed in the 1980s. The configuration of the system typically can support electric rolling stock up to a top speed of 100mph. The wider infrastructure can support diesel trains to run at 125mph along this route on the Fast Lines. The MK3B-00-AT-S system originally installed, was an updated replacement to the Mark 3A system which was used on electrification schemes before the introduction on the St. Pancras – Bedford electrification in the early 1980's. The Department for Transport (DfT) remitted Network Rail to undertake targeted engineering interventions South of Bedford, to enable an increase in the OLE capability up to a maximum of 125mph enabling the introduction of electric traction to replace diesel traction without a journey time penalty.

The electric traction proposed to operate at the increased line speed are:

- Class 810, both 5 and 10 car mode
- Class 360 in 4, 8 and 12 car modes

With the funding and access constraints given, a full conductor renewal programme was deemed not economically viable. Therefore, the project was remitted to undertake tactical enhancements, utilising the existing OLE conductors in the south of Bedford area to achieve the required line speed improvements.

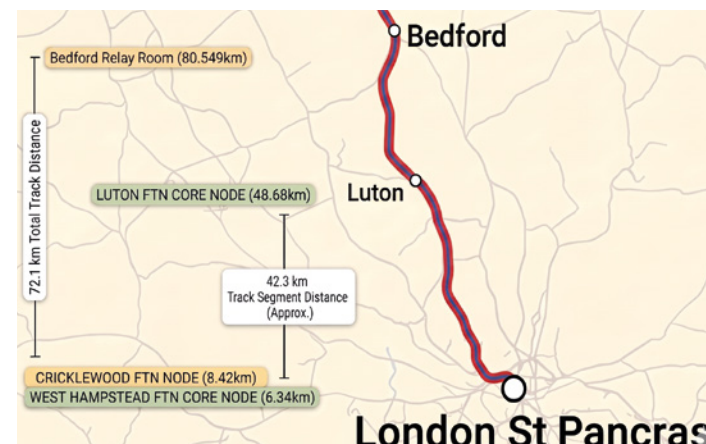


Figure 1: South of Bedford geographical boundary.

THE CHALLENGE

One of the core milestones to achieve a resilient operation of the legacy OLE infrastructure was to improve the OLE to pantograph dynamic interface performance. The MK3B-00-AT-S OLE system basic design principles in addition to the underlying infrastructure condition linked to modifications and maintenance during the asset lifecycle, posed specific performance and reliability risks to the introduction of multi-pantograph formations running up to 125mph.

The team set out to identify the key components within the legacy OLE infrastructure setup and basic design which can be altered to ensure a reliable dynamic interface performance in principle. 'Enhanced' 3D Finite Element models of the infrastructure from various locations were deployed on Dynamic - Rail System Simulation (D-RSS) by Train – Rail Infrastructure Solutions (T-RIS) using high resolution static OLE wire profile measurements from the New Measurement Train (NMT). Various design arrangements of the legacy Mk3B system and MML infrastructure were considered:

- Open route performance at higher speeds with multiple pantograph rolling stock including overlaps and geometric defects
- Head-span operation at higher speeds and interference between adjacent track train passing
- Cross-over design using knuckles at support locations and non-tangential wiring along with the specific placement of Section Insulators
- Neutral Section performance using single rod High Speed Arthur Flury components and setup
- Tunnel and Overbridge approach performance with limited encumbrance and associated grading

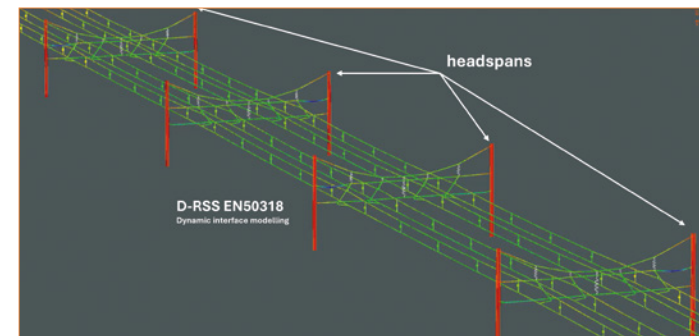


Figure 2: D-RSS models of multiple supported parallel wire runs in an open route configuration at varying degrees of setup tension in the headspan wire.

Figure 2 shows a respective model specific to the multi-track dynamic interface simulation from D-RSS by T-RIS. Supporting the OLE wires with headspans vs. alternative Mechanical Independent Registration (MIR) through portals was considered. It was determined that headspans had insignificant impact to the dynamic interface performance to the pantograph of rolling stock when operating in adjacent lines at opposite directions. Therefore, portalisation of the route wouldn't have tangible benefits in the increased line-speed.

Further changes in the design layout and basic system parameters were considered arriving at the desired performance levels for the 125mph operation. After all the design principles were decided based on limited trials (worst case scenario pantograph layout) the full list of rolling stock formations of MML were simulated. The results were later correlated with the respective instrumented pantograph testing results to determine the accuracy of the modelling and success of the intervention. An example of the progressive evolution of the OLE system is demonstrated in **Figure 3** for a Class 360 Electric Multiple Unit (EMU). Some of the simulated system permutations were:

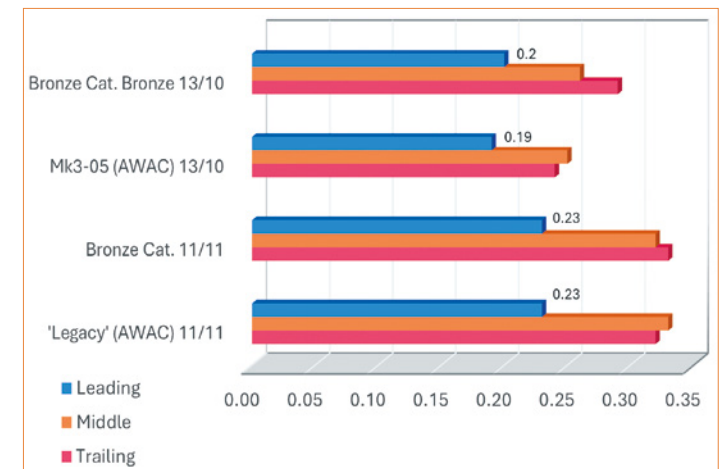


Figure 3: Extract from Remit 2A report (2020) showing the AWAC $\sigma/F_{mean} = 0.23$ criterion for the leading BW HSP Mk2 pantograph at 110 mph comparison with the R2A 10/13 $\sigma/F_{mean} = 0.19$.

- MK3B-00-AT-S 'Legacy' Aluminium-clad Wire Aluminium Conductor (AWAC) catenary benchmark models with existing geometry
- Proposed Bronze catenary replacement at 11/11kN tensions including redroppering and adjusted gradients
- Proposed Mk3B-05-AT-S system maintaining AWAC catenary with revised tensions at 13/10kN, redroppering and adjusted gradients
- Proposed Bronze catenary replacement at 13/10kN tensions including redroppering and adjusted gradients.

The proposed MK3B-05-AT-S system maintaining AWAC catenary predicted a 17% improvement for the worst case performing pantograph rolling stock arrangement which would achieve reliable OLE to pantograph dynamic interface performance levels in the South of Bedford area. This selection further minimised equipment replacement requirements while optimising system performance and not requiring extensive OLE structure renewals.

The resulting MK3B-05-AT-S system upgrades, as part of the OLE 125 Renewals, are summarised below:

- Replacing Balance weight anchor tensioning systems with Siemens anti-fall balance weight anchors
- Re-tensioning of the Catenary and contact wires from 11/11 to 13/10kN
- Re-Dropper whole tension lengths to suit the new system design in line with the new tensions
- Adjust the wire gradients in line with increased speeds
- Headspan renewals where required, replace old with new equipment
- Renew cantilevers to obtain a higher contact wire uplift
- Replace under bridge registration assemblies
- Replacing midpoint anchors in tunnels (Ampthill and Elstree)
- Renew worn contact wire where applicable
- Removing Brown Boveri Section insulators and replacing with BiCC High Speed Section Insulators
- Replacing small core Henley insulators
- Removing redundant insulation at redundant insulated overlaps
- Replacing insulation in the switched-insulated overlaps
- Replacing C-jumpers where applicable

CONDITION MONITORING
'BEFORE' AND 'AFTER'
WORKS (2023-2025)

Following the full system development, baseline interface performance and static geometry data was captured and analysed using Perpetual-OLE (P-OLE) dashboard to establish benchmark performance for each individual wire-run across the entire route. P-OLE has been developed to jointly analyse the dynamic testing outcome with the analysed static wire profile geometry. The cross-correlation of the two independent samples is key in terms of the validation and future monitoring of the infrastructure condition or movements.

The aspiration was to collect and compare the same data following the works' completion to prove that the anticipated level of performance has been achieved (system assurance) and that the installed geometry is within installation tolerances (construction assurance). The proposed approach alleviated significant cost and timeline from the OLE125 works programme using a data-driven approach to establish the direct project benefits to the infrastructure condition and performance without requiring bespoke test train to run at maximum operating speeds.

Prior to the work, instrumented pantograph data from Mentor and the New Measurement Train (NMT) which form the backbone of the Network Rail (NR) service train fleet were used to collect the pre-existing condition and dynamic interface performance of the South of Bedford area. The Mentor train uses a Brecknell Willis HSA pantograph capable of 100mph and instrumented to EN 50317 [3] requirements. The interface force sample aligns to individual spans to identify statistical performance of each wire run (σ/F_{mean}) and mark up locations of 'discrete' features leading to localised poor performance indicators (F_{min} and F_{max}). The NMT uses a non-contact laser based system to identify existing geometric exceedances using OLE Static Analysis Toolbox (StAT). The static and dynamic interface data were jointly analysed through the P-OLE analytics dashboard previously used in MML Kettering to Wigston and TRU East to provide NTSN ENE [1, 5] construction assurance evidence and root cause analysis.

Lastly, the NMT wire wear data was filtered to identify locations where serviceability limits of the Contact Wire (CW) have been exceeded as well as establishing the CW wear rates of the last 4 years before the OLE 125 renewals project.

NMT (static) wire profile and Mentor (dynamic interface @100mph) were collected and analysed following the works completion. The exercise quantified the geometric exceedance correction following the OLE 125 works marking a drop from 33% affected spans prior to works to < 5% following works mostly in wire runs not covered by the project and with further interventions planned as an outcome of the construction assurance assessment to deliver an asset installed to within construction tolerances. Likewise discrete features (F_{min} and F_{max}) were aligned and attributed to a root cause via the P-OLE analysis informing further 'snagging' activities driven by the criticality of the observed force trace at specific locations [2].

Figure 4 shows a representative P-OLE analysis on Wire Run M36 in the UP FAST direction on ELR SPC1. The data 'prior' show discrete F_{max} force features at the x-over location near structures F23-11 and F23-12. These forces are in the region of 200N and are picked out by a single pantograph formation running at 100mph. Similarly, F_{min} forces are picked up near the bridge approach span at F24-02

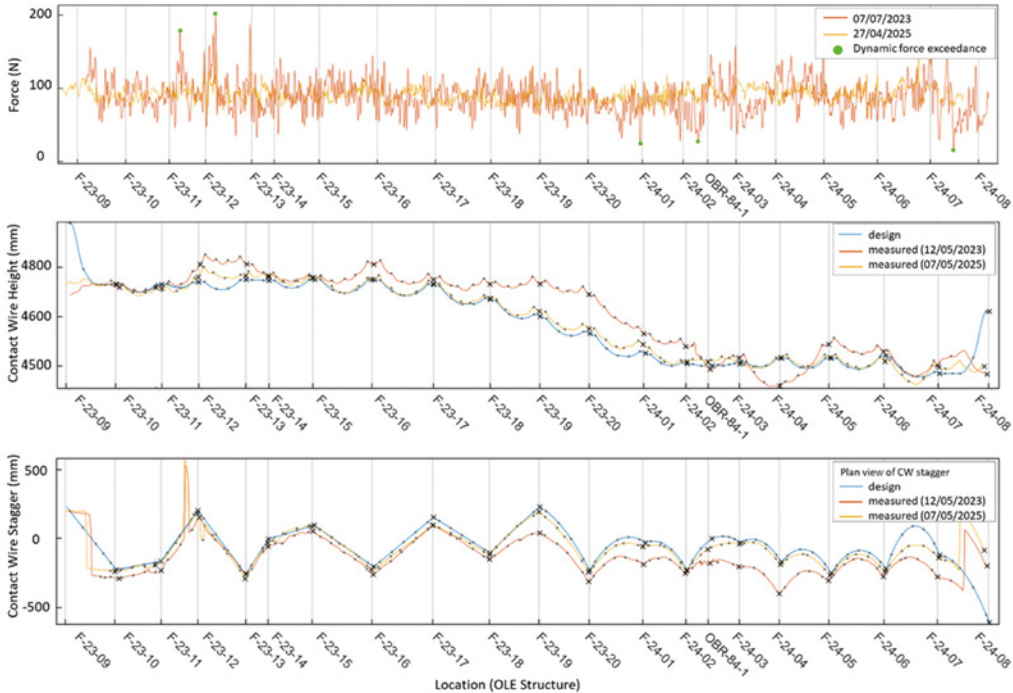


Figure 4: P-OLE data of wire run M36 including dynamic contact force, measured and design contact wire profiles.

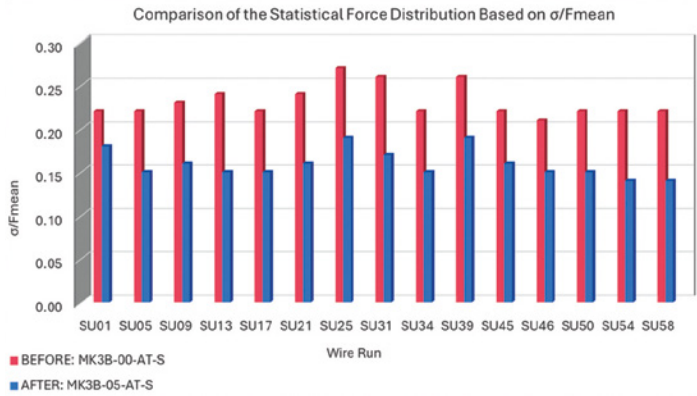


Figure 5: Comparison of the statistical force distribution based on σ and σ/F_{mean}

approximately at 20N. It is evident that the dynamic interface force sample following the works has drastically improved from 'prior' not showing any of those notable forces picked up by the same measuring train. The actual static profile of the wire drastically improved showing full compliance to design.

In addition, the dynamic interface data was used to assess the statistical performance gains of each wire run (σ/F_{mean}) before and after works to establish the performance improvement. A sample of the statistical performance for several wire runs in the UP FAST direction based on the same instrumented pantograph and speed of 100mph is presented in **Figure 5**. A 23% average statistical force distribution improvement was recorded in the UP FAST direction with respective average improvement in the DOWN FAST direction determined at 14%. It is also important to note that performance improvement was achieved across all wire runs adjusted by the OLE 125 renewals project and likewise the analysis clearly demonstrated that out of scope wire runs did not show respective improvement underlining the success of the interventions and the consistency of the Mentor data.

Equally the statistical force distribution improvement is also well in line with the simulation predictions presented in **Figure 3** proving that the system performance milestones have been achieved.

A combined correlation between dynamic interface testing EN 50317 [3] and dynamic interface modelling EN 50318 [4] is provided

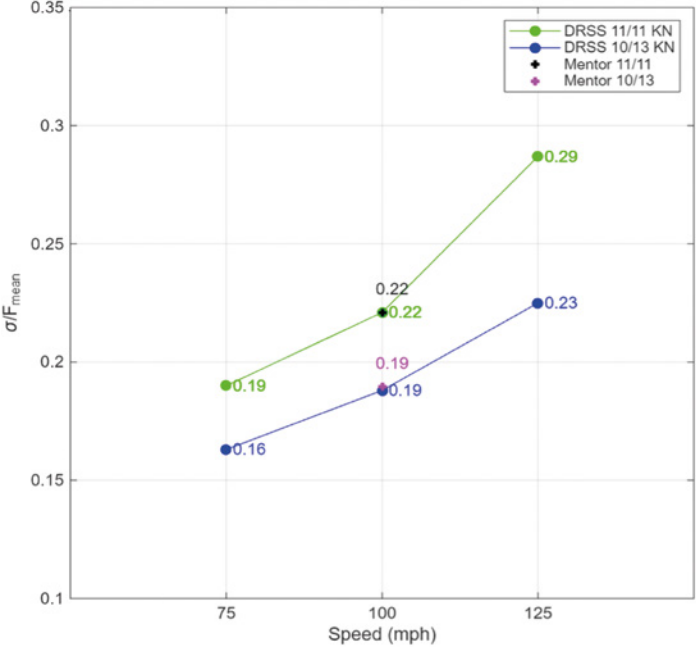


Figure 6: Correlation of Mentor 'before' (11/11) run through wire runs WR68 (SU38) to WR66 (SU44) and 'after' (10/13) OLE 125 works with the equivalent statistical analysis outcome from D-RSS based on a BW HSA pantograph.

in **Figure 6**. It is noted that the statistical force analysis/correlation has been carried out at the exact location with the addition of actual OLE geometry correlated to within 5mm of horizontal, vertical and longitudinal accuracy respectively for before and after the works were carried out. D-RSS statistical analysis results are shown for 75, 100 and 125mph whereas Mentor results are shown for the 100mph increment available. The correlation between the simulated and measured dynamic interface data is evident proving the correlation and the successful implementation of the Mk3b-05 OLE system.

MULTI PANTOGRAPH FORMATION SYSTEM
VALIDATION (2024-2025)

When introducing a new OLE Basic Design the worst case performing rolling stock formations should perform within the specified interface force criteria. That was demonstrated by the simulation carried out at the outset of the project and confirmed using the Mentor testing which was carried out at 100mph and with a single pantograph. To satisfy Notified Body (NoBo) requirements for the multi-pantograph formations' respective performance an additional validation increment was carried out for D-RSS. It is noted that D-RSS had previously been certified by Network Rail Certification Body (NCB) for compliance with the EN 50318 [4] requirements for an AC Simple type of OLE system in 2022.

Suitable data selected for this exercise are summarised below:

- Instrumented pantograph data from the Class 360 UKMS 125 validation testing (KO1 on MML, 2021), which includes a 3-pantograph type BW HSP Mk2 configuration (maximum speed: 110 mph)
- Dynamic uplift measurements from UKMS 125 validation testing (KO1 on MML, 2021), including measurements on the DF direction at SPC2 101.076 at 110mph
- NMT data collected from Key Output 1 (KO1) (2020-2023)

NCB reviewed the technical validation report by T-RIS and confirmed to be compliant for 3-pantograph formations and up to 125mph. The exercise also certified that the D-RSS outputs obtained an average 98% accuracy when compared to multiple dynamic interface test criteria. This last finding solidified the success of the followed overall system validation approach which did not require multi-pan formation testing. It also paved the way to minimise testing requirements in future projects by following a data driven quantitative approach in addition to an 'enhanced' dynamic simulation outputs.

Results Summary – Trailing Pan on 3 pan formation at 110mph				
Parameter	Symbol [units]	Measured	D-RSS	Level of correlation (%)
Standard Deviation of Contact Force	σ [N]	31.6	31.1	98%
Maximum Uplift	U_{125} [mm]	31.0	30.6	99%
Range of vertical position	RU_{125} [mm]	42.0	41.6	99%
Mean Contact Force	F_m [N]	99.1	100.1	99%
Maximum Contact Force	F_{max} [N]*	208.7	210.9	100%
Minimum Contact Force	F_{min} [N]*	19.0	15.8	96%
Percentage of loss of contact	NQ [%]	0.0	0.0	100%
* Exact location and root cause for peak forces captured by the model			Av. Accuracy	99%

Figure 7: Correlation between D-RSS model and EN 50317 instrumented pantograph testing for the trailing HSP Mk2 pantograph on a 3-pantograph Class 360 EMU formation.

CONCLUSIONS

An incremental evidence-based approach has been implemented delivering the MK3B-05-AT-S derivative of the previous MK3B-00-AT-S as part of the OLE 125 Renewals project. The system was progressively developed using an MVP approach maintaining large parts of the infrastructure unchanged and aiming the interventions to the key aspects affecting the interface performance. The by-product of re-dropping and height adjustments was the removal of multiple 'discrete' locations in the infrastructure causing poor dynamic interface performance. While the increase in CW tension, overbridge design optimisation and gradient adjustments fulfilled the specified interface force performance criteria for an acceptable resilient performance at 125mph.

Benchmark geometry and interface force data prior to the works were gathered, analysed and correlated with the same data following construction. This exercise guaranteed the geometric setup conformance of the as-built infrastructure as part of an 'enhanced' construction assurance and determined the realised system performance benefit. The improvement in statistical force distribution was in line with the anticipated levels from the earlier modelling exercise. In addition, a Brecknell Willis High Speed – A (HAS) model specific to the used Mentor formation was simulated through D-RSS using the infrastructure before and after geometry leading in identical levels of performance improvement.

Lastly, NCB reviewed an additional multi-pan D-RSS validation exercise based on prior KO1 data from a 3-pantograph formation for an acceptance up to 125mph. The exercise proved that the 'enhanced' modelling approach resulted in 98% average correlation across 9 selected interface force criteria. This result is beyond the EN 50318 [4] levels and proved that such evidence and simulation approaches can be successfully implemented in other projects alleviating significant parts of the project timelines, budget and interface related complexities.

It is accepted that all supplied evidence proved that following the works completion the route will have an acceptable level of dynamic interface performance at 125mph.

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James Crellin is an Apprentice Overhead Line Equipment (OLE) Engineer at Arup, supporting the delivery of rail electrification projects across the UK.

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TRU: PRACTICAL EXPERIENCE OF EMBODIED CARBON REDUCTION IN OLE DESIGN



With sincere thanks to Arup for providing the images used in this article. Unless otherwise credited, all images are courtesy of Arup.

ABSTRACT:

As part of the Transpennine Route Upgrade Project (TRU), Arup has gained significant practical experience in how the embodied carbon within an OLE design can be reduced without compromising design performance or compliance. Examples include:

- The selection of main supporting steelwork including the comparison of using 2x twin track cantilever (TTC) structures versus the use of portals in four track areas,
- The use of self-supporting anchor structures versus the use of tied anchor mast;
- Evaluating different foundation types and comparing the equivalent embodied carbon contained within;
- The choice of neutral section used within the design;
- The use of low carbon concrete and the selection of OLE anchor structure type.

SYNOPSIS

Reducing embodied carbon in railway electrification is essential to achieving the UK's net-zero targets. Overhead Line Equipment (OLE) systems contribute significantly to infrastructure carbon. However, we need to ensure that the infrastructure carbon spend for electrification offsets the lifetime operational carbon emissions of using diesel powered rolling stock. This paper presents practical lessons from the Transpennine Route Upgrade (TRU), specifically the W3 section between Huddersfield and Ravensthorpe, demonstrating how embodied carbon can be reduced without compromising performance or compliance in the OLE design.

As a global engineering consultancy, Arup places sustainability at the core of its work, embedding low-carbon design principles and supporting clients in delivering net-zero infrastructure. This aligns

with the TRU programme, one of the first major UK rail projects to adopt a whole-life carbon approach in accordance with PAS 2080:2023 Carbon Management in Infrastructure, targeting a 30% reduction in construction carbon. Within this framework, OLE designers play a critical role in influencing embodied carbon through material allocation and component selection.

This paper evaluates several real-world design decisions from TRU W3 that demonstrate measurable carbon savings:

- Structural selection: Replacing portal structures with two twin-track cantilevers (2xTTC) in four-track sections reduced embodied carbon by 45% per structure.
- Anchor structures: The use of Self-Supporting Anchors (SSA) instead of tied mast arrangements achieved a reduction of around 17.5% per structure.
- Foundation design: Concrete auger foundations were found to produce approximately 35% of the carbon compared to traditional Circular Hollow Section (CHS) piled foundations under similar conditions.
- Neutral section optimisation: Transitioning from Carrier Wire Neutral Sections (CWNS) to single rod neutral sections reduced the requirement for additional structures, foundations, and conductor lengths, delivering further carbon savings.

Additional reductions were achieved through material-level improvements, including the use of low-carbon concrete (CEM II/III as per BS EN 197-1:2011) and the reuse of steel components. These examples highlight how early-stage design decisions, supported by collaboration between designers, contractors, and asset stakeholders, can drive significant carbon reduction.

The importance of embodied carbon assessment is further reinforced by the introduction of Network Rail standard NR/L2/ENV/125 Carbon Management for Projects and Engineering Works, which places responsibilities on designers to identify opportunities for carbon reduction throughout project development. The methodologies and digital work-flows developed within TRU W3 support this industry shift towards carbon-informed engineering design.

INTRODUCTION

The Transpennine Route Upgrade (TRU) is a transformative, multi-billion pound railway programme that will better connect passengers in the North between Manchester, Huddersfield, Leeds and York (refer to **Figure 1**). A part of the improvements taking place is the widespread introduction of 25kV AC 50 Hz overhead electrification on the route. Electrification is widely considered as the only current power source capable of decarbonising the whole rail network [1]. **Figure 1** shows the extent of the project.

Within the TRU project there are multiple work packages which will deliver the specific interventions required to achieve the overall project aims. Work package W3 (**Figure 2**) is within the West of Leeds section of TRU and covers the geographic area between Huddersfield to Ravensthorpe with new electrification provided on all lines.

Electrification in W3 is a cornerstone of TRU's sustainability strategy, helping achieve net zero targets and improving air quality. The construction of TRU has an estimated baseline of 1 million tonnes of embodied carbon [2]. TRU is the first Network Rail major programme to develop a whole life approach to the monitoring, measurement, and reduction of carbon, in-line with the ambitions of the Department for Transport.

This robust methodology for carbon reduction and monitoring during design and construction is embedded within the project. TRU have also set a target to reduce the carbon impact of construction by 30% from the GRIP 4 design. The selected whole life-cycle methodology for carbon calculations aligns with the British Standards Institution (BSI) PAS 2080:2023 Carbon Management in Infrastructure standard. This is internationally recognised as best practice for carbon management in complex infrastructure projects.

As part of the OLE design process, Arup has calculated the embodied carbon for main steelwork, foundations, and for support and registrations. By quantifying the embodied carbon, it has enabled the designer to interrogate the GRIP 4 design with a carbon focussed lens to deliver significant carbon reductions. This process has been enlightening and has often questioned the conventional approaches to OLE layout and detailed design.

WHAT IS EMBODIED CARBON?

Embodied carbon is the sum of greenhouse gas emissions released during the manufacture of components [3]. As OLE designers, we are responsible for the 'allocation' of material within the design; in other words, we can choose what mast type or foundation type is used from within the constraints of a system design range. Therefore, the focus of this paper has predominantly been on embodied carbon

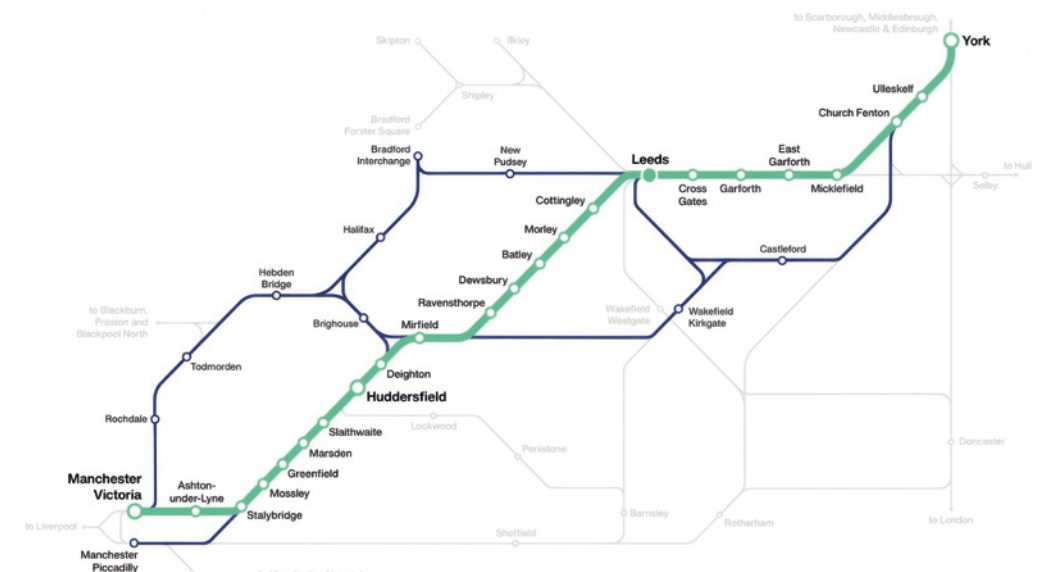


Figure 1: The extents of the Transpennine Route Upgrade Project. © Network Rail Infrastructure Limited.

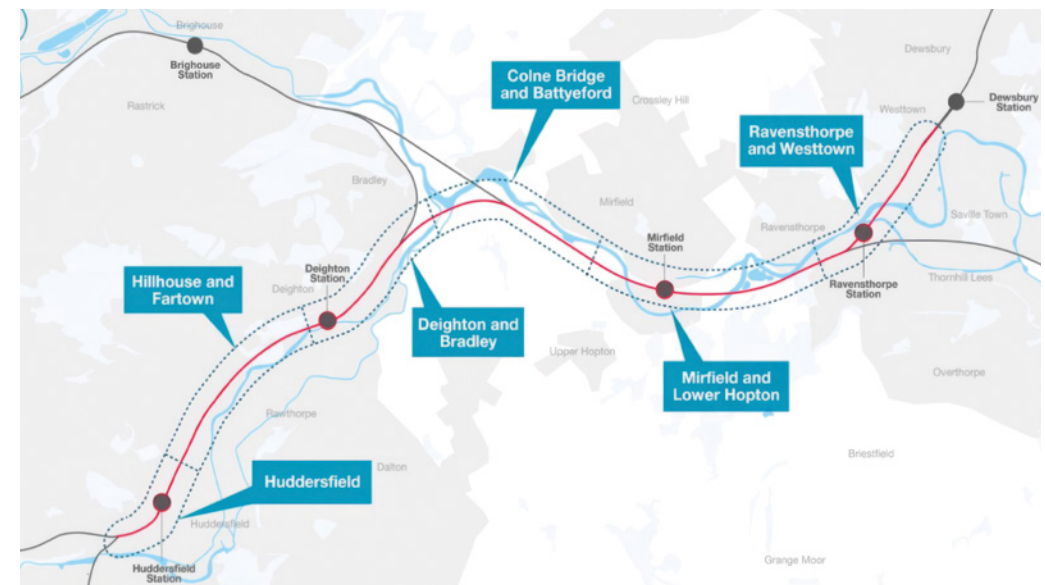


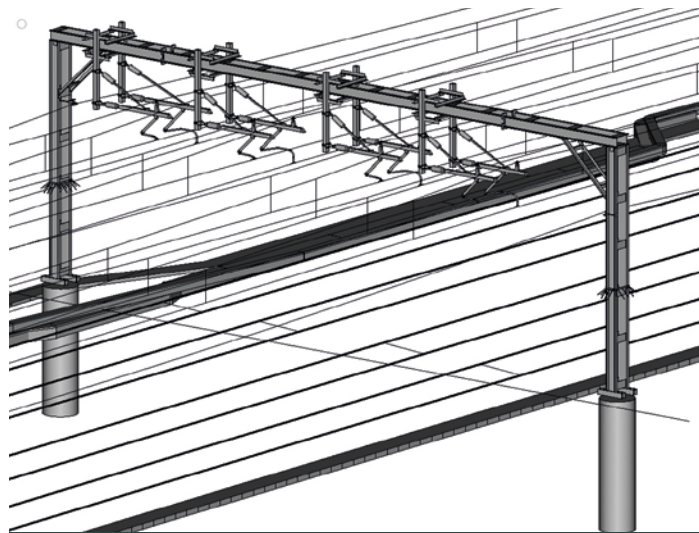
Figure 2: Transpennine Route Upgrade Project W3 extents. © Network Rail Infrastructure Limited.

as we as designers can influence this based upon our choice of components and assemblies.

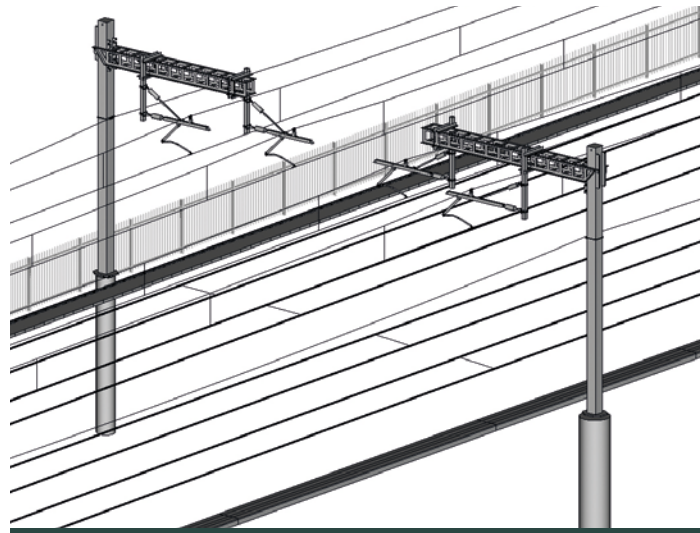
Whole life carbon takes into account transport, construction, maintenance, disassembly and disposal. These factors are harder to control by the designer since they rely upon multiple external factors which the designer is unable to make conscious decisions to influence. Whilst the overall project as is considering whole life carbon emissions it is within the gift of the OLE designer to reduce embodied carbon emissions by making informed design decisions.

HOW IS EMBODIED CARBON MEASURED?

Embodied carbon is measured by factoring the mass of an item by a published carbon factor. For TRU, we have utilised the data published with the Inventory of Carbon and Energy (ICE) [4]. This document published embodied energy and carbon co-efficient per unit weight. For example, for a 610mm CHS pile the stated coefficient for UK manufactured steel pipe using average recycled content is 1.940 kgCO₂e per kg. Once the component mass is known then it is a simple case of multiplying the mass by the carbon factor.



Photograph 1: Design for a typical portal structure in a four-track area.



Photograph 2: Design for a typical 2xTTC arrangement in a four-track area.

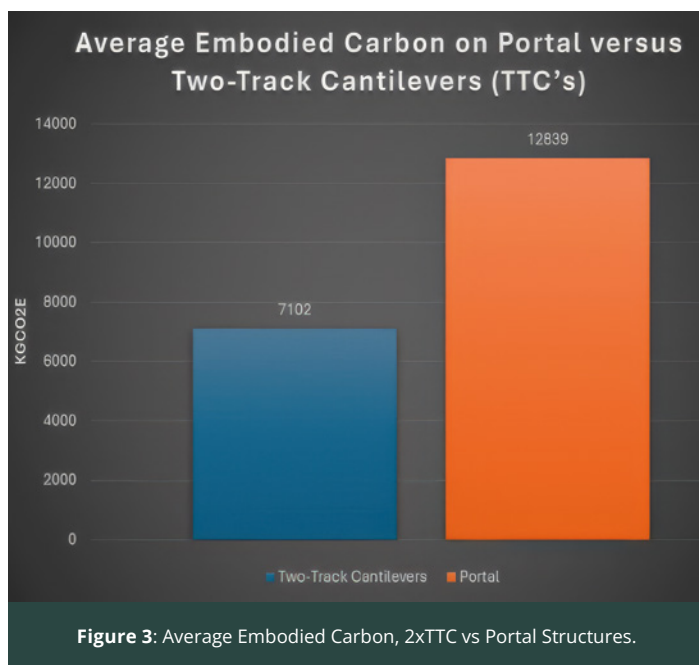


Figure 3: Average Embodied Carbon, 2xTTC vs Portal Structures.

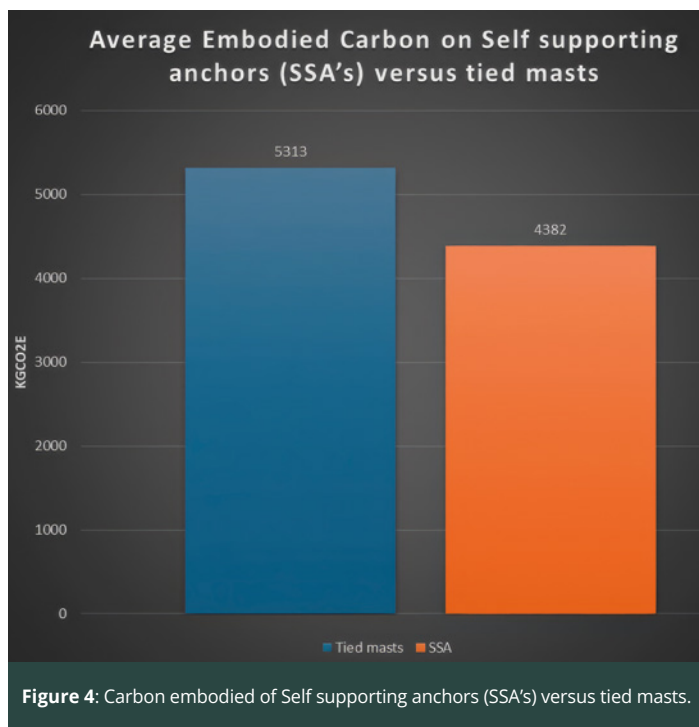


Figure 4: Carbon embodied of Self supporting anchors (SSA's) versus tied masts.

Where allocations may contain more than one material, for example an augured concrete foundation with reinforcement, it is simply the case of working out the mass of concrete, the mass of the reinforcement and the mass of any sacrificial casing and then multiplying these by the relevant carbon factors related to the material and manufacturing method.

The design team has developed a catalogue of common UK Master Series (UKMS) allocations complete with their embodied carbon values. This allows the designer to quickly evaluate different design solutions and allows them to assess the carbon impact of their design decisions.

WHAT DECISIONS CAN BE MADE BY THE OLE DESIGNER TO REDUCE THE EMBODIED CARBON IMPACT OF THEIR DESIGN?

Example 1 – Portal versus Two-Track Cantilevers (TTC's)

For a four-track railway such as that proposed between Huddersfield and Ravensthorpe, the designer is faced with a choice of using portal structures that span all four lines (**Photograph 1**) or two opposite TTC structures each spanning two lines (**Photograph 2**). Whilst each option has their own constructibility advantages and disadvantages, our calculations have shown that TTC's provide a significant embodied carbon saving over portal structures.

The average embodied carbon based upon real world designs from TRU is shown in **Figure 3**. It is clear that TTC's offer significant carbon savings due to a reduction in the overall amount of steel used in the design. Including the foundation, the use of 2xTTC's uses 45% less embodied carbon than a portal structure. To contextualise this, the carbon saving is equivalent to nearly three return transatlantic flights from London to New York. On average, this return flight generates approximately 2.0 tonnes of CO₂e per passenger, based on the myclimate estimate [5].

Example 2 - Self supporting anchors (SSA's) versus tied masts

When a conductor is terminated in the cess, the designer must provide a structure to which the termination assembly is attached. This can be achieved by using a self-supporting anchor (**Photograph 3**) which utilises a mast of generous section size. Alternatively, a slender mast with a back tie arrangement can be used (**Photograph 4**). The back-tie solution results in the need for two foundations but overall, the weight of the steelwork which forms the mast is less.

Our analysis studied real world steelwork and foundations sizes for both types of anchor structure. The results show that tied mast arrangements have an average embodied carbon of 5313 kgCO₂e, when self-supporting anchor (SSA) have an average of 4382 kgCO₂e. This represents a reduction of approximately 931 kgCO₂e per structure, equivalent to average 17.5% lower embodied carbon when we are using SSAs instead of tied mast arrangements. This data is shown in **Figure 4**.



Photograph 3: SSA mast (left) and **Photograph 4:** Mast with back tie (right).

Example 3 - Concrete Auger versus CHS piled foundation

For the last 15 years, 610mm CHS piles have been the preferred foundation choice by designers and contractors, refer to **Photograph 5**. CHS piles are preferred as installation is faster than for conventional side bearing concrete foundations and they eliminate the need for wet works on site. As the W3 route runs through a historic mining area with varying geotechnical conditions it was identified early in the project that a mix of piled, augured and gravity pad foundations were required. In the areas where these constraints did not influence the foundation choice, the OLE designer was responsible for the foundation design. The augured foundations were chosen from the UK Master Series design range and consisted of 1000mm diameter cast in situ concrete surrounded in the top 2m by a sacrificial steel casing. Refer to **Photograph 6**.

Our analysis has shown that for foundations with equal strength depths and non-effective depths, concrete Auger foundations use approximately 35% of the embodied carbon when compared to CHS pile foundations. This is a significant saving and obviously when factored along a route length can provide the project with a major carbon reduction. Refer to **Figure 5**.



Photograph 5: 610mm CHS piled foundation (left) and **Photograph 6:** 1000mm diameter concrete auger foundation (right).

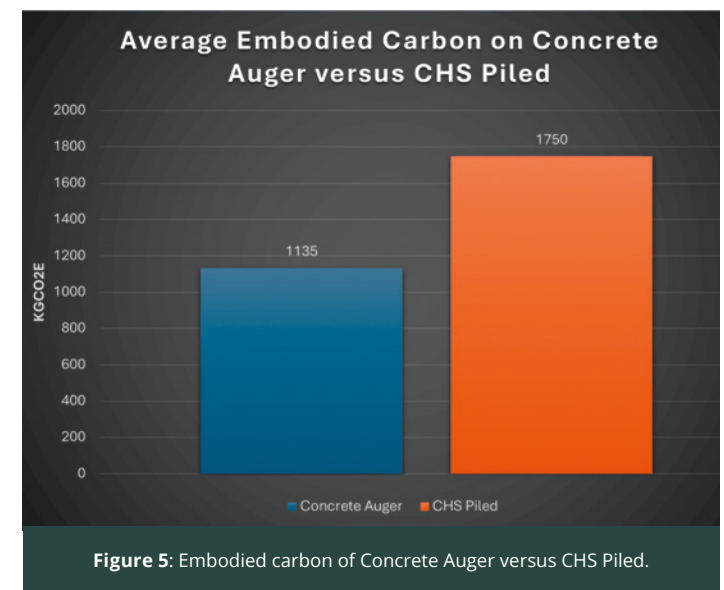


Figure 5: Embodied carbon of Concrete Auger versus CHS Piled.

REAL WORLD EXAMPLES WHERE EMBODIED CARBON SAVINGS HAVE BEEN MADE

Ravensthorpe Neutral Section

Within the GRIP 4 design a carrier wire neutral section was proposed to support a line speed of 100mph. A carrier wire neutral section is made up of a number of consecutive insulated overlaps to form a reliable separation between adjacent feeder phases and eliminating the possibility of pantographs bridging between phases (**Figure 6**). This arrangement is typically used on high speed railways where minimising the variation in pantograph contact force is essential to ensure smooth operation.

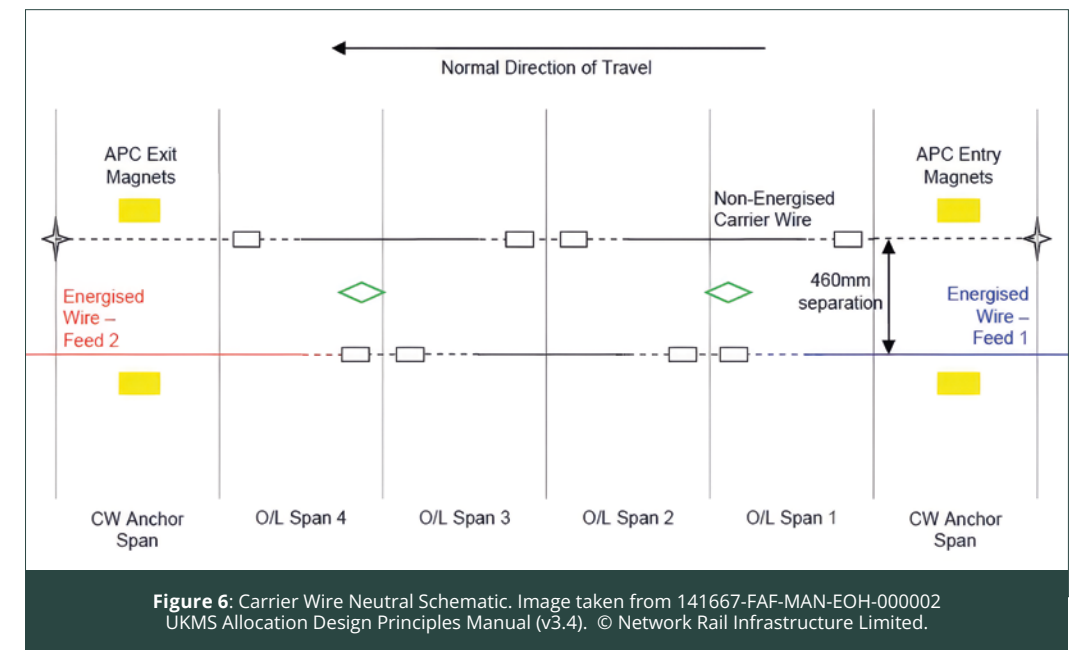


Figure 6: Carrier Wire Neutral Schematic. Image taken from 141667-FAF-MAN-EOH-000002 UKMS Allocation Design Principles Manual (v3.4). © Network Rail Infrastructure Limited.

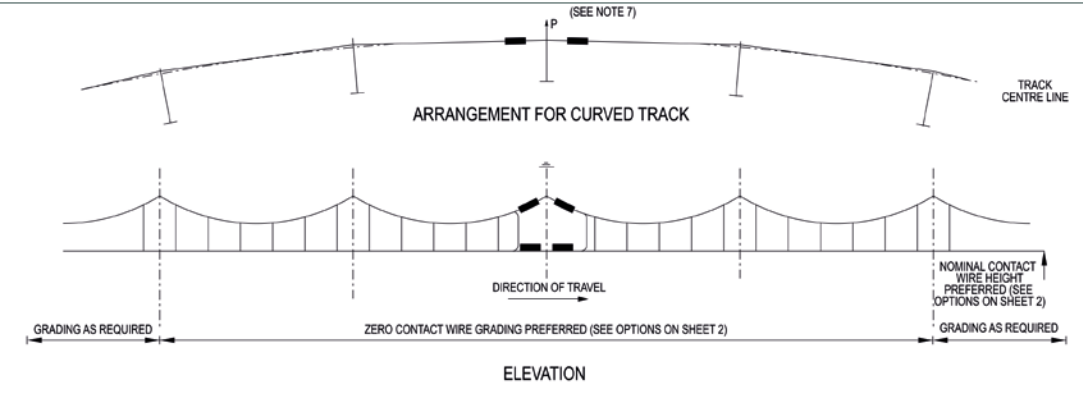


Figure 7: Arthur Flurry single rod skidless neutral section general arrangement (From drawing MS/B12/B01). © Network Rail Infrastructure Limited.

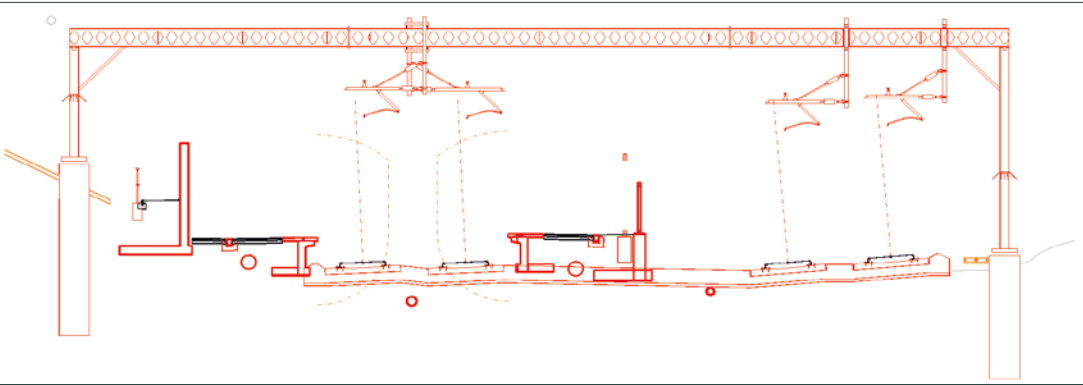


Figure 8: Deighton Station portal.

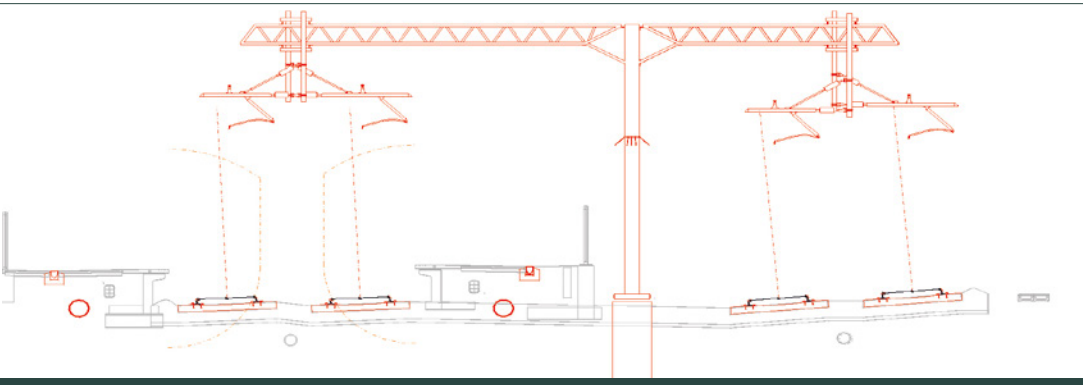


Figure 9: Deighton Station back-to-back TTC.

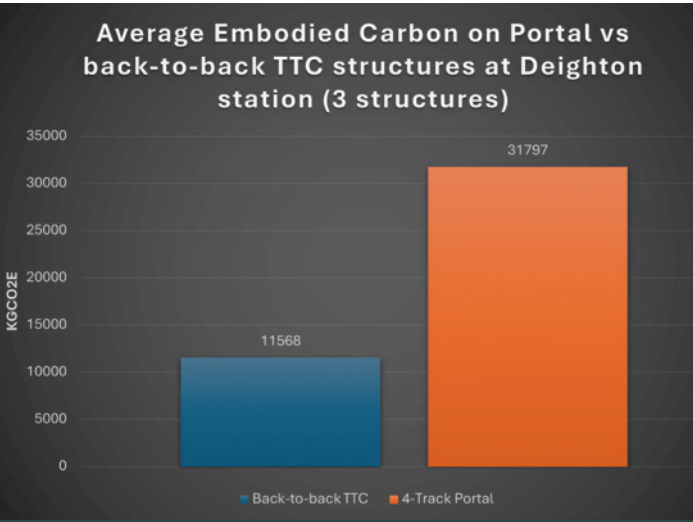


Figure 10: Carbon embodied of 3 structures of 2xTTC vs. Portal Structures at Deighton.

Between GRIP 4 and GRIP 5, discussion took place with the Network Rail Project Engineer and Route Asset Manager to agree the use of a single rod type neutral section as an alternative solution which satisfied the requirements of Minimum Viable Product (MVP). The single rod neutral section involves cutting into the contacting and catenary and installing two sets of insulation to create a short earthed section (Figure 7). This has the benefit of not requiring the anchor structures and additional overlap supports and registrations of the carrier wire neutral section. The UK Master Series design range supported this up to speeds of 100mph and the solution was therefore compliant with the proposed line speed.

The replacement of the carrier wire neutral section resulted in the removal of two anchor portals with four foundations each and 549m of additional contact and catenary wiring, reductions in feeder and bonding conductors, and a reduction in associated switching equipment. This resulted in an estimated carbon saving of 121,600 kgCO₂e.

DEIGHTON STATION

The GRIP 4 design through Deighton station utilised conventional portal structures with an across track span of circa 27m (Figure 8). Each foundation and mast was located behind the platforms. At the time of the GRIP 4 design a realistic programme for the construction of the station and associated civils

assets was not fully understood. A review of this at GRIP 5 concluded that significant civils works and temporary works could be avoided if the three portals were converted to back-to-back TTC's located in the wide way between the fast and slow lines (Figure 9).

The choice of back-to-back TTC's was developed and agreed with the construction team and the design was developed using available items from the UKMS design range. The new structure positions were checked in a 4D environment and confirmed that signal sighting was not affected. The change from portals to back-to-back TTC's saved 11,568 kgCO₂e of carbon; a reduction in 2/3 of the embodied carbon per structure (Figure 10). Ultimately, this option also resulted in reduced civils works which were not included in this saving estimate. Notably, Network Rail, as an alliance partner, supported this design change. The change of structure type did not result in any changes as to how OLE maintenance activities would be undertaken.

LOW CARBON CONCRETE

The UKMS design range specifies the use of C30/37 grade for the concrete used in OLE foundations. From discussions with the installation contractor, they have been able to source low-carbon

concrete which meets the C30/37 grade. This low-carbon mix is either CEM II containing fly ash, slag or limestone up to 35% content. Where possible, CEM III concrete has been used which contains blast furnace slag up to 90% content. CEM I mix concrete which uses ordinary Portland cement has been found to contain twice as much embodied carbon when compared to the CEM II/III.

Additionally, the concrete auger foundations require a sacrificial steel sleeve for the top 2m of the foundation. This is to stabilise any granular material in the ground when the concrete is poured. The contractor was able to produce lengths of gas pipe which were re-purposed as foundation sleeves, avoiding the purchase of 21 new steel sheet sleeves for foundations. In addition to this, around 50 unused reinforcement bar foundation cages and 30 steel sleeves were identified from another project and procured at minimal cost for use on TRU – these would have otherwise gone to scrap.

CARBON FACTORS USED IN THIS ANALYSIS

The carbon factor table sets out the emission factors used to calculate the embodied carbon of the OLE components. Each asset listed with material type, carbon factor, data source and key assumption. The generic material factors such as concrete and steel have been taken from the Bath ICE database [4], while more specific OLE components have been based on manufacturer data, Environmental Product Declarations (EPDs), or bespoke calculations prepared by the carbon team at Arup.

For conductors, the carbon factors are calculated using the material composition and unit weight per metre, allowing emissions to be assessed based on installed lengths. For other OLE components such as insulators, clamps, cantilever arms and tensioning devices, the factors are based on product specific information where available or calculated using known component weights and material carbon factors.

Table 1 provides a consistent basis for converting quantities, lengths, and masses of OLE components into kgCO₂e. It also records the assumptions behind each value, ensuring the carbon assessments remains transparent, traceable and suitable for comparison between design options.

Asset Name	Material Name	Carbon Factor (KgCO ₂ e/Unit)	Source	Assumption
Foundation (Concrete)	Concrete - General	0.107	Bath ICE (2.0)	Based on the Bath ICE database.
Foundation (Steel)	Steel - General	1.46	Bath ICE (2.0)	Based on the Bath ICE database.
Masts	Steel - General	1.46	Bath ICE (2.0)	Based on the Bath ICE database.
Booms	Steel - General	1.46	Bath ICE (2.0)	Based on the Bath ICE database.
Support Steel (Transfer / Adaptor Plates / Wall Brackets)	Steel - General	1.46	Bath ICE (2.0)	Based on the Bath ICE database.
107mm ₂ Copper Silver Contact Wire	Copper	2.28	Bespoke calculations by the Carbon Team	Assuming 100% copper and using the unit weight to calculate carbon per unit length.
120mm ₂ Copper Silver Contact Wire	Copper	3.65	Bespoke calculations by the Carbon Team	Assuming 100% copper and using the unit weight to calculate carbon per unit length.
19/2.1mm Bronze II Stranded Catenary Wire	Bronze	4.1	Bespoke calculations by the Carbon Team	Assuming 100% Bronze and using the unit weight to calculate carbon per unit length.
19/3.25mm Aluminium Stranded Earth Wire	Aluminium	5.69	Bespoke calculations by the Carbon Team	Assuming 19 aluminium strands of 3.25mm diam.
19/4.22mm Aluminium PVC RSC Cable	Aluminium	10.43	Bespoke calculations by the Carbon Team	Assuming 19 aluminium strands of 4.22mm diam & PVC accounts for remaining area assuming a nominal overall diam of 25.0mm. Calculated carbon per unit length.
Kruch Dropper (Average Length)	Copper	1.78	Bespoke calculations by the Carbon Team	Average dropper length. Used weights to approximate weight of dropper and assumed 100% copper material.
Anti-Vandal Tension Insulator	Fibreglass	5.19	PACE via Rebosio (manufacturer)	Based on the EPD of similar product.
Earth Wire Clamp	Aluminium	13.49	Bespoke calculations by the Carbon Team	Based on the weight of the earth clamp multiplied by carbon factor for aluminium.
Bridge Arm - Twin Support Arm for Drop Tube	Glass Reinforced Plastic	8.59	Bath ICE (2.0)	Based on the Bath ICE database.
Omnia - Cantilever Support Arm	Aluminium	347.7	PACE via Bonomi (manufacturers)	Based on the EPD certificate for the product. However, further carbon reductions are possible by 100kgCO ₂ e using recycled content. Case studies presented as evidence.
Other - Single Insulated Cantilever	Stainless Steel	6.52	Bath ICE (2.0)	Based on the Bath ICE database.
Spring Tensioning Device Tensorex C+	Steel	758.52	Bespoke calculations by the Carbon Team	Based on all the components' material and weights within the product.

Table 1: Carbon Factor used for the OLE embodied carbon assessment

CONCLUSION

By considering embodied carbon at the earliest possible opportunity, the designer can eliminate, reduce or change aspects of the design to minimise the carbon spend whilst not compromising the overall OLE design solution or compromising the constructibility of the design. The use of digital design tools along with a carbon catalogue allows the designer to make quick and informed decisions as to the carbon impact of their design decisions.

The adoption of an embodied carbon mindset has required a paradigm shift within the design team along with an element of carbon literacy. This has not been easy particularly when we have had to challenge conventional OLE layout design principles. However, as TRU has shown, by making conscious decisions we have been able to reduce the embodied carbon within the OLE design which in turn will help the TRU project achieve its goal of net zero construction.

Network Rail has recently introduced standard NR/L2/ENV/125 **Carbon Management for Projects and Engineering Works** [6] which places responsibilities on the designer to identify all opportunities for avoidance or reduction of whole life carbon emissions through application of the PAS 2080 carbon reduction hierarchy. Whilst whole life carbon reduction should not be ignored it is often out of the control of the designer to influence where materials are sourced from, how they are transported to site and how they are disposed of. However, by increasing the carbon literacy of the designer this will allow them to make informed decisions and arguments at all stages of the design process.

TRU is committed to leaving a legacy of low-carbon design and build. TRU has opened the opportunity for future projects to learn how low carbon infrastructure can be designed, built and maintained and it has set the benchmark for future electrification schemes in the UK

to aspire to. A cradle-to-grave approach to carbon management in rail recognises that carbon performance is influenced not only by initial material selection and construction, but also by maintenance interventions throughout the asset life. Decisions taken at design stage – such as structure type, component standardisation and build-ability – can reduce the frequency and intensity of future maintenance, thereby lowering whole-life carbon. The minimisation of renewals, possessions, plant use and replacement of carbon-intensive components is essential to achieving lower life-cycle emissions.

As Ove Arup said in his famous 1970 Key Speech *“Only a job done well, as well as we can do it – and as well as it can be done – is that. We must therefore strive for quality in what we do and never be satisfied with the second-rate.”* Over 50 years later this still rings true.

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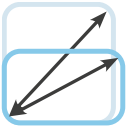
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UKRRIN INSPIRE: DELIVERING MORE VALUE EVENT

In April 2026, RSSB hosted the UKRRIN Inspire event at their offices in London. RailEI was represented by our Technical Manager Joss Apps, who has supported Railway Research for many years including the delivery of several Infrastructure related research projects.



The Rail Safety and Standards Board (RSSB) is the independent safety, standards, and research body for Great Britain's

railways. The UK Rail Research and Innovation Network (UKRRIN) is a collaboration between academia and industry, providing a step-change in innovation across the sector and accelerating the adoption of new technologies and products.

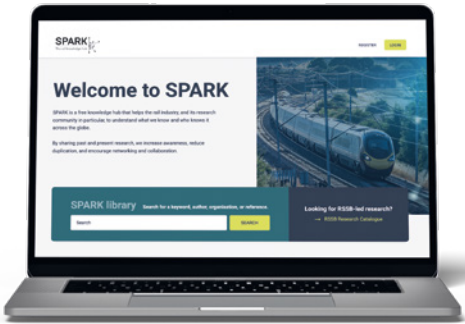
The Inspire event provided an opportunity for rail industry partners, universities and supply chain to contribute their views as to the delivery of future rail research projects managed by UKRRIN in the areas of vehicle/track, electric traction power, and telecoms and positioning.

On the day, delegates had chances to:

- Explore the new arrangements being designed to enable universities and funders to gain more value
- Understand the needs and help share the research pipeline in three live industry challenge areas, with funding available for proposals
- Understand how academic capabilities align with industry priorities
- Network with the UKRRIN community and build consortia

Speakers included:

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- Paul Plummer, University of Birmingham
- Mark Phillips, RSSB
- Mani Entezami, University of Birmingham
- Naomi Corteen, British Steel
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RSSB hosts a free global online knowledge hub managed called SPARK. It serves as a central database for the international rail industry to

share, search, and access past and present research, technical papers, reports, and academic student projects.

Many will be of interest to RailEI Members and you're encouraged to delve into it. Presentations from the UKRRIN Inspire event are available on SPARK.

As for next steps, RSSB welcomes engagement from all those interested in the delivery of railway research projects including Members of RailEI. Presentations from the UKRRIN Inspire event are available on SPARK.

Discover SPARK, RSSB's free global online knowledge hub. It serves as a central database for the international rail industry to share, search, and access past and present research, technical papers, reports, and academic student projects. Many will be of interest to RailEI Members and you're encouraged to delve into it.



SCAN THE QR CODE FOR MORE INFORMATION

To access SPARK, please scan the QR code and register.

On behalf of RailEI, Joss will attend future meetings promoting engagement from our Membership, including sharing opportunities for RailEI Corporate and Individual Membership.





MONA SIHOTA
PAST PRESIDENT,
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UPDATED CODE OF PROFESSIONAL CONDUCT: UPHOLDING PROFESSIONAL STANDARDS ACROSS RailEI

In May 2026, RailEI introduced an updated Code of Professional Conduct, reflecting both the Institution's values and the evolving responsibilities of railway engineers in a rapidly changing world.

The Code applies to all Members, from students and apprentices through to Fellows and professionally registered engineers. It provides a clear framework for professional behaviour and ethical decision-making, helping Members maintain the trust placed in our profession by employers, clients, colleagues and the wider public.

Built around RailEI's values of Integrity, Inclusivity and Empowerment, the Code adopts the latest Statement of Ethical Principles for the Engineering Profession, developed jointly by the Royal Academy of Engineering and the Engineering Council and endorsed by all the UK's Professional Engineering Institutions (PEIs).

Whether working on major infrastructure projects, developing new technologies, leading teams or supporting the next generation of engineers, every member has a role to play in upholding these standards.

THE FIVE ETHICAL PRINCIPLES

RESPONSIBILITY TO SOCIETY

Prioritise health, safety and wellbeing, act lawfully and in the public interest, respect the rights of others and consider the impact of your decisions on them.

LEADERSHIP & COMMUNICATION

Promote inclusive cultures, communicate clearly and responsibly, raise concerns when necessary, and encourage others to do likewise.

HONESTY & INTEGRITY

Act openly, fairly and honestly. Be accountable for your actions, respect confidentiality and recognise and declare conflicts of interest.

ACCURACY & RIGOUR

Work within your competence, maintain your professional knowledge and apply sound and careful judgement based on evidence.

RESPONSIBILITY FOR THE FUTURE

Consider the risks and ethical implications of using fast-moving technologies, and the long-term impacts of engineering decisions on society and the environment.

WHAT HAS BEEN STRENGTHENED?

The updated Code reflects several areas that are becoming increasingly important across the engineering profession:



ARTIFICIAL INTELLIGENCE AND EMERGING TECHNOLOGIES

Members are expected to understand the opportunities, limitations and risks associated with AI and other rapidly developing technologies.



SECURITY AND DATA PROTECTION

The Code places greater emphasis on cyber security, information management and responsible handling of data and communications.



SUSTAINABILITY AND ENVIRONMENTAL RESPONSIBILITY

Members should consider the long-term environmental consequences of engineering decisions and support sustainable outcomes wherever reasonably practicable.



EQUALITY, DIVERSITY AND INCLUSION

All Members are expected to treat others fairly, respectfully and inclusively, helping to create a profession where everyone can thrive.



SPEAKING UP

The Code reinforces Members' responsibility to raise concerns about unsafe practices, unmanaged risks or wrongdoing, and to support others who do the same.

CONTINUING PROFESSIONAL DEVELOPMENT

Professional competence is not static. The Code requires Members to maintain and develop their knowledge, skills and behaviours through Continuing Professional Development (CPD).

For professionally registered Members, annual CPD recording remains a requirement, and selected Members may be asked to submit CPD records as part of RailEI's CPD monitoring process.



SCAN
TO READ
FULL CODE

HELP SHAPE ETHICAL STANDARDS AT RailEI

RailEI has established a new Ethical Standards Committee to support the development, promotion and oversight of professional and ethical standards across the Institution.

We are seeking volunteers from a range of backgrounds, disciplines and career stages who have an interest in professional conduct, ethics, governance or public trust in engineering to further strengthen the Committee.

The Committee will help ensure that RailEI continues to uphold the highest standards expected of a modern Professional Engineering Institution.

Interested in getting involved? Email: membership@railei.org



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Daniel Woods CEng, MSc, MBA
Project Director,
Rail Infrastructure



Daniel Woods CEng, MSc, MBA is a Project Director specialising in railway engineering, track systems, interface management and strategy.

He has over two decades of experience delivering complex multidisciplinary rail projects across metro and mainline networks. He is currently consulting on interface management in the Middle East,

supporting major programmes in operationally constrained environments. His work focuses on interface risk, human factors and governance, with a strong interest in how engineering judgement and system thinking influence long-term railway performance and safety.

MANAGING RISK AT INTERFACES IN LIVE RAILWAY RENEWALS

Why permanent way performance increasingly depends on system integration, human factors and governance

With sincere thanks to Daniel Woods for providing the images used in this article.

INTRODUCTION – TRACK IN A LIVE SYSTEM

Across many rail networks, infrastructure is entering a prolonged phase of renewal rather than wholesale replacement. Track, signalling, power supply and civil assets are increasingly renewed while the railway remains operational, often under constrained access windows and sustained delivery pressure. In this environment, track engineering no longer exists in isolation. Its performance, safety and reliability are inseparable from the wider system within which it operates.

In large-scale railway renewals, interface risk is not an exception to be managed, but an inherent condition that must be actively governed throughout the asset life-cycle. While technical attention

is often directed towards individual components such as rail, sleepers or formation, experience consistently shows that some of the most persistent and difficult risks emerge at interfaces: between systems, between disciplines, and between people operating under pressure.

For track professionals working in live railway environments, understanding and governing these interfaces is now central to effective risk control.



Figure 1: Platform interface works on a new station within a Mass Rapid Transit (MRT) extension. **Description:** Platform interface works associated with the installation of Platform Screen Doors at a new station constructed as part of an extension to an existing MRT network. While the station itself is not yet operational, the works illustrate system interfaces between track, civil structures and station systems prior to handover.

THE REALITY OF LIVE RENEWALS

Unlike new-build railways, renewal programmes are delivered within an operational system that cannot be paused. Access windows are limited, staging arrangements evolve, and temporary conditions often persist far longer than originally planned. Track works must be sequenced alongside signalling commissioning, power outages, possession handbacks, and operational readiness requirements.

These constraints create interfaces that are rarely static. Temporary speed restrictions, evolving earthing arrangements and staged geometry adjustments may remain technically compliant while becoming operationally fragile. Over time, such conditions can normalise, particularly when programmes extend over years rather than months (**Figure 1**).

In this context, permanent way decisions are rarely confined to the track itself. They influence, and are influenced by, signalling tolerances, traction power performance, vehicle behaviour and maintenance regimes. The challenge lies not only in designing compliant solutions, but in understanding how those solutions behave within a dynamic, operational system.

WHERE INTERFACE RISK REALLY LIVES

Interface risk in live renewals rarely presents as a single, identifiable failure point. Instead, it accumulates incrementally across system, organisational and human boundaries, often remaining latent until operating conditions change or tolerances are exceeded.

TYPICAL MANIFESTATIONS INCLUDE:

1. Track geometry tolerances that are individually compliant but marginal when combined with signalling detection limits.
2. Temporary works or staging arrangements that alter drainage, access or load paths beyond their intended duration.
3. Power and earthing interfaces that evolve incrementally during phased renewals, increasing complexity over time.
4. Possession strategies that optimise one discipline's productivity while inadvertently constraining another's ability to test or commission safely.

These risks are not the result of poor engineering, but of



Figure 2: Tunnel inspection under constrained access conditions. **Description:** Track inspection and verification activities within a tunnel environment, illustrating constrained access, limited visibility and the reliance on professional judgement during rail engineering inspections conducted under restricted working conditions.

fragmented ownership. They rarely sit neatly within a single discipline or contract, which is precisely why they are so often underestimated during delivery. Track engineers are frequently at the centre of these interactions, yet may not always hold formal authority over adjacent systems.

HUMAN FACTORS IN LONG-TERM RENEWAL PROGRAMMES

Technical interfaces are only one part of the risk picture. Long-term renewal programmes introduce significant human and organisational pressures that directly influence track performance.

Night works, repeated possessions and sustained delivery targets can lead to fatigue, familiarity and behavioural drift. As tasks become routine, teams may begin to accept conditions that would have prompted concern earlier in the programme. Productivity assumptions established during early planning may no longer reflect on-site reality, yet continue to drive decision-making.

In such environments, risk tolerance can gradually increase without conscious intent. Handovers between night and day teams become critical, yet are often compressed. Lessons identified during delivery are not always fed back into planning assumptions quickly enough to influence future work (**Figure 2**).

COMPETENCE, CONTINUITY AND ENGINEERING JUDGEMENT

As renewal programmes mature, the availability of experienced personnel becomes an increasingly critical factor. While formal training and procedures remain essential, they cannot substitute for engineering judgement developed through exposure to complex, live environments.

The loss or rotation of senior engineers can leave gaps in experiential knowledge that are not immediately visible. Procedures may be followed correctly, yet subtle warning signs go unrecognised. Less experienced engineers may be highly capable within defined tasks, but less confident when conditions deviate from plan.

For track professionals, this places greater emphasis on mentorship, continuity and leadership presence. The ability to recognise when an interface risk is emerging – before it manifests as an incident or delay – often rests with individuals who have encountered similar conditions previously. Protecting and transferring this judgement is as important as maintaining technical competence.

INTERFACE RISK AS A GOVERNANCE ISSUE

As renewal programmes increase in scale and complexity, interface risk increasingly becomes a governance challenge rather than a purely technical one. Fragmented delivery models, multiple contractors and segmented responsibilities can obscure ownership of system boundaries, allowing risks to persist unnoticed until they surface during operations. In such environments, decisions that are locally optimised may still degrade system performance, highlighting the need for governance arrangements that enable informed, cross-disciplinary decision-making.

1. Effective interface management requires:
2. Clear ownership of system boundaries.
3. Defined escalation pathways when risks cross contractual or disciplinary lines.

Leadership structures that prioritise system performance over individual asset optimisation.

Track engineers, particularly those in senior roles, play a central part in this governance landscape. Their decisions influence not only track performance, but the behaviour of the railway as a whole.

IMPLICATIONS FOR THE TRACK ENGINEERING PROFESSION

The evolving nature of live railway renewals has important implications for the Track Engineering profession. Technical expertise remains fundamental, but it is no longer sufficient on its own. System awareness, communication and risk integration are becoming core competencies.

Permanent way engineers are increasingly required to:

1. Understand how track decisions interact with signalling, power and operations.
2. Recognise human and organisational factors that influence risk.
3. Contribute to governance discussions, not just technical reviews.
4. Exercise judgement where procedures cannot fully account for live conditions.

This broader role reflects the reality of modern railways, where performance and safety depend on how well interfaces are managed over time.

CONCLUSION – FROM ASSET DELIVERY TO RISK STEWARDSHIP

Live railway renewals will continue to define infrastructure delivery for the foreseeable future. In this environment, interface risk is unavoidable, but unmanaged risk is not. The challenge lies in recognising that many of the most significant threats to safety and performance do not reside within individual assets, but at the boundaries between them.

For the permanent way profession, this represents a shift from asset delivery towards risk stewardship. It requires a mindset that values system thinking, human factors and governance alongside technical excellence. Ultimately, effective interface management during railway renewals is a leadership responsibility – one that demands clear ownership, informed judgement and a willingness to prioritise long-term system performance over short-term delivery convenience.

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If you would like to volunteer in
chairing a session in our Summer
2026 programme, please contact
stuart.murphy@railei.org

S&C Research

Presenter: Yann Bezin
Date: 15 September

Establishing the causes of a Flange Climb Freight Derailment

Presenter: Nigel Shaw
Date: 29 September

Structuring and Professionalising Maintenance and Works Delivery Management in Network Rail

Presenter: Richard Quigley
Date: 13 October

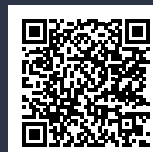
Supporting Neurodivergent Employees in the railway environment

Presenter: Andy Savage MBE
Date: 27 October

What can the Railways learn from our Highways Colleagues

Presenter: Peter Halliwell
Date: 10 November

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LIGHT RAIL: MAKING CITY RAIL TRAVEL MORE SUSTAINABLE

RailEI TECHNICAL SEMINAR 14 MAY 2026

Our second Technical Seminar as the Railway Engineering Institution took place on 14 May at the Royal Armouries Museum in Leeds. It was also our second seminar with a focus on Light Rail (the first taking place in Autumn 2024).



THE EVENT

The event brought together major stakeholders as they described the ambitious goals and future direction for Light Rail, with insights into ongoing projects, sector challenges, and the latest academic research supporting innovation and improvement. The Institution has a role to play in sharing sector specific technical knowledge and helping people make connections. I believe the delegates who attended on the day would agree this was achieved.

The format of the day was a series of presentations interspersed with Q&A and was chaired throughout by **Ben Brooks**, RailEI Vice President North East.

The programme was broadly split into three sections – strategy, projects and innovation and improvement. We were very fortunate to receive a keynote address from **John Reed**, Senior Responsible Officer for Mass Transit, West Yorkshire Combined Authority followed by a presentation from **James Hamnet**, Managing Director of UK TRAM. Both these presentations were complemented

by an excellent talk from **Richard Hines**, HM Chief Inspector of Railways, ORR. There was plenty of food for thought at the end of the first set of presentations.

Following the morning break and networking, we heard from three projects, all in various stages of the life cycle, alongside a presentation from STADLER, who gave a manufacturer's perspective. Each presenter spoke of the trade-offs that had to be considered as they managed the cost, risk and value.

- **Tom Hardwick**, Head of System Development at NEXUS spoke about building the business case for the project which intends to deliver the Metro to Washington.
- **Clare Finlinson**, Engineering Manager and **John Billcliffe**, Regional Engineering Manager with AMCOGiffen presented on the delivery of Magna new Tram stop, a project which is now complete and in use by the public.

- **Dr Christopher Micallef**, Track Systems Lead for the Coventry Very Light Rail project talked through the comprehensive research that has been undertaken to date with respect to this project
- We also heard from **Hams Cruse**, a Light Rail and Sustainable Transportation Expert with STADLER who gave his views on cost drivers when investing in a new fleet of vehicles.

The breaks, including lunch gave delegates the opportunity to visit multiple exhibition stands and network. Returning to the auditorium after lunch, Ben introduced the presentations for the afternoon, which were all from technical experts in the field. They shared their knowledge on what they have learned over many years and also gave some great examples of innovation in the Sector.

- **Rob Carroll**, Principal Engineer with Mott McDonald spoke about Tramway vehicle and Infrastructure interfaces that require thought and consideration.
- **David Crosbee**, Principal Industrial Fellow at the University of Huddersfield and **Paul Allen**, Professor of Railway Engineering and Technology at the University of Huddersfield presented on "Centric" and their involvement with a Tram-Train Best Practice Guide.
- The final presentation of the day was given by **Joao Pombo**, Professor of Railway Technology at the University of Huddersfield who talked about current challenges with electrification systems on some metros.

At all the Q&A opportunities, the delegates asked interesting and pertinent questions of the speakers. Post event, we received excellent feedback about the day, and the Institution is committed to running seminars on this topic on a regular basis.

Our seminars are only made possible with strong support from our Corporate Members who freely offer their knowledge and experience and also provide



financial support as sponsors. In addition to the speakers, we would like to thank the following organisations who provided sponsorship – Volker Rail as Principal Sponsor, STORY, STADLER, Jacobs and Getzner. Thanks also go to Bam, Sekisui, ZF Aftermarket, Goldschmidt, Abtus Limited, Pro Rail Services & S&C Alliance who exhibited at the event.

Special thanks also go to Ben Brooks, Marilena Papadopoulou, Dermot Kelly and Professor Peter Woodward who all helped in developing the agenda.

All the presentations are available on the **RailEI Knowledge Hub**.



JOAN HEERY
TECHNICAL SERVICES DIRECTOR
joan.heery@railei.org



John Reed



James Hamnet



Richard Hines



Tom Hardwick



John Billcliffe, with Claire Finlinson



Dr Christopher Micallef



Hams Cruse



Rob Carroll



David Crosbee



Joao Pombo

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DIGITAL & AI



The integration of digital & AI technologies is revolutionising railway engineering. From ensuring safer operations to optimising performance, these advanced tools and methods are propelling the industry into a new era.

Whether you're starting your career in railway engineering or seeking to enhance your expertise, digital and AI understanding will increasingly become part of your competence toolkit. Our hub brings together essential resources and insights to stay ahead in this fast-evolving sector.



SCAN TO VIEW
**DIGITAL & AI
RESOURCES**

EARTHWORKS & WATER MANAGEMENT



Earthworks and water management are fundamental to building resilient and sustainable infrastructure. By reshaping topography and controlling water flow, they provide the foundation for infrastructure that can withstand environmental challenges, protect natural resources, and ensure long-term reliability.

In railway engineering, earthworks & water management address critical challenges such as constructing stable track foundations on soft soils, designing culverts to manage stormwater, and mitigating risks like erosion, flooding, and landslides.



SCAN TO VIEW
**EARTHWORKS & WATER
MANAGEMENT RESOURCES**

ELECTRIFICATION & PLANT



Electrification and plant are essential to modern infrastructure, supporting the sustainable and efficient operation of transport systems, industry, and public utilities. This field includes key components such as overhead line systems, traction power and distribution networks, and third and fourth rail systems that power electric trains.

Fixed plant also covers power supplies for depots, stations, escalators, lifts, yards and terminals, as well as heating, ventilation and air-conditioning for operational assets and signalling power systems.



SCAN TO VIEW
**ELECTRIFICATION &
PLANT RESOURCES**

TRACK



Track engineering underpins every railway network, providing the foundation for safe, reliable and efficient rail transport. It covers the design, construction and maintenance of the track system, including switches and crossings, with key components such as rails, sleepers, ballast and slab track.

Critical interfaces with substructures, signalling and traction power are also integral. Whether you're new to the field or an experienced professional, this area offers valuable insights, training and resources to support your development.



SCAN TO VIEW
**TRACK
RESOURCES**

SHARE YOUR KNOWLEDGE. SHAPE THE INDUSTRY.



Railei is looking for Members across the Knowledge 200 disciplines to present at Section meetings and Lunch & Learn sessions. Share your projects, insights and experience with the wider community, support professional development, and help shape the future of railway engineering.

If you're interested in getting involved and putting your knowledge into action, we'd love to hear from you. Please contact secretary@railei.org to learn more.

CELEBRATING 125 YEARS OF BRITISH STANDARDS INSTITUTION

British Standards Institution (BSI) is marking its 125th anniversary in 2026, celebrating more than a century of shaping standards.



Few organisations can claim such a lasting influence on industry, engineering, safety and quality across the world. From its origins supporting the standardisation of steel sections for the rail industry, through to today's work in digital systems, sustainability, artificial intelligence and modern infrastructure, BSI has played a significant role in shaping how industries operate safely, consistently and effectively.

For those involved in railway engineering and infrastructure, the anniversary provides an opportunity not only to celebrate the Institution's history, but also to reflect on the importance of standards within an increasingly complex and fast-moving industry.

Founded in 1901 as the Engineering Standards Committee, BSI became the world's first national standards body. Its creation

FOUNDED IN 1901 AS THE ENGINEERING STANDARDS COMMITTEE, BSI BECAME THE WORLD'S FIRST NATIONAL STANDARDS BODY. ITS CREATION WAS DRIVEN BY A GROWING RECOGNITION THAT INDUSTRIAL PROGRESS REQUIRED CONSISTENCY.

was driven by a growing recognition that industrial progress required consistency. At the turn of the twentieth century, different manufacturers often produced components to their own specifications, creating inefficiencies, compatibility issues and safety concerns. Standardisation offered a solution.

Railway engineering was closely connected to those early developments. The rail sector was expanding rapidly, relying upon thousands of interconnected components and systems working reliably together. Consistency in materials, dimensions and manufacturing practices became critical to improving both safety and operational efficiency. It is therefore fitting that rail and infrastructure professionals continue to see standards as fundamental to successful engineering delivery today.

Over the past 125 years, BSI has evolved alongside industry itself. What began primarily as technical standardisation for manufacturing and engineering has broadened into a global system supporting quality management, information security, environmental performance, occupational health and safety, resilience and governance. Many of the standards now considered routine within organisations have their foundations in BSI's work.

Standards such as ISO 9001 for quality management, ISO 14001 for environmental management and ISO 45001 for occupational health and safety are now embedded across large parts of the railway sector. They help organisations establish robust systems, improve consistency, manage risk and demonstrate competence to clients, regulators and stakeholders. In a highly regulated and safety-critical environment such as rail, these frameworks provide assurance that organisations are operating to recognised good practice.

However, standards are often misunderstood as simply being compliance exercises or administrative requirements. In reality, they are far more significant. Good standards capture collective knowledge and experience. They represent lessons learned across industries and over many years of operational practice. They provide a common language that enables organisations, suppliers and engineers to work together more effectively.

In railway engineering, where projects frequently involve multiple contractors, disciplines and interfaces, this shared understanding becomes particularly valuable. Standards help ensure that systems are interoperable, risks are managed

consistently and expectations are clearly defined. They support innovation by creating reliable frameworks within which new technologies can be safely introduced.

This balance between consistency and innovation is increasingly important as the railway industry continues to evolve. Decarbonisation, digital signalling, remote monitoring, AI-enabled asset management and modern methods of construction are all changing the engineering landscape. At the same time, the sector faces growing pressures around cost, efficiency, sustainability and skills.

In this context, standards continue to play a critical role. They help organisations adopt new technologies responsibly while maintaining safety and reliability. They also provide confidence for investment and procurement by establishing recognised benchmarks for performance and quality.

The development of standards itself is also highly collaborative. BSI works with industry experts, professional institutions, businesses, regulators, academics and practitioners to ensure standards reflect practical experience and emerging needs. Many professionals from the railway and infrastructure sectors contribute directly to committees and working groups, helping shape future guidance and best practice.

THE DEVELOPMENT OF STANDARDS ITSELF IS ALSO HIGHLY COLLABORATIVE. BSI WORKS WITH INDUSTRY EXPERTS, PROFESSIONAL INSTITUTIONS, BUSINESSES, REGULATORS, ACADEMICS AND PRACTITIONERS TO ENSURE STANDARDS REFLECT PRACTICAL EXPERIENCE AND EMERGING NEEDS.

This collaborative approach reflects an important principle within engineering more broadly – that progress is achieved through shared knowledge and collective expertise. Professional institutions, standards bodies and industry organisations each play a part in creating environments where learning and improvement can take place.

The 125th anniversary also comes at a time when public trust in infrastructure and engineering remains essential. Passengers, clients and communities expect systems to be safe, reliable, sustainable and resilient. Standards support that trust by providing transparent and recognised approaches to achieving quality and consistency.

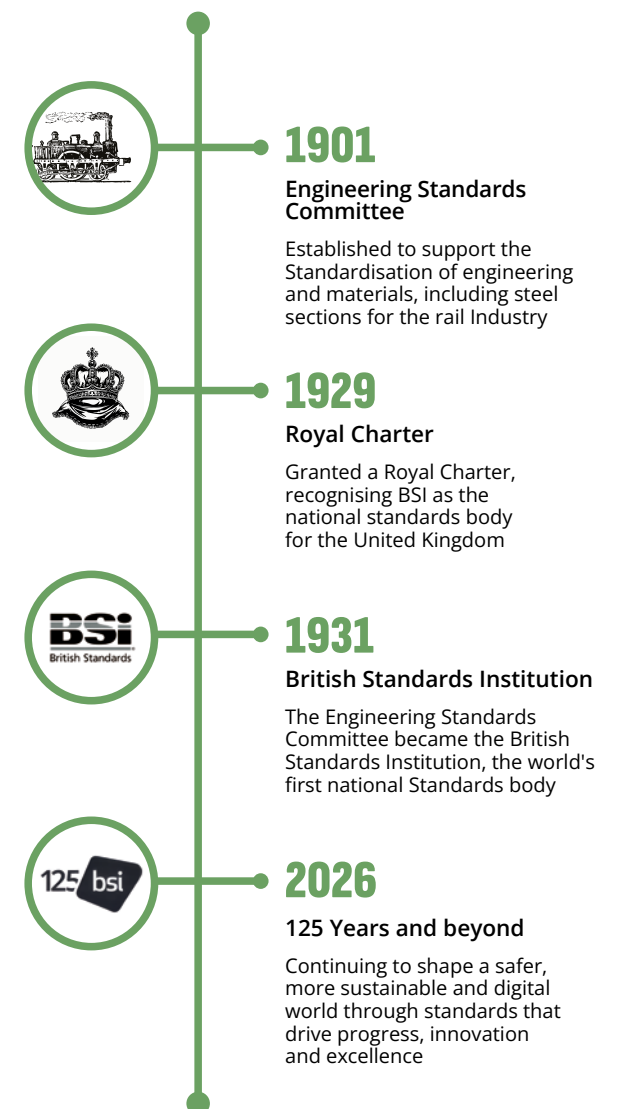
Looking ahead, the challenges facing industry are unlikely to become simpler. Climate resilience, cyber security, ageing infrastructure, workforce development and rapid technological change will continue to test organisations across the engineering sector. Standards alone will not solve these challenges, but they will remain an important part of the solution.

For engineers, standards should not be viewed as barriers to innovation, but as enablers of it. They provide the foundations upon which innovation can scale safely and effectively. They allow organisations to build upon shared knowledge rather than repeatedly solving the same problems independently.

As BSI celebrates 125 years, its legacy can be seen not only in the thousands of standards published over the decades, but also in the industries, systems and professional practices those standards have helped shape. From the earliest days of industrial standardisation to the complex digital and sustainable systems of today, BSI's work has consistently supported improvement, safety and collaboration.

For the railway engineering community, the anniversary is a reminder of the enduring value of professional standards and shared technical knowledge. In an industry built upon precision, reliability and long-term thinking, those principles remain just as relevant today as they were in 1901.

125 YEARS OF STANDARDS A LEGACY OF TRUST, A FUTURE OF INNOVATION





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PROFESSIONAL REGISTRATION

BECOMING A PROFESSIONAL REGISTRATION SPONSOR – WHY IT MATTERS AND WHAT TO EXPECT

Professional registration is one of the most significant milestones in an engineer's career, and behind every successful candidate is often a dedicated Sponsor. Yet many experienced engineers hesitate when asked to be a Sponsor because they are unsure what the role involves.

The good news is that sponsoring a candidate is both rewarding and straightforward when you understand the expectations.

A Sponsor's primary role is to help a candidate demonstrate how they meet the Engineering Council's Competence and Commitment criteria (UK-SPEC A-E). This is more than simply signing a form. Sponsors provide guidance, review the report, and offer professional judgement on whether the candidate is ready to submit their application.

To act as a Sponsor, you must be professionally registered with the UK Engineering Council at or above the level sought by the candidate, and you should have sufficient knowledge of the relevant technical discipline. You do not need to be a member of RailEI, nor do you need to have worked closely with the candidate for many years.

During the process, Sponsors are expected to:

- Review the candidate's submission thoroughly
- Advise and guide the candidate on the sufficiency of their evidence
- Provide short statements supporting the candidate against Competences A-E
- Verify relevant academic qualification certificates
- Confirm that the application is accurate, authentic and of an appropriate professional standard.

Importantly, a Sponsor should be confident that the submission genuinely reflects the candidate's own achievements and professional experience. The Sponsor is central in helping maintain the integrity and standards of professional registration.

Beyond mentoring and guidance, Sponsors play a crucial quality assurance role. By critically reviewing submissions and challenging weak or incomplete evidence before an application is submitted, they help safeguard the standards of professional registration and ensure that only suitable candidates progress through the process.

An engaged Sponsor significantly increases the chances of a 'right first time' submission too, by ensuring the evidence is complete, relevant and clearly demonstrates the required competence and commitment criteria.

SO WHY BECOME A SPONSOR?

The answer is simple: you are helping to develop professional engineers. By sharing your experience and judgement, you support colleagues and peers in achieving a career-defining goal, strengthen professional standards across the rail industry, and help build a workforce that is recognised for its competence and commitment.

As a registered engineer, you are expected to support the development of others, and it is an important part of maintaining the strength and reputation of the profession. By becoming a Sponsor, you are directly fulfilling that commitment.

For many, the role is more than a professional responsibility though – it is also an opportunity to give something back to the profession. You benefited from the guidance, challenge and encouragement of a Sponsor during your own registration journey. By becoming a Sponsor, you have the opportunity to give back to the profession by passing that support forward, and help the next generation achieve the same success.

Many Sponsors describe it as the greatest reward – seeing a candidate they have supported be successful at professional review and elected as an EngTech, Incorporated or Chartered Engineer.

IF YOU ARE A REGISTRANT, WHY NOT ENCOURAGE A COLLEAGUE TO APPLY AND OFFER TO BE THEIR SPONSOR?

CPD AUDIT 2026

Our **annual CPD Audit** has begun and if you were randomly selected to participate, you will have already received a direct email from us, setting out what you now need to do. If you've not heard from us – relax!

We will share the learnings from this Audit in early 2027. Scan the QR code on the right to see learnings from previous Audits.



SCAN
TO VIEW
LEARNINGS

“THE PROCESS WAS GREAT – THE APPLICATION FORM WAS CLEAR AND STRAIGHTFORWARD TO COMPLETE, AND RailEI OFFERS LOTS OF SUPPORT SUCH AS THE PROFESSIONAL REGISTRATION FORUM AS WELL AS THE MONTHLY PROFESSIONAL REGISTRATION CALLS.

MY SPONSOR AND SUPPORTER ALSO PROVIDED LOTS OF SUPPORT AND GUIDANCE WHICH MADE THE WHOLE PROCESS REALLY STREAMLINED.”



Harry Topping EngTech MRailEI
Permanent Way Degree Apprentice,
Central Rail Systems Alliance



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Get all your Professional Registration application questions answered:

- ▶ 31 July 2026
- ▶ 28 August 2026
- ▶ 25 September 2026
- ▶ 23 October 2026
- ▶ 27 November 2026
- ▶ 18 December 2026

**2026
SESSIONS**

Add the dates to your diary and drop-in to any session and ask any questions you have with regards to your application. If you don't have any questions, you are still welcome to join and listen in to the guidance and advice being provided.

If you're a Sponsor and have a question, these sessions are for you too, so please join us.

SCAN
TO BOOK
THE DATES IN
YOUR DIARY



READY TO SIT FOR PROFESSIONAL REVIEW? DATES FOR YOUR DIARY

INTERVIEW DATES

If you are going for IEng or CEng, use the submission deadlines – linked to our quarterly Professional Review Interview dates – to set your progress milestones. Whilst our 2027 dates are not yet confirmed, they will likely follow these broad timescales.

SUBMISSION DEADLINE

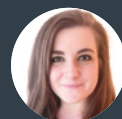
(at least six weeks prior to interview)

20 July 2026	→	14 September 2026
2 November 2026	→	14 December 2026
Late January 2027	→	Late March 2027
Late April 2027	→	June 2027
Late July 2027	→	September 2027
Late October 2027	→	December 2027

Remember: there are no deadlines for EngTech applications. Submit as soon as it is ready, and we will get a decision to you within six weeks.

INTERVIEWS IN W/C

(to be held remotely)

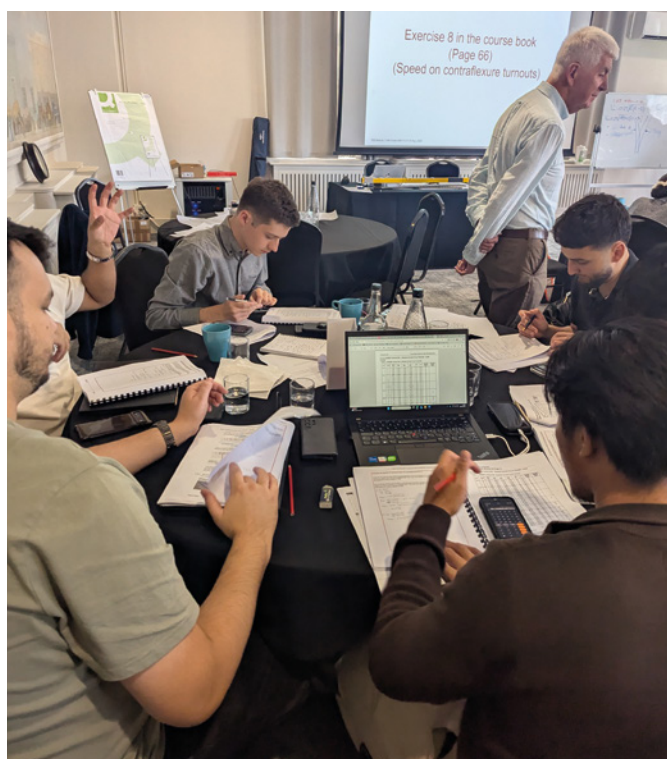


MOLLY DALTON
HEAD OF TECHNICAL EDUCATION
molly.dalton@railei.org

AN UPDATE FROM OUR HEAD OF TECHNICAL EDUCATION

LEARN WITH US

TRAINING BY INDUSTRY EXPERTS



Track Engineering Diploma Delegates at Derby Conference Centre completing a group activity

Developments in artificial intelligence and predictive maintenance are changing how we maintain and manage our assets. Instead of reacting to faults, engineers are increasingly predicting them, using data, and real-time monitoring to intervene before a failure occurs. This shift demands new skills, new ways of thinking, and a willingness to learn continuously.

Lifelong learning is immeasurably beneficial. It is what enables us as engineers to support the railway to move forward, safely. The railway industry faces skills shortages, an ageing workforce, and increasing expectations around sustainability and performance. Learning and development are not just activities expected of a person in isolation, they are central to building the collective capability of our profession.

Being an active member of a Professional Engineering Institution is one part of that development. You only have to attend a **Lunch and Learn** with RailEI to see this in action. Using a Teams call to bring together a specialist speaker and a group of people keen to learn, question and challenge, develops us all, and breaks down the silos we all can be guilty of working in. RailEI events such as **training courses** and **seminars**, **Journal articles** and **practical challenges** are spaces to be curious and learn from each other, irrespective of our usual geographical restrictions. Selflessly sharing knowledge, mentoring others, attending a **Section Meeting**... whatever you choose to do, it all strengthens our industry.

So, at the mid-point of the year... rather than asking "Have I done enough CPD this year?", here are some questions which might broaden your reflections:

- Am I making a development plan to acquire skills the future railway will need?
- Am I adapting to the increased digitalisation, automation, and data-driven engineering within railway engineering?
- What have I learned recently that has changed how I work?
- How can I do more to help develop others?
- Am I treating CPD as a requirement, or as an opportunity?

So, as you look to the remainder of 2026, please seek out enriching experiences. Be intentional, curious, reflective and collaborative in the development opportunities you seek for yourself and others. If you come to a Lunch and Learn you think will benefit someone else, tell them about the recording on the **RailEI Knowledge Hub!** If you see a seminar advertised you think would benefit your team, share it!

Ultimately, lifelong learning is what enables railway engineering to remain safe, innovative, and relevant. **Our railway is evolving. The question is: are we all learning fast enough to keep up?**

OUR RAILWAY IS EVOLVING. THE QUESTION IS: ARE WE ALL LEARNING FAST ENOUGH TO KEEP UP?



Lansdowne Road Level Crossing



Dublin Pearse railway station



ROUTE TO IEng

TRACK ENGINEERING DIPLOMA

LEVEL 6 IN-PERSON DERBY ONLINE

One Diploma, three modules.

Delegates are taught by experienced rail infrastructure engineers who share their wealth of experience. Attendees receive three technical textbooks, comprehensive course materials and coursebooks with worked examples to support their learning.

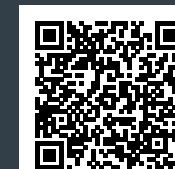
PROGRAMME AIM

Delegates gain an understanding of the principles of the theory and practise of track engineering in the UK. It is comprised of three consecutive modules and involves 100 hours of taught study all mapped to HE Level 6.

Upon successful completion of all three modular assessments, candidates are awarded the RailEI Diploma in Track Engineering. These courses are aimed at newly qualified and experienced engineers and gives delegates the knowledge and skills needed for professionals in track engineering.

WHO IS THIS COURSE FOR?

- Engineers looking for academic recognition of track knowledge, possibly to support registration
- Useful for people new to railways/ track engineering looking for CPD



SCAN TO SIGN UP

If you feel like you have experience to share and would like to be considered to join our lecturing pool, please contact molly.dalton@railei.org to arrange an introduction.

Thanks,

MOLLY DALTON
HEAD OF TECHNICAL EDUCATION
molly.dalton@railei.org

HAVE YOUR SAY

LIFELONG LEARNING IN RAILWAY ENGINEERING

All photos provided courtesy of Molly Dalton (unless otherwise credited).

Railway engineering has been constantly evolving over the last 200+ years, however the pace of change in our industry today is greater now than ever before! The question for us as engineering people is... are we evolving with it?

Continuing Professional Development (CPD) is a critical requirement, something we all diligently record, evidence, and reflect upon. However, in today's world, CPD itself is a changing landscape. How can we all remain relevant in such a rapidly changing environment?

Digital Signalling is one such example. Programmes introducing the European Train Control System (ETCS) are fundamentally changing how the railway is operated, moving from physical signals to real-time, in-cab digital data. This is not just a change in equipment, it is a change in mindset, requiring engineers to think in systems, data flows, and integration rather than isolated assets. Less physical equipment is also changing how disruptive maintenance activities are. (Reference: Revolutionising the way we deliver signalling - Network Rail*).

*networkrail.co.uk/stories/revolutionising-the-way-we-deliver-signalling/

LEARN WITH US TRAINING BY **INDUSTRY EXPERTS**

TECHNICAL EDUCATION AND **TRAINING PROGRAMMES**



ADVANCED TRACK TECHNICIAN COURSE

LEVEL 4 IN-PERSON DERBY

One course, three weeks.

The aim of this course is to give delegates advanced technical knowledge and understanding of track systems, and their associated methodologies and plant. It is comprised of three consecutive modules and involves 120 hours of taught study all mapped to HE Level 4.

PROGRAMME AIM

Delegates learn how innovations in survey, design, maintenance, renewal, and project work can be harnessed to help make safe and efficient plans. Diversity and sustainability issues are explored, as are the interdependencies between the various engineering functions and train operations, so that key management skills including decision making, prioritisation, record keeping, data analysis, and report writing are developed. Practical skills are developed in plain line and S&C surveying and inspection, rail and rail defect management, mechanised alignment maintenance, and rail stressing.

WHO IS THIS COURSE FOR?

- Newly-qualified technician level technical staff
- Maintenance, renewals or project-based staff
- Good for people looking to increase site-based skills



SCAN
TO SIGN UP



EARTHWORKS, DRAINAGE & OFF-TRACK ENGINEERING COURSE

LEVEL 5 IN-PERSON DERBY

One course, one week.

This course provides delegates with the knowledge, understanding, and insights necessary to manage the risks presented by earthworks, drainage and associated Off-Track railway infrastructure assets.

PROGRAMME AIM

Delegates will learn about track formation, earthworks, drainage and water management, vegetation, level crossings, line-side security, and their relationships with interfacing engineered systems such as track. Weather related effects are examined and the potential longer term impact of climate change explored.

Through theory, worked examples, case studies, and exercises, attendees will gain an appreciation of good practice in the design, installation, and ongoing safe management of critical Off-Track assets.

WHO IS THIS COURSE FOR?

- Anyone looking to learn more about Earthworks, Drainage and Off-Track
- Those who currently or previously work in these disciplines
- Those who work in Track/Civils looking for EDOT knowledge



SCAN
TO SIGN UP



S&C REFURBISHMENT COURSE

LEVEL 5 IN-PERSON DERBY

One course, one week.

This course provides the knowledge and skills needed to plan and deliver safe and effective S&C refurbishment. The processes for scoping, specification and quality assurance have been produced in conjunction with Network Rail and identify good-practice. The course is mapped to HE Level 5.

PROGRAMME AIM

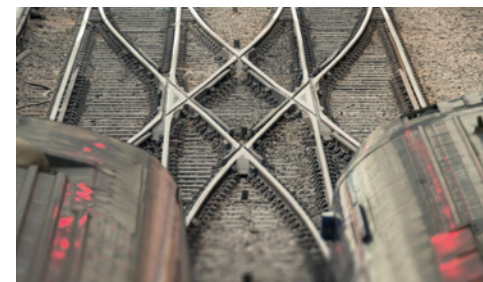
Delegates will gain a comprehensive knowledge of S&C and how to undertake refurbishment safely, efficiently and to the required engineering quality. The course covers both the track assemblies and the trackbed under S&C. Participants undertake detailed analysis and inspection of layouts so they can scope and specify work to provide the necessary life extension of the layout. The course then ensures that delegates understand the various maintenance interventions suitable for S&C and its components and can plan those required in the correct sequence.

WHO IS THIS COURSE FOR?

- S&C Refurbishment
- Track engineers and managers



SCAN
TO SIGN UP



ADVANCED S&C SYSTEMS ENGINEERING COURSE

LEVEL 5 IN-PERSON DERBY

One course, two modules.

This course is designed to strengthen your knowledge of S&C design, operation, and maintenance. It provides a structured blend of classroom learning, and practical activities to improve your understanding of track and signalling S&C engineering.

PROGRAMME AIM

To equip you with skills to optimise reliability by understanding failure modes, enhancing coordination between track and signalling disciplines, and applying effective planned preventative maintenance.

The course also aims to give you a deeper perspective of other interfaces across the full S&C asset lifecycle.

WHO IS THIS COURSE FOR?

- Track engineers
- Signalling engineers



SCAN
TO SIGN UP



DC 3rd – 4th RAIL ELECTRIFICATION COURSE

LEVEL 5 IN-PERSON DERBY SOUTH

One course, one week.

In today's UK railway, DC 3rd – 4th Rail Electrification Systems still have a strategic part to play in the future of rail transport and the journey towards its sustainable future. This programme aims to give delegates an understanding of the electrification principles, their application and safe practices within the context of the integrated railway as a whole.

PROGRAMME AIM

Delegates will gain a comprehensive knowledge of DC 3rd – 4th railway electrification systems in their context; be able to describe the principal elements of the DC electrification system, from the supply of the bulk energy, its transmission and distribution along the rail route, to its conversion and feeding as usable power for train traction and other operational systems.

WHO IS THIS COURSE FOR?

- Both newly qualified and experienced engineers
- Electrification professionals



SCAN
TO SIGN UP



ELECTRIFICATION ENGINEERING DIPLOMA

LEVEL 6 IN-PERSON DERBY LONDON

One Diploma, three modules.

The Diploma is comprised of three consecutive modules involving 100 hours of taught study, all mapped to HE Level 6. Delegates receive a technical textbook and comprehensive course materials with worked examples to support their learning.

This course is aimed at newly qualified and experienced engineers and gives delegates the knowledge and skills needed for professionals in electrification engineering.

PROGRAMME AIM

Delegates gain an understanding of the principles of the theory and practice of Overhead Line Electrification engineering in the UK.

Upon successful completion of all three modular assessments, candidates are awarded the RailEI Diploma in Electrification Engineering. For further development we offer a stand-alone DC 3rd – 4th Rail Electrification Course.

WHO IS THIS COURSE FOR?

- Engineers looking for academic recognition of electrification knowledge, possibly to support registration
- Useful for people new to railways/ electrification looking for CPD



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OUR CORPORATE MEMBERS

Corporate Members are fully involved in the development of the RailEI, ensuring that our products and services meet the needs of the rail industry for technical expertise.

For details of Corporate Membership please contact Joan Heery, Technical Services Director: joan.heery@railei.org

OUR HERITAGE MEMBERS

Heritage Members can benefit from the expertise the RailEI provide to help run their largely volunteer led organisations. For details of Heritage Membership please contact secretary@railei.org

Formerly known as the PWI

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OUR COMMUNITY

NEW MEMBERS

We're honoured to have you on board and look forward to working with you. Watch out for us in your inbox, we don't want you to miss a thing, and remember - we're here to help, so if you have any questions, then please do get in touch!

- Ashford:** Albert Grunfeld, Josh Connelly
- Birmingham:** Catalin Ciobanu, Thomas Coughlan, Wahiba Erriadi
- Cheshire & North Wales:** Karl Gillgrass, Rhys Hayton, Jack Knight
- Edinburgh:** Wiktor Gebus, Hollie McKinlay, Alan Wright
- Exeter:** James Hammett
- Glasgow:** Corey Meechan, Michael Lam, Kirsty Armstrong, Christopher Booth
- International:** Tarun Kumar Korada, Satyaki Bhattacharyya, Navajyoti Das, Ho Fung Ngan, Guoqing Jing, Ruohui Zhang, Surapan Noppharat, Liu Siqi
- Ireland:** Liam Fowler, Robert Scott, Aidan Slattery

London: Mauricio Restrepo, Lee Simmons, Tristan Leach, Ramees Saidalavi, Adnan Dahir, Hussein Adan, Michael Hadley, Anisah Edoo, Francesco Celentano, Duncan Whittle, David Lewis, Toby McEwan, Mark Duke, Micky Ferguson-Beaver, Aliya Foster, Samjustin Onuegbu, Katrina-Rose Allen, Sho Okazaki, Jack Williamson, Christine Baldwin, Jhayed Miah, Ahmed Hassan, Matt Horan, Tendai Mungwadzi, Osaho, David Izekor, Thomas Dejean, Ho Wang Owen Yip, Harmeet Takhi, Lewis Fletcher, Wang Mingzhe, Shuai Li, Catherine Burrin, Darrieal Ramku, Stephen Smith, Scott Crow, Abdullah Hussein Zadah, Lewis Blenkinsop, Mark Wedley, Bob Ejimogu

Manchester & Liverpool: Mohamed Elhadi, Jack Maddison, Raabiah Ahmed, Darren Andrews, Alex Emmerson, Danish Tanveer Syed, Paul Bleasdale, Lee Watson, Aamir Zahabi, Jay Foster, Ross Paterson, Richard Mansfield, Shakir Kakuji

Milton Keynes: Shaun Crehan, Sebastian Southcombe, Scott Morrison

North East: Jonathan Glen, Simon Maguire

Nottingham & Derby: Talia Cheng, Tom Turley, Nafi'u Hanafi, Ameer Hamza, Martin Gregory

South & West Wales: Snowdon Mountain Railway

Thames Valley: Daniel Mccarville, Luke Shuttle

West of England: Katherine Plenty, John Webb, Lok-hang Kong, Edward Cooper, Karl Somers, Grant Stratton

Yorkshire: Thomas Jimmeson, Shaun Leatherba, Morgan Llewellyn, Scott Hazeldine, Nick Turner, Anton Rodenburg, Barry Rusk, Greg House, Alan Pattison, Andreas Bougas, Alexandra Long

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Brian Mason, Luke Peters, Ryan Barnett, Steven Makowski, Jonathan Walesby, Shaun Mackinnon, Robert Dempsey, Meik Jensen, Lee Evans, Jack Burbidge, Christopher Finch, Richie Williams

INCORPORATED ENGINEER:

Joseph Watters, Andrew Gardner

CHARTERED ENGINEER:

Haoyu Wang, Alasdair Robertson, Sarah Boffey, Michael Cunningham

FELLOWSHIPS:

Scott Hazeldine – Yorkshire, Stephen Varley – Nottingham & Derby, Binesh Baby – Nottingham & Derby, Robert Lester – South & West Wales

TRACK ENGINEERING DIPLOMA:

Michael Wylie, Benjamin Haines, Tsz Wang Wong (Victor), Yan Lik Philip Wong, Bekir Danyildiz, Chun Ning Chung (John), Charles Cheuk Wing Hung, Adrian Chun Hei Leung, Kelvin Hiu Chun Poon, Kam Hei Cheng, Kit Chau, Ka Lun Alan Lau, Ka Wai Yuen (Alex), Chi Chiu Alan Cheung, Chak Shun Jason Tung, Chin Lok Yan, Wing Sum Chan, Ho Yin Ka, Tommy Cheuk Hin Ng, Ming Yin Gary Tse, Man Hin Zach Lam, Man Him Wan, Kai Ho Ying (Henry), Suet Man Raven Choi, Kelvin Shing Kai Chan, Willis Kim Ting Yip, Shun Yu Ryan Lui, Ho Ming Edmond Wong, Wai Bing Candice Poon, Eoin Quinlan, John Cannon, Shane O'Shaughnessy, Joanna Clarke, David Keating, Cian Campbell, Shane Callaghan, Tony Breen, William Whelan, Michael Coleman, Shashank Gowda Menasagere, Martin Donegan, Abigail Daly, Sonal Malakar

S&C REFURBISHMENT:

James Todd, Darren Plassard, Joseph Mahoney, Lee Carey, Tim Bond, Joshua Geere, Christopher Jeary, Lee Pepper, Matthew Low, Liam Russell, Elinor Harris, Declan McFadyen

ADVANCED S&C SYSTEMS ENGINEERING:

Ashley Brown, Robertas Jankauskis, Jamie McMahon, Jack Bloomfield, James Bayley, Brian Woods, John Dixon, Emily Hopkin, Andrew Witton, Robert Buckley

APPLYING FOR FELLOWSHIP?

Fellowship of the Institution is the highest honour a member can receive.

But it is not just a badge of honour: Fellows are expected to engage and further the work of the Institution.

Scan the QR code to learn more:



SCAN TO LEARN MORE

SECTION UPDATES

JOIN OTHER RAILIE MEMBERS AND RAIL PROFESSIONALS IN YOUR REGION

By attending your local section meetings, you can listen to expert talks and discuss different aspects of railway engineering. Section meetings are open to all RailIE Members, so you can dip into other regions whenever you want. Non-members are also welcome as a taster.

FROM WORKSHOP TO TRACK: OUR VISIT TO KGJ PRICE RAILWAY CONTRACTORS

Recently, the South and West Wales Section visited KGJ Price Railway Contractors' main site in Bedwas to learn more about the specialist work that helps keep railway infrastructure operating safely and efficiently.

With sincere thanks to Petar Krcunovic for providing images and kindly granting us permission to use them.

Founded in 1983, the company has grown from its roots in the coal and steel industries of South Wales into a respected national rail contractor, delivering projects across the UK, from Cornwall to the north of Scotland. Operating primarily from its Bedwas base where its main manufacturing is based (Figure 1), the company employs around 90 people.



Figure 1: Main factory floor at KGJ Price, showing rolled rail machined and/or drilled ready for assembly.

During the visit, we were able to see how KGJ Price works across an impressive range of railway sectors, including industrial, mainline, heritage and narrow-gauge railways. Its services cover surveys and design, manufacturing, installation, patrolling and emergency call-out support, demonstrating the breadth of expertise within the business. Our host, Ewan Keir (Business and Product Development Manager at KGJ Price) explained that much of the company's maintenance activity is reactive, with teams responding efficiently to faults on the track, reporting back to the client and then delivering the required repair works from start to finish.

One of the most interesting aspects of the visit was seeing how closely linked design, manufacturing and installation are within the company. KGJ Price described its strongest offering as a complete package, starting with surveys and design, then moving through manufacture, pre-assembly, delivery, installation and follow-up support. We were shown examples of components produced in the workshop, ranging from buffer stops to a section of Switches and Crossings (S&C) for an oil platform project in Brunei (see Figure 2). This demonstrated both the company's technical capability and the variety of projects it supports. We were also able to see how parts are pre-assembled in the workshop, checked for fit and function, then dismantled and sent to site for rapid installation.

KGJ Price also highlighted the importance of developing practical skills across the workforce. Apprentices and new starters spend time in the manufacturing department before progressing into



Figure 2: Assembled S&C layout under construction at KGJ Price for an oil platform project in Brunei.

specialist roles, helping them understand how components are produced, assembled and installed before working on railway infrastructure.

The visit also provided an encouraging example of innovation within the business. We were able to take a close look at KGJ Price's redesigned cast baseplate (Figure 3), developed with support from Thomas Dudley Foundry. The re-engineered design reduces weight from 28 kg to 16 kg while maintaining the required strength, bringing it within the limits of a one-person lift and improving manual handling for maintenance teams. Designed for CEN56 rail with Pandrol PR401 fastenings, it is intended as a replacement for PAN-V and PAN-11 baseplates, subject to final product acceptance. Trial installations on Network Rail and heavy-industry infrastructure have performed successfully, while the reduced material content also supports sustainability objectives.

The cored design leaves a grid pattern, which has been reported to improve grip with the sleeper by avoiding long, smooth surfaces where pitting can occur. As a result, the design not only reduces material use but also provides more effective support for the rail in maintaining gauge.

Overall, the visit showed that KGJ Price is far more than a rail contractor carrying out installations. Its integrated approach to design, manufacture, installation and maintenance, combined with a clear commitment to training and innovation, makes it a strong example of specialist capability within the rail sector. Ewan's explanations throughout the visit provided valuable insight into the company's work. Thank you Ewan!



PETAR KRCUNOVIC GMICE MRAIEI
GRADUATE CIVIL ENGINEER,
Network Rail (Wales and Western)



Figure 3: KGJ Price's lightweight cast baseplate design for CEN56 rail and Pandrol PR401 fastenings.

WANT TO PRESENT A SECTION MEETING?

RailIE are encouraging Section Members industry-wide to come and present section meetings to discuss their projects.

Please contact your local Section to learn more.

UPCOMING SECTION MEETINGS

SUMMER/AUTUMN 2026

AUGUST 2026

YORKSHIRE SECTION
HOPETOWN DARLINGTON
– NEW TRACK FOR
A NEW HOME

20 August, 17:30 - 18:30
James Hodge, Director,
Hodge Rail Limited

HYBRID

WEST OF ENGLAND SECTION
ADAPTING THE WESTERN
ROUTE'S RAILWAY
INFRASTRUCTURE TO OUR
CHANGING CLIMATE

3 September 13:00 - 14:00
Julie Gregory, Regional Head of Resilience
and Sustainable Growth, Network Rail

HYBRID

SEPTEMBER

THAMES VALLEY SECTION
BASIC STEEL METALLURGY AND THE
EFFECT OF RAIL SECTION ON RAIL
STRESS AND DEFECT GROWTH

9 September 17:45 - 19:15
Andy Franklin, Retired Permanent Way Engineer
and RailEi Technical Education Lecturer

HYBRID

OCTOBER

YORKSHIRE SECTION
RAIL-ABILITY BALLAST UNDERCUTTER
15 October 17:30 - 18:30
Jonathan Glen, Operations Director,
Rail-Ability Ltd

HYBRID

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- 1) Log into your Member Dashboard
- 2) Book an event
- 3) Your CPD will be automatically recorded.

EVERY MEMBER WELCOME AT EVERY SECTION MEETING

Join RailEi Members and rail professionals at your local Section meetings to hear expert presentations and discuss railway engineering. All Members are welcome to attend any Section, and non-members are invited to come along for a taster.

If you'd like to present or get more involved, please contact your local Section.

Please note: This information is correct at the time of going to print.

Please check for up-to-date information on the website, as on occasion topics, speakers, venues, times and dates may change: railei.org/whats-on/section-meetings

SECTION CONTACT DETAILS



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Birmingham Acting Secretary: Kate Wilson.
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Venue: Varies – please see RailEi events calendar

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INDIA

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Email: victoria.pwi@pwinsw.org.au



CALLOUT TO MEMBERS

YOUR RAILWAY. YOUR PERSPECTIVE.

Help us showcase the real story of rail through your lens.

We'd love to see your view of the railway. Whether it's a project you've worked on, something from your day-to-day role, or simply a moment you've captured through your own interest in rail, we're inviting Members to share their photographs.

As we develop our brand, we want it to reflect the people behind the industry - building a rich, authentic library of images that truly represents railway engineering.

Recent submissions (as displayed on page 8-9) show exactly the kind of insight and quality we're looking for. Selected images may be featured in the Journal, online, and even on future covers.

Please submit original, high-resolution images (suitable for print), with clear detail and good overall image quality.



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