



THE PWI

THE JOURNAL

JULY 2024 | VOLUME 142 | PART 3

MEMBERS

3921

PROFESSIONAL REGISTRANTS

342

CORPORATE MEMBERS

58

HERITAGE MEMBERS

20

21
SECTIONS

908
KNOWLEDGE HUB
RESOURCES

8,692
EMAIL
SUBSCRIBERS

140
1884-2024

140 CAMPAIGN

38 successful Professional Registrations so far in 2024

TARGET 140
PROFESSIONALLY REGISTERED ENGINEERS
IN 2024

27
EngTech

2
IEng

9
CEng

1364
COURSE
DELEGATES

5 TRAINING
COURSES

**TOTAL SOCIAL
MEDIA FOLLOWERS,
15,261**

TOGETHER WE CAN GROW OUR COMMUNITY

HELP TO SHARE OUR MESSAGE

- **COMMENT** - Tell us your thoughts and views on our posts, and engage in discussion with other Members.
- **LIKE** - Show a reaction to our posts and it will help the social platform to know other railway engineers may like our content.
- **SHARE** - Share our posts, it will help your colleagues and wider network see more from the PWI and help to grow our message.
- **TAG** - Tag us in posts when you are at our events, reading our articles or even to share a project you're working on with the wider PWI community.

JOIN THE DISCUSSION

-  in the PWI
-  @the_pwi
-  the PWI
-  PWInstitution
-  PWInstitution

VOLUNTEER OPPORTUNITIES

The PWI Executive Team is made up of less than 15 employees, most of whom work on a part-time basis. Therefore, we are very grateful to be supported by hundreds of amazing volunteers who give up their time to give back to the railway community.

Scan to find out more



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2024 PWI ANNUAL SUBSCRIPTIONS

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Apprentice, Student	£0 e-Journal £30 printed Journal
Member	£108
Members (67.5 or older on 01.01.24)	£44
EngTech Members*	£108
IEng/CEng Members*	£172
Fellow	£146
Fellow (67.5 or older on 01.01.24)	£57
EngTech Fellow*	£146
IEng/CEng Fellow*	£227

CORPORATE MEMBERSHIP

Small enterprise (Turnover up to £17.5m pa)	£2,400
Medium enterprise (Turnover £17.5m - £200m pa)	£6,150
Large enterprise (Turnover above £200m pa)	£12,350
Heritage railway	£150

PROFESSIONAL REGISTRATION

Application fee: New Registrant** EngTech £60 IEng £225 CEng £225
Application fee: Additional Membership EngTech £0 IEng £90 CEng £90
Engineering Council fee* EngTech £22.34 IEng £38.96 CEng £45.91

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



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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 and tell us more. One of our Technical Managers will be in touch to discuss the suitability of the topic. Please note - we do plan which technical articles will be included at least six months in advanced of an edition.



PRESENT A LUNCH & LEARN

If you would like to present to a live Lunch & Learn session, please do let us know. Over the past year these sessions have gone from strength to strength and regularly attract from 100-200 participants as well as being recorded and stored in our online Knowledge Hub for engineers to learn from for years to come.



A CLOSING LETTER FROM THE PRESIDENT

As my Presidential Year comes to a close, in this article I am exploring several key themes which for me resonate with how the PWI is connecting people and railway engineering interests.

Our multi-faceted Technical Seminars provide groundbreaking thought leadership and a collaborative environment to meet, engage and have influence.

Our work in broadening our population of professionally registered engineers continues to grow very strongly and given impetus by initiatives like the 140 Challenge.

As an Institution, and as individuals, one of our blind spots can be communication, and in particular listening to understand different perspectives. The PWI Survey sought to engage, draw in diverse views, and help provide a fact base to shine a light into some of these potential blind spots.

TECHNICAL AND THOUGHT LEADERSHIP ACROSS THE RAILWAY ENGINEERING COMMUNITY

Our Technical Seminars have been outstanding. I had the pleasure and privilege to chair sessions at three, in York, Manchester, and Dublin as we explored Earthworks & Drainage; Infrastructure, Resilience; and Performance and future enhancements in the island of Ireland. I would draw out several strands that have reinforced the consistent excellence of these events.

Firstly, technical excellence and renowned speakers who were clear subject matter experts in their field. Secondly, the structure of the Seminars encouraged engagement with the audience and provided many opportunities for thoughtful and well utilised question and answer sessions in addition to the presentation slots. Thirdly, the engagement with sponsors and delegates provided a breadth of opportunity to explore the Seminar themes more deeply and promote business and knowledge networks.

Finally, the professional organisation from the PWI team was consistently superb from the speakers and sponsors dinner, through the venue set up, and

positive energy supporting all of those attending. Passion, commitment and knowledge was evident (and shared) by so many at each of the Seminars. I must also acknowledge the bravery in tackling the hybrid Seminar on Infrastructure Resilience in March which 'beamed in' contributors live from Australia and South Korea as well as those visiting Manchester in person! There were many opportunities for glitches, but the team carried it off very well. Congratulations!

Looking forward, our programme for the remainder of 2024 tackles Electrification this month (building on the outstanding work by Peter Dearman and colleagues establishing us as a great home for electrification engineering), and Light Rail in November.

CHALLENGE 140

Moving forward, our outstanding Professional Registration Team is well underway with the objective to achieve 140 new registrations in our 140th anniversary year. This is at the heart of what we can do for our Members, and it has been a delight to see the breadth of candidates from all stages and backgrounds in their career journey taking up the challenge.

And I'd ask you to support our Professional Registration Team. Firstly, I would encourage Fellows and Members to actively understand and support candidates as sponsors. It is a critical role and provides valuable insight and constructive challenge to help the candidate demonstrate their best work. Secondly, please engage and support professional reviews and scrutineering if you can. Again, this type of contribution from Members and Fellows is invaluable to the Institution and our candidates. Finally, finding effective ways of helping our growing international cadre of Members seeking professional recognition. Both the Institution and our senior Members can reflect on how we can continue to build effective outreach to the strong interest and worldwide demand we see. Listening to, and acting on, their feedback on recent engagement such as the coworking sessions and the PWI Survey will build a broader and more inclusive Institution.



THINK
ARTICLE



STEVEN BELL
PRESIDENT
president@thepwi.org

SURVEY

Our PWI Survey has generated tremendous interest from Members and non-members. Engagement has been immensely powerful and listening hard (and then deciding how we need to act) will help us continue to develop and address the needs of Members and understand how we can provide the right environment and opportunities for current Non-members to join our railway engineering community. The survey is enabling us to connect with a different, broader network of people with interests in railway engineering. Including perspectives of that broader and diverse community of stakeholders will make us more effective as a PEI and provide a potential 'tribe' for those who have not found the right 'home' yet. This type of survey is invaluable in accessing different views and perspectives, thank you all who have contributed and shared the links to reach out through your networks to a broader base of stakeholders.

**IF YOU CAN CONTRIBUTE TO ANY
OF THESE THEMES, PLEASE REACH OUT.
YOU WILL MAKE A POSITIVE DIFFERENCE.**

THANK YOU.

THE PRESIDENTIAL CHAIN

FAREWELL

This month sees the end of Steven's reign as President of the PWI and makes way for a new Member to step into the position and become the PWI President for the next year.

Please join us in saying thank you to Steven for all of his shared knowledge and expertise over the last year, his dedication to the PWI and the impact that he has made on our Members and the wider railway engineering sector.

As with all of our Presidents, following his Presidential year, Steven will still play a vital role here at the PWI as a Past President, helping the new President fully embrace her new role.

WELCOME

We are pleased to welcome Mona Sihota as the new PWI President and look forward to embracing her passions, knowledge and ideas as we take on the next step in the future of the Institution. Hear more from Mona in the October Journal.



CEO'S ARTICLE

WELCOME TO THE JULY JOURNAL

Welcome to another issue of The Journal - packed, as ever, with a fascinating mix of technical topics and more people-focussed articles. Recent travels in Scandinavia (of which more later) reminded me that the great challenge of public transport is both getting the engineering right *and* looking after the travelling public while they experience our 'production line' at close quarters. The latter is not just about moving people, it's also about making them aware that they are being, and will be, cared for while travelling on our infrastructure, and beyond it. That way lays a successful public transport sector and a successful railway industry.

And in that spirit, having used my pieces in the last two Journals to talk extensively about our Institution and its future, I thought those who read my articles deserve a bit more variety with some discussion of wider topics. Before moving on however, as those of you who were at our AGM on 5 July will already be aware, I must quickly note that the Board has deferred putting a special resolution on name change to the membership.

NAME CHANGE RESOLUTION DEFERRED

Our fellow Professional Engineering Institutions (PEIs) are keen to ensure that a PWI name change does not introduce scope for confusing PEI identities to the extent that people join the 'wrong' Institution or seek technical support from one body where another would be better placed to provide it. The PWI having been in the business for 140 years, I am certainly keen that under its new name it should not be confused with any other body. The Board is therefore discussing further naming options with colleagues in other PEIs with the intention of arriving at a new PWI identity which is clearly differentiated. (It's good to report that these discussions are also looking at how we can improve mutual cooperation and coordination.)

Such discussions inevitably take time, so a special resolution on the new name will not be put to Members before mid-Autumn this year, and it may yet be 2025 before this is practicable. A further matter I must stress is that all PWI Members will be entitled and able to vote on the resolution. The PWI is and will remain a firmly democratic Institution!

RAIL LIVE 2024

On a somewhat lighter note, it was great to be part of the PWI team on our stand at this year's Rail Live, the UK's largest outdoor railway industry exhibition. The main purpose of the Institution's presence is to raise its profile and explain the benefits of membership to those who work in the field of railway engineering and who have yet to join us. In that respect this year's event did not disappoint.

Following hard on the heels of our Seminar in Dublin (looking at developments on the Irish railway systems), and with the PWI's London-based Electrification Seminar in sight, interest in our technical education programmes and the other opportunities we provide for personal and



PWI stand at Rail Live.

career development was higher than ever (and that's despite the PWI being accidentally omitted from the list of exhibitors on the site information boards!). I look forward to welcoming into membership many of those who encountered the Institution for the first time, and I remain determined to further expand the scope of technical and professional support that the Institution provides.

I never cease to be impressed by the enthusiasm and commitment of the Institution's Ambassadors who manage our stand, and by the knowledge and experience of our Members who pop by to say hello and catch up on industry news and developments. It's also great to have the chance to visit many of our Corporate Members on their stands, hear about current and planned technical advances, and view their latest ranges of products and services. Many thanks to all for the huge support given to the Institution.



Ambassadors on the PWI stand at Rail Live.

THE HEAT IS ON

Literally... As I write, the UK is experiencing its first really sustained bout of warm weather this year. Whilst this made 'holding the fort' on the PWI's stand at Rail Live a very enjoyable experience, railway engineers of all disciplines will be wary. Hot weather risks - including track instability, sagging electrification contact wire, and overheating electrical and electronic equipment - have the potential to seriously impact railway safety and performance, and I know that much thought and effort is being applied to 'engineering-out' and mitigating those risks on Britain's railway networks. Thankfully, Summer 2023 didn't see a repeat of 2022's historically unprecedented temperatures, but climate science indicates we will see them again. Our railways can't afford to be complacent and the evidence from Rail Live shows that companies in our industry supply chain are working very hard to develop increasingly sophisticated technology and techniques for inspecting and monitoring railway infrastructure, for modelling future performance, and for eliminating or reducing heat-related risk at source.

That said, to be effective, those technologies must be applied - and there are still significant challenges there. Our environment is changing and solutions that appear just about viable today may well not be so in the future - and railway assets are notoriously long-lived. If UK railways are to remain relevant - let alone flourish, many of the assets we install today must continue to perform in 25 years' time or more, when heatwaves are likely to be five times more frequent and with air temperatures peaking close to 50 °C. If railway engineers don't make the case for building 'fit for the future', who will?

OBSERVATIONS ABROAD

A Spring holiday to Scandinavia by rail provided some interesting insights into how other European countries and railway administrations are developing their networks and how those networks are performing. It rapidly became obvious that the UK is not the only place where train service disruption and dislocation occurs when my wife and I arrived at Hamburg main station to catch a morning train to Denmark. A large fire in an industrial unit adjacent to the Rendsburger Hochbrücke (the famous bridge which carries the main North-South rail route high

over the Kiel Canal) (**Figure 1**) had led engineers to close the bridge due to concerns over its ability to carry traffic loads without suffering permanent deformation. The steel structure had become so hot in places that the risk of 'plastic' deformation had to be taken very seriously. In the event rail services over the bridge were halted for the rest of the day and overnight.

So far, so understandable: but it then proved almost impossible to get sensible information about alternative travel arrangements. Discussion with other passengers and platform staff finally suggested a long detour via Kiel and then a rural branch line (itself disrupted by bridge reconstruction work enroute), resulting in a 6-hour late arrival in Sweden - that day's destination.

It's difficult to envisage how such external risks to railway infrastructure can be identified and mitigated, but I'm certain that better contingency planning and arrangements for providing travellers with information and support are feasible. Some three weeks later, one leg of our return journey through Germany was also disrupted due to a

suicide in Berlin (300 km off our route, but the origin of our connecting train). This time, the delay was just under two hours and information on alternative travel arrangements was readily available. We had made a generous time allowance for shopping in Brussels, so thankfully managed to catch our scheduled Eurostar service

back to London. As a result of these incidents, I now have practical experience of the German version of 'delay-repay' (which works quite well!). So most clouds seem to have some sort of silver lining...

Back in Scandinavia, extensive investment by Norway and Sweden in their railway networks was clearly visible in work on new routes, track doubling, and electrification schemes, and it was interesting to see different engineering solutions to some familiar problems. The Norwegian approach to new and replacement electrification, for example, includes mast foundations formed from reinforced (or perhaps prestressed) concrete piles (**Figure 2 and 3**). Whilst I didn't witness any installation in progress, it appeared that the piles were either driven into the ground (in a similar way to UK tubular steel mast foundations) or set up in previous excavations and then surrounded with in-situ poured concrete. I wonder whether these piles would suit UK geology in some



Figure 1: Rendsburger Hochbrücke.



Figure 2: Concrete pile installation train.



Figure 3: Concrete pile mast foundation in situ.



Figure 4: Legacy timber electrification mast.



Figure 5: Modern Norwegian steel masts.



Figure 6: Danish electrification mast.



Figure 7: Norwegian bridge collapse.



Figure 8: Norwegian lineside verge cleared of large trees.

areas and bring advantages in cost or carbon footprint?

Older electrification schemes in Norway incorporated timber electrification masts and many of these remain in service, albeit being gradually replaced with modern steel masts. Those modern steel masts have obviously been designed to reduce material use (and thus embedded CO₂). (Figure 4 and 5).

Interestingly, modern electrification masts in Denmark are brown in colour - due to a layer of iron oxide (rust) (Figure 6). This looks to be due to the use of a 'corten-type' steel: a steel alloy in which environmental protection is provided by a tenacious oxide layer which does not flake or laminate. The costs of initial galvanising and, in later years, painting are thus avoided.

Though we found train services in Norway generally reliable, we encountered some disruption there also. On the first occasion, due to problems coupling two trains together and making the doors work (rolling stock engineers please note), and on the second, in having to be bussed around a bridge which had collapsed in August 2023 (Figure 7).

It was reassuring to hear from local staff that the bridge had been closed to railway traffic as a precaution several days before it collapsed (a lesson learnt in the UK in 1987 at Glanrhyd Bridge, near Llandeilo). And, to be fair, having rebuilt the undermined bridge pier, lifted the bridge girders back into position, and reinstated track, signalling, electrification, and communication services, the bridge reopened for railway traffic three days after our journey past it, some nine months after the collapse.

Unsurprisingly, we found large expanses of rural Norway to be heavily wooded, but it was interesting to note the 10m-15m wide verges on each side of the railway where large trees had been cleared to reduce or eliminate the risks presented by a

tree falling on the track or onto the overhead electrification equipment: vegetation management in action (Figure 8).

A final observation from Scandinavia is the effort that governments, both national and municipal, are putting into the electrification of public transport as a whole, and into the promotion of its use. The subsidies provided to encourage use of electric cars in Norway are well-documented elsewhere, but I was impressed by the widespread electrification of bus fleets and the extensive use of e-scooters. Though the general cost of living in Scandinavia is undoubtedly higher than in the UK, it was notable that 'walk-up' rail fares were generally somewhat lower! The integration of electrified public transport; rail, metro, tram, bus, and e-scooters, was well advanced in all the large towns and cities we visited and provides examples that I'm sure other countries, including the UK, could learn from (Figure 9).



Figure 9: Bus charging batteries, and e-scooters adjacent to bus stop.

MEANWHILE, BACK IN THE UK... PWI SURVEY 2024: DRIVING POSITIVE CHANGE

Returning to the UK, it was good to find that much progress had been made on our extensive Member and non-member surveys. Whilst these surveys formally concluded in mid-June, we decided to leave them open for input during the Rail Live event and to actively canvas responses there, particularly with a view to gathering yet further responses from non-members. The surveys were then closed to allow analysis and I hope to see the comprehensive assessment of responses prepared by our consultants towards the end of this month (July). Those responses and the conclusions we draw from them will provide one of the prime inputs to work to better define the Institution's new mission, vision, and value statements, and to set priorities for the development of Member services.

I must thank profusely all those Members who took the time to respond to the survey, and particularly those Members who did so in detail. Having looked briefly at the anonymised Member responses, I am heartened that the overwhelming majority support the Institution's current range of Member support services. Indeed, I can't find much that you'd like us to stop doing! Even more important however, are the products, activities, and services you've suggested we might add to the PWI's portfolio to provide even better support. All these will receive serious consideration and, while we may not be able to deliver them tomorrow, those practical ideas with high levels of support will be included in our development plans.

Having thanked Members for completing their own survey responses, I must be even more effusive in my thanks to those who took on the role of PWI Champions to take the survey out to non-members working in the railway engineering sector. The responses from non-members, now well into three figures, will be of enormous value in helping us decide how we can most effectively grow Institution membership.

I hope to be able to give wider coverage of the results of the surveys and the conclusions we can draw from them in the October Journal.

CRM – CUSTOMER RELATIONSHIP MANAGEMENT

I'm really pleased to report that, after a truly massive amount of work by the PWI executive team, we have started to go live with the Institution's new Microsoft Dynamics-based customer relationship management system. We've opted for a 'soft go live' which means we'll be cutting over functions and tasks to the new system over the next month or two, and then customising the system's capabilities to better serve each of our Members. The system will increasingly integrate all aspects of our relationship with Members, so that each Member is offered and provided with services tailored to their individual circumstances and interests.

So, I hope that, as the year progresses, you'll notice (perhaps small) but significant improvements in the services we offer you through our website, and in the communications you receive from the Institution. As ever, if there are aspects of the new arrangements that cause you difficulties, please let me or one of my executive colleagues know as soon as you can.

AND A LOOK TO THE FUTURE...

By the time you read, this the 2024 UK general election will be 'done and dusted'. I'm not going to comment on the outcome other than to hope that whoever is now in charge of the country properly recognises the massive long-term environmental, cultural, and economic challenges we (and the rest of the world) face.

Though not much discussed during the election campaign, global warming - both how to slow it down and how to cope with it - looms large (or *should* loom large) in any strategic agenda. Rail-based transport - as part of a national (and international) low-carbon, properly integrated transport system - is part of the answer to those challenges. And investment in infrastructure is central to facilitating low-carbon economic growth. This Institution remains committed to supporting its Members and our industry as they work to deliver that transport system.



STEPHEN BARBER
CEO
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¹ <https://www.statista.com/statistics/1323348/projected-climate-change-impacts-england/>

² http://www.railwaysarchive.co.uk/documents/DoT_Glanrhyd1987.pdf

THE PWI IS BECOMING INCREASINGLY RECOGNISED AND IDENTIFIED FOR ITS CONTRIBUTION TO RAILWAY KNOWLEDGE, TRAINING AND CAREER DEVELOPMENT



DR. BRIAN COUNTER
TECHNICAL DIRECTOR
technicaldirector@thepwi.org

We have spread our 'PWI wings' all over Britain and Ireland in the last few months. It is exciting to see the growth of PWI registered Members to over 420 and student/apprentice numbers over 900.

TECHNICAL AND SAFETY

The last couple of months have not been good for railway safety, although thankfully nobody has been injured. There was a runaway trolley collision, a temporary road/rail access point left in place and hit by a train and a trackworker near miss. Our colleagues in the Rail Accident Investigation Branch (RAIB) do thorough investigations, which we regularly discuss at the Technical Board. We liaise very strongly with them and welcome Jonathan Graham to all our Diploma courses to explain the importance of learning from mistakes and failures.



Track Engineering Diploma Module 3 : Advanced Track Asset Engineering and Renewals

Session 14 Learning from failures

- Rail accident investigation in the UK
- Jonathan Graham, Inspector of Rail Accidents

Figure 1: Opening slide from RAIB on PWI Diploma Courses. (PWI)

In Wales, at Cardiff University, we were involved in the Joint Board of Moderators (JBM) accreditation. It was good to see several students who had joined PWI as they were interested in railway careers, as engineering folk see us as a place to get involved. We are also working hard with our Corporate Member employers such as Network Rail (NR), Transport for London (TfL), SPL and Balfour Beatty (BB). to work towards our target of 140! Thanks must go to Liz and Charlotte for their quick responses to get people going!

PEOPLE

In the last Journal I mentioned degree apprenticeships offered by English Universities, such as BEng Railway Engineering courses, and how important it is to develop

engineers through this route which leads to Incorporated Engineer status. PWI reviewers are being trained to carry out the End Point Assessments in August for degree apprentices at London South Bank University. This is a first for the railway industry, and it is good to see that nationally, there are over 50 new starters a year. We are already helping them prepare through support and the Knowledge Hub, as well as working with Sheffield Hallam University to support their first cohort in November 2024.



We continue to have exciting developments in the PWI Technical Education and Training provision, with many recent requests (Figure 2).

The Advanced Track Technician Course at Derby and the Midland Railway is progressing well and will be extended this autumn to include bespoke events for Network Rail.

We were pleased to deliver our new DC Electrification 3rd and 4th Rail course to Network Rail Graduates in May at Milton Keynes. This was a great group who were fascinated by the history and development of these systems, which are fundamental to the Southern England Railway.

The key element of the coursework is to plan a 3rd Rail extension to an existing electrified route and evaluate all the necessary requirements and interfaces.



Figure 2 Prof. Bob Hutchison PWI Lecturer explains the Assessment Scenario to Network Rail graduates at Milton Keynes. (photo courtesy B Counter)

A FIRST FOR SCOTLAND!

The first Practical Trackwork Challenge in Scotland took place in March at the Bo'ness Railway near Falkirk. This was well attended, with 38 delegates from PWI Corporate Members (Figure 3). It was good to see participants from Mott MacDonald, Jacobs, HS2, ORR, RSSB, TfL, and Network Rail. Exceptional technical, plant and machinery and supervisory support was given by Story Contracting, Swietelsky Babcock, Railcare, McCulloch, Systra, and Network Rail. It was good to see a range of companies also explain their products at the event.



Figure 3 Organiser Andy Steele with the delegates and helpers at Bo'ness, near Falkirk. (photo courtesy B Counter)

NOW FOR IRELAND!

Firstly, hopefully many of you know that Irish Gauge is 1600 mm or 5 feet 3 inches and is the same all over the island. We delivered the PWI Track Engineering Diploma Module 1 for Irish Rail in May with many subtle changes for their railway. Bob Langford did a superb job liaising with the local people to give good examples, whilst delivering the classic standard track engineering theory.

The Irish PWI Seminar held in Dublin in May was titled 'Railways in Ireland: Performing today and planning for tomorrow'. The plans and projects for railways across the whole of the island were impressive with Irish Rail and Translink working together on innovations.

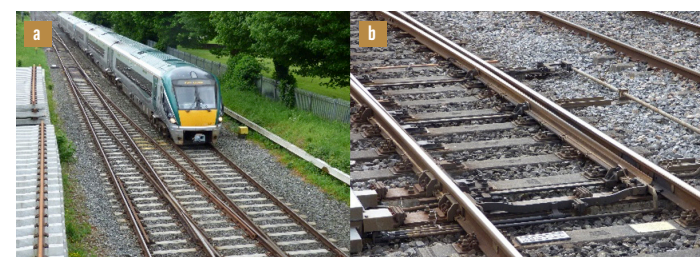


Figure 4 (a) Kildare - panels ready for installation (b) Points at Portlaoise. (photos courtesy B Langford)



Figure 5 DART railway Dublin Area. (photo courtesy Irish Rail)

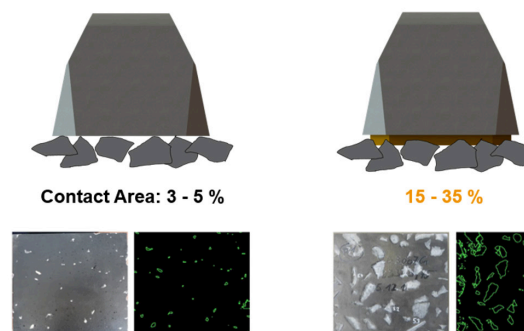


Figure 6 Aerial View the new Belfast Grand Central Station. (photo courtesy Translink)

TECHNICAL QUALITY AND VALUE

The PWI is committed to promote railway innovations that deliver asset life improvements. We are indebted to Andy Moore from Getzner who has exhibited at PWI Seminars about under-sleeper pads which are now almost, but not exclusively, standard in the UK. All forms of ballast mats, mass spring systems and structural mats are incredibly useful to spread complex rail loads. The full presentation is on the Knowledge Hub PWI NE March 2024 and I recommend you to watch it.

Unpadded vs. Padded Sleepers



State Of The Ballast Unpadded Vs. Padded Sleepers



Figure 7 Benefits of using under-sleeper pads for loading and reduced ballast attrition. (photos courtesy A Moore)

AND FINALLY.....

A special mention for Scott Aston IEng MPWI who spoke on behalf of the PWI at the Network Rail Track Maintenance Conference in May. He talked about the opportunities he took, the support he received from the PWI team and how smooth he found the Professional Registration process.



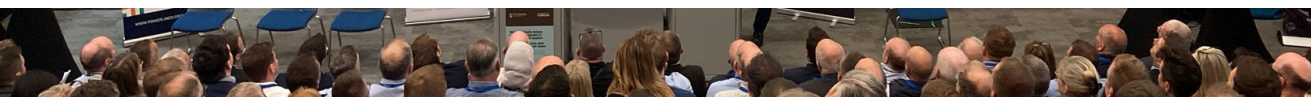
Scott started working on the railway in 2009 and now works for Network Rail as a Senior Gauging Engineer in Wales and West, having previously worked for Colas, Balfour Beatty and Babcock.

In 2023 he used the PWI Experiential Learning Route from HNC and passed his Incorporated Engineer Professional review. Scott is proud of his success and gave us a few laughs about his 'journey' and is now looking forward to the next challenge, becoming a PWI Chartered Engineer.



RAILWAYS IN IRELAND: PERFORMING TODAY AND PLANNING FOR TOMORROW SEMINAR

TRINITY COLLEGE, DUBLIN, 23 MAY 2024
IN PARTNERSHIP WITH IARNRÓD ÉIREANN/
IRISH RAIL AND TRANSLINK



It is many years since the PWI held an all-day technical seminar in Ireland. Given the recent rail resurgence across Ireland, we were presented with the perfect opportunity to formulate a plan to deliver a seminar.

A small working group comprising of members of the PWI, Iarnród Éireann /Irish Rail and Translink, was established in late summer of 2023 to start discussions on the art of the possible. Several conversations later, we concluded there was a lot of material to share, and the difficulty lay in choosing a suitable range that would appeal to a broad audience. We felt it was essential to look at the overall strategy and the ambitious plans for the future whilst giving equal recognition to current methods of working that ensure a reliable service today. We also wanted to include specific elements on investment in people; without good people nothing will be achieved.

The Dargan Theatre at Trinity College, Dublin, was chosen as the venue and delivered against all our requirements. The space was ample for delegates and exhibitors, the food and refreshments were plentiful, and the staff were very supportive. The Audio-Visual technical support team were also excellent.

MORNING SESSION

Steven Bell, PWI President, chaired the morning session and began by welcoming all the delegates and speakers. The presentations in the morning covered the following subjects:

- Keynote address entitled 'All Island Strategic Rail Review' given by Andrew Ebrill, Head of Public Transport Investment and Policy, Department of Transport Ireland. This paper set the scene on the level of ambition throughout Ireland for improvements and expansion of the rail network.
- The subsequent two presentations focused on key projects that form part of the overall strategy. The first was a look at the Cork Area Commuter Rail Programme given by AJ Cronin, Delivery Manager for the Programme, Iarnród Éireann /Irish Rail. The subject of the second paper was Belfast Grand Central Station & Weaver's Cross, given by Duncan McAlister, Head of Belfast Grand Central Station & Weaver's Cross Programmes, Translink.
- The remainder of the morning's presentations brought us back to day-to-day asset management and delivery, ensuring the service remains reliable for current users. Denis Hickey, Programme Manager of the Track Delivery Unit of Iarnród Éireann /Irish Rail, spoke about advancements in track renewals techniques, including the approach to higher line speed opening. This was followed by a presentation by Andrew McGivern, Track Engineering Manager, and Stephen Lavery, Technical Engineer from Translink, who talked about improvements in track condition assessment to inform decision-making. The presentation described the methods and tools that Translink has developed to manage the track asset.

The various presenters of the morning session responded to multiple questions from the audience.

AFTERNOON SESSION

Chair of the afternoon session was Eamonn Balance, Director Infrastructure Manager at Iarnród Éireann /Irish Rail, who was delighted to be present and contribute to the discussion. The first two presentations of the afternoon took a different tack from those before lunch in that they were focused on people and the investment both Translink and Iarnród Éireann /Irish Rail are making in their staff Members.

Mervyn McCollum, Head of Rail Infrastructure for Translink, led a discussion panel focusing on the approach the Translink team have taken in developing apprentices. Mervyn was joined by colleagues Wilma Kirkpatrick, Training and Competence Manager and Neil Mulholland, an experienced trainer within Translink, along with two apprentices, Matthew Cummings and Danny McGinley. The conversation covered the realisation of addressing the skills shortage, how the scheme was developed to meet this challenge and its implementation phase. The two apprentices also gave their views on what the scheme meant to them.

Iarnród Éireann /Irish Rail's Head of Talent Development, Suzanne Flynn, then gave a comprehensive presentation on the graduate development scheme across all disciplines required to run an operational railway—from engineers to finance specialists. Over the last few years, this scheme has been in high demand amongst the graduate population and has gone from strength to strength, with the numbers increasing annually.



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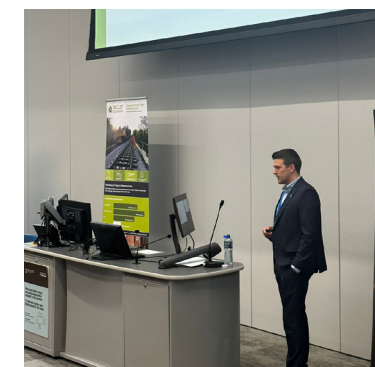
The penultimate presentation of the day brought us back to more technical aspects. Tony Knipe, Track Maintenance Manager for Translink and Bob Hardwell, Rail Engineering Expert with LINMAG International Ltd, talked about the importance and usefulness of rail milling as another tool in the armoury to help with asset management. Michael Reidy, Head of Strategic Planning and Sustainability in Iarnród Éireann/Irish Rail, concluded the day's presentations by looking at the initiatives Iarnród Éireann/Irish Rail have taken and are putting in place to give due consideration to sustainability, helping to meet the net zero commitment.

As with the morning sessions, the speakers were asked plenty of questions before Eamonn Balance gave the closing address.

The PWI can only run these events with the support of Corporate Members and others in the supply chain. For this Seminar, we extend our thanks to our sponsors—Babcock, SPL Powerlines, SICUT, RSRG, BAM Ireland, Pro Rail Ireland, Helix Rail, and Geobear—and our exhibitors, Aqua Fabrications, Konux, and Fugro.

We would also like to recognise the efforts of Cathal Mangan and Joe Walsh of Iarnród Éireann /Irish Rail and Mervyn McCollum and Andrew McGivern of Translink, who sourced the speakers. The demand for tickets to this Seminar exceeded our expectations, and we apologise to anyone unable to secure a space. Next time, we will seek a larger venue.

All the presentations from the Seminar are available on the PWI's Knowledge Hub.



THE PRACTICAL TRACKWORK CHALLENGE: GETTING THE ON-TRACK EXPERIENCE

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The 'Practical Trackwork Challenge' run by The Permanent Way Institution (PWI) aims to give office-based professionals and people new to the rail industry an understanding of the practicalities of track work. (Figure 1). This year's challenge was the seventh such event with the first one being held at the Didcot Railway Centre in 2017. Since then, the event has been hosted at various heritage railways to provide participants with a low risk, on-track, daylight environment. This year's challenge took place in Scotland at the 8km long Bo'ness and Kinneil Railway.

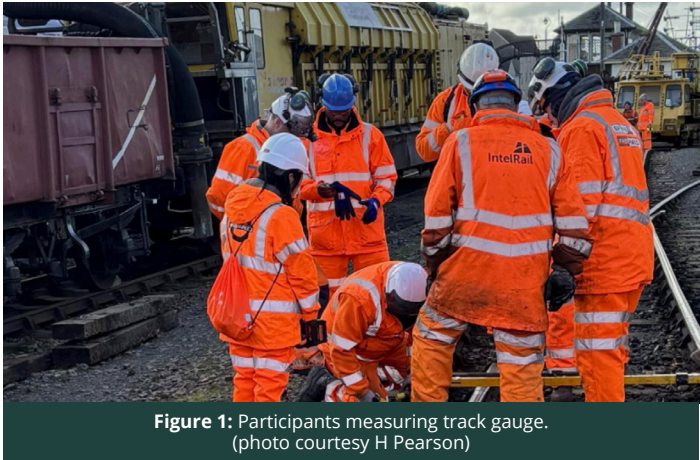


Figure 1: Participants measuring track gauge. (photo courtesy H Pearson)

Visitors to the railway may find it hard to imagine that the first two kilometres of this line, including Bo'ness station, were built on a brown field site between 1979 and 1985. This 'new' line runs along the foreshore of the Firth of Forth to the site of Kinneil colliery which closed in 1983. From there, the railway is the refurbished colliery branch line which climbs above the Forth before turning south to join the Edinburgh to Glasgow main line at Manuel.

ORGANISING THE CHALLENGE

The challenge was organised by Andy Steele, one of the PWI Technical Managers, and Jim Watson of the PWI's Glasgow Section. It was supported by various companies who provided their services free of charge. The principal designer was Systra and the principal contractor was Story Contracting which was supported by Vital Rail. Plant was provided by McCulloch, Railcare and Swietelsky Babcock Rail. Cloburn Quarry at Lanark also provided 350 tonnes of ballast free of charge. Temporary stairs were provided by VPA. Thanks are due to Hannah Persson of Progress Rail, Jim Stevenson of Story Contracting, Andrew Anderson of the Bo'ness Railway, and Dr. Brian Counter of The PWI.

The 38 participants at this two-day event came from a wide range of companies which included Office of Rail and Road (ORR), HS2, Transport for London, the Rail Safety and Standards Board (RSSB), and Network Rail. The PWI offers this event free of charge to its Corporate Member's employees. Participants were split into groups which each had the opportunity to visit four sites: Progress Rail: a reballasting site; a resleepering site; and various activities at the Bo'ness yard.

FOUR DIFFERENT EXPERIENCES

Progress Rail's South Queensferry foundry is 10km further east along the Forth from Bo'ness. Here, participants had the opportunity to see how this factory produces cast manganese crossings for Network Rail's S&C. This included seeing the two five-tonne electric arc furnaces used for steel production and the in-house pattern making.

The resleepering site was on the foreshore by Kinneil where the track crosses an oil pipeline from the North Sea to the nearby Grangemouth oil refinery. To do so, it has to cross the pipeline's protective slab at an acute angle which requires a 200-metre radius S-curve. (Figure 2).



Figure 2: The 200-metre radius curve crossing the pipeline.

The task here was spot resleepering 1 in 3 sleepers. This replaced about 60 obsolete F19 concrete sleepers that have SHC fastenings with F23 sleepers having Pandrol clips as the SHC fastenings are not suitable for such sharp curves. (Figure 3). The S-curve was then given a design tamp. (Figure 4).

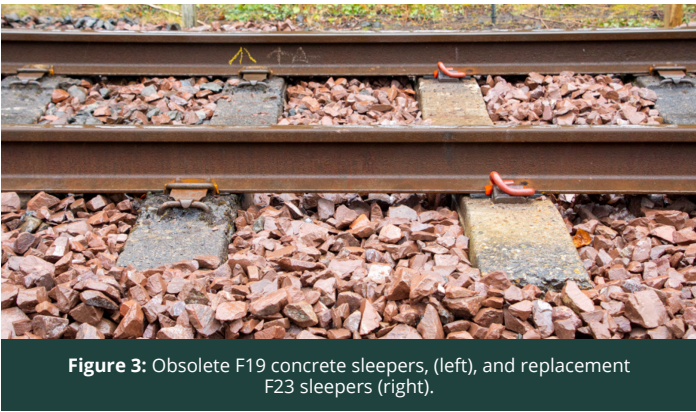


Figure 3: Obsolete F19 concrete sleepers, (left), and replacement F23 sleepers (right).



Figure 4: Swietelsky Babcock Rail's 08-16 4X4C-RT tamper working on the reverse curves.

Reballasting was undertaken in a steep cutting, five kilometres from Bo'ness where the line has some drainage issues. Access to this site was made possible by steps provided by TPA. This location also had thin ballast which made it difficult to maintain the track level with good top alignment. For the track challenge, 10 track panels with a total length of 180-metres were reballasted. The track was lifted using McCulloch track panel lifters, after which old ballast was removed and the track bed levelled. (Figure 5).



Figure 5: McCulloch track panel lifters in operation.

After the track panels were replaced, ballast to the site was delivered by a road rail excavator with two trollies that made several runs from lineside stockpile at Bo'ness. The excavator then positioned it ready for its design tamp. (Figure 6).



Figure 6: Ballast placement by excavator.

At the Bo'ness station area, participants assisted the regauging of points which required baseplates to be removed and the replacement of rotten bearers. Baseplate holes were plugged with a DWG Spikefast resin, and baseplates refitted. (Figure 7). Slide chairs and fishplates had solidified black grease removed and were re-oiled with Interflon and fitted with Staytite bolts. Participants then hand compacted new ballast utilising Robel vertical tampers supplied by Torrent Trackside.

At Bo'ness there were display stands provided by CIRAS, McCulloch, Staytite, Torrent Trackside, Pandrol, and Robel where battery powered tools were on display. This included a rail saw that can make 16 cuts on a single charge.

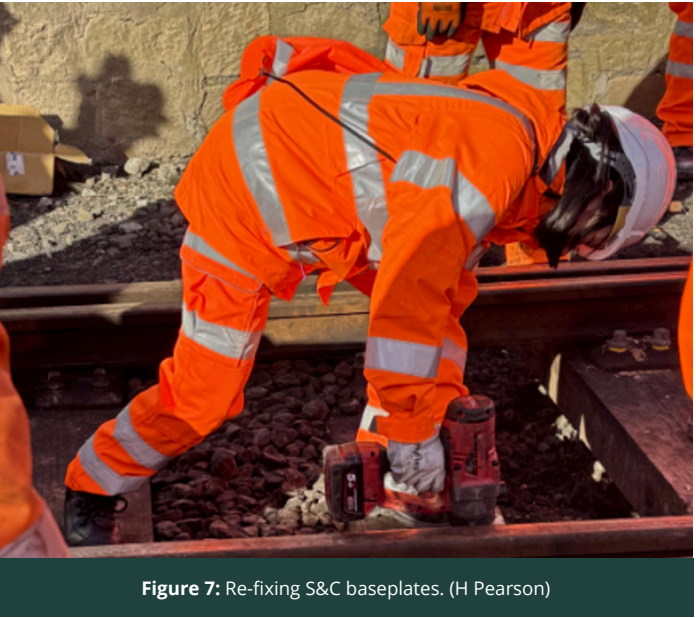


Figure 7: Re-fixing S&C baseplates. (H Pearson)



Figure 8: Railvac removing old S&C ballast.

ON-TRACK PLANT

The use of a RailVac machine to extract ballast from S&C in the yard at Bo'ness was demonstrated. (Figure 8 and Figure 9). This on-track plant has a ballast vacuum extraction system to remove material between rails and sleepers without the need to remove them. The use of this machine avoids damage to other infrastructure such as cables and pipes. It is intended for use in areas where it is difficult to use standard excavators and can be quickly set up on site so operates efficiently in short possessions. Under its own power it can only travel at 20 km/h so it needs locomotive haulage during main line transits. The RailVac was built, and is operated by, Railcare AB which operates similar machines in Sweden.



Figure 9: Aerial view of Railvac. (Railcare AB)

Prior to its use at the resleepering and rebalasting sites, the Swietelsky Babcock Rail 08-16 4X4C-RT tamper was on display at the Bo'ness station platform. This was built by Plasser and Theurer in 2000 and can tamp 440 metres/hr. It has four split head tamping units with a total of 16 tines. These units can be moved independently from each other which enables it to tamp most S&C units. Adjacent to the tamper unit is a track lifting frame with flanged rollers to grip the track. (Figure 10).

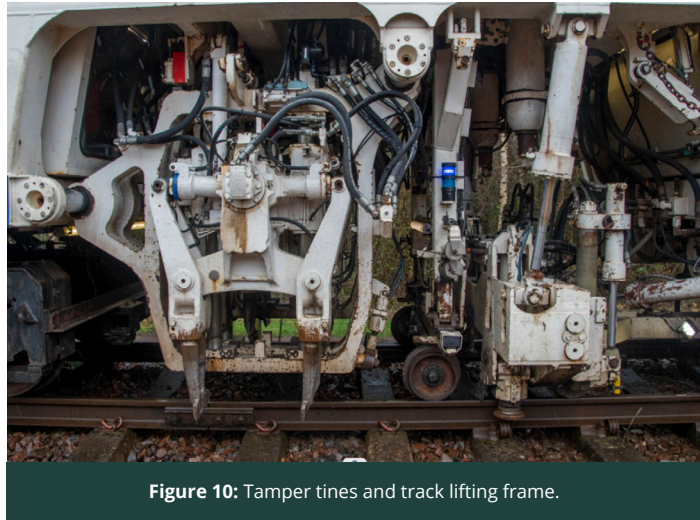


Figure 10: Tamper tines and track lifting frame.

On board the tamper there was the opportunity to sit in both operator positions, one in the driving cab and one above the tamping units. (Figure 11). Network Rail's Neil Wightman explained how the driving cab operator controls the movement of the machine whilst the other operator controls the tamping units. Neil explains how the tamper measures track line, cant, and level prior to tamping using trolleys at the front, centre, and rear of the machine. The tamper's computer then determines how the track needs to be adjusted for the optimum alignment. This is maintenance tamping. An alternative

approach is design tamping, when a previously developed track design is input to the tamper's computer which then computes the difference between this design and the measured track.

Both the rebalasting and resleepering sites had design tamps for which the track geometry files, as well as surveying services prior to the event, were prepared by a team led by Graham Hutchinson of Network Rail.

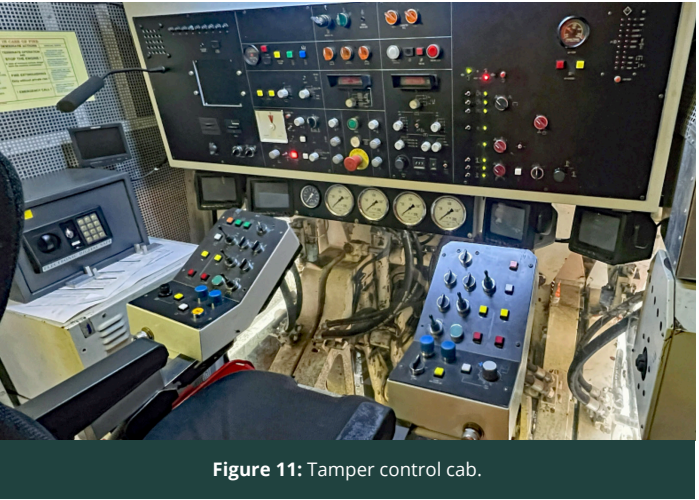


Figure 11: Tamper control cab.

A WIN-WIN EVENT

The PWI packed a wide variety of track experiences into this two-day track challenge and are to be congratulated for organising such a worthwhile event. It is a great way of developing railway engineers who would otherwise not get the chance to get up-close to trackwork and its associated plant and equipment.

Participants came from a wide variety of backgrounds who, whatever their role, will no doubt benefit from their exposure to the practicalities of track engineering. The event also gave participants the opportunity to learn from each other and from networking with those who they would otherwise not meet. (Figure 12). Your writer, who is not a track engineer, certainly learnt much from this event.

The many companies which freely supported this event deserve credit as do the PWI Members who provided support and guidance on site. The Bo'ness and Kinneil railway's cafe also provided excellent hospitality and the opportunity to visit its impressive museum.

Last but not least, the event left the railway with some much-improved track. The track challenge is certainly a good opportunity to support the heritage rail community.

All in all, this challenge was a win- win event for all concerned.



Figure 12: Group photo of participants and organisers.



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Jamie Orme
Infrastructure Technician
Edinburgh Waverley
Track Maintenance

This paper
achieved
3rd place
in the PWI
Young
Achiever
Awards

IDENTIFY TWIST AND REPAIR BY MANUAL METHOD

Before joining Network Rail Track Maintenance, Jamie graduated from Edinburgh University, completing a Bachelor's degree in Arts, Humanities and Social Sciences, specialising in Fine Art. Post-university he had a complete career redirection and joined Network Rail on their Level

3 Rail Engineering Apprenticeship. Jamie successfully completed his apprenticeship in October 2023 and is now an Infrastructure Technician for Edinburgh Waverley Track Maintenance. Jamie is a Member of the PWI and a Technician Member of the IET.

On the night of the 4th September 2022, I led the major works team to identify a twist fault and repair it by manual method. At that time, I was only in the second year of my apprenticeship and therefore I asked my team leader if he would supervise me and guarantee that I was leading the task compliantly. Before beginning the activity, I examined the Trace report from the 16th August which exhibited the locations and severity of the respective faults. I was able to use this to locate the twist fault, and I was able to determine that the twist fault was directly positioned at a joint.

This information helped guide me to the physical fault. From looking over the Controller of Site Safety (COSS) pack, I was also able to determine the safest and most effective access point to the twist fault accounting for equipment we had brought. I could determine the correct access by looking over the site diagrams and I could also confirm the line that the squad would be working on. I made sure to bring a hard copy of the walk out report with me to help me accurately locate the fault on site. We were able to detect the fault quickly by walking to the mileage on the trace and looking for the closest joint to the mileage which happened to be an Insulated Rail Joint (IRJ).

I had to make sure that the paperwork which I had brought was compliant and within date. An updated version of the TEF forms and relevant standards can be found on My Connect. To check if a physical copy of a standard or TEF is in date you must check the issuing date matches between the physical copy and the one on My Connect. It must be an in-date version that is referenced when performing the task. If an out-of-date issue is referenced, then this poses a hazard as the inspection and maintenance will be out of tolerance and non-compliant.

To confirm the team understood the process I was going through I verbally communicated my intentions as I went through the activity. This had the secondary benefit of keeping me focused on the task in hand. I went through my brief with the team after the COSS brief. I presented the walk out report and the COSS pack site diagrams to everyone at this point, so everyone was clear where the fault was. Due to this briefing, there was clarity about the process and method I would be following and what jobs I need them to fulfil respectively. I described all the steps I was taking so everyone involved knew what part of the process I was on.

I had to initially check the calibration on the track gauge. There is a sticker attached to the track gauge that has the calibration written on it. This will tell you when it was calibrated and when the next calibration will be due. I also checked the calibration certificate that comes with the equipment. Then I took a gauge reading and checked the security of the pins that are abutted against the rail's running edge. Then I inspected the spirit level on the gauge to see if it had been tampered with. To do this I viewed the stickers located over the screws to check they were there and positioned appropriately. The

stickers were located as expected and there was no obvious wear or tear to the equipment so I could confirm the gauge was suitable for its intended use. I performed the same process for the Robel portable hand tamping equipment and additionally requested one of the competent squad members to test the plant at the depot to make sure it was working and fit for purpose.

As mentioned, I gave the squad a brief for the maintenance activity before accessing the track. In my brief I mentioned what the defect was and where I expected to find it, the process for dealing with the defect and I delegated specific tasks to each member of the team. I brought a copy of the track work instruction for twist repairs as well as a copy of the standard so that I could understand what to do in various circumstances. Once I arrived at the fault, I communicated mostly with my team leader who has more experience than me, so that I was able to double check my thoughts and processes with him. I communicated in an alphanumeric style when I was taking the measurements to avoid miscommunication. I also communicated with the squad about when they were to begin their tasks. When using the Robel plant we all had to wear safety ear defenders and to gain the squad member's attention I would use hand gestures or pat them on the shoulder.

Before starting I used the thermometer to check the temperature of the rail. As it was late in the year, and at night, I had no concerns of the rail temperature being over the Critical Rail Temperature, however, I had to check that the rail was at least over 0 degrees. After I decided the start and finish point, I walked through the site making sure that I made a mental note of anything that would prevent me from lifting the track. I took my time to make sure I didn't miss anything. I was particularly on the lookout for equipment like AWS magnets, hot axle box detectors, treadles, foot crossings and TPWS grids. In the case of the presence of this equipment I would need to confirm the staff on the job were competent to work around this.

I performed a walkthrough and took cross levels and marked my findings on the sleepers. I measured the six foots every 10 metres and marked this on the sleeper. This is done to make sure that there is no disturbance to the track alignment during the lift. This will give good references to return to later. I did the sighting by eye as the repair was short. I considered using sighting boards but as it was only a short fault this was not essential. I had an assistant point on the rail to find the low spots. Meanwhile, I directed the maintenance team to insert a jack under the rail and start lifting it incrementally until I could no longer visually identify the dip. Once at this point, I directed the team to start packing ballast underneath the sleeper using handheld Robel Tampers. Once the sleepers were packed, I had the jacks removed. I double checked the cross levels to make sure we hadn't worsened the site. I checked the line again by eye and compared my new cross level measurements with the ones at the start. Once I was happy with the improvement, I made sure the track was fully boxed in again.

THE
JOURNAL

TECHNICAL ARTICLE

Using the track gauge I was able to accurately measure the defects on the track. It was a zero-cant area so some of my measurements I took were as high as 12 millimetre meaning the cant was quite bad. I took the measurements against every sleeper and noted my findings on the sleeper using chalk. Once I took my measurements, I got the squad to place jacks under the rail and lift until the cant equals zero. They then Robel tamped 375 mm each side of the rail. Once the squad were satisfied that the ballast was consolidated, we dropped the track and remeasured the cross level which in most cases was now zero as designed. Although this was not for all instances as some parts were still relatively high at 5mm this was no longer a defect that was actionable but now just to be monitored going forward. I double checked with my team leader that my processes and methods were all correct. He was satisfied with the work as I had directed it and was comfortable with us leaving the track in its new condition.

To make sure that the track was fit for the passage of trains after conducting work that affected the track geometry, I had to retake cant, gauge and 6-foot measurements using a rule and a track gauge. This was to make sure that we had not accidentally over lifted or slewed the track making the kinetic envelope of the train at hazard of hitting clearances or adjacent structures. I also had my team leader with me to observe my methods and processes and he was available for me to ask questions about anything I was unsure of. I had the track work instruction for removing twist defects with me as well as a hard copy of the track standard so I could double check my measurements and clearances were safe for the passage of trains. We reprofiled the ballast so that the track was laterally and vertically secure, and we cleared all tools away from the track.

Once the work was completed and inspected by my team leader we cleared away from the track and the COSS contacted the signaller to let them know that we were clear and that the track was safe for the passage of trains. There was no TEF form to complete, but we took photos of the work to show our line manager to prove the work had been completed. This has since been confirmed in the recent trace report as the fault is no longer being detected. At the end of the shift, we returned to the depot and replaced all the plant and equipment back in the stores. I referenced my list of equipment to make sure everything had been appropriately returned to its housing.

Midway through the activity, two of the Robel's ran out of fuel which obviously meant they were no longer available. However, I had asked for the squad to bring fuel canisters with them in the case this happened. The machines were refuelled by an operative with the competency to do so. As we had the fuel canisters with us at the location it meant that we promptly and effectively were able to continue work once more. A worst-case scenario would have been that the fuel canisters were left at depot meaning a long period of time would have been spent returning to depot to collect them.

This could potentially have caused an overrun leading to financial penalties for the company.

In the case that it was impossible to complete the activity it would be my responsibility to contact fault control to advise them on the reason for incompleteness. As a result, I would be given a fault number that can be logged for the work to be completed later. Also, my section manager should be contacted to explain the circumstance so that remedial actions can be taken to rectify the situation. Fault control should also be contacted to notify them of any site defects that they should be aware of. This is so that when the remedial work takes place the fault number can be addressed and logged as completed.

An issue we had during this activity was how severe the twist seemed to be when we first took our measurements. The measurements were varying quite heavily at each sleeper and so we wondered whether the track gauge was calibrated properly. However, we checked the calibration sticker on the side of the gauge and saw that it was recently calibrated allowing us to have confidence in the measurements we were reading. I was shocked at the readings I was taking at first and so I asked my team leader to double check that I was performing the task correctly. He confirmed I was correctly taking the measurements and at this point I took the initiative to read the calibration sticker. I confirmed with the team leader that the gauge was correctly calibrated and fit for use and that the measurements we were taking were in fact accurate.

Leading this activity was necessary for the completion of my apprenticeship. The Level 3 Track Engineering technician apprenticeship requires twelve NVQ reports are written by the apprentice on track specific maintenance and inspection activities that the apprentice led. Each activity led by the apprentice contributes to their continuous professional development. Performing this activity benefited my leadership skills and solidified my understanding of identifying, locating, and repairing track faults. It also contributed to my understanding of the hazards posed by a twist fault and by non-effective maintenance. I was delighted when it was confirmed that the defect was no longer detectable on the following trace run. For the first time in my apprenticeship, I had tangibly contributed to Scotland's Railway. My section is responsible for the flagship lines that connect Haymarket to Fife and to Glasgow. It is my section that makes sure people across the central belt of Scotland get to their work and get home every day and keep Scotland's infrastructure running. If I can help the members of my section complete and manage their work better and more effectively, then I am contributing to something much greater than gaining qualifications. It is for these reasons that I made and am making a personal commitment to the rail industry and its governing standards.



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Robert Earles MSc MPWI
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ADAPTING AN AGEING INFRASTRUCTURE TO THE CHALLENGES OF THE FUTURE: ROCK ARMOUR SOLUTION TO BALLAST WASHOUT

INTRODUCTION

The UK's stunning countryside is often praised due to how fresh and green the landscape looks. We are fortunate to receive plentiful amounts of rain which brings many benefits. However, from the railway's perspective, this brings a unique challenge in protecting our ageing infrastructure from mother nature's most powerful force, water. Flooding leads to the closure of the railway, and in extreme cases where the ballast is washed away this can be for months. This threat grows stronger every year as a result of climate change leading to more frequent high-intensity rainfall events leading to an increased risk of flooding, so it is essential we adapt our railways to be resilient to match this.

One excellent example where the railway has been modified in a high-risk flood area is a project near the River Monnow, on the border between England and Wales, (Figure 1). The railway here runs from Newport to Shrewsbury and further beyond connecting to North Wales and Manchester. It is paramount it is kept open, as it is the main route that connects both passengers and freight between South and North Wales. This line often had to be closed in winters previously due to flooding leading to lots of disruption. Put simply, life could not carry on like this, something had to be done.

A resilience scheme was delivered at this site involving the design and implementation of a rock armour solution. The scheme involved the following individuals (**Table 1**):

Name	Role
Alex Hinshelwood	Sponsor
Heledd Walters	Principal Designer and Client Project Manager
Sean Wootton	Principal Contractor
Gary Lynam	Delivery Manager and Construction Contractor's Responsible Engineer (CRE)
James Booth	Contractor's Engineering Manager (CEM)
Darren Atwood	Track Project Engineer
Tom Hughes	Designated Project Engineer
Joe Martin	Senior Designer
Ryan Barrett	Designer and Design Contractor's Responsible Engineer (CRE)
Alex Clark	Assistant Designer
Tim Dodge	Property Liaison
Shuhaba Khanum	Finance

Table 1: List of key personnel involved in the River Monnow project.

Robert Earles is an Asset Engineer (Geotechnics) at Network Rail, after completing degrees in Earth Sciences (MSci) and Engineering Geology (MSc). In his 2 years on the graduate scheme, Robert completed placements in earthwork asset management, geotechnical design, project management for reactive works and commercial management of contractual frameworks. In addition to placements, Robert built a new national dashboard for Network Rail asbestos management and led a project reviewing engineering standards. In 2023, Robert was shortlisted for the YRP's Young Rail Professional of the Year award. Robert is an active STEM ambassador, and hopes to become a chartered engineer with PWI and ICE.

This project has prevented the main failure mechanism called overtopping. This is where the floodwater moves from one side of the railway to the other following the hydraulic gradient, often taking the ballast with it. The project cost approximately £4.5 million but will show a return on the investment in years to come due to the washouts and resultant closures it will have prevented. The entire project was designed, managed and delivered by Network Rail staff, following on from the success of works completed in the Conwy valley.



Figure 1: Maps showing where the site is located relative to the rest of the UK and its railway network.

HISTORY AND CHALLENGES

For many years flooding has been the railway's arch nemesis in this area. This threat has become increasingly potent in recent years with enhanced rainfall. The site floods to some extent most winters and in bad years this can lead to a complete washout of the embankment supporting the track. For example, in the Winter of 2019-2020, floodwater washed out the track twice in 4 months, where the line was closed for more than seven days each time as emergency repairs took place (**Figure 2**).

As the reader, you are probably asking at this stage why is this area particularly bad for flooding? You're probably also wondering why is the floodwater here so prolific at washing away the embankment?



Figure 2: Images showing the damage from two different washouts in Winter 2019/2020. These washouts happened within 4 months of each other.

Well, the answer lies in the unique combination of several factors, including topography, the meandering river, and the low bridge. As the diagram below shows (**Figure 3**), the railway is running across a steep slope dipping towards the South-East. The slope forms one side of the river valley, meaning water will be flowing in the downhill direction towards the River Monnow. The River Monnow bends sharply just after passing under the railway to run almost parallel with it, which means the downwards hydraulic gradient will transect the railway at a right angle. It is also worth noting that the railway is on a raised embankment at this site (**Figure 3**).

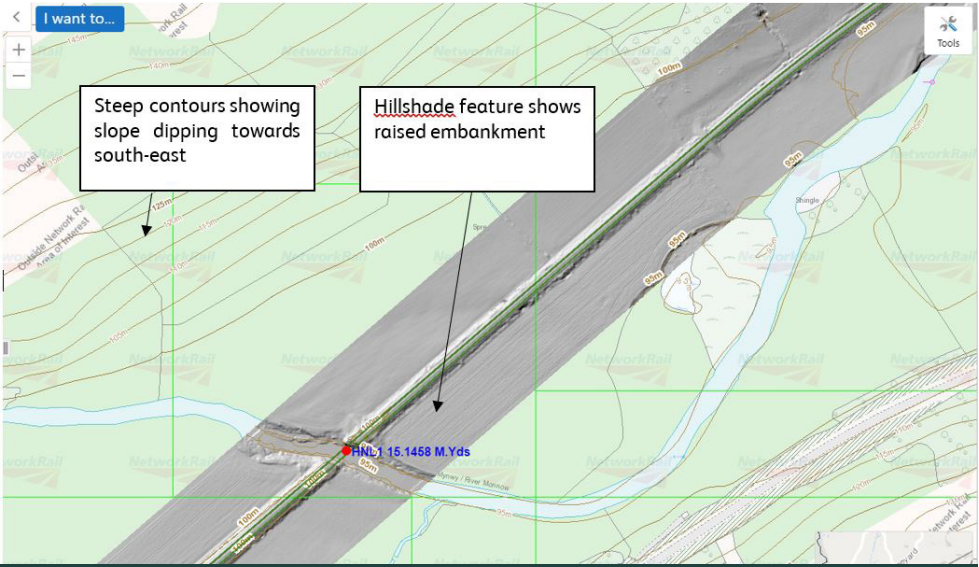


Figure 3: Topography and contoured map highlighting the natural slope and raised railway embankment at this site, both key to the overtopping mechanism.

Water that falls within the local catchment area percolates towards the river. After periods of exceptionally heavy rainfall, this leads to the discharge in the river exceeding the capacity of the channel. When the river reaches the railway bridge at HNL 15.1458 (**Figure 4**), the water is forced sideways due to being obstructed. The water is channelled between the steep natural slopes and the railway embankment and starts to accumulate there, almost like filling up a bathtub at home. As the mass of this surface water increases, so does its gravitational potential energy as it looks to travel down the hydraulic gradient to the river on the other side of the railway (**Figure 4**). Eventually, the water gains enough energy to force itself through the embankment to get to the river. This results in the ballast being washed away with the powerful flow.

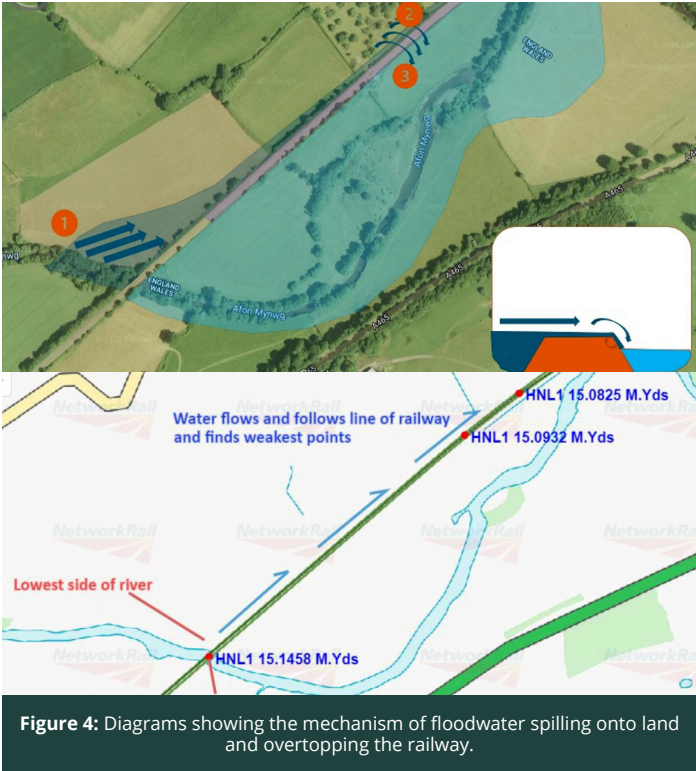


Figure 4: Diagrams showing the mechanism of floodwater spilling onto land and overtopping the railway.

This leads to the disastrous consequences of suspended rails and months of closures, which on an important line like this are problematic for several reasons. Firstly, economic damage must be noted. This recurring issue was incurring costs to Network Rail for delay repay compensation to the train operating companies. Enhanced delay repay across the country has knock on effects on how Network Rail operate, with financial cuts having to be made elsewhere in the business. By reducing the number of days important lines like this one are closed, more opportunities to maintain and improve the infrastructure are created elsewhere on the network.

Apart from the financial aspect, another really important point is the social issues which line closures cause. People being able to connect to each other easily for work, leisure or emergency reasons is paramount to having a thriving society. This line is very much the corridor connecting South Wales with North Wales as well as the North of England. Approximately 25% - 40% of the British

Population cannot drive, (figures vary across sources), meaning when the railway is out of action a lot of people suffer more than simply having to drive instead of taking the train!

For those who do have the luxury of driving to their destination instead, our good friend the atmosphere would not be best pleased at the increased usage of cars. According to ourworldindata.org taking the train instead of the car cuts an individual's carbon emissions for that journey by 80%. Put simply, the more days a railway line is closed, the more carbon is pumped needlessly into the atmosphere!

ADAPTING AN AGEING INFRASTRUCTURE TO THE CHALLENGES OF THE FUTURE:
REDROCK ARMOUR SOLUTION TO BALLAST WASHOUT

Remediating this site to address the issues outlined would not be an easy task. The access to this area is poor. Narrow, bumpy country roads on steep inclines make up the access to site, meaning it would be a real struggle to drive heavy machinery to site. Another difficulty was simply the task at hand. Installing artificial measures to keep mother nature at bay is always a daunting ask. Would flooding have to be prevented altogether or did the railway infrastructure itself need protecting? These were all questions posed at the team involved in this work, and the following section elaborates on how this story unfolds.

IMPLEMENTATION

Following the early stages of the project including desk study and evaluation of the issues at site as well as the mechanisms at play causing the damage (as discussed above), several options were considered initially, and the pros/cons were laid out via an options report.

Out of all the possibilities, four main options were considered for implementation. The first option was to replace the embankment and low bridge over the river with a viaduct. This would allow water to drain underneath the railway and avoid floodwater building up. The second option proposed was to raise the embankment and bridge height, thus allowing more water to flow underneath the bridge and reduce the risk of flooding next to the railway. A third option was to install more culverts underneath the embankment. The final option was to install a rock armour solution on one side of the embankment. Possibly surprisingly to the reader, this was the solution that was opted for, and the remainder of this article will explain exactly why it was chosen. It is an example of smart engineering, where the mechanism of failure has been directly addressed. The other three options were deemed not suitable. The first two options would have required significantly more funding and would have taken much longer to implement, and possibly caused more disruption to the landowner and the environment. The third option would not have worked due to the uphill side of the embankment getting damaged, as floodwater would powerfully rush through the culverts to reach the river.

As can be seen in the design (Figure 5) and sitework (Figure 6), geotextile matting was placed on one side of the embankment, the downslope side nearest the river. From here, large boulders of specified size were placed on top. The boulders were laid from the toe of the embankment up to the top. The rock shapes and sizes were carefully chosen as they were laid to fit together as a strong, interlocked structure. A good analogy would be to compare this to putting together a jigsaw puzzle. If the boulders were piled on in any order, the entire embankment would be much more susceptible to collapse and movement.

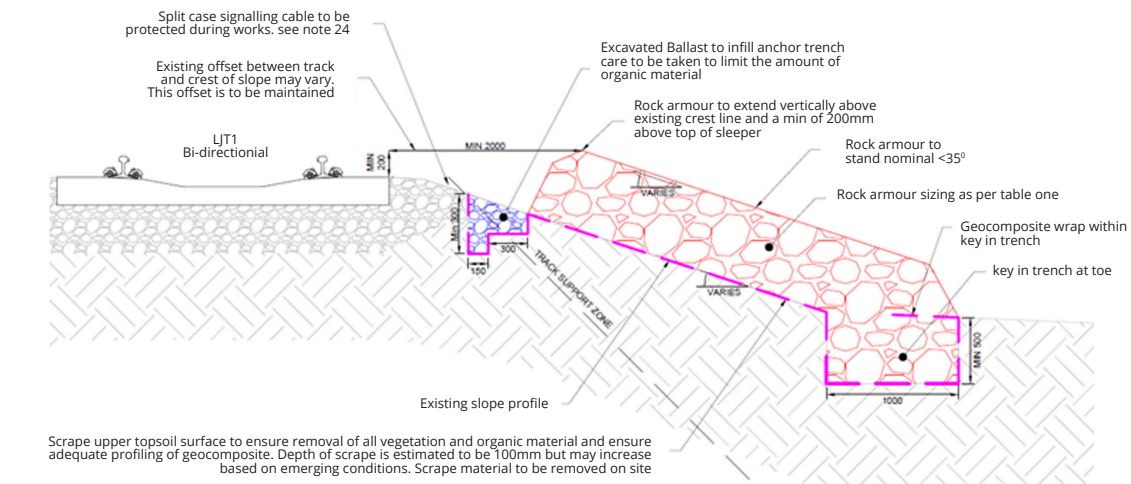


Figure 5: Approved for construction design plan of the rock armour solution.



Figure 6: Image of rocks being placed on top of matting.

In addition to the rock armour installation, the existing drainage system was improved as part of the design (Figure 7). Gabion baskets were positioned around each culvert, and outfall pipe diameters were increased to ensure that water travelling through the culverts could drain quickly away from the rock armour.



Figure 7: Drainage improvements, including increased outfall capacity and gabion baskets.

This solution does not prevent the track being flooded, but it does prevent a washout of the embankment supporting the track and long closures of the line. The rock armour being placed on the downhill side of the embankment forces the water to flow around it as it travels towards the river, thus slowing its flow. This triggers a reduction in velocity to all the flowing water, including water moving into the ballast from the uphill side of the railway. Consequently, the flowing water will not have sufficient energy to transport the ballast, so does not wash it away as it travels towards the river.

The solution still allows water to flow through the embankment, and this is important to note, as if an impermeable barrier was installed preventing water from passing through the ballast, then the washout issue would be diverted to another location further along the railway. The improved drainage plays a key part here, as if water was not able to exit the site quickly through outfalls, then flow would stop completely. Once again, the flooding issue would be diverted elsewhere on the upslope side of the railway. It is also interesting to observe

the importance of placing the rock armour on the downslope side. If the rock armour was installed on the upslope side instead, the water would be able to pick up speed after passing through the obstacles, and washouts from scouring would still occur.

Furthermore, the remediation installed is impressive for more reasons than the main overtopping mechanism being addressed. Careful thought was put into how this project could be delivered in the most sustainable and efficient manner possible. For example, the entirety of the 8,000 tonnes of rock armour used at this site was delivered in eight freight trains. (Figure 8). By doing this, difficult access issues were overcome as large lorries were not having to traverse the single lane tractor tracks of the Welsh countryside. The rock armour was also sourced as locally as possible from Machen Quarry, using particularly hard limestone that was compliant with engineering standards. The alternative and often default option is to use granite boulders for rock armour, which in this case would have meant importing rock from over 100 miles away.



Figure 8: Rock armour being delivered by rail.

Finally, to supplement the main works, ecology surveys were carried out and appropriate action was taken to accommodate the ecosystems in place already. For example, in the ecology survey, a family of dormice were identified towards the high mileage end of the site. To accommodate this, the rock armour work was started from the low mileage side of the site, while plans were put in place to rehouse the dormice safely. The site was also restored, with no permanent damage to agriculture or the environment left behind (Figure 9).



Figure 9: Restoration of site.

BENEFITS FOR THE FUTURE

On top of the railway being repaired and less susceptible to wash outs in the future, a good way to evaluate the longer term benefits this work will bring is to explore each branch of the sustainability model. (Figure 10).



Figure 10: Simple sustainability model, showing the three essential legs.

From an environmental perspective, carbon emissions were at the forefront of decision making in this project. By delivering supplies by train, approximately 320 lorries were kept off the road. Keeping vehicles off the road and replacing them with trains (even diesel trains) is very effective at reducing carbon emissions. For instance, if the entire UK population regularly used the train as opposed to driving, this would be substantially more beneficial for the environment than electrifying the entire railway network. It is always helpful to include that information, before anyone jumps in and argues that diesel trains delivered the supplies! Furthermore, by using local limestone that was also compliant instead of granite from further away, thousands of miles of unnecessary road journeys were prevented. If more engineering projects across the country could utilise their site-specific advantages (instead of following generalised protocol in autopilot) like this project has, the probability of reaching the 2050 target of zero net carbon would be improved. Additionally, the overall work completed here will prevent months of closures over the next few decades. Many road trips that would have happened if the line had continued to be closed regularly now won't occur.

From a social viewpoint, the work done in this project has massively improved the reliability of this very important railway line. This means people are connected pretty much all year round between south Wales with the Midlands, north Wales and northern England. All reasons for connecting people are important, whether it is to link businesses as the world continues to reduce remote working, or for friends and family to meet in person promoting happiness and a better quality of living. Additionally, members of the population that have mobility issues will be able to travel on a safe and reliable form of transport, promoting diversity and inclusion within the railway. Furthermore, the number of fatalities and injuries on the road will decrease, with less cars using the few connecting roads between south and north Wales. Freight can also be more reliably connected, allowing food and other important resources to be transported from source and distributed in larger quantities.

With a more reliable railway becomes a more profitable one! Having a better reputation will naturally see more people turn to taking the train as opposed to driving. More services running regularly results in a significant reduction in delay repay minutes paid out to the train operating companies (TOCs) and freight operating companies (FOCs). Additionally, the economy of Wales and parts of England will be boosted as tourism and travelling is a more accessible option for many, especially during important winter periods such as Christmas and the new year.

CONCLUSION

Summing everything up, this project at River Monnow needed to be written about to promote smart and sustainable engineering practices to the rest of the railway community. While this project alone will make negligible difference to global carbon emissions and the worldwide economy, it does set an excellent example of how more projects could be planned and delivered. This doesn't mean every project needs to import their materials by train, it also doesn't mean every project needs to use rock armour as a defensive mechanism to mother nature.

The take-home message is that as an engineering community we can often get caught doing 'cookbook' engineering and delivering work in a certain way because it is the routine option that has been done for decades before. Instead, if we could spend more time thinking about how each individual project could be adapted to take advantage of its site-specific circumstances, there would be more progression to meeting sustainability targets.

WORLDWIDE RAIL GLIMPSES: PART 3 OF 3 – ADHESION RAIL – STANDARD GAUGE

M Morris Smith, elected an Honorary Life Member of the Institution in 2008 was Chairperson of the West Yorkshire Section. Most of his 50+years PWI Membership has been as Section Secretary or Chairperson, serving a number of years as a Non-Executive Director of the Institution. A career railwayman, he held senior positions pre and post privatisation through to Chief Civil Engineer and continued into part-time consultancy with Railtrack and Network Rail before full retirement.

At around half a million miles, standard gauge accounts for around 60% of the railway network worldwide. Indeed, this percentage is likely to rise with standard gauge now being the gauge of choice, especially where projected traffic growth merits separation from the existing railway network and/or is heralding the introduction of high-speed.

Shinkansen was an early example. Its adoption of standard gauge at introduction enforced separation from the 3ft 6ins 'Cape Gauge' of the Japan railway network then existing.

Described earlier, narrow gauge Brazil and neighbouring broad-gauge Argentina are planning to extend their railway networks in similar fashion. Both countries are intending to adopt standard gauge in their construction of new high-speed routes, with Brazil additionally considering the development of separate freight infrastructure to this track gauge.

EAST COAST MAIN LINE (ECML), UNITED KINGDOM



Figure 1: 'Mallard' (now housed at York National Railway Museum); a HST pictured in Australia in 2016, based on a forerunner that in 1973 held the world speed record for diesel traction, and a picture taken on the 2019 West Yorkshire Section visit to the Hitachi Azuma assembly facility at Newton Aycliffe (a location recently earmarked to assemble part of the HS2, 360kph fleet, commencing in some five years).

For almost two centuries, on its Victorian alignment and largely on and through its original Victorian infrastructure, the East Coast Main Line (ECML) has often been at the railway world forefront.

On 3rd July 1938, South of Grantham, the world speed record for steam traction of 126mph was achieved by 'Mallard'. Retired as diesel replaced steam, the ECML flagship Class A4 Pacific was succeeded by the Deltic, thus uplifting the ECML to a 100mph railway. This was happening as I started my railway career in 1966, joining an Eastern Region whose Headquarters was about to move from Kings Cross to York and within a railway not long having been re-named British Rail. (Figure 1).

Shinkansen services opening up just two years previous in 1964, showed toward what we as young railway engineers might aspire. Indeed, hope transferred to the early development stage of the Advanced Passenger Train (APT). Perhaps a step too far, priority was soon given to the development of the High Speed Train (HST). I was then fortunate to be part of an on-board team observing HST ride quality when on 12th June 1973 it achieved the world speed record for diesel traction of 143.2mph on the ECML North of York. Exciting times!

My connection with HST continued with a move to Darlington and responsibility for maintaining/improving sections, including safety cesses in preparation for 125mph service running. Known as Inter-City 125, HST passenger services were introduced onto the ECML in 1977 and the Deltics eventually all retired by 1981. Then recognised as a 125mph railway, from 1989 ECML services were further enhanced with the introduction of Inter-City 225. This locomotive had proved its pedigree on the 17th September 1989 when it achieved the British locomotive speed record of 161.7mph on the ECML South of Grantham. Disappointingly, even with the 2019 displacement of the HST fleet with the Azuma and an expectation that Network Rail was soon to be renamed Great British Railway (GBR) with its 'bold new vision', the ECML continues to operate up to 125mph - a speed limit already spanning 4 decades! In-cab signalling and European Train Control System (ETCS), might allow Inter-City 225 and Azuma to run at 140mph, but my career vision of a high-speed (200mph) ECML, separated from local stopping services and freight, seemingly won't ever be attained, nor a 200mph railway reaching Leeds in my lifetime!

SHINKANSEN JAPAN



Figure 2: Bullet trains ready for 'lift off' at Tokyo Station.

Shinkansen opened on 1st October 1964, in time for the first Tokyo Olympics. Although over 70 years later than the Chicago 'L', it needed similar guile and tenacity to C.Yerkes, for Shinji Sogō, the first President of Japanese National Railways, to persuade politicians to support the 'revolutionary' technical development of a standard gauge, rapid transit, passenger only railway, completely separate from Japan's existing 'saturated' narrow gauge railway network. Clearly Sogō recognised more upgrade potential in standard gauge and was forthright in his determination for separation. The memoir of his 'head hunted' Vice President of Engineering, Hideo Shima, however, suggests the foresight of physical separation was primarily to force change and encourage a climate of innovation. Reference: 'Birth of The Shinkansen – A Memoir' (Shima H, 1994 EJRCF). It is to Sogō's enduring credit therefore, that the bullet train, as it became colloquially known, operating over its dedicated 15% of Japan's total railway network (≈1,700 miles), now has worldwide renown as a high-speed role-model synonymous with reliability, punctuality, comfort, efficiency and safety, spread over five decades. Over the same period, its infrastructure footprint has also accommodated progressive improvements in bullet train design to permit 200mph service running, rivalling all other railway networks even to this day. (Figure 2). It is fitting that a first generation, over 55 year old Shinkansen 0 series has sat pride of place in the National Railway Museum since 2001.

EURO-HIGH-SPEED DEVELOPMENT

Similar to Shinkansen in spanning nearly all my railway career, France had also made its high-speed intentions clear with Train à Grande Vitesse (TGV). TGV 100, an experimental gas turbine-electric locomotive-powered train set built by Alstom, achieved a top speed of 318kph (198mph) on 8th Dec.1972. Progress over the next twenty years saw TGV raise its record to achieve 515.3kph (320mph) on the 18th May 1990. This wasn't long before a privileged visit inside the Channel Tunnel soon after 'breakthrough' and then later the same decade visiting sections of the TGV railway being constructed near Avignon. TGV is now the acclaimed world speed record holder for a conventional wheeled passenger train of 357.2mph made on 3rd April 2007 – the world's fastest adhesion train.

In France's footsteps, a succession of 'Euro-High-Speed' developments soon followed. Coupled with work that was harmonising technical standards within Europe, the progressive raising of service train speeds connecting major European cities to 320kph (200mph) has been enabled. An approaching speed of 311kph displayed when travelling between Paris and Frankfurt exemplifies this (Figure 3).



Figure 3: In-carriage display on a joint-crewed ICE train between Paris and Frankfurt.

Indeed, examples of harmonisation continue apace. In his article 'Railway safety and interoperability requirements and new TSIs' (Global Railway Review, 08.02.24), Jakub Tomczak describes how digital rail solutions, such as the European Rail Traffic Management System (ERTMS), coupled with Technical Specifications for Interoperability (TSIs), will considerably reduce the complexity of international rail travel. Further benefits from the standardisation of railway signalling and control and the sharing of infrastructure can increase capacity, enhance safety and make a contribution to decarbonisation. Images below glimpse evidence of 'seamless operation' at Paris, Venice and Rotterdam (Figures 4,5 & 6).



Figure 4: Both taken at Paris, Gare de l'Est, the first image shows two TGV electric multiple units manufactured by GEC-Alstom that are in Classes that include Eurostar e300 units: the second shows a Deutsche Bahn(DB) unit manufactured by Siemens, that is of a similar Class to Eurostar e320 units.



Figure 5: Both taken at Venice, Santa Lucia, the first image shows an Alstom manufactured NTV (Nuovo Trasporto Viaggiatori) Pendolino 'italo'. Originally built by Fiat, the first 'Pendolino' came into operation in Italy in 1976. Subsequently acquired by Alstom, Pendolinos now operate worldwide. Their ability to tilt and traverse curves on existing track alignments at up to 30% higher speed than a conventional train whilst assuring passenger comfort, provides operators opportunity to reduce journey times and increase capacity. Avanti West Coast operate Pendolinos on the West Coast Main Line. Operated jointly between state operator Trenitalia and the private Spanish operator Iryo, the second image shows a Frecciarossa ETR1000 that was built within a partnership of AnsaldoBreda (now Hitachi Rail), and Bombardier (now Alstom). Through compliance with European TSIs, this latter train manages to overcome infrastructure limitations even in cases of different power supplies and signalling, with clearance to run in France, Germany, Spain, Austria, Switzerland, the Netherlands and Belgium.



Figure 6: Built by GEC-Alstom this image taken at Rotterdam Central is of Eurostar SNCF TGV Thalys PBKA e300. Eurostar is an international high-speed rail service connecting Belgium, France, Germany, the Netherlands and the United Kingdom.

HIGH-SPEED AND DECARBONISATION

Along with Shinkansen, approaching 200mph is henceforth the likely ambition for all high-speed new builds. Within a near half-century of TGV, France has built the third longest high-speed railway in the world; Spain in less than 30 years has built marginally more to become the second longest with some 2,200 miles; but China in less than 15 years now has by far the longest high-speed railway network. Indeed China, with rapid extension, has already doubled its length in the last 5 years. It cumulatively has a high-speed route mileage already likely to be exceeding all that exists in the rest of the world and has intentions to further expand and achieve a high-speed network total of some 25,000 miles by 2025.

However, although Japan, France, Spain and latterly China are high-speed ‘front runners’, in her article ‘Speed Seekers’ (New Civil Engineer, September 2023), Belinda Smart describes a renaissance of ‘high-speed rail projects now rolling out at pace worldwide’. Surely contributing to the achievement of carbon targets, her article makes reference to the International Union of Railways (UIC) Rail Atlas 2022 which shows a ‘total length of 19,700km of high-speed rail lines that are currently under construction globally’.

In contrast, it is only on the short 67 miles of HS1 between London St. Pancras and the Channel Tunnel, that there is dispensation for trains to run above the United Kingdom speed limit of 125mph and reach a speed of 300kph (186mph)! Nevertheless, it is gratifying to read the recent PWI Journal article by Robert Dean, Jonathan Scott and Ben Straw [‘The High Speed 1 mid-life renewals programme’ (PWI Journal Vol 139 Pt 3)] and gain encouragement that there will at least be some valuable home-grown experience/expertise available from over 14 years of HS1 that can be of benefit to HS2. HS2 could then provide opportunity to regain credibility in worldwide high-speed railway construction, by showcasing the exploitation of low embodied carbon options. Typically, new-build high-speed railways would minimise the need for bridge and viaduct construction, but wherever such structures are unavoidable use low carbon steel and concrete and maximise the re-use of materials, alternatively described as ‘minimal virgin resource’, [‘Decarbonising the rail industry’, Dr. Rossa Donovan (PWI Journal Vol 139 Pt 4)]

There is now much research coupling high-speed trains with decarbonisation. Studies suggest that when various transport modes are being used near to their passenger carrying capacity the carbon footprint of a train (powered by electricity from renewables) versus air is stark. In Our World in Data published 13th October 2020, Hannah Richie has written an article entitled ‘What form of transport has the smallest carbon footprint?’ Measuring the carbon footprint in grams of carbon dioxide equivalent per passenger kilometre, Richie suggests a rail passenger footprint is only 16% of that measured for a domestic air travel passenger. Her study comparing Eurostar (international rail) with short haul flight (economy) reduces the footprint even further, from 16% to a stunningly low 4%! Connectivity at each journey end, together with its seamless interoperability across borders, referred to earlier, will be an eco-friendly factor in this determination.

Likewise, a study by the International Energy Agency (IEA) entitled ‘The Future of Rail’, published in January 2019, accordingly showed the ‘emissions intensity of freight rail nearly 10 times lower than trucks’. In the face of such compelling evidence, it is no wonder that grain transportation now overwhelming the existing road and rail infrastructure is incentivising the construction referred to previously of a completely separate Granrail in Brazil. However, whilst Granrail’s decarbonising effect merits recognition, it will surely fall short of fully off-setting the deforestation that originally allowed grain production within the Amazon rainforest to flourish.

DISCUSSION

With Richie’s assertion of rail’s green credentials when compared

with domestic air travel, I now contrast the British mainland (whose Government actions with regard to HS2 seem at best indifferent to high-speed rail development) with Japan, (the long-term high-speed front runner) to examine whether inter-city high-speed connectivity can disincentivise air travel.

Japan’s population is nearly double that of the UK. Indeed this 2:1 ratio broadly applies when further comparing each country’s mainland size; the yearly number of passengers taking mainland domestic flights, and the average domestic flight distance each passenger actually takes. For each passenger, D.Gorca has determined this to be 600 miles in Japan (‘Average domestic stage length of airlines in Japan FY 2011-2020’ 22.11.21), whereas for Great Britain the distance is almost half this at 326 miles and when considering mainland England only, is just 215 miles (Carl Baker, House of Commons Library, ‘Domestic flights in the UK: where do we fly?’ 30.11.21.). Rudimentary as this comparison might be, Shinkansen’s apparent disincentivising effect on Japan’s domestic flight travel appears significant especially when travel distances are less than 500 miles and therefore within the range of a 3hr Shinkansen train ride. In practice, this means a near 100% of passengers journeying the 284 miles between Tokyo and Kyoto take the 2¼hr journey by Shinkansen: which also has a market share of around 67% for the 4hr, 550-mile journey between Tokyo and Hiroshima.

Applied to the most patronised UK mainland domestic flights between London and Edinburgh/Glasgow, in mimicking Shinkansen speeds, HS2 had the potential to bring this near 400 miles within the 3 hours journey time that on Page 39 of the Union Connectivity Review, author Sir Peter Hendy, considers ‘Rail is typically favoured...’.

Coinciding with First Group stating ‘... that it was six times greener than air’ in terms of CO2 emissions’, even within the present route infrastructure limitations it made the proud announcement of ‘rail now being the preferred choice (at 57%) over air travel between Edinburgh and London’ (Railnews articles April 2022 & 2023). Albeit that an ‘Azuma campaign’ coupled with fare pricing might have done much to influence patronage, such encouragement appears to be heralding a wider receptiveness to longer distance rail travel by passengers and a switch from air to rail. This is a challenge to which HS2 as it was originally conceived could have responded. Indeed, HS2 was the sole legislative opportunity for eliminating, or at the very least subduing, all domestic air flights in Great Britain!

Such action is not without precedent. In their bid to reduce carbon emissions and meet net-zero targets, European countries, many of whom are already blessed with high-speed rail infrastructure, are considering such a strategy, with France already banning short-haul domestic flights that can be covered by train in less than 2½ hours. Although in this case enforced, such a strategy is encouraged by Sir Peter Hendy, who in his ‘Union connectivity review’ published 26.11.21 by the Department of Transport, recommends the establishment of a multi-modal transport network (UKNET), who rather than relying on competition, seeks a collaborative strategic approach, within which the Government expects the railways and aviation to achieve ‘net zero’ carbon emissions by 2050.

The United States (US) and China, accounting for over a quarter of the world’s railway (US ≈160,000 miles and China ≈95,000 miles), together exude carbon emissions that exceed all other countries combined. Although the US is committed to achieve net zero carbon emissions by 2050, with China presently aiming to reach peak carbon emissions in 2030 and be carbon neutral by 2060, they will clearly exert a major influence on the attainment of a worldwide railway ‘net-zero’ target, for at least the next two decades.

Freight orientated, with 40% of freight being carried on rail, integration of freight with passenger traffic in the US has excluded high-speed. Also, with only 1% of the network presently electrified practically all passenger and freight trains are dependent on diesel power. As a result, the US has much potential for reducing

carbon footprint by transferring from diesel to traction powered by renewables and developing high-speed projects that disincentivise air travel. However, the US faces challenges. It presently boasts ‘2,900,000 passengers fly every day in and out of U.S. Airports’, mostly on domestic flights’ (Federal Aviation Administration [Fiscal Year ‘19 figures], ‘Air Traffic By The Numbers’). Significant is the fact that the only US rail line making an impact on domestic flight patronage, coincides with being one of the few routes that is electrified and is on the US’s fastest section of railway. However, this 230-mile Northeast Corridor between Boston and New York, is generally limited to 125mph, with only a ‘token’ amount of 150mph [Reference John Dolan’s PWI Journal article ‘US railways today, Part 2: The Infrastructure’ (Vol 136 Pt 3)].

But there are glimmers of hope! Albeit at least five years off, the Northeast Magnetic Levitation (Maglev) project, initially running between Washington DC and Baltimore, is intended to increase capacity with a speed potential of 500kph. Also under consideration is California High Speed Rail (CHSR) a 354km/h high-speed railway between Los Angeles basin and San Francisco, [Reference New Civil Engineer article ‘State of Speed’ (Page 28, March 2024)], with a recent pronouncement that Network Rail Consulting has been awarded a contract to provide this project with systems engineering services. [Reference Railnews article ‘Network Rail Wins key part in USA high speed project’ (Page 16, Feb. 2024)].

Analogous with our HS2 debate, when first researching this paper over four years ago, a high-speed bullet train project likewise linking San Francisco and Los Angeles was on the verge of abandonment. At that time and seemingly indicative of the contrasting US ‘love’ of air travel, but general lethargy toward rail, the Washington Post was running an article by Charles Lane entitled ‘A ‘crazy train ‘ that’s going nowhere fast’. At conclusion, his critique wished ‘the several massive concrete structures already completed.....serve as ‘monuments to magical thinking about infrastructure ‘! Notwithstanding that World Bank analysis suggested competitive advantage of rail relative to air travel should the project proceed, Lane’s article clearly reflected the US stubbornness of mindset/culture that is continuing to inhibit the ‘net-zero’ collaboration between air and rail transportation that Sir Peter Hendy believes necessary and recommends. The award to Network Rail and President Joe Biden’s recently declared financial support of high-speed, does at least suggest these projects are reprieved and will now come to fruition.

China has a similar area to the US but has a population four times as great. By rapidly expanding its already extensive high-speed railway network and coupling this with electrification, already covering two-thirds of its railway network, China has done much to create a railway infrastructure assisting the realisation of its decarbonisation targets. Indeed, once its electricity becomes sustainably sourced, China will have opportunity to become the leader in scale at railway carbon footprint reduction, providing more credibility in its aspiration to expand its foothold assistance in Brazil and Argentina for example. Internally however, transportation in China also appears to be lacking Sir Peter Hendy’s integrated, collaborative, strategic approach. Notwithstanding China’s railway becoming increasingly competitive with domestic air travel, China has embarked on a programme of massive airport expansion, and the 2020 passenger numbers for internal air travel show that for the first time ever, ‘China passenger numbers exceed the US.’ [(James Palmer of Foreign Policy (Washington): The Week, Issue 1377)]. With its railway’s share of freight haulage presently standing at just 8%, it would seem this should be the more urgent focus for China’s transportation investment if it is to achieve its carbon emission targets.

A RETROSPECTIVE

My worldwide rail glimpses confirm a United Kingdom with worldwide influence, recognised for being at the forefront of both ‘non-adhesion’ and ‘adhesion’ rail development in a variety of track gauges, through most of the 19th and into the first half of the 20th century. This recognition was enhanced, not only from being the first, but also the fastest. The Mallard was inspirational, but it was only after WW2 and into the 60’s that the ECML stepped up to operate sections at

100mph. The early 80’s then saw UK take its next and last jump to 125mph.

From the mid-60’s, it was Japan with its ‘Bullet Train’ which emerged to take the speed ‘baton’ forward.

By constructing a completely separate electrified Shinkansen railway network, solely devoted to inter-city passenger traffic, customers could benefit from 130mph travel. Within the following six decades, Shinkansen progressively raised the bar to 200mph, to still remain a worldwide role-model for this high-speed era, with its decarbonising role now having the recognition it deserves. Now with maglev running with negligible carbon footprint, Japan is again at the forefront of the next step change, possibly to 300mph.

Rail convenience, connectivity and speed is a proven ‘green’ alternative to domestic road and air travel. With COP27 generally setting the focus on achieving net zero carbon emissions by 2050, worldwide rail can play a significant role in reaching this target. However, here in the UK where even HS2 looks increasingly depleted and fragile, early investment encouraging wholesale network electrification and high-speed seems extremely unlikely! Great British Railways (GBR)/Network Rail nevertheless has a target requiring the elimination of all-diesel traction by 2040. Further infrastructure carbon reduction targets will undoubtedly follow, but presumably in anticipation of HS2 delay and contingency for route diversion, there is dispensation for the new HS2 bi-mode and tri-mode fleet to continue diesel powered operation until 2050.

My hope is that the UK will eventually embrace a construct dedicated to high-speed (200mph), that in emulating Shinji Sogō, will give an energetic spur to new countrywide railway innovation and wholesale rejuvenation. With Charles Lane’s Washington Post critique in mind, are PWI Journals illustrating UK derived high-speed 200mph rail glimpses within a decade ‘magical thinking?’ (The signalled curtailment of HS2 on 4th October 2023 certainly suggests this!)

CLOSING GLIMPSES

Still with the hope of experiencing 200mph GBR train travel in my lifetime, here is a glimpse of a rising sun over Tokyo as a bullet train approaches. Next to it, near Mount Fuji, Japan, my closing glimpse in October 2015 of the rising of high-speed maglev - a new generation ‘bullet train’ system under construction. **(Figure 7).**



This was shortly after an open section had seen the maglev world speed record of 603kph (374mph) attained. Not alone, China has similar maglev aspirations with their train, already built, said to be capable of 620kph. Very costly to construct, seemingly high in embodied carbon (using materials not yet conducive to low carbon infrastructure), it is nevertheless destined to become a truly permanent way that is practically maintenance free. There being no frictional contact between structure and vehicle, maglev must also provide opportunity to be exceedingly carbon friendly in its future working.

Whether maglev heralds a new non-adhesion, rail-less but guided worldwide high-speed transportation system, for a ‘full circle’ in my glimpses, only time will tell.



Peng Le
CEng MPWI



Tan Jianlong



Chua Kien Pin

Peng Le is currently a Principal Engineer in SMRT Trains' Civil, Architecture and Permanent Way Engineering Department, where he is working on technical matters relating to civil engineering maintenance and projects in SMRT Trains.

He graduated with a Bachelor of Engineering (Civil Engineering) and Master of Science (Civil Engineering) from National University of Singapore. He is professionally registered as a Chartered Engineer with Engineering Council, UK, and a Member of Institution of Engineers, Singapore.

Jianlong heads SMRT Trains' Strategy and Risk Management Department. The department develops and orchestrates SMRT Trains' strategic plans, to drive long-term value for its stakeholders.

It also oversees the organisation's risk management and governance processes, to assure compliance with applicable operational, regulatory and legal requirements, and to keep pace with best business practices. He also holds a secondary portfolio in leading environmental sustainability efforts for SMRT Group. In this role, he works with different stakeholders to plan and implement efforts to reduce SMRT's carbon footprint, resource usage and waste generation.

Jianlong holds a Bachelor of Science (Electrical Engineering) and a Master of Engineering (Electrical Engineering and Computer Science) from the Massachusetts Institute of Technology. He is a Member of the Institution of Engineers, Singapore.

Kien Pin graduated from National University of Singapore with a Bachelor of Civil Engineering and obtained his Master's of Science from University of Michigan at Ann Arbor.

He is currently the head of Civil, Architecture and Permanent Way Engineering in SMRT Trains. He is a registered Singapore Professional Engineer with 27 years of design and project management experience in urban high-rise building developments, petrochemical, infrastructure, as well as rail transit developments and maintenance. Earlier in his career, he garnered full cycle project and design management experience in greenfield and brownfield projects through working within international teams in the Middle East, United Kingdom and Singapore. His current work in Singapore's key public transport operator involves close collaboration with government agencies and authorities to deliver sustainable train transport infrastructure, maintenance and service. His current interest includes implementing practical and sustainable building development in maintenance and facilities operation using technology.

REDUCING CARBON EMISSIONS: FRICTION CLAMPING FOR URBAN RAILWAY VIADUCT BEARING REPLACEMENT IN SINGAPORE

WINNER OF THE SUSTAINABILITY AWARD 2023

INTRODUCTION

Bearings are important components between viaduct decks and substructures, accommodating movements from thermal expansion and contraction, as well as live loads. While various service life estimations exist for viaduct bearings, there is a general consensus that the service life of bearings is significantly shorter than that of superstructures and substructures. When bearings no longer perform their intended functions, they should be replaced as soon as practical to ensure the safety, serviceability, and durability of viaduct structures.

In Singapore's urban railway system there are over 16,000 bearings on above-ground viaduct structures in North-South Line (NSL) and East-West Line (EWL). Most of these bearings are located at half-joints, with very limited access for inspection and replacement work. As these bearings are approaching the end of their service life, with some showing signs of deteriorations, Singapore's Land Transport Authority (LTA) and SMRT Trains Ltd have initiated a condition-based asset replacement program to progressively replace these bearings.

The most significant challenge for bearing replacement at half-joints is establishing a supporting system for hydraulic jacks, as there is no space to place the hydraulic jacks inside the half-joint gap. The traditional method of bearing replacement involves excavating to the pile cap and erecting support from the pile cap. In 2021, SMRT Trains Ltd, as the client, engaged PSC Freyssinet (Singapore) Pte Ltd to conduct a pilot project using the friction clamping method instead of the traditional approach. This paper will discuss how the clamping method works and how it has significantly reduced the carbon footprint compared to the traditional approach.

BACKGROUND OF THE PROJECT

The project involved the replacement of two bearings, BN0683S1FLS and BN0683S1FRS, situated at Pier CN0683 between Marsiling Station and Woodlands Station in Singapore. This pier is positioned between a canal and the delivery carpark of the largest supermarket within the housing estate (Figure 1). The pile cap of the viaduct is situated 6 metres below the present ground level.



Figure 1: Site Conditions and Constraint for Pier CN0683.

The two bearings are positioned within a half-joint gap, providing a clearance of 131mm (Figure 2). Due to the restricted space within this half-joint gap, it is not feasible to place the hydraulic jacks within the half-joint. Therefore, an alternative approach must be devised to create external support for the hydraulic jacks.



Figure 2: Original Bearings BN0683S1FLS (Left) and BN0683S1FRS (Right).

In order to minimize disruption to the train service, only the lifting and lowering of the viaduct girder are executed within the designated maintenance window, after regular train service hours. The removal of the old bearings and the installation of the new ones are conducted during revenue service hours, allowing trains to continue operating atop the viaducts.

TRADITIONAL METHOD

A typical bearing replacement work involves three steps: jacking up the viaduct girder to release the load from the bearing, replacing the original bearing with the new one, and lowering down the viaduct girder to transfer the load to the new bearing. In the traditional approach, the hydraulic jacks are supported by the steel tower, and the steel tower is, in turn, supported by the pile cap. To erect this support, excavation is necessary, and the ground is backfilled with sand after the work is finished. SMRT Trains Ltd carried out a similar project using the traditional approach in 2019, and the different stages of the work are shown in Figure 3.



Figure 3: The Typical Process for Traditional Bearing Replacement Method - (Upper Left: Excavation; Upper Right: Installation of Steel Tower; Lower Left: Installation of Hydraulic Jacks; Lower Right: Backfill the Ground with Compacted Sand).

FRICTION CLAMPING METHOD

For the friction clamping method, the hydraulic jacks are supported by the steel frame. The steel frame, in turn, is supported by the viaduct pier based on the following principles:

- The lateral steel bars are pre-stressed with tension to induce a strain in them. As steel is an elastic material, after being pre-stressed with tension, it tends to return to its original shape. This generates a compression force on the viaduct pier.
- This compression force introduces a frictional force on the pier. The magnitude of this force is equal to the product of the compression force from the lateral steel bars and the friction coefficient for the interface between the steel frame and the pier.
- The frictional force at the interface of steel frame and the pier supports the steel frame, and in turn, the steel frame supports hydraulic jacks and the viaduct girder.

The design and an actual on-site photograph of the friction clamping system are shown in Figure 4.



Figure 4: Friction Clamping System Design (Left) and On Site (Right). (Photos from PSC Freyssinet (Singapore) Pte Ltd)

CARBON FOOTPRINT ANALYSIS

A carbon footprint analysis is conducted for both the traditional approach and the friction clamping approach for this project. This analysis is based primarily on the Singapore Building Carbon Calculator (<https://carboncalculator.sg/>), a web-based tool tailored for assessing carbon emissions within Singapore’s built environment.

For traditional approach, the carbon analysis is computed according to the following assumptions (mostly based on our experience in earlier bearing replacement projects that follow the traditional method):

- The volume of excavated soil is calculated based on an area of 6m×6m, with an excavation depth of 6m intended to expose the pile cap.
- On-site fuel emissions are calculated under the assumption that a small excavator is deployed on-site for 10 hours daily over a 15-day period to complete the excavation. The hourly diesel fuel consumption rate is considered to be 10 litres.
- For the calculation of the transportation of excavation materials, it is assumed that these materials are disposed of at the staging ground located at Changi East Staging Ground, Singapore. This staging ground is situated 41.1 km away from the project site.
- For backfilling, unwashed sand is utilized. It is assumed that this material is transported from a supplier based in Johor Bahru, Malaysia, which is located at 60.0 km away from the project site.
- A total of 19,170 kg of steel material is utilized for the erection of the steel tower, designed to provide support for the hydraulic jacks. The embedded carbon within the steel amounts to 20,511.90 kgCO₂eq. It is further assumed that the steel members can be recycled and reused for up to 20 projects. Hence, for the purpose of calculating the carbon footprint of the steel material in this project, it is taken as 1/20 of the carbon footprint associated with steel production.
- For the steel members used to erect the steel towers, it is transported from a warehouse situated in Tuas West, Singapore, which is located at 22.9 km from the project site.

The results of the analysis are calculated and presented in **Table 1**.

Items	Carbon Emission (kgCO ₂ eq)
Excavation	4,020.00
Transportation of excavation materials	1,785.37
Steel members	1,025.60
Transportation of steel members to site	46.53
Backfill	4,020.00
Transportation of backfill materials	1,969.55
Transportation of recycled steel members	46.53
Total	12,936.67

Table 1: Carbon Emission Using Traditional Method.

For the friction clamping approach, the carbon analysis is based on the following assumptions:

- The steel members for the steel clamping are transported from a warehouse in Tuas West, Singapore, at a distance of 22.9 km from the project site. The steel clamping system itself is pre-assembled offsite at the warehouse before being transported to the construction site.
- A total of 11,660 kg of steel materials are utilized for the construction and assembly of the steel clamping system. The embedded carbon within these steel materials amounts to 12,476.20 kgCO₂eq. It is assumed that the steel members can be recycled and reused for up to 20 projects. Consequently, for the purpose of calculating the carbon footprint of the steel material in this project, it is taken as 1/20 of the carbon footprint associated with steel production.
- A Grade 80 concrete packing, measuring 40mm in thickness, is cast around the viaduct pier to increase the friction coefficient and to facilitate the clamping mechanism. The concrete is transported from the same location as the steel clamping system. The weight of the packing concrete is determined to be 3.72 kg, and the estimated carbon emission is assessed to be 0.76 kgCO₂eq, encompassing both embedded carbon and transportation-related emissions.

The carbon emission from the clamping method is calculated in **Table 2**.

Items	Carbon Emission (kgCO ₂ eq)
Steel Members	623.81
Transportation of steel clamping system	28.30
Concrete packing (Material and transportation)	0.76
Transportation of Recycled Steel members	28.30
Total	681.17 (~5% of the carbon footprint of the traditional method)

Table 2: Carbon Emission Using Friction Clamping Method.

COMPARISON OF CARBON FOOTPRINT

In comparison, the friction clamping approach has reduced the carbon footprint by 95%, over the estimated service life of 50 years for the 2 bearings replaced. As there are over 16,000 bearings in both North South Line and East West Line of Singapore, the adoption of clamping method over the traditional method would have the potential to avoid carbon emission by close to 100 million kgCO₂eq when the system-wide replacement is implemented progressively.

LIMITATIONS OF THE ANALYSIS

While the author has made the best efforts to estimate the carbon emissions for the two methods, there are limitations to the analysis:

- The transportation of the materials in the analysis only covers the last leg transportation from the supplier to the construction site. The information on the earlier transportation is not available to the author and hence it cannot be calculated.

- The carbon emission from the welding of the steel members is assumed to be negligible in the analysis.
- The clamping method also reduced the number of manpower working in this project. However, the carbon emission from transportation of workers has not been included in the calculation as the residential address of the workers are unknown.
- The embedded carbon in the aluminium scaffolding platform is not included in the calculation as the scaffolding materials can be reused numerous times.

OTHER SOCIAL AND ENVIRONMENTAL BENEFITS OF THE CLAMPING METHOD

Apart from the reduction of the carbon footprint, there are other qualitative social and environmental benefits for from using the clamping methods in this project, including:

- The use of the clamping method reduced the usage of heavy machineries like excavators, which reduces the noise generated from the construction.
- For the traditional method, the site area is 210m². Using the friction clamping approach, the site area is reduced to 108m². With the reduction of the site area, there is less obstruction to delivery carpark for the supermarket and the pedestrian walkway to the train station.
- With the use of friction clamping method, the time for site possession is reduced from 2 months to 1 month as there is no need for excavation. This reduces the disturbance to the residents.
- There is a likelihood that there are utility services that are not shown in any as-built drawings in the ground. Using the friction clamping method, there is no excavation involved and hence the likelihood of hitting unrecorded utility services is eliminated.

PROJECT EXECUTION AND COMPLETION

With the consideration for sustainability, SMRT Trains Ltd decided to use friction clamping approach to carry out the replacement work for bearings BN0683S1FLS and BN0683S1FRS, with PSC Freyssinet (Singapore) Pte Ltd appointed as the contractor for this project. The bearing replacement work was successfully executed in December 2021 with minimum impact on regular train services and the surrounding neighbourhood and business operations. (**Figure 5**).



CONCLUSION

This paper has demonstrated that the use of the friction clamping system can reduce the carbon emission for replacement of viaduct bearings in the railway system by close to 95% , and a pilot replacement work by SMRT Trains Ltd in 2021 has demonstrated the viability of this method in the urban railway context. As there are more than 16,000 bearings in Singapore’s North South Line and East West Line, the adoption of the friction clamping method potentially will lead to almost 100million kgCO₂eq of carbon avoidance for the system-wide replacement of viaduct bearings.

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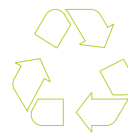
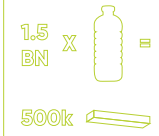
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"RAIL, ALE & THROUGH THE PINT GLASS"

This article is a personal reflection from Richard Hill,
a current Member of the PWI's Environmental Sustainability Committee.

In a world where sustainability has become the buzzword of the century, the quest for eco-friendly practices extends beyond reusable bags and electric cars. To engineer a green future we might be best placed to look to the past through the bottom of a pint glass or two. Enter the world of real ale, micro pubs, and the circular economy.

You may be lucky enough, like me, to live in Derbyshire, the greatest county in the UK. Those of you from other counties may challenge my assertion and I'm happy to debate this 'fact' over a pint in any of the micropubs, that have sprung up all over the rail network. I say it's the greatest considering the evidence presented. In my borough alone, Amber Valley, we have a UNESCO World Heritage site dedicated to the birth of the factory system at the outset of the Industrial Revolution. It's home of the last armed revolution in the UK, possibly the oldest surviving lineside station building left, picturesque landscapes, fantastic rail links and birthplace to many a great citizen. One of whom is a champion of the next industrial revolution, the circular economy, Dame Ellen MacArthur.

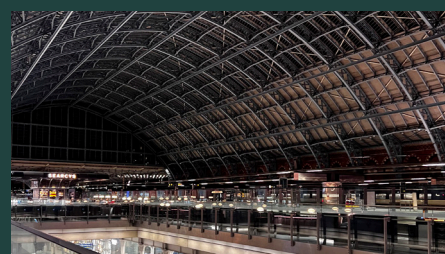
Your perception when gazing into a part supped pint glass is dependant on your disposition. It's either half full or half empty. If like me you're an optimist, it always contains more to enjoy and of course the beauty of a glass in a pub is you can always refill and reuse it. Better still, the cask or keg it came in can be similarly reused when it's time for a refill. If it happens to be a crafted barrel even better as a skilled cooper can always repair it to maximise its useful life.

Travelling south from Derby by train, the natural southern final terminus is St Pancras station with its fine arched roof made in Amber Valley by the Butterley Engineering Company in the 19th century. Things were very different then, the undercroft at the station wasn't the rail terminus to Europe nor was it the shopping experience it is today. It was a beer warehouse with the columns spaced at 14ft intervals, designed to accommodate barrels that came from Burton upon Trent on the train for storage and distribution in the capital and then use again. The Victorians understood there was value in the packaging and therefore engineered a circular recycling system to preserve investment in the containers.

Somewhere along the way however we have lost our sense of direction and it may be time to start things going round in circles again. Not a meeting action that never gets done, as we have all possibly experienced, but a new design philosophy in line with the UN Sustainable Development Goal number 12: Sustainable Consumption and Production, transitioning to a circular economy. It's time we engineers really begin again to think about how we design and maintain the railway. This is where some real personal commitments come in. Not "I will recycle everything I can at home", that's the job of everyone right now. I mean us! The ones with the power to change the system, ensure that we embed circularity right from the design stage or finding new uses for existing waste.

BUT HOW DO YOU CHANGE THE SYSTEM?

Looking back in the history of Amber Valley, we find a man called Jeremiah Brandreth. Not born in Derbyshire, he was the leader of the last armed revolution in the UK back in 1817. This was a time of mass unemployment, rising prices, a prior poor harvest and a broken political system activists were attempting to change via an armed uprising. The movement starting near South Wingfield and by the way of a few pubs gathering people along the way, several hundred revolutionists, came through my hometown of Langley Mill, ending up a few miles away in Giltbrook. Here it all came to a sticky end with arrests and sadly for Jeremiah, the ignominy of being the last man to be beheaded in England outside Derby Gaol.



Returning to my **3/4 full glass**. After listening to some of the world's most eminent scientists and speakers on the subject of climate change, some I have even had the pleasure of meeting, one common theme crops up as they describe the problems of achieving climate change adaptation, mitigation and circularity. The language used around the subject isn't always understood by politicians or the public. Standing, as I have done before, in Parliament Square, in a white coat with other scientists holding placards and banners with slogans like 'system change not climate change' may be well understood by those in the group and maybe some passers-by and some of the elected officials, but not everyone!

A **1/2 full glass** now helps see that great strides have been made in the last decade with renewable energy generation and the sales of EV vehicles continuing to rise. But this cannot and will not solve all the problems. That is where we come into play, as environmentally aware engineers. No matter what your role in the rail industry, we all have a part to play. Rail transport is the most efficient and cleanest way to travel and the best way to move freight but we need to get even more efficient as an industry and look to some of the ways of the past and make circular by design, business as usual.

In my now **3/8 full glass** of real ale which aligns with the principles of the sustainable circular economy, where the packaging was designed to have a longer life cycle, reducing waste and environmental impact. The traditional craft of brewing real ale fosters a connection to local ingredients and communities, making it a natural fit for the circular economy ethos. But why do I keep referring to ale? It's about finding a common language and goal. It's very easy to demonstrate the idea of circularity if the subject matter is familiar to a very

large part of your audience. I could have chosen the milkperson but sadly the sight of a milkperson is not as common as it used to be. My time delivering the daily pint is long gone. A change in public habits put an end to the traditional milkround. Having said that, milk deliveries are making a comeback. Similarly train travel is again increasing, the leisure market is thriving, and we can all play a part in



"RAILWAYS DRIVE CHANGE IN THE COMMUNITIES WE SERVE, AND NEW LINES OR REOPENING OLDER LINES BRING INVESTMENT. WE HAVE SOME GREAT PRODUCTS OUT THERE THAT COULD BE FULLY CIRCULAR, AND WE NEED A LOT MORE."

making that trend continue. One very easy commitment to make, and we all can do it (and as workers of the industry we should) is to use the train when we travel. There is a huge nostalgia for train travel in this country. Some of the most iconic movie moments of the 20th century involved trains. Carnforth is yet to be visited by me for leisure; I did have a brief encounter

there once, but only looking into a trackbed trial hole. Some of the great 21st century movies have, and no doubt will continue to use rail as a backdrop.

But while this glass, as I write, is now **1/4 full**, that's where hope and optimism come into play. We have young apprentices and graduates coming on board this journey. They will need help and guidance from the experienced, not to show old techniques or outdated methods, but to offer words of encouragement, guidance and most of all the benefit of a voice that can carry more weight for their new ideas. Those coming into the industry will have fresh ideas and new ways of thinking. However, their ideas can get drowned out and lost. It can be demoralising if all they hear is "We have always done it like this"... which we haven't by the way! The new generation must have access to corporate memory, something that can get lost along the way as organisations change.

This year marks 140 years of the PWI and I wonder what our forebears were thinking at that time. What were their goals? The fact is they have left a legacy in this Institution and the infrastructure that they and their later peers have left behind. But now we stand in that very same position, we can wonder what we will leave behind. The definition of sustainability is 'to serve the needs of the current generation without detriment to future generations'. That is something we can do exceptionally well. This leads to some very tricky questions that may even get debated well into the night with no easy answer. Questions like 'How do we finance what's needed?', and 'Why should this generation bear the cost?'. If you look at the investment markets, fossil fuels attracts huge investment but in time that will change. The railways could look very appealing as a long-term stable investment platform. However, we need stability



SUSTAINABLE DEVELOPMENT GOALS



SCAN TO READ RICHARD'S JULY 2023 ARTICLE - 'CLIMATE CHANGE DECARBONISATION AND GETTING THE CUTTING EDGE'.



and a robust long-term strategy that will last decades, reducing operating costs improving safety and remaining profitable. Moving towards circularity could look very attractive to those who want to invest in a greener future. We need to change what we do! Not at a snail's pace though, but at the rate at which the climate is changing.

Railways drive change in the communities we serve, and new lines or reopening older lines bring investment. We have some great products out there that could be fully circular, and we need a lot more. From the PPE we wear to the heaviest of components that we use. We need a full rethink of the way we do things. Rail can be cascaded as well as S&C etc. Ballast can go for a second life elsewhere. I have lost count of the times I've seen materials discarded along the line and it begs the question, if you were an investor looking at a factory would you invest if it looked like a dumping ground? If I were to go even further and seek huge investments I would advocate for a second Channel Tunnel. We could get huge swathes of people away from air travel if you look at some of the work done by SilverRail, for example, demonstrating in terms of time and cost that rail travel can be an affordable and potentially a quicker alternative to flying in some cases. It's time to be bold and ambitious and reignite that Victorian sense of an ability to change the world albeit in a way that doesn't harm the environment.

Watching life go by on my days off in a platform pub is a firm favourite of my pastimes. It allows some contemplation time. We are all cogs in a very big machine and we each play our part. Dame Ellen talks about resources on a ship as she sailed around the world and some of you may have read the works of Buckminster-Fuller and his notion of spaceship earth. But how many people do we need to convince that circularity is the way forward? So start small by finding the common goal that will inspire change but more importantly, be the change yourself. There are some very quick easy wins, a refillable water bottle rather than plastic. The same goes for a travel mug. Once you peer through the circular looking glass it's very hard to see the world the same again. It's not like going down the rabbit hole, it's more like a wormhole! If you want to know more there are some great reads you can find in a local library and if you can't find one, I'm sure any helpful librarian will order you one in. So go and find a nice spot to relax, read, and enjoy your journey as we hurtle around the galaxy together on our little lump of rock.

References UN Sustainable Development goal No 12

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TECHNICAL BOARD UPDATE

The quarterly PWI Technical Board met on 24 April 2024, hosted at the RSSB offices in London and online.

The meeting opened with a safety briefing from Jonathan Graham (RAIB), who updated the meeting on recent incidents under investigation by the RAIB. The Chair welcomed this as a standing agenda item from now on.

Stephen Barber confirmed that Turbine Creative had been working with the PWI on the five year plan and potential name change for the organisation. Commensurate with this, two surveys, one for Members and one for non-members, were recently issued seeking views from the railway community. Stephen urged as many respondents as possible (individual and corporate) to inform the future direction of the PWI.

Stephen outlined a change to the PWI organisation to reflect current directorial responsibilities. Brian Counter will remain the Technical Director, leading education and training. Joan Heery will move from Membership Director to Technical Services Director, retaining corporate membership management and leading the technical requirements for seminars, committees, knowledge hubs, and practical challenges.

Brian Counter briefed the meeting on

education, apprentices, training, and development. Joan Heery then informed the meeting of the current thinking regarding the programme of technical seminars being considered during 2025.

Liz Turner, the PWI Registration Manager, led the meeting to discuss the PWI 140 challenge. The aspiration is to have 140 railway engineers gain Professional Registration during the year to celebrate the 140th anniversary of the establishment of the PWI. Liz outlined measures the PWI were taking to facilitate this aspiration, including a series of online Professional Registration surgeries and local briefing sessions, encouraging Members to make contact should they wish to have a workshop for their staff to help direct them in pursuing Professional Registration.

As a follow-up to the February board meeting where Gareth Evans introduced the Network Rail research development and innovation team, Roger Moore, Network Rails Senior Product Acceptance Specialist, took the meeting through the Network Rail approvals process. Roger started with an overview video, which can be found on the Network Rail website, and went on to talk in more detail and, importantly, discussed the communication channels between Network Rail and suppliers for gaining approval for a

product/application. Should it be of value, the PWI will be happy to help this process through the PWI technical board.

After lunch, Robert Staunton of the RSSB briefed the meeting on the latest status of several research and development products being undertaken by the RSSB. Robert confirmed that RSSB often funds this research to avoid important work disappearing in gaps in funding between other funding organisations. As Robert outlined, RSSB funding looks at the bigger picture and potential interdisciplinary or inter-company-related projects with broader benefits.

For the day's final presentation, AlphaTek gave an update on their hypertrax GR8 S&C wear resistance coating, drawing interest from the ORR due to the identified safety benefits of reducing maintenance interventions for S&C where this coating is applied. Much discussion followed the presentation, offering other potential applications for this wear-resistant coating to reduce maintenance and enhance product life. In addition, the potential for designers to identify situations where they have been unable to establish what they would consider an optimum design and the possibility of using the wear-resistant coating in this situation as mitigation is to be explored.

OUR HERITAGE MEMBERS



Heritage Members can benefit from the expertise the PWI provide to help run their largely volunteer led organisations. For details of Heritage Membership please contact email (secretary@thepwi.org)

HERITAGE AND INDUSTRIAL TECHNICAL BOARD

The second meeting of the PWI Heritage and Industrial Technical Board was held on-line on 25 June. Along with previous attendees, the Chair was delighted to welcome Adrian Crees from our newest Heritage Member, the Watercress Line and Steve Oates Chief Executive Officer (CEO) of the Heritage Railway Association (HRA). Brian Counter, PWI Technical Director started by outlining the courses available offered by the PWI which may be of interest to heritage railways. Steve Oates confirmed that HRA are increasingly being asked for training but HRA are not set up as training providers so possibly a good opportunity to collaborate with the PWI in this respect to facilitate the training required identified within the heritage sector.

Brian then turned to Professional Registration and confirmed that the title of Engineering Technician (EngTech) is of particular interest to the heritage railway community. The award of this title concentrates more on competence, experience and responsibility in a railway engineering setting as opposed to straight academic achievement. Consequently, Eng Tech is more likely to be appropriate and achievable by engineers, often volunteers, working on heritage railways.

Mike Barlow, PWI Technical Manager informed the meeting of information of interest to be found on the PWI knowledge hub and the ongoing work to include first and second additions of 'British Railways track' on the hub. These early editions will cover track infrastructure common at the time of publication and pertinent to current heritage assets.

THE PWI WILL AGAIN BE RUNNING A PRACTICAL TRACKWORK CHALLENGE AND A NUMBER OF HERITAGE MEMBERS HAVE EXPRESSED INTEREST IN SUPPORTING THIS EVENT. THE PWI WILL BE FOLLOWING UP WITH INTERESTED MEMBERS OVER THE NEXT MONTH TO CONFIRM THE DETAIL OF FUTURE EVENTS.

Roy Hickman asked the meeting to identify some specific 'older' railway fastening systems (AD, Mills spike, Clyde, Turton Platts clip, Wisclip, and BJB type B) being sought by a railway museum in the Netherlands.

It was agreed that the HRA would provide a regular update on heritage matters for inclusion in the PWI journal. This update can be supplemented by any specific 'focus item' pertinent to any of the Heritage Members railways. The intention to increase both national and local heritage information for PWI Members.

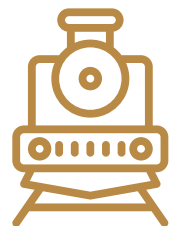
The Chair closed the meeting confirming the next meeting of the PWI Heritage and Industrial Technical Board will be held on 24 September.



OUR CORPORATE MEMBERS



Corporate Members are fully involved in the development of the PWI, 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@thepwi.org)



FULL STEAM AHEAD THIS SUMMER

As I write this, today's temperature is a pleasant 28°C. With summer in full swing, I encourage all our Members to take the opportunity to explore some of the beautiful heritage railways across the UK.

Earlier this year, I travelled from Kent to Teeside to visit some family and, while there, took the opportunity to visit the beautiful countryside in the neighbouring county of Yorkshire.



Image 1: The first sighting of the steam train.

We explored a beautiful area called Causey Arch, and to my delight, through the trees there in the distance I spotted the smoke of a steam train headed towards me, so as inquisitive as I am, I had to take a closer look!



Image 2: Locomotive plate.

Less than half an hour later, my family and I had purchased a full-day ticket and were ready for an adventure. We boarded a stunning heritage train, eager to explore and take in the sights. Admittedly, I was even more excited than my children, but only just!



Image 3: Signage nestled in the woodlands sharing the history of Tanfield Railway.

Inside, the train was a real trip back in time as the pulldown windows reminded me of my own travel as a child, although not quite as far back in the era of such a beautiful steam engine. I pointed out the signage inside the carriage to my children which led to a discussion on if £5 was really a deterrent in this day and age and how the value of money has changed over the years.



Image 4: Original signage inside the carriage.

It would appear that we had stumbled across Tanfield Railway, the world's oldest railway. One of the stations we alighted at was Andrews House, and it really was the most quaint and lovely station. The children enjoyed the giant Jenga blocks, which they decided to use to build a track and a tunnel, I'll make a railway engineer out of them yet! Whilst I got the opportunity to meet some of the dedicated volunteers and staff who support Tanfield Railway and after a conversation about the PWI I'm pleased to say we have now welcomed them onboard as a new Heritage Member.



Image 5: The train was hauled by Sir Cecil A Cochrane, and stopped at a number of rural stations including Andrews House.

I thought my own experience and sharing this with you in the Journal would be a great opportunity to encourage Members to offer support in terms of time, knowledge, or contacts. As with many of our Heritage Members I have spoken with, there is a real need for practical and technical support to help maintain these beautiful tracks and trains.

Collectively, as Members, if we all decided to visit a Heritage Railway this summer at

least once, not only would it be a beautiful day out and an amazing experience, but we'd be supporting and financing the Heritage Railways to continue their excellent work.

To finish our day, we found a cosy little cafe, The Poppy Coffee Pot, located a stone's throw away from where we originally boarded the train at Causey Arch. Run by an ex-Army veteran, this little treasure was the perfect finish to a wonderful day and if you are in the area, I really would recommend you pop along for a visit!

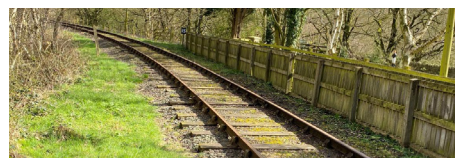


Image 6: Track near Causey Arch.



Image 6: Footway to cross the track.



Image 7: Footpath alongside the track between the carpark and station.



JADE DOVER

MARKETING MANAGER
jade.dover@thepwi.org

INSPIRING THE FUTURE GENERATION OF RAILWAY ENGINEERS



As a Professional Engineering Institution we continue to feel passionately about working together with the wider engineering community to build excitement and interest in careers within railway engineering among the younger generation. We have been actively engaging in a number of initiatives with the support from our Members to showcase the dynamic and rewarding career opportunities within our sector. By promoting railway engineering as a vibrant and essential profession, we aim to attract a diverse and talented workforce that reflects the rich variety of our society. We ask you to join us in our mission to inspire, educate, and support the next generation of railway engineers who will drive innovation and sustainability in transportation.

On the Fast Track: Exploring your future in railway engineering

Later this year on 8 November we are partnering with Sheffield Hallam and Southampton Universities to host a PWI Technical Seminar exclusively for students studying engineering. We hope to demonstrate that the railway sector is a great career path for graduate engineers and we welcome many new student Members into the PWI community!

Call for Nominations: Engineering Role Models

As we gear up for National Engineering Day 2024 on 13 November, we invite all our Members to nominate inspiring engineering role models from within our community. This is a fantastic opportunity to help inspire the next generation of engineers, particularly those from underrepresented groups.

If you know an engineer who can motivate and guide young people toward a career in railway engineering, please submit your nomination by 16 August.

Let's work together to celebrate diversity and inspire future engineers!

Submit your nomination here: <https://raeng.org.uk/national-engineering-day>

Building Stronger Connections with Schools, Colleges, and Universities

We are dedicated to engaging the next generation of engineers, and one impactful way to contribute is by delivering career talks to secondary school students about the benefits of a career in railway engineering. If you are already involved in such initiatives or have considered participating, we would love to hear about your experiences and share them with our broader membership.

Additionally, I would like to make a direct appeal to Members based in Kent or Medway who are willing to deliver a career talk at a local secondary school that has requested our involvement. Your participation could make a significant difference in inspiring future engineers.

If you can help please email marketing@thepwi.org

MEMBER SURVEY REPORT 2024

Over the last few months we have been asking for your participation in the largest Member and non-member Survey that we have ever undertaken. Thank you for everyone who took time to complete the survey and support us in our efforts to engage the wider railway engineering community.

We are pleased with the number of responses that we received which included feedback from **486 Members** and **116 non-members**.

In the coming weeks we will be releasing the full findings in a report which will be available to read on our website.





PROFESSIONAL REGISTRATION

Professional Registration is an important step in pursuing a career in engineering and it lends itself to a ready-made career path, progressing through the grades as your experience broadens and deepens.

Putting those letters after your name (EngTech, IEng or CEng) instantly tells employers, clients and wider society that your competence and understanding of engineering principles has been independently assessed, that you have the knowledge, skills and professional attitude they value, and that you are committed to developing and enhancing your competence. It sets you apart from your non-registered colleagues.

CEng

Chartered Engineers develop solutions to complex engineering problems using new or existing technologies, and through innovation, creativity and technical analysis.

They hold Level 7 (Masters) engineering/technology qualifications and 3-6 years industry experience, OR 10-15 years industry experience.

IEng

Incorporated Engineers maintain and manage applications of current and developing technology, and may undertake engineering design, development, manufacture, construction and operation.

They hold Level 6 (Bachelors) engineering/technology qualifications and 3-5 years industry experience, OR 5-10 years industry experience.

EngTech

Engineering Technicians apply proven techniques and procedures to the solution of practical engineering problems.

They hold Level 3 engineering/technology qualifications and 2-3 years industry experience, OR 3-5 years industry experience.

The right Professional Registration title for you is based on your academic and professional competence.

HERE'S A GENERAL GUIDE...

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 2025 dates are not yet confirmed, they will likely follow the broad timescales.

SUBMISSION DEADLINE

(at least six weeks prior to interview)

5 August 2024	→	16 September 2024
4 November 2024	→	16 December 2024
Late January 2025	→	March 2025
Late April 2025	→	June 2025
Late July 2025	→	September 2025
Late October 2025	→	December 2025

INTERVIEWS IN W/C

(to be held remotely)

16 September 2024
16 December 2024
March 2025
June 2025
September 2025
December 2025

CPD AUDIT 2024

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 2025. Scan the QR code below to see learnings from previous Audits.



DEGREE APPRENTICESHIPS

We're delighted to be working with London South Bank (LSBU) and Sheffield Hallam universities on their Level 6 degree apprenticeship: Rail and Rail Systems Senior Engineer.

The apprenticeship is designed to enable a combined end point assessment (EPA) and professional review interview for Incorporated Engineer, and our trained Reviewers also act as the Independent Assessor on the apprenticeship.

The first cohort from LSBU will be sitting their combined event this summer, and we look forward to supporting them in this final stage of their studies.



Charles Hung
CEng

"AS A CHARTERED ENGINEER WITH THE ISTRUCTE, I WAS EAGER TO FURTHER DEMONSTRATE MY COMMITMENT TO THE RAILWAY INFRASTRUCTURE INDUSTRY. THAT'S WHY I DECIDED TO PURSUE CHARTERSHIP FROM THE PWI.

I BELIEVE THIS ADDITIONAL CREDENTIAL EMPOWERS ME TO TAKE ON MORE STRATEGIC LEADERSHIP ROLES AND MAKE EVEN GREATER CONTRIBUTIONS TO THE ADVANCEMENT OF RAILWAY INFRASTRUCTURE."

WHICH ROUTE WILL YOU TAKE?

ROUTES TO REGISTRATION

TITLE	QUALIFICATIONS					
	NO FORMAL QUALIFICATIONS	LEVEL 3	HNC LEVEL 4	HND / FDENG LEVEL 5	BACHELOR DEGREE LEVEL 6	MASTERS DEGREE LEVEL 7
	✓ + 3-5yrs	✓ + 2-3yrs				
	✓ via Technical Report + 5-10yrs		✓ via Experiential Learning + 5yrs	✓ via PWI Diploma and Supplementary Report + 5yrs	✓ Recognised Qualification + 3-5yrs ✓ Academic Panel Approval + 3-5yrs	
	✓ via Technical Report + 10-15yrs				✓ via Experiential Learning + 5yrs ✓ via MSc + 3-6yrs	✓ Recognised Qualification + 3-6yrs ✓ Academic Panel Approval + 3-6yrs

WILL YOU BE 1 OF OUR 140 BY YEAR-END?

You're probably aware that 2024 is our 140th year, and we've set ourselves the challenge of 140 registrations: a commitment to engineering excellence and increasing standards within the rail industry.

It was always an ambitious target given past performance, and we're thrilled with the high levels of engagement from individuals, and support from our Corporate Members.

At this half way point, we have registered 38 registrations to 30.06.24 / Q1 and Q2 24 in the same period in 2023

Support available to you:

- Sign up to the dedicated Teams channel where you can access a task list, forms and guidance
- Access a dedicated quiet online space available every Friday between 10:00-14:00, joining others who are also focusing on progressing their application
- Join an online drop-in surgery every other Monday between 12:30-13:30, hosted by one of the Registration Team, to ask any questions you may have.

Support available to your team:

Want to support your team through Professional Registration? We can help with Guidance on creating an in-house Accountability Group, and support your Sponsors as they support your team. Get in touch today!

MAKE 2024 THE YEAR YOU BECOME

PROFESSIONALLY REGISTERED



Simon Wu
EngTech

In September 2023 the PWI ran it's first EngTech Accountability Group. Simon was one of the successful applicants who joined the programme and dedicated time over three months to complete his application. We're pleased to announce that in January 2024 Simon was awarded EngTech status!

"I AM ENCOURAGING OTHERS WITHIN MY COMPANY TO UNDERTAKE ENGTech AS A FIRST STEP ON THEIR PROFESSIONAL REGISTRATION JOURNEY AS I HAVE DONE. IT WAS AN ENJOYABLE EXPERIENCE AND I NOW HAVE A BETTER UNDERSTANDING OF THE UK-SPEC COMPETENCES FOR CHARTERED ENGINEER."

GET INVOLVED AND SUPPORT THE CHALLENGE
SCAN TO TAKE PART



RAIL SAFETY WEEK: BUILDING SAFETY TOGETHER

This past month, we proudly supported Rail Safety Week, an industry-wide initiative focused on promoting safety within the rail sector. Rail Safety Week aims to spotlight the importance of rail safety for everyone, from industry professionals to daily commuters. By partnering with a range of organisations, from leading names to small SMEs, the week featured health and safety conferences, site briefings, and school-based safety events across the UK, all dedicated to fostering a culture of safety.

Throughout the week, we actively engaged our Members via social media and highlighted the significance of safety in Professional Registration. Our Registration Manager shared a video explaining the connection between rail safety and the UK-SPEC for Professional Registration, while some of our professionally registered Members reflected on how they integrated safety into their applications. By collaborating and delivering a unified message, Rail Safety Week strives to prevent accidents and fatalities, ensuring a safer rail environment for our people, passengers, and the broader public.



Mark Jackson | CEng MPWI

Mark Jackson, Programme Engineering Manager for Network Rail, achieved CEng status.

He shares how he met the requirements of competence E2 – 'To understand the safety implications of the role and manage, apply, and improve safe systems of work'.

I manage a facility that produces Point Operating Equipment for distribution and use across the UK rail network. The management of Health & Safety within the facility is within my remit and I used some of the examples below to demonstrate my competence in E2.

- Leading on the closure of over 170 actions and recommendations from a Special Instruction Notice 199 (SIN199) audit. This SIN mandated a systematic review of all Network Rail-owned and operated depots, including mine, following a fatality at Eastleigh in 2020. This included making many safety improvements, such as updating

safety controls on plant and equipment, drafting and introduction of new Safe Systems of Work, and a review and update of all Work Activity Risk Assessments.

- Drafting and publishing a Health & Safety Management System for the site, which includes accountabilities & responsibilities amongst the team and details the processes and control measures in place with regard to Health & Safety.
- Holding several safety stand-down tidy days on site.
- Re-mapping of the workshop areas, removing the '7 wastes' (TIMWOODS) from manufacturing processes, resulting in a safer workshop and more efficient working practices.



Mark Howells | IEng MPWI

Mark Howells, Senior Asset Engineer (Drainage) at Network Rail has recently achieved IEng status.

As part of my commitment to maintain and improve safe working practices, I have always held all the essential track safety competencies to allow a deep understanding of current safety protocols and measures that exist to keep both me and my teams safe. Current competencies held include personal track safety (PTS), site warden, controller of site safety (COSS) and safe system of work planner (SSOWP). Holding the above competencies has enabled me to gain a deep understanding of safe working practices for working on the railway and the direct linkages between the Health and Safety at Work Act 1974, the Construction, Design and Management Regulations 2015 and Network Rail standards most critically NR/L2/OHS/019, Issue 10 (Safety of personnel on or near the line).



Paul Coleman | IEng MPWI

Paul Coleman, Senior Engineering Leader at TfL achieved IEng status.

As a Senior Project Engineer, it is a great privilege to be involved in worksites across a broad variety of environments within the London Underground Network. The very nature of the network: its age, the challenging environment and difficult access for maintenance mean that risk management and safe systems of work are always at the forefront of our designs and planning.

For my IEng application, I wanted to make sure that I demonstrated the safety implications of my role and tried to factor the E2 competency into a large proportion of my answers. In my projects, it is vital to understand the knock-on effects that track renewals work can have on the surrounding environment and an aging infrastructure. I included two examples where I was required to liaise heavily with my Bridges and Structures colleagues and work collaboratively on a safe system of work where tunnel and embankment structures were monitored with an emergency preparedness plan in place.

Being able to improve our safe systems of work and contribute to an innovative and safety-conscious Project Team is a really enjoyable part of my day-to-day role.



Stephen Dougan | EngTech MPWI

Stephen Dougan, Drainage & Off-Track Route Engineer for Network Rail, recently achieved EngTech status and excelled at demonstrating Competence E2.

Throughout my railway career, I have always taken my safety, and the safety of others, seriously. Safety is not just when you are on site but also during the planning and review processes after the site visit.

My current and previous roles have enabled me to pass on my safety experience to other members of these teams by discussing past experiences and educating people on how to safely plan access to the rail network and control a site throughout that access.

My current role enables me to bring people from outside the industry onto the railway, which I enjoy greatly as they aren't aware of the risks an operational railway brings. Before my team or I access the live railway, I always ensure we are fully briefed on the safe system and work content. I am never afraid to challenge as everyone has a voice, especially when it comes to safety.

Finally, we have a weekly discussion within the team on all safety matters, which is very open and honest and helps empower the team to become more safety conscious.

LEARNING FROM THE PAST



Thank you to the RSSB for allowing the PWI to share the publication key findings.

Learning from past mistakes is essential for managing safety on Britain's railways. This principle led to the creation of the Rail Safety and Standards Board (RSSB) and the Rail Accident Investigation Branch (RAIB), organisations dedicated to gathering and codifying safety insights to guide future practices. Despite significant improvements in safety management, there is still untapped knowledge within the workforce that could be invaluable if properly captured and utilised.

As the railway industry faces the Great British Railway Transition (GBRT), it is crucial to ensure that corporate memory resources are preserved to maintain and enhance safety practices.

Historically, transitional periods have posed significant risks, as evidenced by incidents like the 1988 Clapham Junction derailment and the 2016 wrong routing in Cardiff. Both were linked to infrastructure upgrades and organisational changes, highlighting the dangers of losing critical knowledge during transitions.

The RAIB's chief inspector emphasised the ease with which lessons can be forgotten, underscoring the importance of maintaining a just and learning culture. As the industry prepares for another major transition, safeguarding corporate memory is vital to proactively manage risks and prevent repeating past mistakes.

To address this challenge, the RSSB offers systems and expertise to help the industry capture and utilise corporate knowledge. An example of this effort is the recent 'lessons learned' exercise documenting the railway's response to the Covid-19 pandemic, resulting in a comprehensive report and a 'Pandemic Playbook'.

Additionally, the Safety Management Intelligence System (SMIS) serves as a national database for health and safety events, providing valuable insights for industry-wide risk management. By leveraging these tools and fostering collaboration through initiatives like the Futures Lab, the railway industry can anticipate and mitigate emerging risks, ensuring a safer and more resilient future.

PRESERVING CORPORATE MEMORY

SPOTLIGHT ON SAFETY: CORPORATE MEMORY— A RESOURCE FOR PROACTIVE RISK MANAGEMENT APRIL 2023

This resource from the RSSB outlines six ways to preserve your corporate memory.



1. KNOWLEDGE TRANSFER PROGRAMMES

Organisations can create knowledge transfer programmes to facilitate the transfer of knowledge from retiring or departing employees to their successors. This can include mentoring programmes, job shadowing, and knowledge sharing sessions.

2. DOCUMENT AND INFORMATION MANAGEMENT

Establishing clear document and information management policies can help ensure that critical information is captured, stored, and easily accessible. This can include creating a centralized document repository, establishing clear naming conventions, and developing document retention and archiving policies.

3. SUCCESSION PLANNING

Developing a robust succession plan can help organisations prepare for the loss of key employees and their institutional knowledge. This can include identifying key roles and individuals, developing training and mentoring programmes to transfer and record knowledge, and creating contingency plans to address unexpected departures.

4. COLLABORATIVE PARTNERSHIPS

Establishing collaborative partnerships with other organisations in the rail industry can help ensure that critical knowledge and expertise are shared across the industry.

This can include participating in industry associations and forums, collaborating on research and development projects, and sharing best practices and insights including the 'codification' of our learned lessons in standards, procedures, risk models and safety management systems

5. CONTINUOUS LEARNING AND DEVELOPMENT

Encouraging continuous learning and development can help employees stay up to date on the latest trends, technologies, and best practices. This can help ensure that the organization remains competitive and can adapt to changing circumstances.

6. DIGITAL TRANSFORMATION

Adopting digital transformation strategies can help organisations better manage their data and information, identify trends and patterns, and make data-driven decisions openly and transparently. This can help ensure that critical knowledge is not lost and can be used to inform future decision-making.

USEFUL RESOURCES



- KEYNOTE ADDRESS: LEARNING FROM CARMONT
- LEARNING FROM CARMONG THE IMPORTANCE OF DRAINAGE ASSET MANAGEMENT
- RAIB RAIL INVESTIGATION IN THE UK
- RAIL ACCIDENT INVESTIGATION BRANCH
- ACCIDENT INVESTIGATION TRACK WORKER SAFETY
- RAIL ACCIDENT INVESTIGATION IN THE UK
- TRACK WORKER SAFETY IN RAIL ACCIDENT INVESTIGATIONS

We are delighted to share that our past CEO, David Packer, has been appointed as the new vice-chair of the Rail Safety Working Party. David brings extensive experience from across the railway industry, including heavy rail, light rail, and metro systems. His tenure at the Permanent Way Institution saw him transform our organisation into a thriving Professional Engineering Institution, earning widespread industry support. In addition to this new role, David currently serves on the Board of the Romney, Hythe and Dymchurch Railway.



David's appointment follows a competitive recruitment process and we are proud to see him join forces with Carolyn Griffiths, Chair of the Working Party and founder of the UK's Rail Accident Investigation Branch. This announcement demonstrates the ongoing commitment from the PWI, our staff (past and present), Members and wider community towards driving standards and keeping rail safety a top priority.

SCAN TO FIND OUT MORE

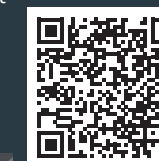


DID YOU KNOW...

The PWI Track Engineering Diploma Course Module 3 is a strategic and delivery oriented module which covers advanced asset management techniques and applications.

Delegates gain a deep understanding of UK track renewal planning, plain line, S&C, existing and future methods, rail renewal scenarios and optioneering and learning from accidents.

So if you want to expand your knowledge and expertise around safety to understand advanced technical rail management issues, rail sustainability and strategic track asset management then the the Track Engineering Diploma could be a great next step for you!



OUR COMMUNITY

TIME TO GET THE PROFESSIONAL RECOGNITION YOU DESERVE?

Book a call with our Professional Registration Team to discuss the next steps to fast track your career.



NEW MEMBERS:

We're honoured to have you on board and are thoroughly looking forward to working with you. Look out for us in your inbox or on your socials. We don't want you to miss a thing! Remember to join our thriving social media network as we'd love to see you get involved! We're here to help, so if you have any questions, then shout out!

Ashford: Paul Bailey, Humzah Ahmad, Dr Robin Coombes - Kent & East Sussex Railway

Bengaluru: Abhishek Srivastav, Chandra Shekhar Kar, Anubhab Dutta

Birmingham: Oliver Higham, Christopher Hejdner, Christian Thomas, Brett Nelson, Yihuan Lin, Lalitphat Khongsomchit, Abayomi Gbaja, Charlie Celmer, Dale Bayliss, Michelle Freestone, Ben Pattison, Joshua Edwards, Conor Moon, Michael Goodwin, Robert Tait, Liam Bent

Cheshire & North Wales: Harry Topping, Jack Blow, Adam McCreddie, Jack Schorah, Peter Neve, Esteban Aguilar

Edinburgh: Cameron McPhee, Parthasarathy Kalamegam

Exeter: Damon Ashall

Glasgow: Andrew Steel, Nichola McParland, Marta Zarantonello, Jeff Wood, Anjana Kizhakkekonil Santhosh, Anu Sidharthan, Eloise Weir, Cameron Steele, Jack Matheson, Euan Stirling, Tess Lincoln, Andy Banks, Kevin Brown, Christopher Millar, Jack Paton, Daniel Doherty

International: Agung Firmansyah, Mohammad Al Rousan, Lorenzo Giannelli, Kamil Zulkepli, Finnbar Hamill, Aung Kyaw Than, Cing San Lian, Lee Chen Choon, Reenad Tasji, Benjamin Zuliani, Judah Kampkes, Michael O'Grady, Cheng Sheng Loong, Ramesh Chandrasekaran, Gherardo Manetti

Irish: Raymond Hoy, Glen Stewart, Lewis Marshall, Marc Craney, Aonghus Mc Ginn, Cathal Mangan

London: Michael Brown, Ian Franklin,

Mohiddin Omar Mohiddin, George Flint, Lemar Whyte, Luke Harrington, Albert Blakeley, Chrysilla Lewies, Ronnie Legg, Abu Iyiola, Richard Jackson, Thomas Jordan-Pearce, Saheb Yousefi, Matthew Appleyard, Yusuf Ali, Ragavan Ratnasothy, Callum Davidson, Lwin Moe Oo, Pann Ei Phyu, Thwe Thwe Aung, Mar Kyaw Yin, Khin Chan Myae Lwin, Cing Kop Niang, Hnin Su Su Maung, Mohamed Elmi Osman, Henry Robinson, Charlie Simmons, Daniel Timson, Michael Walker, Bruno Pankui, Amrutha Ajay, Rhys Lidstone, Darren Evans, Kenny Nguyen, Nikul Vakaria, Rameyaan Selvamohan, James Swift, Saeed Sotoudeh, Richard Smith, Charles Renton, Liam Alexander, Thomas Leatherbarrow, Karmarl Thompson, Mitt Shiyani, Matthew Bellinger, James Ashby, Peter Willats, Emmanuel Isaiah, Muhammad Akram Raja

Manchester & Liverpool: Praise Wellington, Kai Sumner, Shahinoor Shaik, Mark Jackson, Louis Ostle, William Baron, Darren Green, Luke Wade, Adam Furlong, Stuart Park, Mark Banham, Victoria Butler, Thomas Russell, John Glennon

Middle East: Jaden Marshall

Milton Keynes: William Duncan, Susan Taylor, Joshua Pyrah, Monika Wrzesinska, Joseph Marsh, Domantas Dambrauskas, Charlie Burge, Natasha Brazier

North East: Max Riley, Bradley Houlahan, Ryan Murrie, Patthamas Kusonjai, David Watchman – Tanfield Railway

Nottingham & Derby: Ayo Alao-Abiodun, Graham Simpson, Christopher Wall, Christopher Midson, Scott Thayer, Liam Hefford, Ross Greenway, Luke Galland, Howard Blakeley, Gary Vickers, Jack Wagg, Jim Davies, Anish Mathai, Charles Fearn-Wright, Matthew Richardson, Samuel Hurst, Rory Chiverton, Jaydan Thorne

South & West Wales: Douglas Eatherington, Ryan Crandon, Richard Edmonds, Rhys Evans, Charles Evans-Bates, Jose Jimenez Lledo, Ewan Thomson

Thames Valley: Christopher Finch

Wessex: Christopher Ainscow, Giles Phillips,

Sulayman Olalere, Clive Hudson

West of England: Jamie Barrett, Victor Cai, Jose Guillermo Valencia Correa, Ryan Green, Joshua Ong, Anthony Harmes, Samuel Huish-Davies, Joseph Cosgrave - Somerset and Dorset Railway Heritage Trust, Riana Hattrell

Yorkshire: Jack Armitage, Graham Essex, Oliver McIntosh, Levi Wilkes, Michael Beesley, Tim Bruce, Ben Watson, Tayla Franklin, Callum Oldroyd, Richard Nesbitt, Andrew Donaldson, Angus Gatus, Smitha Kurian, Aaron Nowell, Alex Kirk, Chris Daykin, Kevin Ball, Evan Cunningham, Almoatasem Alhashemi, Jack Longfield, Jozsef Taylor, Jessica Hughes

ENGINEERING TECHNICIAN:

Simon Wu, Neil Wightman, James Ransome, Dallas Prodger, Mateusz Krzemien, Louis Ireland, Stephen Dougan, Hannah Thomson, James Todd, Jordan Yates, Jamie Bell, Andrew Donaldson

INCORPORATED ENGINEER:

David Banister (Additional)

CHARTERED ENGINEER:

Richard Marsh, Ching Man Lui, Richard Bond, Dr Matthew Frost (Additional), Peter Veryard (Additional)

PWI S&C REFURBISHMENT:

Paul Granger, Benjamin Newman, Daniel Timson, Jamie Bell, George Budgell, Allan Fitzpatrick, Charles Slavin, Iain McMillan, Ian Moffat, Keir Gillan, Terence Keegans, Richard Bond, Antony Peacock, Mark Leek, Gary Shields, Alistair Grice, John Walsh, Levi Wilkes, Graham Essex, Wioletta Ciszewska, Bujar Grajqevci, Matthew Tungate, Dale Bayliss, Neil Burditt

PWI TRACK ENGINEERING DIPLOMA:

Keir Smith, Gari Mwanda

FELLOWSHIPS:

Les McCormack – Yorkshire, Adam Rapley – Manchester & Liverpool, Michael Andrews – Birmingham, Robert Wilkins – Yorkshire, Richard Tilley – Yorkshire, Cathal Mangan - Irish

THANK YOU...

Phil Kirkland and Lynn Garner who are stepping down as Vice Presidents.

We would also like to say a thank you to Andrew Wilson who is stepping down from the role of South and West Wales Section Secretary.

SECTION UPDATES

The Yorkshire Section has a full programme of hybrid meetings with varied topics and exciting speakers planned for the remainder of the year. York meetings take place on the third Thursday of every month and Leeds meetings are scheduled every second month on the first Tuesday.

Two visits have been arranged see track materials manufacturing facilities nearby this autumn:

Trackwork's concrete sleeper factory in Doncaster, on Thursday 5 September between 16:00 - 18:30.

British Steel rail manufacturing facility in Scunthorpe provisionally on Tuesday 15 October from 15:00 – 18:30.

Please email yorkshire@thepwi.org if you are interested in attending either or both visits. We'll finalise travel plans once we understand the level of interest.

Dear Members, colleagues and friends,

Many of you will know of my decision to stand down this year from the role of Vice President England (North) after several fantastic years. Originally appointed in 2000, then in 2013 and again in 2018 to date, quite a number of years for a role with a supposed 2 year term of office!

It has been a true privilege to serve, something I shall always cherish along with my Honorary Life Membership award. May I therefore sincerely thank you all at both home and abroad for your continued support, friendship and guidance over the many, many years.

My active participation with the North East PWI section will continue as a Committee Member, so you will still see and hear from me!

Remember too, focus on the next generation of PWI Members, and continue to look and learn from all of those splendid railways overseas.

Best regards,
Phil Kirkland



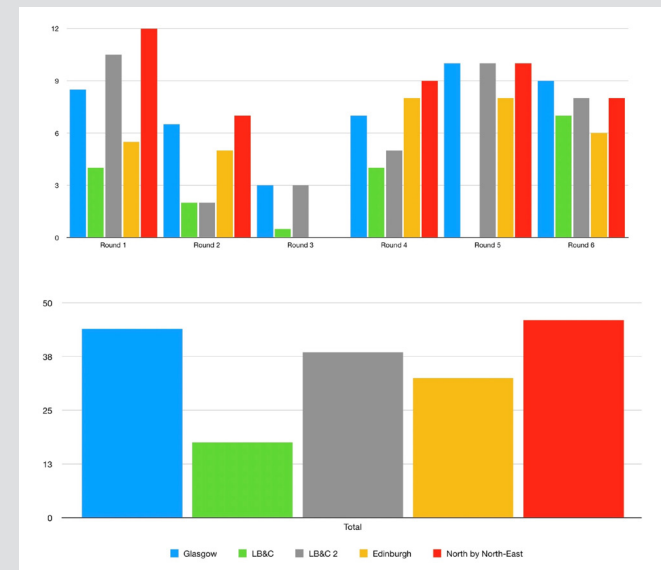
PWI INTER SECTION QUIZ IN CARLISLE

The 2024 PWI Inter Section Quiz took place on the afternoon of Saturday 8th June at the Griffin Hotel in Carlisle with participating section teams from Edinburgh, Glasgow, Lancaster Barrow & Carlisle (official and unofficial) and also a joint 'North by North East' team, which consisted of North East (2), Manchester & Liverpool and London Section Members. The six rounds of questions covered topics including railway general knowledge, technical permanent way knowledge, trackside signs and the PWI itself, and the North by North East team emerged as the narrow winner from Glasgow by 46 points to 44 (from a possible 70), with Edinburgh section coming third and the Lancaster Barrow & Carlisle team fourth (the unofficial team also produced a sound performance).

This year's quiz was organised by Lancaster Barrow & Carlisle section as last year's winners, and the questions were set by the Chairman, Secretary and two section Members. As usual the event offered a good opportunity for Members of the different sections to meet, and an ample buffet was served as part of the proceedings. Many thanks to those Members and visitors who attended what was a very enjoyable social occasion.

The photograph shows Phil Kirkland from the winning North by North East team receiving the Hadrian's Shield from the Lancaster Barrow & Carlisle Section Chairman, John Parker (centre).

Philip Benzie
PWI Lancaster Barrow & Carlisle Section Secretary



OUR OBITUARIES



Tribute to Brian Lucas
September 1950 - February 2024

Chartered Engineer and Fellow of the Permanent Way Institution and former Irish Section Chair passed away peacefully surrounded by his loving family.



Tribute to Jon Jarrett
September 1966 - April 2024

Jon was a Member of the PWI for 33 years, deservedly becoming a Fellow during this time. Jon has been a wonderful friend, colleague and mentor to so many during his career.



The full version can be found on the PWI website.

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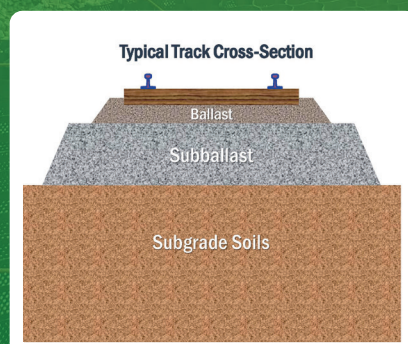
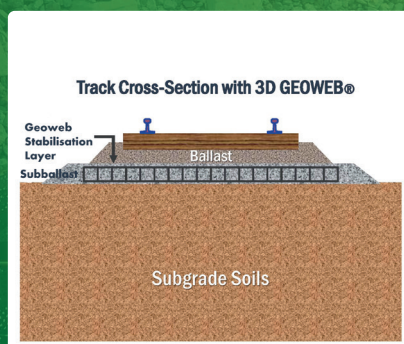
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ED&I COMMITTEE UPDATE

**74% OF ADULTS HAVE
EXPERIENCED STRESS
IN THE PAST YEAR.**

YouGov poll 2018.
The UK's largest study on stress.



ED&I MOMENT

The ED&I Committee meet once a quarter and always start the session with an ED&I Moment. One of the Committee Members presents a key learning to the rest of the group, enabling a discussion and time to reflect. In the last Committee meeting, Mo Safari presented on the topic of stress, and we are pleased to share it with our Members.



TO DOWNLOAD
MO'S FULL
PRESENTATION

STRESS AWARENESS MONTH

In recognition of Stress Awareness Month in the UK, observed every April since 1992, Mo delivered an insightful EDI Moment on stress and its implications. Stress Awareness Month serves as a crucial reminder to address the various aspects of stress and its profound effects on individuals' health and well-being.

Mo highlighted the Mental Health Foundation's 2018 study*, which reported that 74% of UK adults experienced stress during the year of the study.

* Mental Health Foundation. (2018) Stress: Are we coping? London: Mental Health Foundation.

Mo suggested effective stress management strategies, including mindfulness practices, regular physical activities, time management techniques, fostering social connections, and seeking professional help. These methods can be instrumental in alleviating stress and promoting a balanced lifestyle. Utilising workplace resources, such as employee assistance programs, can also provide valuable support.

It was also emphasised that humans are naturally equipped to handle certain levels of stress, and it can be harnessed positively. Stress can act as a motivator, enhancing performance and resilience when managed correctly. However, it is crucial to recognise the tipping point where stress becomes problematic and be proactive in taking measures to manage it effectively.

From a managerial perspective, Kate Hatwell pointed out the discrepancy between what managers and staff may consider acceptable stress levels. Managers must be attuned to their employees' stress signals and strive to create a supportive work environment that acknowledges individual stress thresholds.

Ruth Thomas concluded the discussion by noting that the term 'stress' is typically used when demands cause harm, with consistent and prolonged demands being particularly detrimental. It is essential to differentiate between healthy, motivating stress and harmful, chronic stress to protect both personal well-being and professional productivity.

This discussion underscores the importance of understanding and managing stress to maintain personal well-being and professional productivity. Stress Awareness Month is an opportunity for individuals and organisations to reflect on their stress management practices and commit to creating healthier, more supportive environments.

DEVELOPING A STEM OUTREACH PLAN

Moira Shaftoe from Engineering UK STEM Research also joined the meeting and gave a presentation on the help and support available to the PWI in developing a STEM outreach plan. Engineering UK is a not-for-profit Institution funded by registration fees that aims to inspire the next generation of engineers.

Goal 6 of the PWI Strategy is to have the foundations of a STEM strategy in place.

Moira explained that both financial and non-financial resources are available. Engineering UK manages 'Tomorrow's Engineers Code' on behalf of the Department for Education – 'Inspiring Connection – Driving Inclusion – Showcasing Engineering – Improving Impact'.

The North East Community of Professional Engineers in Tyneside and Tees Valley was founded by a number of organisations with a focus on STEM. Their website links to several available resources.

RECOMMENDATIONS

- Defining a plan and taking a common approach across a network of Members. The EDI STEM strategy should be mapped to a criteria – schools with free school lunches or % ethnic minorities e.g.
- Stakeholder Mapping - Engaging with the Corporate Members network – who are they engaging with for STEM and what are they doing?
- PWI volunteers to attend Engineers UK STEM Fair
- PWI judges for competitions
- Engineering UK can share policies with the PWI EDI Committee
- Building a volunteer network – become a STEM ambassador (Rail ambassador).

ED&I COLLATING DATA

As you may know, this month marks the launch of our new online portal, an exciting milestone for the PWI that promises to enhance the Member experience. When you log in to the portal, you will be able to manage your own personal data and preferences. We encourage you to take time to review and update the information that we hold.

To be a truly inclusive Institution, it is crucial for us to understand the demographics of our membership. This knowledge allows us to better meet our Members' needs, encourage participation from underrepresented groups, and drive positive change within the wider railway engineering industry. By sharing your information, you will be supporting our mission to lead the way in fostering diversity and inclusion.

We want to reassure you that all data collected is treated with the utmost confidence and stored securely to protect your privacy. The Engineering Council requests anonymised data from all Professional Engineering Institutions to monitor and report on ED&I across the engineering sector.

We hope you will feel comfortable contributing to this important initiative, but it is entirely your choice. You have the right to request that any information we hold on you be erased at any time. For more details, please refer to our privacy policy. Your participation is invaluable in helping us create a more inclusive and supportive community.



KATE HATWELL
OPERATIONS DIRECTOR
kate.hatwell@thepwi.org

WHAT'S NEXT FOR YOU?

THE PWI EXISTS PURELY FOR THE WORLD OF RAILWAY ENGINEERING

Dr Brian Counter, along with his team of lecturers, deliver our programme of railway engineering technical education and training.

OUTCOME 1

Have an overview of the context of Off-Track assets and the impact on track and railway infrastructure performance. The assets include cable routes and services around the railway.

OUTCOME 2

Understand good practice asset management associated with Off-Track assets and the benefits of co-ordinated whole infrastructure asset management in the railway environment.

OUTCOME 3

Understand earthworks, embankments, cuttings and the interface with retaining structures and track sub-structure, including their construction, inspection and assessment and maintenance (incorporating repair and renewals).

OUTCOME 4

Have an understanding of the importance of water management around the railway, in particular drainage for optimising the life cycle of the track bed, the track structure and supporting assets. Have knowledge of how to survey, design, install and refurbish new or existing drainage systems efficiently and safely. Understand the significance of local rivers, waterways, ponds and lakes, including the potential environmental impact.

OUTCOME 5

Have a knowledge and understanding of lineside vegetation and the potential effects. Understand good practice vegetation management including modern forestry and woodland management and associated environmental issues.

Our lecturers are experts in their field, having worked as engineers on the railway in a range of roles across the country and even the world!

By attending technical education and training run by the PWI you can be assured that you will gain knowledge, expertise and practical skills to help you develop.

OUTCOME 6

Understand level crossing systems, legal requirements, interface issues including inspection, maintenance, repair and renewal.

OUTCOME 7

Understand the importance of well-managed, good, effective lineside fencing and security including good practice site access arrangements.

OUTCOME 8

Understand the effects that 'Third party' involvement can have for railway infrastructure. Be aware of good practice with respect to reactive and proactive relationships with neighbours and stakeholders.

OUTCOME 9

Understand weather science and data, managing the effects of extreme weather events. Understand the risks and potential effects of climate change.

OUTCOME 10

Be aware of and understand the options available for 'Smart Monitoring' of assets including interpretation and management of asset data.

OUTCOME 11

Understand the importance of effective guidance, legislation and regulation associated with the management of health and safety, the protection of the environment and good practice asset management. Be aware of what guidance and legislation applies with regard to Off-Track assets management.

OUTCOME 12

Review of incidents and case studies associated with Off-Track assets.

EARTHWORKS, DRAINAGE & OFF-TRACK ENGINEERING COURSE

ONE COURSE, ONE WEEK

LEVEL 5 IN-PERSON DERBY

11-15 November 2024

IDEAL FOR: Engineers who want to develop their knowledge, understanding, and insights necessary to manage the risks presented by earthworks, drainage and associated off-track railway infrastructure assets.

PROGRAMME:

- Earthworks, slopes, cuttings and retaining structures
- Drainage systems and water management
- Level crossings and other infrastructure interfaces
- Vegetation and lineside management
- Third Party interfaces
- Good practice asset management.

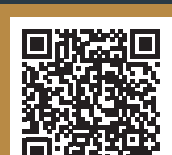
ACHIEVEMENT: PWI Earthworks, Drainage and Off-Track Engineering Certificate

NEXT STEPS: Join the PWI as a Member, undertake Professional Registration or further technical education.



I ENJOYED THE COURSE IMMENSELY AND LEARNT A LOT, THE COURSE SHOULD BE MANDATORY FOR ALL ASSET ENGINEERS! THE INSTRUCTORS WERE EASY TO UNDERSTAND AND KNEW THERE STUFF AS WELL AND IT HELPED ME GAIN A BETTER UNDERSTANDING OF HOW ALL ASSETS INTERLOCK WITH EACH OTHER.

► **Nigel Clements** Drainage Engineer - Western



OUR **EXPERT TUTORS** ALL HAVE RAILWAY INDUSTRY EXPERIENCE

ADVANCED TRACK TECHNICIAN COURSE

ONE COURSE, THREE WEEKS.

LEVEL 4 IN-PERSON DERBY

IDEAL FOR: Newly qualified and experienced engineers who want to gain the knowledge and skills required for all technical staff involved in track maintenance, renewals or project activities on the railway.

ACADEMIC LEVEL: Level 4

DURATION: 120 hours of taught study over three weeks throughout the year

DATES:

MODULE 1: 21-24 October 2024 /

13-16 January 2025

MODULE 2: 9-12 December 2024 /

17-20 March 2025

MODULE 3: 7-10 October 2024

27-30 January 2025 / 28 April-1 May 2025

NEXT STEPS: You will be supported to make a formal application for Professional Registration to be awarded PWI EngTech.

MODULE 1: Track Theory, Practice, Inspection and Surveying

Track types and components, measurement of cross level, twist, cant, track quality, horizontal and vertical design, gauging, Hallade surveying, levelling, inspection of rails and track, rail defect management.

MODULE 2: Advanced Surveying, Design and Switches and Crossings

Design reviews, advanced track surveying techniques, drainage design and surveying, stressing, S&C; types, configurations, components, inspection, adjusting and measuring, tamping and design.

MODULE 3: On-Track Machines, Planning and Technical Site Supervision

Trackwork planning for maintenance and renewals, tamping theory and design, CDM, site supervision of tamping and other maintenance and renewals machinery, quality assurance, report writing.

TRACK ENGINEERING DIPLOMA

MODULE 1

4-7 November 2024 / 3-6 February 2025

9-12 June 2025 / 3-6 November 2025

MODULE 2

30 September-3 October 2024 - Final few spaces remaining

10-13 February 2025 / 12-15 May 2025

29 September-2 October 2025

MODULE 3

16-19 September 2024 Fully booked

9-12 December 2024 Final few spaces remaining

28 April-1 May 2025

15-18 September 2025

8-11 December 2025

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 course books with worked examples to support their learning.

PROGRAMME AIM

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

Upon successful completion of all three modular assessments, candidates are awarded the PWI 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.

TOP-UP QUALIFICATION TO IENG

The PWI Track Engineering Diploma is a form of further learning and, together with a short supplementary report, fills the academic gap to IEng for those with relevant HND or Foundation degree qualifications.

I THOROUGHLY ENJOYED ATTENDING AND COMPLETING THE TRACK ENGINEERING DIPLOMA WITH THE PWI OVER THE THREE MODULES.

THE DEPTH OF KNOWLEDGE AND EXPERIENCE CONVEYED TO US BY THE SPEAKERS WAS SECOND TO NONE. THE COURSE GAVE A COMPREHENSIVE UNDERSTANDING OF WHAT TRACK ENGINEERING IS AND HOW WE CAN APPLY THAT KNOWLEDGE IN

OUR NORMAL DUTIES. ENGAGING IN A VARIETY OF ENGINEERING WORKSTREAMS, FROM MAINTENANCE TO DESIGN TO ASSET, WAS A GREAT LEARNING CURVE, ESPECIALLY TO UNDERSTAND HOW THE TRACK DISCIPLINE INTERFACES WITH OTHER ENGINEERING DISCIPLINES.



► **Thomas Minards**
Assistant Track Maintenance Engineer
Manchester South NW&C Region
Manchester Delivery Unit
Network Rail



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We are a trusted leading rail systems company playing a key role in decarbonising the railway and delivering national critical infrastructure.

ELECTRIFICATION ENGINEERING DIPLOMA

LEVEL 6 IN-PERSON DERBY

100 HOURS TAUGHT STUDY

IDEAL FOR: Newly qualified and experienced engineers who want to develop their knowledge and skills in electrification engineering.

OVERVIEW: Gain an understanding of the principles of the theory and practice of Overhead Line Electrification engineering in the UK. The trainers are all very experienced electrification engineers who have spent their careers designing, constructing, operating and maintaining systems in the UK and abroad. Delegates also receive a technical textbook and comprehensive course materials with worked examples to support their learning.

ACHIEVEMENT: Upon successful completion of three modular assessments, candidates are awarded the PWI Diploma in Electrification Engineering.

DIPLOMA MODULES

Module 1 Systems and maintenance

Gives a knowledge of OLE system types and the interfaces with the pantograph. Understanding the essential interfaces with other rail infrastructure including earthworks, structures and clearances. Knowledge of Inspection, maintenance, servicing and repair processes. Gives an understanding of the concept of the UK rail system, operations, timetables, and legislation.

Module 2 Design

Focuses upon electrification design for projects and enhancements. Understand design categories and processes. Develops skills in design of electrical, mechanical and civil engineering aspects including construction design and bonding design. Includes design case studies and exercises.

Module 3 Advanced asset engineering, construction and renewals

The study becomes more strategic and delivery oriented with advanced asset management techniques and applications. Gain a deep understanding of UK OLE construction and renewal processes including commissioning, OLE system testing and handback to service. Understanding of ethical and sustainability aspects of OLE work and future proofing for climate change.

TOP-UP QUALIFICATION TO IEng

The PWI Electrification Engineering Diploma is a form of further learning and, together with a short supplementary report, fills the academic gap to IEng for those with relevant HND or Foundation degree qualifications.

Module 1 2-5 December 2024 / 19-22 May / 1-4 December 2025

Module 2 20-23 January / 14-17 July 2025

Module 3 21-24 October 2024 Final few spaces remaining
7-10 April / 20-23 October 2025

Module 4 23-26 September 2024

SCAN TO BOOK
YOUR PLACE



I REALLY ENJOYED THE COURSE, ESPECIALLY THE PRACTICAL WAY IN WHICH IT WAS TAUGHT. THE LECTURERS HAD A WEALTH OF EXPERIENCE BUT STILL WELCOMED DISCUSSION AND IDEAS FROM THOSE ATTENDING THE CLASSES.



Graham Lewis
PWI Electrification Engineering Diploma
Project Sponsor (TRU) at Network Rail

3RD/4TH RAIL ELECTRIFICATION COURSE

VENUE: Woburn House, Tavistock Square, London

DATE: 23-26 September 2024

PRICE: £825 (ex VAT)

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.



S&C REFURBISHMENT COURSE

LEVEL 5 IN-PERSON DERBY

14 – 18 October 2024

IDEAL FOR: Engineers who want to gain the knowledge and skills needed to plan and deliver safe and effective S&C refurbishment.

OVERVIEW: Gain the knowledge and skills needed to plan and deliver safe and effective S&C refurbishment. The course will cover both the track assemblies and the trackbed under switches and crossings.

Participants will undertake detailed analysis and inspection of layouts so that they can scope and specify work correctly to provide the necessary life extension of the layout.

The course will then ensure that delegates understand the various maintenance interventions suitable for switches and crossings and its components and can plan those required in the correct sequence.

INCLUDES:

- S&C components design and analysis
- Site survey and measurement
- Scoping and planning
- Practical sessions and a site visit to survey and prepare a plan.

ACHIEVEMENT: Delegates that successfully pass the end of course assessment will be awarded a PWI S&C Refurbishment Certificate.



WOON KHAI JHIN

Manager at SBST Rail | CEng

I am delighted to attend and complete the PWI Switch and Crossing Refurbishment Course, marking a significant milestone in my professional journey. This intensive 5 days program has been a profound exploration into the core of railway infrastructure, deepening my understanding of switch and crossing refurbishment. The course's comprehensive curriculum and hands-on approach have not only expanded my knowledge but also honed my practical skills, enabling me to contribute effectively to the enhancement of rail systems.

Throughout this 5 days course, I embraced the opportunity to be an active participant in advancing the sustainability and reliability of rail transport. The steadfast commitment to professional development has been the driving force behind my journey. I am immensely grateful for the support, challenges, and growth experienced during the PWI Switch and Crossing Refurbishment Course. This accomplishment is not just a personal triumph but a commitment to making a meaningful impact to rail systems in SG.



SCAN TO BOOK
YOUR PLACE



incorporating: **STECH 2024**

"The 10th International Symposium on Speed-up and Sustainable Technology for Railway and Maglev Systems"

1-5 September 2024

Prague, Czech Republic

- *Papers from Industry, Research Organisations, Governments, Research Institutes and Universities*
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For more information please see: <https://www.civil-comp.info/2024/rl/>

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A REALITY

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atkinsrealis.com

UPCOMING SECTION MEETINGS

AUTUMN/WINTER 2024

AUGUST 2024

STREAMS – NETWORK RAIL’S STRATEGIC DRAINAGE AND LINESIDE DECISION-MAKING TOOL

Aug 15
Mona Sihota and friends, Network Rail

HYBRID YORKSHIRE SECTION

SEPTEMBER 2024

DESIGNING A RAILWAY TO ENABLE THE 21ST CENTURY TIMETABLE BETWEEN DEWSBURY AND HUDDERSFIELD

Sept 3 16:00 - 18:00
James Hodge, Director, Hodge Rail Ltd and Design Lead for TRU West of Leeds

HYBRID YORKSHIRE SECTION

OXFORD REMODELLING PROJECT

Sept 11 17:45
Lawrence Walton, DPE Oxford Phase 2

HYBRID THAMES VALLEY SECTION

NORTH-EASTERN RAILWAY ENGINEERS FORUM

Sept 18
Speakers TBC

HYBRID YORKSHIRE SECTION

LINESIDE NEIGHBOURS – BEAVERS AND THE RAILWAY

Sept 18 17:30 - 19:00
James Morrison

HYBRID GLASGOW SECTION

GOOLE SWING BRIDGE – TRANSFORMING A VICTORIAN WONDER

Sept 19
Rob Sellars and Tim George, AmcoGiffen Ltd, James Wright, Network Rail

HYBRID YORKSHIRE SECTION

OCTOBER 2024

PLANNING AND DELIVERING VISION 2025 – 200 YEARS OF THE RAILWAY

Oct 17
Robyn Dodsworth, Vision 2025 Director, & Benedicta Keegan, Railway Logistics Manager, The National Railway Museum

HYBRID YORKSHIRE SECTION

NOVEMBER 2024

BRIDGE 27 RENEWAL

Nov 5
James Barlow, Chief Engineer of Keighley & Worth Valley Railway

HYBRID YORKSHIRE SECTION

PROFESSIONAL REGISTRATION

Nov 20 17:30 - 19:00
Brian Parkinson

HYBRID GLASGOW SECTION

TRACK FROM AN OPERATIONS PERSPECTIVE

Nov 21
Rachel Heath (Head of Ops, NR Wales) and Karen Duffy (Head of Ops, NR N&E Route)

HYBRID YORKSHIRE SECTION

Thames Valley Section are finalising their speaker programme, but be sure to put these dates in your diary: **Oct 2 and Nov 6.**

Please note: This Section meeting information is correct at the time of going to print. Please check up-to-date information on the website, as on occasion topics, speakers, venues, times and dates can change. www.thepwi.org/whats-on/section-meetings. **This is all free CPD.**

DECEMBER 2024

ANNUAL TECHNICAL AND HISTORICAL QUIZ

Dec 3 17:00
Colin Brading and David Brace

IN-PERSON THAMES VALLEY SECTION

LEVENMOUTH PROJECT

Dec 11 17:30 - 19:00
James breckenridge and Chris Doig

HYBRID GLASGOW SECTION

YORKSHIRE SECTION ANNUAL GENERAL MEETING AND CHRISTMAS SOCIAL EVENT

Dec 12

HYBRID YORKSHIRE SECTION

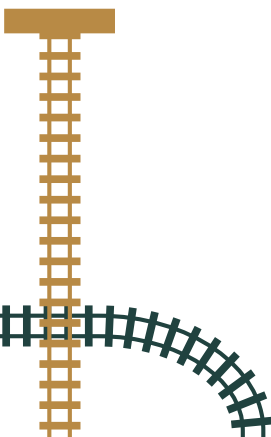
SCAN HERE TO RESERVE YOUR PLACE



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

FREE CPD

COME ALONG TO NETWORK WITH LOCAL ENGINEERS, SHARE GOOD PRACTICE AND LEARN SOMETHING NEW.



SECTION CONTACT DETAILS



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Birmingham Joint Secretaries: Bob Langford and Kate Wilson, Email: birmingham@thepwi.org
Venue: Systra, 5th Floor, Alpha Tower, Crown Plaza, Suffolk Street, Birmingham, B1 1TT
Milton Keynes Acting Secretary: Jaydan Manyan
Email: miltonkeynes@thepwi.org
Venue: Online until further notice
Nottingham & Derby Secretary: John Garlick
Email: nottingham-derby@thepwi.org
Phone: 07532 071727
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Venue: Newcastle College Rail Academy, NE10 0JP
Yorkshire Secretary: Louise Walley
Email: yorkshire@thepwi.org
Venue: Network Rail, George Stephenson House, YO1 6JT / Mallard House, Marshgate Depot, DN1 1QU / Aecom Offices, 2 City Walk, Leeds, LS11 9AR

NORTH WEST ENGLAND & NORTH WALES

Vice President: Rob Cummings
Email: vpnorthwest@thepwi.org
Cheshire & North Wales Secretary: Peter Veryard
Email: cheshire@thepwi.org
Venue: YMCA, 189 Gresty Road, Crewe, CW2 6EL

Lancaster, Barrow & Carlisle Secretary:

Philip Benzie
Email: lbc@thepwi.org
Phone: 01704 896924
Venue: Station Hotel, PR1 8BN / Network Rail, CA28 6AX / Network Rail, CA1 2NP / Network Rail, Warton Road, Carnforth LA5 9ET
Manchester & Liverpool Secretary: Richard Wells
Email: manchester-liverpool@thepwi.org
Phone: 07817 302652
Venue: online until further notice

SCOTLAND

Vice President: Hannah Persson
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Edinburgh Secretary: Mark Taylor
Email: edinburgh@thepwi.org
Phone: 07710 959630
Venue: The Scots Guards Club, EH12 5DR
Glasgow Secretary: Angus MacGregor
Email: glasgow@thepwi.org
Phone: 07775 544509
Venue: WSP Offices, G1 3BX / Arcadis Office, 180 West George Street, G2 2NR

SOUTH CENTRAL ENGLAND

Vice Presidents: Anup Chalisey & Darren Sharp
Email: vpSouthcentral@thepwi.org
London Secretary: Sean Tarrant
Email: london@thepwi.org
Phone: 07764429211
Venue: RSSB, 1 South Place, EC2M 2RB
Thames Valley Secretary: Richard Antliff
Email: thamesvalley@thepwi.org
Phone: 07804 329497
Venue: Network Rail Ltd, Apex Plaza, Forbury Road, Reading, RG1 1AX
Wessex Secretary: Paul Meads
Email: wessex@thepwi.org
Phone: 07919 470293
Venue: Varies, see PWI events calendar

SOUTH EAST ENGLAND

Vice President: Jonathan Bray
Email: vpSoutheast@thepwi.org
Phone: 07976 199011
Ashford Secretary: Colin Burnikell
Email: ashford@thepwi.org
Phone: 07801 913562
Venue: online until further notice
London Secretary: Sean Tarrant
Email: london@thepwi.org
Phone: 07764429211
Venue: RSSB, 1 South Place, EC2M 2RB

SOUTH WEST ENGLAND & SOUTH WALES

Vice President: Andy Franklin
Email: vpSouthwest@thepwi.org
Phone: 07901512293
West of England Secretary: Simon Warren western@thepwi.org
Venue: Engine Room, Atkins, SN1 1DW
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Phone: 07974 809639
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Venue: online until further notice

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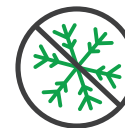
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