

Practical Trackwork Challenge

Churnet Valley Railway

The third Practical Trackwork Challenge (PTC) was held on the Churnet Valley Railway on 9 and 10 October. The practical trackwork challenge consisted of relaying 250 m of track near Leek Brook Station to complete stage 1 of the preservation railway's project to "Reconnect Leek". This first stretch of track was funded by Churnet Valley Railway and Staffordshire Moorlands District Council.

The PTC is essentially a training course that allows people who work in the industry but who have little or no site knowledge to experience working in a live railway environment in a safe and controlled manner. Participants are split into two groups and can undertake all of the tasks involved with track renewals under expert supervision, whilst a plain line track renewal is taking place. The challenge is non-competitive. This year the 40 participants included a site agent, possession planners, resource planners, a PhD qualified geotechnical engineer, a civils supervisor, track designers and a signalling engineer. The participants assembled at the Borough Arms Hotel in Newcastle under Lyme on Tuesday 8 October for a pre-course meal and a detailed briefing of the works to be completed over the next two days.

Any track renewal takes time to plan and to prepare for properly whether that renewal is on a 125 mph mainline or on a 25 mph preservation railway. So, prior to the PTC taking place, PWI representative and experienced railwayman Malcolm Pearce had been hard at work for many months procuring materials, machines and designs. A team from the joint Balfour Beatty Transport for London office based near London Victoria had surveyed and designed the new layout and had set out the works prior to the start of the challenge. Malcolm and another PWI "old hand", Roy Hickman, had spent time with machine operatives and machines supplied by Quattro and TXM Rail plant clearing the site of debris and vegetation and installing messing facilities so that the challenge could go ahead. Of course, the setting out, site set up and all of the other pre-challenge work could not have happened without the great support provided by the Churnet Valley Railway's band of volunteers.

On day one the participants gathered on site at 09:00 for a detailed safety briefing. The first group were then shown the principle of two-dimensional ("2d") installation using a balanced laser, ably demonstrated and explained by Balfour Beatty Engineer, Jonathon Wright.

AUTHOR



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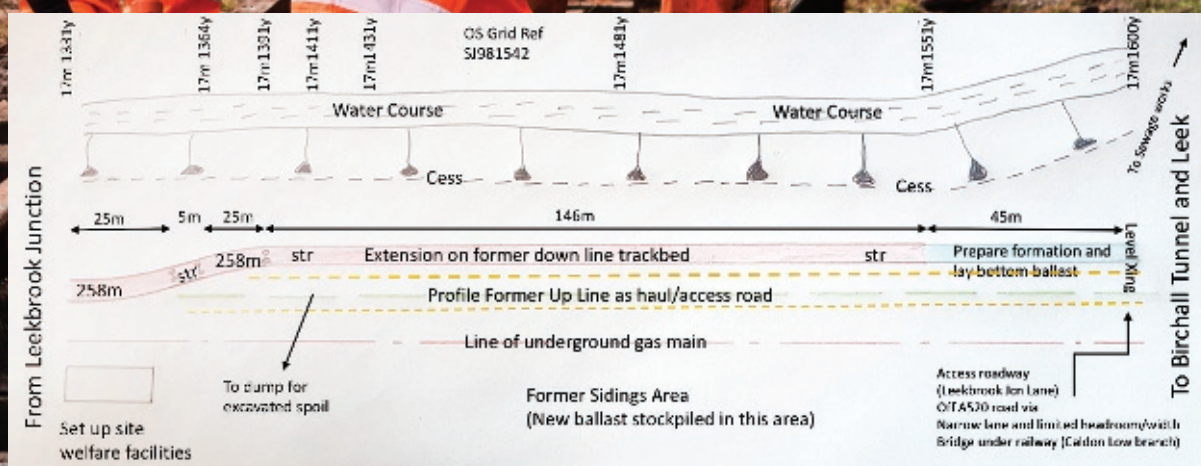
Andy has 35 years' experience of surveying, design, renewal and maintenance of the Permanent Way. He has worked for British Rail, GTRM / Carillion, Owen Williams and Amey. Andy has worked mainly on the British mainline network but he has also had brief experience working on the Underground for Tubelines whilst with Amey and for NIR on secondment from British Rail.





This was an incredible opportunity to be hands-on and experience the physicality involved in renewing a railway.

DELEGATE
FEEDBACK





Jonathon also demonstrated how the receivers to the balanced laser are set up on the blade of the dozer. Following this explanation, the dozer set to work trimming the formation to the correct gradient and installing a cross fall of 1 in 40 into the cess under the new track alignment.

Whilst the first group were being shown how to trim the formation and cut a cross fall, the second group were learning about small tools and powered plant under the direction of Jon Winborne of Cleshars. Jon is a qualified trainer and he enthusiastically demonstrated the small powered tools including the impact wrench, disc cutter, auger and rail drill as well as encouraging our challenge participants to handle them and start them up. Jon concentrated on how to handle all of the tools safely. He also demonstrated the numerous hand tools that everybody would use later in the challenge, such as the jacks, sleeper nips, bars, keying hammers and of course that most ubiquitous of all plate layers tools, the good old shovel. The information gained from this briefing would prove to be invaluable for our participants later in the challenge.

The site was now ready to drop the bottom ballast. Jonathon Wright and James Field of Balfour Beatty had shown the groups how to mark up the edge of the ballast from taking offsets to the setting out pegs and the edges of the track bed had been marked out in paint. The dumpers then placed the bottom ballast and the dozers graded it level and to a depth of 150 mm. All the participants were able to gain hands on experience of checking the ballast depth and setting up the balanced laser to the design gradient.

As described previously there were several machines on the site; 360 diggers loading ballast into dumpers and a dozer to grade both the ballast and formation. The safety briefing in the morning by Owen Stratford of Balfour Beatty had explained the principles of exclusion zones around machines and also explained the duties of the crane controller. However, a session was set up where a crane controller explained to the groups exactly what his role was, the general principles of what they were trying to do and the purpose of the crane plan. The participants were each given the opportunity to sit in the cab of a RRV 360, watch the operator rotate the machine and were made aware of the blind spots, the areas where the machine operator cannot see an operative on the ground.

After lunch our groups started to prepare the existing track ready to attach the new track panels. This session was led by track supervisor Steven Day-Murphy of Balfour Beatty who is attached to the Central Track Alliance. Steven set about organising our participants with gusto. Our groups trimmed the rail ends with the disc cutter and learned how to square across the cut at 90 degrees by taping out a 3,4,5 triangle. Two new sleepers with baseplates were installed at the end of this existing panel, which involved digging away some very old and very compacted ballast indeed. Steven's vocal encouragement urging the group to bend their backs certainly helped the job to be completed in a timely manner, or something like that anyway!! Steven then demonstrated how to remove that stubborn ballast and achieved more in ten seconds than our group achieved in ten minutes. I think our groups learned just how much physical effort is needed during a renewal. Steven showed them what he had already told them.





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The event felt realistic, rather than staged in a safe environment, and allowed me to see in real time the considered response to uncontrolled changes.

DELEGATE FEEDBACK



The operations were explained in a civil manner without undue haste, which provided an ideal environment for understanding and to ask questions.

DELEGATE FEEDBACK



Under the supervision of Jon Wimborne, the groups used the impact wrench to change some broken baseplates on the existing panel. They learned how to jack the rail, replace keys to the bull head chairs and the purpose of the bolts and ferrules. It was great to see our groups gel into teams and all were enthusiastic in their participation.

The author of this piece has worked on the railway for over 35 years and has no experience of a bullhead renewal at all, so at the end of day one, I talked to the site engineers, Owen Stratford and Jonathon Wright as I was impressed with their knowledge of the bullhead componentry that we were installing. For example, the baseplates were all dated 1951 and both Jonathon and Owen knew about the seat depth and the jaw lipping on certain plates. I asked them if their knowledge was due to working on the London Underground where bullhead use is more prevalent than in the national rail network. Owen works on a preservation railway in Norfolk in his spare time and Jonathon too works on preservation railways in the South East keeping the skills alive.

Day two began with another good safety brief from Owen Stratford which like all the briefings was interactive. He asked some good questions of the group; where the safe walking route to site was, where the muster point was should we need to evacuate the site and also the importance of wearing gloves and the need to be aware of trapping fingers in the tasks that were to be completed that day.

Malcolm Pearce started the day by propelling an engineering train onto the site loaded with track panels, loose rails and other materials including

keys, baseplates and ferrules. Once on the site the groups were able to observe a tandem lift made by two of our machines to lift the panels off the train and place them onto the new bottom ballast. James Field positioned all of the panels from his offset pegs. The groups then had the opportunity to install the fishplates between the panels.

Jonathon Graham from the Rail Accident and Incident Branch (RAIB) delivered a very interesting, informative and interactive session on the work that the RAIB conduct and went through some of the reasons how and why trains de-rail from the track. Jonathon stated that the British railway network was one of the safest in the world and was the second safest in Europe after Luxembourg, and of course we have many more miles of track than the Grand Duchy. He expanded on the reasons why trains de-rail with his groups and explained that trains are far more likely to de-rail within switches and crossings (S&C) than in plain line. He went into some detail on the highest risk area of all, that is when a train passes over a switch in the facing direction.

Jonathon then discussed the process and demonstrated the gauges used in facing point inspections, known throughout Network Rail (NR) as "S053". For a train to de-rail it is necessary for a train wheel to lift off the rail, but it is also necessary for that train wheel to shift across the rail. He stated that where track geometry transitions from straight to curved there is often a kick of high cant deficiency which will make a train naturally lurch to the outside of a curve. He then explained to the group the principle of twist with an analogy about a wobbly table in a restaurant.

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It was brilliant to be able to use tools and be in an environment where you had time to ask as many questions as possible, but it was also good to have a bit of pressure on the second day to appreciate the situation of needing to hand back after a possession.

It was invaluable to meet people with a huge range of experience and knowledge. Leading experts of the industry took a lot of time and effort to train us. It was great to know that they are willing to share their knowledge.

Thank you.

**DELEGATE
FEEDBACK**

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I found the event to be very useful for my professional development and I met some great people!

The comradery and willingness to share knowledge was appreciated.

DELEGATE FEEDBACK





Twist is a difference in cant measured over 3 metres or a train bogie length and will cause a wheel to lift from the rail if the cant difference is large enough. These two factors, twist and high cant deficiency, combined with high friction will cause a derailment anywhere in plain line or S&C, but is more likely at facing points. He described the principle of flange climb at the switch tips and showed the group on site the difference between straight cut and undercut switches. Jonathon described chamfered switches which are the current standard for switches used in the mainline network. He explained that by lubricating the first metre of a facing point, rail friction can be substantially reduced. By utilising a gauge which mimics a wheel set, Jonathon accurately described to the group how flange climb can happen if the switch rail is offset just 4 mm foul of the stock rail. He demonstrated the red and green lines on a standard track gauge as a go/no go gauge for points of contact to the running faces of the rails.

Jonathon explained the purpose of stretcher bars and talked about the example of the accident at Grayrigg where lack of maintenance to the stretcher bars caused the train to leave the track and where sadly a female passenger was killed.

The session went on to discuss removing track workers from the presence of trains particularly when patrolling. Jonathon described the plain line pattern recognition system (PLPR) used on NR's track recording trains, where photographs are taken at each sleeper recording differences from the expected shape caused by conditions such as missing rail fastenings.

These differences are noted and flagged to the track maintenance engineer who can rectify then in first available white period.

The dumpers then unloaded more ballast onto the new track. Steven Day Murphy then organised a machine fitted with a ballast plough to profile the ballast. The purpose of the plough is to create a ballast shoulder and to remove excess ballast from the sleepers. The plough is an attachment that fits onto the end of an arm on one of the RRV360 machines. This process was only partially successful as the plough is designed to fit onto flat bottomed rail and concrete sleepers not bullhead rail, chairs and wooden sleepers. It was absolutely great to see all of our participants pick up shovels and start removing the ballast from the chairs and sleepers in readiness for the tamper. Steven most certainly didn't need to use any vocal encouragement at this point.

The engineering train had returned to the depot and the tamper was brought to the site. The tamper is owned by the Churnet Valley Railway and for the benefit of the tamper enthusiasts out there (of which there are many in the PWI) is an old 07 machine previously owned by Jarvis and Centrac (Tarmac).

The tamper finished its pass of the track just after 3 o'clock on Thursday afternoon and with that the challenge was complete. Our teams had completed a 250 m plain line renewal in two day shifts and learned lots of new skills. PWI CEO Stephen Barber closed the challenge by presenting certificates to all 23 participants. It should be noted that more than a quarter of the students were female and whilst as an industry



The most enjoyable aspect of the event was the opportunity to observe track laying by professional contractors at close quarters, using present-day methods and machinery.

DELEGATE FEEDBACK





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The RAIB presentation on derailment was first class.

DELEGATE
FEEDBACK

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PWI CEO Stephen Barber closed the challenge by presenting certificates to all 23 participants.

It should be noted that more than a quarter of the students were female and whilst as an industry we are far from parity between the sexes, it is refreshing to see a proper balance beginning to happen at long last.

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We are very grateful to Churnet Valley Railway for hosting this year, and to the many companies who gave their time, resources and staff.

Thank you.

ALL AT THE PWI

TXM Plant

RAIB
Rail Association of Ireland

ORR
Office of Rail and Road

CLESHAR

SNC-LAVALIN

Stobart Rail

QUATTRO

VolkerRail

COSTAIN

Transport for London

Balfour Beatty

JACOBS

NetworkRail

SB RAIL
Swietelsky Babcock Rail

Shannon Rail

AECOM

STORY

CHURNET VALLEY RAILWAY



we are far from parity between the sexes, it is refreshing to see a proper balance beginning to happen at long last.

The PWI Practical Trackwork Challenge is a carefully curated learning experience that would not be possible without the support of our industry friends.

We are very grateful to Churnet Valley Railway for hosting this year, and to the many companies who gave their time, resources and staff, including TXM Plant, Quattro Plant, Cleshar, TFL, Network Rail, AECOM, RAIB, VolkerRail, SNC Lavalin, Balfour Beatty, Swietelsky Babcock Rail, Story Contracting, ORR, Costain, Stobart Rail, Jacobs and Shannon Rail.

We would also like to extend a special thanks to Roy Hickman and PWI Honorary Life Member Malcolm Pearce whose commitment to delivering a comprehensive, safe and efficient challenge was immense.

Last but not least, thank you to all the young professionals who participated. We hope that you enjoyed the experience and we look forward to seeing you out and about on track again soon!

Finally, we are already planning our next Practical Trackwork Challenge which will take place in the Autumn of 2020. If you would like to enquire about being involved in next year's challenge, either as a potential host or supporting company, please contact kate.hatwell@thepwi.org



Setting up 2D laser - basic principles by James Field



New track formation and haul road prepared



Track alignment and longitudinal level pegs set by TfL survey & design team



OTP D41 laser guided dozer preparing ballast bed



Prepared ballast bed ready for track laying



Prepared ballast bed ready for track laying



Individual appreciation of OTP operational and safety regime by TBM OTP supervisor



Appreciation of SPP operation and use of hand tools by Cleshar supervisor / trainer



Manual sleeper threading by team members



Materials train on newly laid track



Hydrema dumper unloading trackbed ballast



Cleshar operative using rail saw



Tightening fishbolts manually



Team carrying chaired sleeper to position



Tightening fish bolts utilising an impact wrench, supervised by Cleshar trainer



Teams distributing and boxing in ballast manually



Materials train approaching site



OTP with fork attachment preparing to unload sleepers from wagon in groups of four



Hydrema dumper unloading trackbed ballast



Team members manually packing run in sleepers prior to passage of materials train



OTP in tandem for lifting, carrying and placing 18.3 m track panels



OTP in tandem for lifting, carrying and placing 18.3 m track panels



Teams manually fine aligning track



Materials train on site; wagon conveying chaired sleepers in groups of four



OTP in tandem placing 18.3 m track panel to design position



Hydrema dumper side tipping boxing in ballast



RRV with ballast profiling tool attached



Tamper setting up for work



Tamping and lining newly laid track



OTM tamping and lining newly laid track





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TECHNICAL ARTICLE

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