

Testing times

A look back at freight car brake testing by Steve Morris of Ty Mawr Publications. All photos by the author

My short article in the October 2009 edition of *TRACTION* covering the speed record for a heritage railway, achieved as part of a freight car brake test, prompted me to dig out a few more images of some of the freight car brake performance tests I have been involved in over the last 20 years or so.

The approval process for new freight cars, or where a modification to the braking system is proposed, inevitably involves ensuring that brake performance meets certain criteria. Currently, in the case of UK operation, this means meeting the requirements of Railway Group Standard GM/RT2043 'Braking System and Performance for Freight Trains'. To demonstrate compliance with this specification a 'Slip Brake Test' is conducted on a single vehicle, unless the design is sufficiently similar to one already in service that has already been approved. This means that for vehicles that will operate in trains of up to 690m length, the maximum stopping distance for the single vehicle, must not exceed 951m. This applies to operation in 'goods' timing from a maximum speed of 60mph and 'passenger' timing at up to 75mph. The difference between goods and passenger timings concerns the brake application time. Passenger timing, as it suggests, is in line with what is found on



47 981 (ex-47 364) is seen at Warrington Bank Quay having just run around the test vehicle and Test Car 2 and waiting for the road back towards Crewe and Derby. In this case the vehicle was a CAIB owned 90T 'class A' bogie tanker number 86912. It had been built with cast iron brake blocks but a conversion to a composition material was being approved in order to reduce tare weight and so increase capacity. The date was December 9, 1993 and this was the first slip test to be funded by a supplier. Given the cost involved I am glad to report that the test was a success and the fleet still runs with the alternative material. 47 981 ended its days at the Wigan CRDC in June 2000.



December 10, 1997 near Crewe. This image illustrates the nature of the Crewe/Winsford test location. 37 515 working the Middlewich British Salt to Warrington trip passes Dave Chorley and Chris Wisser who are in the process of carrying out static brake tests on an EWS BAA steel carrier number 900172 that are necessary prior to any slip testing. The presence of running lines alongside the section used for testing made any work other than the actual brake testing itself impossible. In this case the test locomotive was 47 976.

passenger rolling stock and is used for example on Freightliner vehicles that operate at up to 75mph. For vehicles that are intended to operate in trains between 690 and 750m length at up to 75mph, such as with Freightliner operation, the maximum stopping distance allowed for a single vehicle reduces to 890m. It should be mentioned that the same principle can and has been used in the past for acceptance of coaching stock although this article focuses on the freight side of things.

A slip brake test involves 'slipping' the vehicle concerned from a test car/ locomotive at a number of speeds in order to build up a plot of brake performance with the maximum allowable stopping distance mentioned above kept in mind. There is also a recommended minimum stopping distance that should be observed in order to reduce the likelihood of overbraking and subsequent wheel tread damage.

Slipping vehicles from a moving train is not a new concept, it was previously done with passenger vehicles to speed up timetables, removing the need to stop at a

particular station. The last vehicle in a train consist, passengers on board, would be physically isolated from the rest of the train on approach to the station, it would then be uncoupled and brought to a stand in the platform in a controlled fashion whilst the remainder of the train carried on. Try making a safety case for that today! The process is basically the same for a Slip brake test except that the vehicle concerned is subjected to an emergency stop.

A summary of the process involved is as follows:

1. Tow the test vehicle along a straight and level as possible section of track and achieve the target speed.
2. Physically uncouple the vehicle by means of a slip coupling.
3. Allow the auto air brake pipe on the test vehicle to vent to atmosphere. This initiates an emergency brake application on the vehicle being tested. Just before doing this you need to stop the test car/locomotive brakes from applying by preventing the auto air brake pipe at the slip coupling end from venting to atmosphere. All this takes a split-second and at the same time as the test vehicle is physically separated from the test car/locomotive.
4. As soon as the test vehicle auto air brake pipe venting is initiated a distance measurement commences and the exact speed at that time is recorded.
5. The locomotive/test car continues until it is confirmed that the test vehicle has come to a stand, and is then brought to rest.
6. The locomotive/test car reverses back to the test vehicle and couples up ready for the next test. The distance travelled back to the stationary vehicle is deducted from the total distance covered from brake initiation to the locomotive/test car coming to rest and this equals the stopping distance of the test vehicle.



47 976 again, this time entering the test section just north of Crewe. The date is October 5, 1998 and on this occasion we were testing a new disc brake pad material on a single disc per axle CAIB owned PGA aggregate hopper. This was a success and resulted in some new business replacing the competitor's material in a number of single disc per axle applications. Withdrawn in June the following year, Aviemore Castle also ended its days at Wigan CRDC in 2000.

7. The stopping distance achieved from the speed at which the slip test was initiated is plotted on a graph as shown in figure 1 below. This information is presented as part of the acceptance process for the vehicle concerned.

Over the last 20 years I have been involved in a number of these tests as a result of supplying friction material, composition brake blocks and disc brake pads, to the UK freight market. The work was carried out on the Down slow line between Crewe and Winsford. Prior to that

other routes had been used including the Mickelover test track although that was before my time. The test train would come across from the Railway Technical Centre at Derby and following static brake tests the dynamic testing would commence by about 11.00. However, the time allowed for testing was restricted and we normally had to be off the section by 15.00. If all went to plan the four or so hours we had was sufficient to allow a brake curve to be generated, although sometimes for various reasons this was not the case and additional, very expensive, testing time was needed. In the majority of cases at least two tests had to be conducted, one in the empty (tare) condition and the other in the

loaded (fully laden) condition, so this meant two full days of testing with a day or so in between them to allow the test vehicle to be loaded for the laden test. The traction employed in the early days was predominately the Class 47, particularly those examples operated by the Derby Research in the 47 9xx range. The Research Centre, Serco Railtest from 1997, utilised a modified Mk.1 BSK coach, Test Car 2, number ADB975397 for carrying out the work. During this time we had to travel to Warrington following the testing in order to run-round to travel back to Derby. In later years, Freightliner won the contract to provide the traction resulting in Class 86s being used for the testing and class 47/66s employed to work to Crewe from and to Derby, and as 'pull-back' locomotives to remove the need to travel to Warrington to run-round. The Class 86 was a good choice as it enabled the target test speed to be achieved quicker, particularly in the case of laden tests from 75mph, so reducing the time needed for testing. This arrangement was a good one but the cost associated with carrying out the tests was significant. Up until 1993, this type of testing was carried out free of charge. Then, in the run up to privatisation this all changed and with track access charges, traction hire, train crew, test staff, etc. costs to meet it would

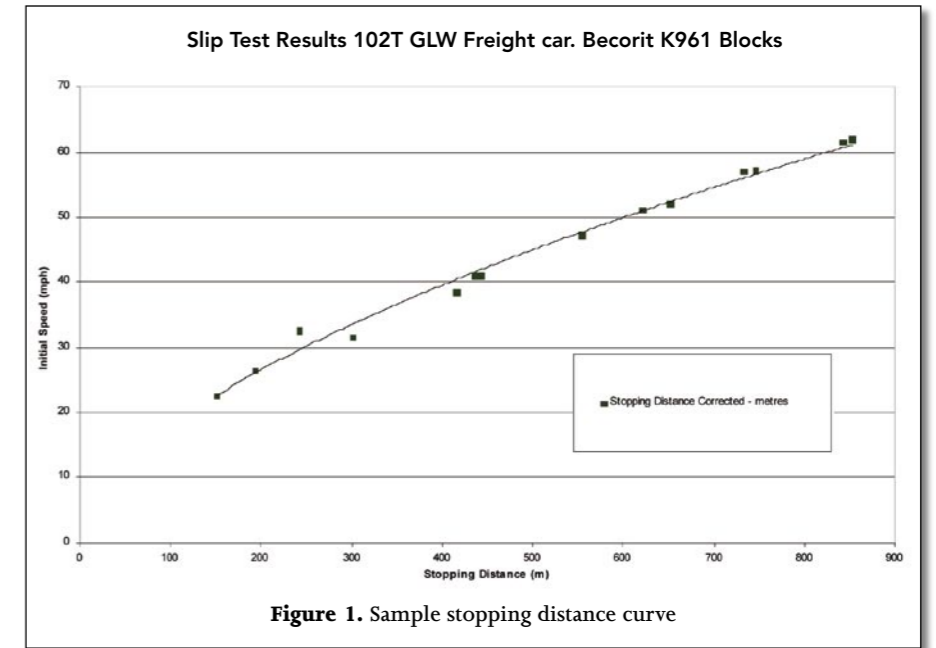


Figure 1. Sample stopping distance curve

typically be in excess of £10,000 for the four-hour test slot!

An alternative solution was investigated in 2001. This involved testing on the Great Central Railway where permission to run at up to 60mph had been gained. Testing

between Rothley and Quorn, with the actual slip test taking place on the straight section on the approach to Quorn station, we were able to achieve double the testing time and the lack of trains passing at up to 110mph made the whole situation much more



ABOVE LEFT: Crewe/Winsford January 12, 2001 and this is the view from the rear of Test Car 2 and Chris Doleman has just slipped HHA coal hopper 370001. In this case the test train locomotive was 86 632 with 66 602 to pull-back. This was one of the few tests that we failed, the maximum stopping distance recorded being well in excess of target. Eventually, an issue surrounding the lateral movement of the TF25 bogie primary suspension resulting in a reduction in brake block application force was diagnosed and the repeat test following modification was a complete success.



ABOVE RIGHT: A view inside Test Car 2 with the data collection equipment on the right hand side and slip test initiation area at the end of the coach. Jonathan Lowden of Powell Duffryn Rail (the bogie supplier) sits analysing the results so far while Chris Doleman and Peter Metcalf prepare for the next slip test.



March 13, 2001, preparing for the first slip tests to be conducted on the Great Central Railway. Various cables and pipes associated with the slip coupling operation can be seen running out of the back cab of D123. On this occasion we were testing a cast iron block replacement material and had purchased a redundant two-axle tank wagon from E G Steele to use for a variety of tests.



ABOVE: 86 621 is seen on Platform 12 at Crewe station following testing of MRA Side Tipper 501061. 66 517 has just drawn the test train into the station from the test site on May 15, 2001.

RIGHT: June 7, 2004, this was a frustrating day! We had attempted to slip test an EWS FIA Multifret wagon fitted with an alternative brake block material. However, due to a lack of staff provided by Network Rail to man the possession needed on the section of track for testing, the whole thing was cancelled. We spent most of the day sat on Test Car 2 on the down slow line getting nowhere! It would be July 13th before we could get another possession but this time it all went to plan! For a change, one of Freightliners dwindling fleet of Class 47s, 47 847, was employed as pull-back locomotive, 86 622 the train test loco. In this view Serco Railtest's Andy Wheatley is seen on 47 847 shortly after arrival back at Crewe. The class 86 would now be detached and the train would carry on to Derby.



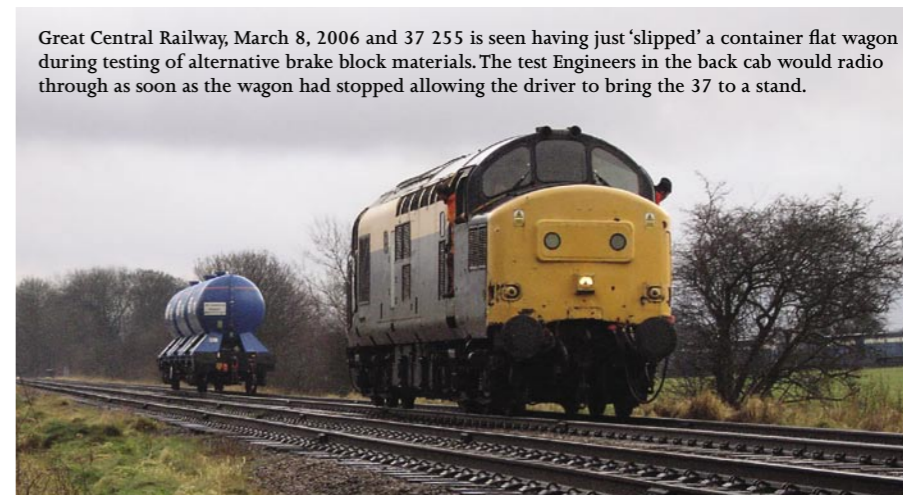
BELOW: Great Central Railway, November 1, 2001 and D123 is seen propelling MBA 50034 back towards Rothley to carry out the last test of the day. We had to transport the wagon in fully laden, 102 Tonnes, condition to the GCR for this test, as there were no loading facilities available at the time.



flexible. Lack of rail access and a maximum speed of 60mph was a disadvantage but the overall benefits of this alternative were quite significant particularly as it was also cheaper as well! More recently, running at up to 75mph on the brake test section means that all freight vehicle types can now be tested on the Great Central.

In terms of traction, Class 45 number D123 has been the most commonly used although 37 255 and 25 265 have also been used on at least one occasion. In this case, the slip test coupling is attached directly to the locomotive as opposed to the Serco Railtest method of using a test car between the locomotive and test vehicle. The control of the slip coupling and data collection is carried out in the rear cab. This reduces the cost associated with the testing but it can get a bit cramped in the rear cab as a result! I started the ball rolling on the GCR in March 2001 and have been involved in a number of tests there since then, the most recent being the first 75mph tests carried out on the WH Davis SL45 container flat which was covered in the October edition of TRACTION. The images depict a selection of the tests that I have been involved in and illustrate the motive power used. A number of factors including a reduction in new build, use of exiting designs and an increasing number of slip tests being carried out overseas near to manufacturers premises make it likely that the number of slip brake tests conducted in the UK will reduce significantly. It is five years since Test Car 2 has been involved in any slip brake testing.

I hope that this article has given an overview of what is a vital part of accepting new or modified freight vehicles for use.



Great Central Railway, March 8, 2006 and 37 255 is seen having just 'slipped' a container flat wagon during testing of alternative brake block materials. The test Engineers in the back cab would radio through as soon as the wagon had stopped allowing the driver to bring the 37 to a stand.



Another GCR test, this time on March 9, 2006. As far as I am aware this was the only time that a Class 25 was used and was due to a fault on 37 255. The wagon concerned is a JNA bogie open box wagon owned by Network Rail. 25 265 is seen coupling up on the slip test section. The Class 25 was not a success, it was not possible to achieve sufficient speed for the higher speed stops due to a field divert problem. In the end we coupled up 37 255 as well and between them they managed the job!



37 255 and 25 265 prepare to start a laden slip test on the Great Central Railway. March 9, 2006.