

Overspeeding incidents at Wood Green, and Melton Lane level crossing, 11 and 12 June 2023

Important safety messages

These incidents demonstrate the importance of:

- designers of speed restrictions being aware of the location and status of existing restrictions which may interact with new designs
- staff installing speed restrictions not using equipment that had been previously installed, where this does not meet with the requirements of a new design
- having adequate numbers of competent staff available to ensure that speed restrictions are correctly designed, reviewed and installed
- the rail industry considering the conclusions and recommendations arising from RSSB research project T1251 'Review of technological interventions to mitigate train over-speeding risk'.

Summary of the incidents

On 11 June 2023, a 20 mph (32 km/h) emergency speed restriction (ESR) was imposed from 05:20 hrs on the Down Fast line at Wood Green, near Alexandra Palace station in north London. A parallel ESR was imposed on the Down Slow line. These ESRs had been imposed due to forecast hot weather and the expectation that critical rail temperatures would be exceeded later in the day, increasing the risk of track buckling.

By the end of 11 June, at least four passenger trains had exceeded the 20 mph (32 km/h) ESR on the Down Fast line:

- a. At 10:11 hrs, train 1D09, the 10:07 hrs London North Eastern Railway (LNER) service from London King's Cross to Leeds, passed through the 20 mph ESR at 89 mph (143 km/h).
- b. At 14:43 hrs, train 1B86, the 14:36 hrs LNER service from London King's Cross to Lincoln Central, passed through the 20 mph ESR at 40 mph (64 km/h).

- c. At 19:04 hrs, train 1P86, the 18:56 hrs Govia Thameslink Railway (GTR) service from London King's Cross to Peterborough, passed through the 20 mph ESR at 94 mph (151 km/h).
- d. At 22:11 hrs, train 1N36, the 22:05 hrs LNER service from London King's Cross to York, passed through the 20 mph ESR at 86 mph (138 km/h).

On 12 June 2023, a 20 mph (32 km/h) ESR was imposed from about 12:00 hrs at Melton Lane level crossing, between Brough and Ferriby stations in East Yorkshire, due to forecast hot weather.

Before the ESR was withdrawn at 19:15 hrs on the same day, at least one passenger train had exceeded the 20 mph (32 km/h) speed limit. At 15:47 hrs, train 2R99, the 14:43 hrs Northern service from York to Bridlington, passed through the 20 mph ESR at 65 mph (105 km/h).

There were no adverse outcomes from any of these overspeeding incidents.

Cause of the incidents

These overspeeding incidents occurred because the drivers of the trains involved did not realise that the ESRs applied to their trains. This was because equipment already installed on the track which related to earlier speed restrictions had been adapted to warn drivers about these ESRs.

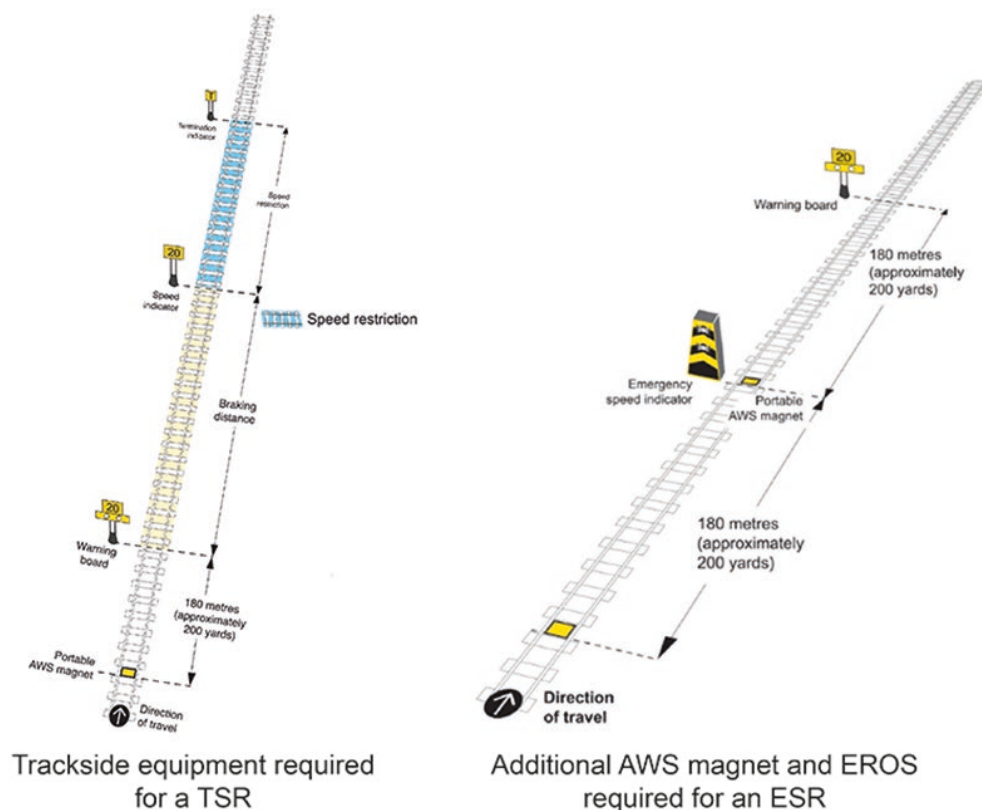
ESRs are applied in hot weather by Network Rail in accordance with its company standard NR/L2/TRK/001/mod14, 'Managing track in hot weather'. Issue 7 of the standard, dated 6 March 2021, specified three levels of critical rail temperature (CRT), each with an associated action to mitigate the risk from track buckling (in order of increasing probability of track buckling):

- CRT(W): the temperature at which a person is deployed to monitor the track concerned
- CRT(30/60): the temperature at which speed restrictions of 30 mph and 60 mph (48 km/h and 97 km/h) are imposed for freight and passenger trains respectively
- CRT(20): the temperature at which a 20 mph (32 km/h) speed restriction is applied for all trains.

Issue 8 of NR/L2/TRK/001/mod14 was released on 3 June 2023 (eight days before the incidents on 11 June) but the associated changes to the standard were not relevant to the ESRs imposed at Wood Green on 11 June and Melton Lane on 12 June.

The railway Rule Book (GERT8000-SP ‘Speeds’, issue 6, which came into force in December 2021) describes the equipment provided for temporary speed restrictions (TSRs) and ESRs. Both types of speed restriction involve the erection of trackside equipment to provide information to train drivers, including a portable automatic warning system (AWS) magnet, a warning board, a speed indicator (commencement board, showing the start of the speed restriction) and termination board (showing the end of the speed restriction). Additional signage is provided where there is a diverging route, to clarify to train drivers which line(s) the speed restriction(s) apply to.

As TSRs are planned speed restrictions, their details must have been published in the relevant Weekly Operating Notice (WON) that is issued to train drivers. The urgent nature of ESRs means that there may not be sufficient time to publish their details in the WON, and so they require further trackside equipment to warn drivers of their presence. This consists of an additional portable AWS magnet followed by an emergency restriction of speed (EROS) indicator. Where there has not been time to install this additional equipment, GERT8000-SP requires signallers to stop each train that will travel over the ESR to tell the driver the location of the ESR, and the speed limit imposed (known as ‘cautioning’ trains).

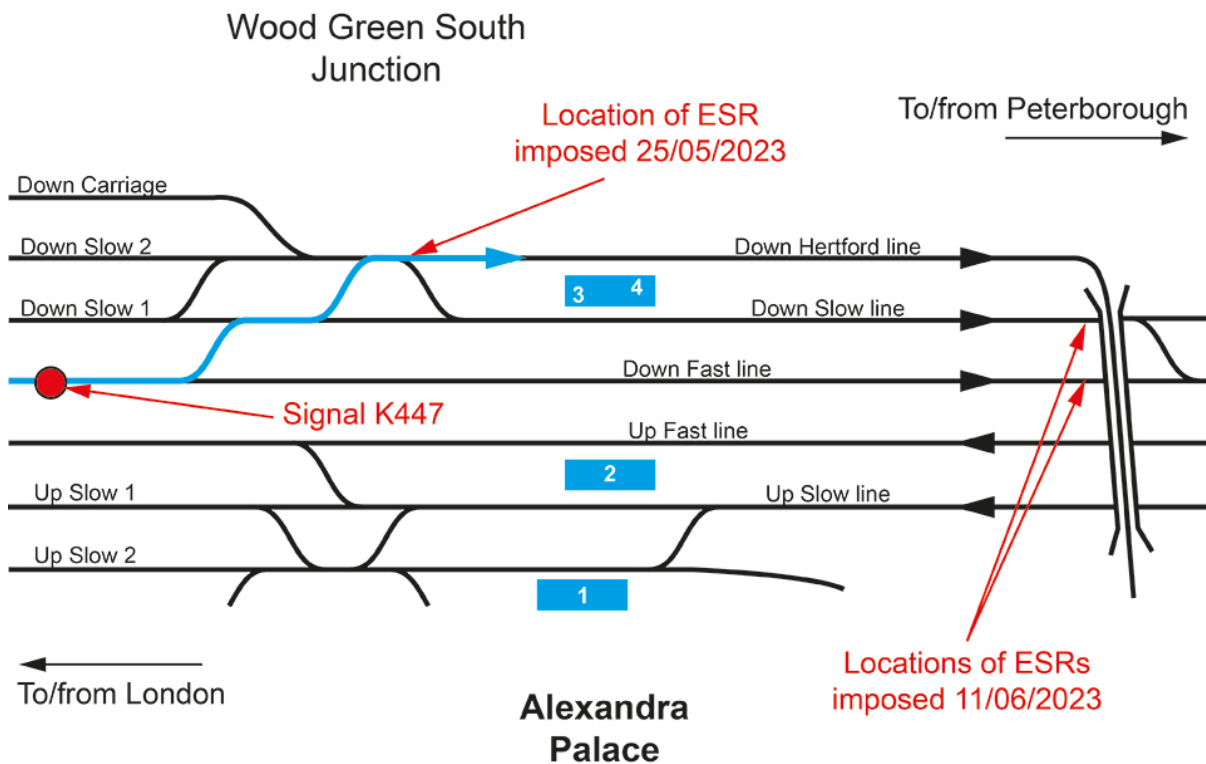


Diagrams from GERT8000-SP showing the equipment required to implement a TSR (left diagram) and the additional equipment needed for an ESR (right diagram).

Network Rail company standard NR/L3/TRK/7006, 'Creation and application of an Emergency Speed Restriction (ESR) design', issue 3, dated 3 September 2022, requires ESRs to be designed, checked, installed and verified by staff with appropriate competencies. For clarity, the ESRs at the two locations and how they were planned and implemented are discussed separately below.

Wood Green

A previous ESR that was unrelated to hot weather had been in place at Wood Green South Junction (4 miles 67 chains from London King's Cross) since 25 May 2023, following the replacement of track components. Although this restriction applied only to the Down Slow 2 line, the ESR design required trackside equipment to be installed on adjacent lines including the Down Fast line because of the possibility that trains might be routed across from these lines onto the Down Slow 2 line.



Track layout diagram showing the path of a train (blue arrow) crossing from the Down Fast to the Down Slow 2 line at Wood Green South Junction (note Down Slow 2 line becomes the Down Hertford line beyond the set of points covered by the ESR). Not to scale and not all features shown.

This meant that every train driver travelling along the Down Fast line received an AWS audible warning (a horn tone) and a visual indication (the 'sunflower') from each of the two portable AWS magnets associated with the ESR, as well as passing the EROS indicator and a warning board, which had an arrow indicating that the ESR applied only to the diverging route. In the period between 25 May and the implementation of the ESR relating to the high temperatures on the night of 10 to 11 June, nearly three thousand trains passed the equipment installed on the Down Fast line; only sixteen of these trains were routed across to the Down Slow 2 line.

The design for the ESR that was implemented on 25 May 2023 was for the equipment on the Down Fast line to have been installed between 3 miles 28 chains and 3 miles 46 chains. However, this design overlapped with existing equipment that had been installed for another, earlier, ESR at Ferme Park (between London King's Cross and Alexandra Palace) on 17 April 2023.

As a result of this conflict, track maintenance staff from Network Rail's Finsbury Park depot installed the ESR equipment on 25 May 2023 beyond signal K447, between 4 miles 14 chains and 4 miles 27 chains. This was significantly closer to the ESR commencement board than the approved design and did not provide the minimum deceleration distance required by Railway Group Standard GKRT0075, 'Requirements for minimum signalling braking and deceleration distances', issue 5, dated December 2018. This arrangement relied on trains that were crossing over from the Down Fast line to the Down Slow 2 line slowing down before they reached the ESR equipment, because the maximum speed through the junction is 30 mph (48 km/h).

On the night of 10 to 11 June 2023, track maintenance staff based at Finsbury Park depot had been instructed to install ESR equipment for as many of the sites that were expected to be affected by critical rail temperatures on the following day as possible. This was because route control staff were concerned about the impact on the workload of signallers of having to stop and caution a significant number of trains, as required by GERT8000-SP. As there was no one competent available at the depot to design the CRT(20) ESRs on the Down Fast and Down Slow lines at Wood Green, Network Rail's section manager (track) in Doncaster designed the installation and then emailed it to the staff at Finsbury Park depot at 22:08 hrs. However, this design did not take account of the existing ESR equipment that had been installed for the ESR on the Down Slow 2 line on 25 May 2023.

Because of the presence of this existing equipment, the additional equipment required for the CRT(20) ESRs on the Down Fast and Down Slow lines could not be installed in accordance with the design. The depot staff installing the ESRs on 10 to 11 June 2023 therefore decided to adapt the equipment that had previously been installed on 25 May. They did this by adding a third AWS magnet and a second warning board, which was placed 85 metres beyond the existing diverging route warning board.

The configuration of the ESR warning equipment on the Down Fast line at Wood Green on 11 June meant that drivers were less likely to realise that a new ESR was in force because:

- Equipment relating to the earlier ESR had been in place for the previous sixteen days. All of this equipment was left in the same locations for the ESR of 11 June, with some additional equipment added.
- The warnings that drivers would have received during the previous sixteen days had not applied to the majority of trains that received them, potentially resulting in drivers on the route becoming habituated to receiving warnings for an ESR that did not apply to their trains.
- The newly installed warning board for the ESR on the Down Fast line was only two seconds' running time at 95 mph (153 km/h) from the additional AWS magnet. Consequently, drivers had little time to react to the AWS warning and to identify the reason for it.
- The sequence of warning boards did not sufficiently draw drivers' attention to the new ESR on the Down Fast line. GERT8000-SP specifies that the warning board on the track on which the train is travelling should be installed on the approach to a diverging route warning board if the latter is required. In this case, the required sequence was reversed when the boards were erected.

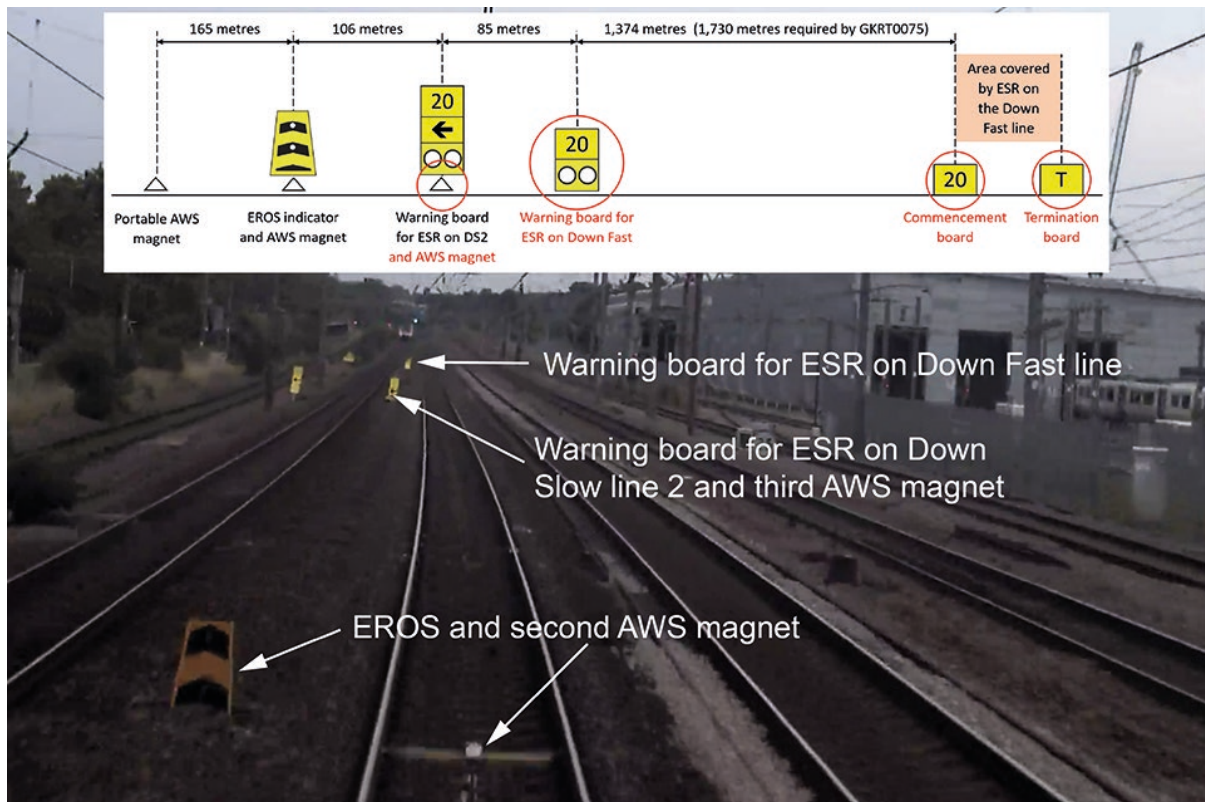


Image from forward-facing CCTV showing ESR equipment on the Down Fast line on 11 June 2023, and a corresponding diagram. The additional equipment installed for the CRT(20) ESR on the Down Fast line on 10 to 11 June is shown in red on the diagram.

In addition to possibly misleading drivers by the incorrect sequence of warning boards, the position of the second warning board provided an insufficient deceleration distance for the speeds involved. This was because it was installed 1,374 metres from the ESR on the Down Fast line while (a) the design required the warning board to be installed 1,609 metres from the ESR and (b) the minimum deceleration distance from 95 to 20 mph (153 to 32 km/h) given in Railway Group Standard GKRT0075 is 1,730 metres.

RAIB notes that when it was necessary for Network Rail to impose a 20 mph (32 km/h) ESR due to a track defect on the Down Fast line at Alexandra Palace on 24 July 2023, the track maintenance engineer decided not to erect speed restriction warning boards due to the complexity of designing an ESR at the location. Instead, trains were cautioned by signallers until track repairs were completed overnight.

Melton Lane level crossing

An ESR had been imposed on the Down Hull line approaching Melton Lane level crossing on 23 May 2023. This speed restriction was designated 30/75, indicating that a 30 mph (48 km/h) restriction applied to freight trains but that passenger trains could continue at up to the normal permissible speed of 75 mph (121 km/h).

The equipment for this ESR was installed in accordance with its design and provided the minimum deceleration distance specified in Railway Group Standard GKRT0075 for a reduction in speed from 75 to 30 mph (121 to 48 km/h) of 1,187 metres and was in place before the need to further reduce speed arose due to forecast hot weather on 12 June 2023.

RAIB has seen no evidence that a new design was produced when it became necessary to impose a CRT(20) ESR due to the hot weather on 12 June. Instead, track maintenance staff swapped the 30/75 mph (48 and 121 km/h) warning and commencement boards for 20 mph (32 km/h) boards. Network Rail advised that this was because it had insufficient staff to move the ESR equipment when the critical rail temperature was reached. If the CRT(20) ESR had been implemented in accordance with the requirements of Railway Group Standard GKRT0075 for a reduction in speed from 75 to 20 mph (121 to 32 km/h), it would have been necessary to have moved the warning board and associated equipment 70 metres further from the start of the ESR, as the minimum deceleration distance would have needed to increase to 1,257 metres.

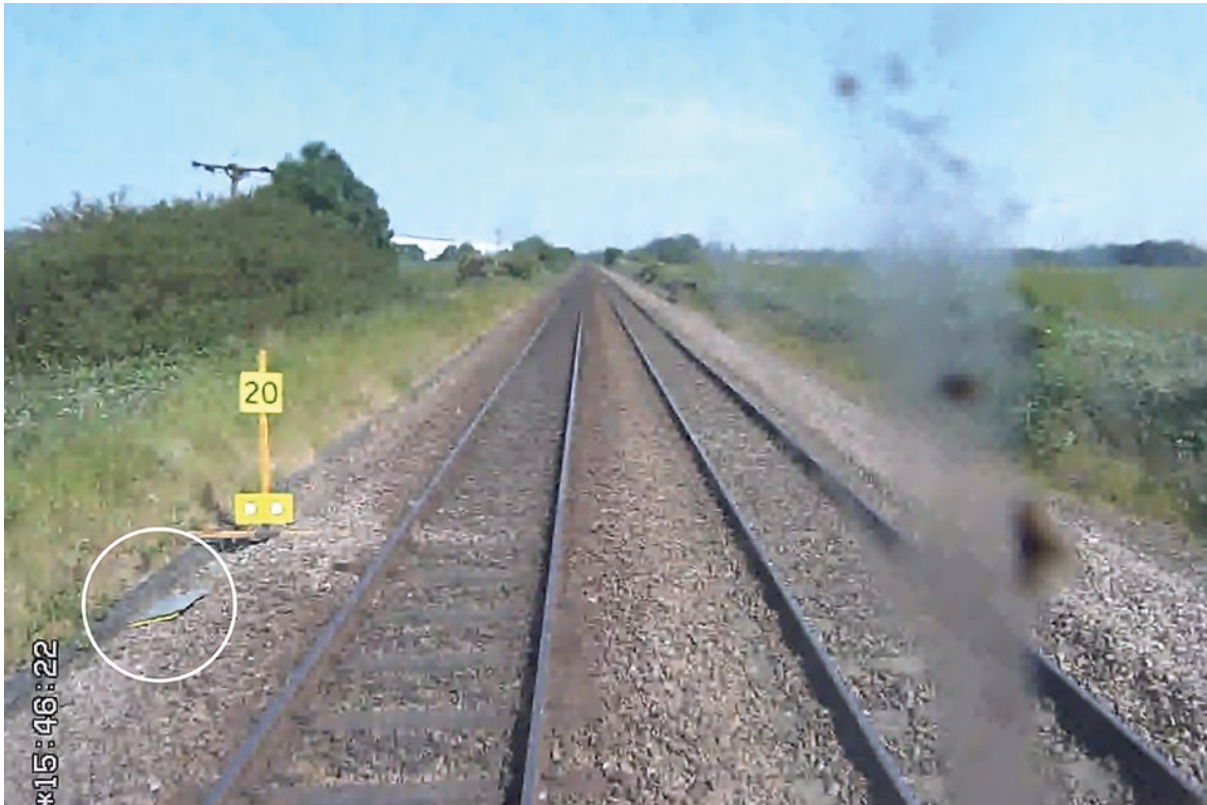


Image from forward-facing CCTV showing the CRT(20) warning board on 12 June 2023 (previous 30/75 warning boards lying on ground, shown in white circle).

The configuration of the ESR warning equipment on the Down Hull line approaching the CRT(20) ESR at Melton Lane level crossing on 12 June 2023 had the potential to mislead drivers. This was because it was installed at the same location as the earlier 30/75 ESR that had not been applicable to passenger trains throughout this period. Repositioning the ESR equipment would have provided drivers with a cue that the ESR speed limit had changed.

Previous similar occurrences

RAIB has investigated several incidents involving overspeeding at speed restrictions. These include:

- a. At Sandy South Junction, Bedfordshire, on 19 October 2018 ([RAIB report 10/2019](#)), when a passenger train traversed a 20 mph (32 km/h) ESR at approximately 121 mph (195 km/h). RAIB's report included a recommendation intended to provide drivers with additional warnings of speed restrictions near to the location of the restriction via the use of available technologies. This fed into RSSB's research project '[Review of technological interventions to mitigate train over-speeding risk](#)' (T1251) published in May 2022.

- b. At Wootton Bassett Junction, Wiltshire, on 7 March 2015 ([RAIB report 08/2016](#)), when a passenger train passed a signal at danger. One of the causal factors arose partly due to the way a TSR had been implemented. RAIB's report included a recommendation intended to ensure that ESRs and TSRs were designed and implemented in a way which resulted in clear and correct information being provided to train drivers. This led Network Rail to develop its company standard NR/L3/TRK/7006, aimed at improving the way ESRs are designed and implemented.