

INFORMED SOURCES e-Preview October 2022

The railway had an embarrassing shutdown in the July heat wave, so this month's column provides a guide to how the expansion of rails in hot weather is managed – or should be managed. A related item reports on Network Rail's reaction to the crisis. I also analyse the remaining ex-British Rail rolling stock fleets in service and consider their future roles.

Heat Wave melt-down - Continuous Welded Rail demystified

Heat-wave 'Task Force' side-lines engineers

BR stock – still in demand.

DfT funds new train-operator association lobby group

Over a century of traditional track based on 60ft lengths of rail bolted together with fishplates has left an enduring folk memory, not least the knowledge that gaps had to be provided between adjacent lengths of rail to allow for thermal expansion. Today, people still ask how the expansion of Continuous Welded Rail (CWR) on a hot day is accommodated. To which the answer is, 'it isn't allowed to expand'.

On the UK Network CWR is clamped to concrete sleepers by steel track clips. Below this, the heavy concrete sleepers rest on a deep bed of ballast. In addition to the friction between the bottom of the sleeper and the ballast, additional longitudinal and lateral resistance to movement is provided by the depth of ballast at the ends (shoulder) and sides of the sleeper.

This rigid structure means that when the temperature increases, the rail cannot move longitudinally, creating compressive stress in the rail, trying to push the sleepers apart. When it gets colder, the rail contracts, creating a tensile (pulling) stress.

While the focus is on the compressive stress caused by the rail expanding, which can cause the track to buckle, the civil engineer is equally concerned by what happens when the temperature drops. Cold rails under tensile stress are vulnerably to breaking, particularly if a train with a wheel-flat passes over it.

So the challenge with CWR is managing the stress in the rail across the range of temperatures encountered on the UK network. In the article I explain the concept of the Stress Free Temperature, the temperature at which there is no stress in the rail and how this is achieved when laying CWR.

As the temperature rises, the importance of the resistance provided by the ballast increases. After CWR has been laid, the passage of traffic consolidates the ballast, giving the maximum resistance to movement.

Tamping the ballast, reduces the resistance until more traffic has passed to restore the lost resistance. With so many variables involved, and I have not mentioned the effect of the vibration from passing trains on the interface between sleepers and ballast, you might think that civil engineers faced a difficult task in reacting to the record temperatures experienced in July.

Not so. The answer is to calculate what is known as the 'Critical Rail Temperature' (CRT). The CRT is the temperature to which rail can reach, before Network Rail company standards dictate that actions are needed to protect traffic from potential buckling.

The generally accepted rail temperature before buckling becomes a potential risk is 53 degrees C. In fact, that is on the conservative side. Network Rail's company standard gives 59 degrees C as the CRT for CWR under ideal conditions.

Of course, as already mentioned, tamping reduces the resistance of the sleepers and thus the CRT, and I have a Table showing this.

But CRT is not a safe/unsafe indicator. Rather it is an escalation of risk, each step requiring an increased level of precautions, ranging from monitoring to Temporary Speed Restrictions.

In the case of High Speed 1 (HS1) the infrastructure operators evaluated the risks of continuing to run at the 300km/h linespeed ahead of the predicted record temperature. While after 20 years some loss of stress in the rail was assumed, with correctly ballasted track the (CRT) was assessed at 55 degrees C. The highest rail temperature recorded was 54 degrees C and services ran normally at line speed.

Which raises the question of why it was considered necessary to close the East Coast Main Line during the hottest part of the hottest day when Britain's fastest line remained operational?

'Task Force' for well understood technology

British Rail introduced its first Continuous Welded Rail (CWR) in 1958. The concept soon became the standard, replacing jointed track on timber sleeper.

Today's CWR is the result of nearly 65 years of constant development by track equipment manufacturers. It was a fundamental topic for British Rail Research, of blessed memory, not to mention other national and international railway research centres.

In short, today's British railway civil engineers should know pretty much all there is to know about the application, performance and maintenance of CWR. Yet, the day after the service disruption caused by unprecedented high temperatures, Network Rail announced the launch of a new taskforce 'led by independent experts to investigate and make recommendations on how the railway can develop its approach to resilience during hot weather.'

According to Network Rail, task force members' considerable experience in their fields both in the UK and across the world will arm us with the guidance we need to make our railway resilient in the face of climate change for generations to come'. The inference was clear: the task force members know more than engineers with over 60 years' experience of CWR.

In fact, only two of the four task force members are actually concerned with the track itself. In the article I review their relevant experience.

And what worries me is that the appointment of the Task Force implies a loss of confidence by Network Rail management in its engineers. This actual, or perceived, loss of expertise since privatisation is something I have been considering for some time. The Williams-Shapps Plan makes no reference to the organisation of engineering within Great British Railways. I will return to this in a future column.

BR stock keeps on rolling.

This coming November sees the 27th anniversary of the disposal of the British Rail passenger fleet through the sale of the three Rolling Stock Companies (ROSCOs). Between them they acquired around 11,000 vehicles, the oldest dating from nearly 20 years earlier.

Having concentrated on the newest train fleets' trials and tribulations in recent issues, I thought it would be interesting to see what had happened those original fleets.

Well, 30% of the vehicles remain in service. And while around 800 vehicles are scheduled for imminent withdrawal, the combined impact of the Pandemic on the passenger operators' finances, plus the policy hiatus associated with the transition to Great British Railways, means that replacement of the remainder is, at best, uncertain.

Perversely, given the pressure to decarbonise the railway, most of the ex-BR fleets facing an early visit to the scrapyard are Electric Multiple Units. Similarly, the survivors are dominated by the 1980s Sprinter and Super Sprinter DMUs.

As you might expect I provide numerous tables, plus an analysis of the prospects for the largest fleets remaining in service. Scotland has a coherent programme as part of its decarbonisation programme. South Eastern is working up a plan for its Networkers and Northern has a lot of DMUs.

When it comes to acquiring replacements, I issue word of caution. It looks as though the era of cheap trains and cheap money, which fuelled the current new fleets, is ending. Future new trains could be significantly more expensive to lease, while hydrogen and battery powered units will be even more costly.

Researching the 'noughties' in my review of Modern Railways' six decades has brought home how privatisation has hamstrung the railway. When it comes to traction and rolling stock, the contractual relationships between lessors and train operators have hindered the creation of the national cascade strategy we now need.

Finding homes for cross industry support.

Back in 2011 Sir Roy McNulty's 'Rail value for money study' recommended the formation of a Rail Delivery Group (RDG) to provide top-level direction, drawing on the most senior people' from Network Rail, the passenger and freight operating companies and other stakeholders. In 2017 this RDG (Mk1) was reversed into the Associations of Train Operating Companies (ATOC), becoming the RDG Mk2. In fact the RDG branding was a vinyl, as the organisation's legal name is still ATOC Limited.

Formed at privatisations, ATOC had managed a range of central services, such as National Rail Enquiries and Railcards. As RDG Mk2 it also took over four strategic Boards from RDG Mk 1.

Within the Boards are various Groups and Councils. Clearly, the ATOC functions within RDG should transfer seamlessly to Great British Railways in due course. But the future of the various Boards is less clear.

In July it was announced that Rail Partners (RP), a new trade body for private sector rail freight and passenger companies, had been spun out of RDG. Its aim is to advocate the private sector owning groups' continuing role when GBR takes over.

So, a straightforward member-funded, pro-private sector rail lobbying organisation. Can't object to that. But then, it emerged that DfT was making up to £2.2 million available to Rail Partners over two financial years.

What was going on? DfT explained that the funding is intended to support the continuation of 'a small number of industry forums up to 2024'. DfT added that it will 'monitor the costs of these activities and ensure public funding is not used for

any lobbying or advocacy purposes’.

The DfT sponsored activities will be the responsibility of a separate Rail Partners’ Operator Services Division headed by Director Mark Gaynor. It will be responsible for continuing the work of RDG’S Engineering Council and Operations Council, both retitled as Executives.

The reason for the move is the continuing need to provide forums where the various sectors of the industry can meet on neutral territory and talk freely, a ‘safe-space’, as Rail Partners puts it. Transferring over from RDG are Neil Ovenden for Engineering and Phil Barratt for Operations.

These changes are not a big issue in the scheme of things. But they highlight yet another of the known unknowns which have characterised the Williams—Shapps Plan. Although how long that title will survive with Mr Shapps’ return to the backbenches is questionable.

Meanwhile the list of Bills going before parliament in the new session could be worth close study.

Roger’s Blog

September got off to a good start with this week’s Waterfront conference on decarbonisation. Even by Waterfront’s standards, this was an exceptionally timely and informative event, as readers should find out when the November Modern Railways is published.

Meanwhile the change in Government, with a new team of ministers at Transport, adds to the overall state of uncertainty and drift. The uncertainty includes what happens when the wage dispute resumes, following the truce on industrial action during the period of public mourning and the funeral for her late Majesty.

Meanwhile, there has been no let-up in the steady flow of documentation from the various parts of the industry. I really must produce an update on the Office of Rail & Road’s Periodic Review of Network Rail’s income for the five year control period starting on 1 April 2024.

Then I have just received the draft of Version 7 of Key Train Requirements. Its 297 pages tell manufacturers and procurers what to look out for when designing, specifying and buying trains for the UK market. Whether anyone takes any notice is another matter, judging by recent deliveries.

Another ‘must do’, given Abellio’s retreat from the UK market and the operational problems at Avanti West Coast and TPE, is an update on the status of the train operating companies, with some consideration of their future prospects, if and when GBR happens.

TMR for 2023

A permanent feature of the ‘ready to use’ reference shelf above my desk, is Modern Railways’ annual directory ‘The Modern Railway’. The good news for those who, like me, find it a handy source of information on everything UK railway, is that the 2023 edition is on the stocks.

I have been fortunate to write all the introductions, looking ahead to the coming year, since the first edition in 2008. It has now become a tradition that the headline sums up the year ahead in one word. Last year’s heading was ‘2022 – year of waiting’.

Some years’ headlines have taken much head scratching. But for 2023 it took only a couple of days for the Editor and me to settle on ‘le mot just’.

So a busy period of researching and writing ahead, with the main attraction being the Rail Freight Group conference at the start of October.

Roger