

Explanation why Arriva Cross Country Nottingham line services can call at Chepstow without affecting the overall journey times to and from the stations on either side.

Timetable Planning

The creation of the timetables is a complex, iterative and evolving process. Rather than start with a fresh sheet each timetable starts with the previous version, with priority given to existing unchanged services and those required to meet the contractual agreement with the DfT / WAG. Thus if a Train Operating Company bids for a new timetable slot it will initially be rejected by Network Rail if it conflicts with an existing planned movement, even if this movement is classified as lower in rating such as a freight, local / stopping or even empty stock movement.

Network Rail issues a document each year called the "Rules of the Plan" which among other information includes the "Headway" between trains for every line of railway. The "Headway" is the minimum time for timetable planning purposes after a train has passed before the next train can be planned to proceed.

Between Cardiff and Severn Tunnel Junction this is four minutes, so in theory a maximum of fifteen trains ($4 \times 15 = 60$) can be timetabled to leave Cardiff heading eastwards on the busy Main Line. In practice a pragmatic approach has been made and trains are planned to leave five minutes apart. This approach is realistic in that it allows for minor perturbations in dispatching trains without causing knock on delays from one train to the next, and hence helps to deliver higher reliability in timekeeping. This of course limits the total number of trains an hour to twelve ($5 \times 12 = 60$), but as the maximum hourly number of trains presently timetabled in any one hour is only nine (Two London services, Portsmouth, Taunton, Manchester, Holyhead, Cheltenham, Nottingham and Ebbw Vale) this is not a problem.

The timetables have evolved so that eastbound trains generally leave Cardiff at five minute intervals starting with the "On the Hour". These are: -

XX:00 Cardiff to Taunton
XX:05 Spare
XX:10 Maesteg to Cheltenham
XX:15 Spare
XX:20 Cardiff to Holyhead
XX:25 Swansea to Paddington
XX:30 Cardiff to Portsmouth
XX:35 Cardiff to Ebbw Vale
XX:40 Spare
XX:45 Cardiff to Nottingham
XX:50 Carmarthen to Manchester
XX:55 Cardiff to Paddington

For operational convenience the Maesteg to Cheltenham departs at 12 minutes past as there are no constraints because the next five minute Slot is at present spare.

As can be seen the Arriva Cross Country Cardiff to Nottingham could leave five minutes earlier if required as the XX:40 slot is spare, but it cannot leave five minutes later without affecting the Arriva Trains Wales Carmarthen to Manchester with knock on alterations to the First Great Western Cardiff to Paddington and the Cardiff to Taunton services before the next spare "Slot" becomes available to absorb the change. Each of these three services has an associated "half hour" departure. (The Carmarthen to Manchester has the Cardiff to Holyhead along the Abergavenny line, The Cardiff to Paddington has the Swansea to Paddington along the Bristol Parkway / Swindon line and the Cardiff to Taunton has the Cardiff to Portsmouth along the Bristol Temple Meads line. So an alteration to any of the original three would need an alteration to its associated service to maintain the half hourly pattern on the line concerned)

Recovery Times

The theoretical times it takes for a train to make its journey is calculated based on the performance and the maximum speed of the type of train, the effects of gradients, the maximum speed of the line and specific geographical limitations due to the track on the allowable speeds of trains, called "Permanent Speed Restrictions". It is the 30mph Permanent Speed Restriction through Chepstow Station on a line that otherwise has a 90mph Maximum Line Speed that is relevant to the case for stopping the Cross Country services.

Once the theoretical time has been calculated for the journey then additional time is added to the timetable. This is often referred to as "Recovery Time" and there are three main types.

The first is "Engineering Time". The maintenance regime on the railway consists of regular inspections to identify the start of any deterioration of the infrastructure. The work needed to rectify the potential problem is identified, prioritised and planned based on the priority and the availability of access to the track without disruption to train services wherever this is possible. To ensure absolute safety there are occasions when it is deemed prudent to lower the speed of trains over the developing defect until it has been dealt with. These are called "Temporary Speed Restrictions". By the very nature of this system it is not possible to predict in advance where these Temporary Speed restrictions may be required. It has been practice therefore to sprinkle odd single minutes across the whole of the journey. This is based on years of experience so that the total minutes added would normally cover the requirements before the end of the journey.

The second is "Performance Time" this is also usually spread as single minutes across the whole journey and in the same way as the additional minute added to the Headway helps to keep minor perturbations during the journey at stations etc. from impacting on the performance reliability.

The third and the one that is of significant implication to the stopping of the Cross Country service is "Pathing Time". This is where when all of the other items have been considered there is a theoretical conflict between two or more train movements. This can occur for example where a train at a diverging junction needs to cross the adjacent line at a time when another train would be passing. In the case of the Cross Country service it is where two trains coming from different locations converge onto a single line and both have been calculated to arrive at about the same time.

Birmingham New Street and the limitations that it causes

The sheer number of trains that converge and then diverge from Birmingham and the number of different directions from which they come; added to the complexity and limitations of the confined space have made Birmingham one of the main bottlenecks on the railway system. This has resulted in the DfT dictating which routes services are allowed to use. This is not based on which routes most passengers might want to travel on but simply to reduce to a minimum the number of conflicting train movements within the constrained area, even though this may result in more people having to change trains to get to their destinations.

Even with the major changes as a result of the upgrading of the West Coast Main line and increased service frequency of Virgin Trains, the timetable has still been an evolution of the previous version. This has restricted Arriva Cross Country to historical timetable slots through Birmingham that are less than ideal for running the Nottingham – Cardiff services. This has resulted in an excessively long turnaround time at Nottingham and a shorter than ideal turnaround at Cardiff.

The high utilisation of the line between Gloucester and Birmingham tends to preclude any extended dwell times at stations along this part of the line. This with the specified times for Birmingham itself has dictated the arrival at Gloucester for southbound trains (XX:21) and the departure time from Gloucester for northbound services (XX:46).

Effect of Stopping at Chepstow

It is usual to add three or four minutes for each station stop on lines up to 100mph and four to five minutes on lines above 100mph. This gives time for deceleration, a minute for station dwell time to enable passengers to alight and join the train, and then for the acceleration back up to maximum speed.

The effect of the 30mph Permanent Speed restriction through Chepstow means that a station stop can be accommodated within two minutes. This has been verified on site by BT4C by timing both stopping and non stopping services.

Adding Chepstow into the stopping pattern of the Nottingham line trains therefore could be expected to extend the journey time for through travellers. However owing to the specific circumstances of the timings of the Nottingham service this two minutes can be accommodated both in the down direction (southbound Nottingham to Cardiff) and in the Up direction (northbound Cardiff to Nottingham) without affecting the departure times at the two stations either side (Newport and Gloucester)

Special Circumstances Down / Southbound Trains

Having arrived at Gloucester at XX:21 as a result of the limitations at Birmingham detailed above, this results in the Cardiff bound train arriving at the trailing junction where it joins the London to Cardiff line at Severn Tunnel Junction at theoretically one minute behind the Paddington to Cardiff train. In order to separate the two trains a five minute "Pathing time" is added to the Nottingham to Cardiff service. This can be verified by examining the Draft Timetable for Consultation which shows the Arriva Cross Country service without this Recovery time arriving and departing from Newport only one minute after the existing First Great Western Paddington to Cardiff service. As explained above there must be a minimum four minute separation and ideally five minute.

What this means is the train is held at the red signal protecting the convergence point until after the First Great Western has passed clear ahead. This protecting signal is actually on the west end of Caldicot Halt. Every hour throughout the day if both trains are running to time you can observe this Arriva Cross Country service crawling slowly towards and then stopping at the signal to wait its pathing time.

By stopping at Chepstow it will use up two of the five minutes waiting time that would otherwise be spent waiting at a wayside signal. The arrival and departure at Newport would remain unchanged.

Special Circumstances Up / Northbound Trains

Having left Cardiff at XX:45 the train would arrive at Gloucester at around XX:40. As explained above owing to the busy line between Gloucester and Birmingham and the specific time slot to arrive at Birmingham the service waits at Gloucester until XX:46 before departing. This has also been verified by BT4C and on one occasion the train was timed to wait in the platform at Gloucester for seven minutes before leaving at its official departure time.

The effect of adding in the Chepstow stop means that instead of waiting six minutes the service only has to wait four minutes at Gloucester.

This can also be verified by the first train in the morning that under the Franchise is required to call at Severn Tunnel Junction, Caldicot, Chepstow and Lydney. Assuming three minutes at the other stations and two minutes at Chepstow to be added to the timings this would add eleven minutes to the overall journey time. This service departs Gloucester at the standard XX:46. To do this one might have expected that the departure from Cardiff would have to be eleven minutes earlier at XX:34 but examination of the timetable shows it using the spare XX:40 slot. This is only five minutes earlier than the standard departure time, confirming that another six minutes can comfortably be accommodated from the built in recovery time.

Conclusion

Adding the two minutes necessary for trains to stop at Chepstow can be accommodated in both directions, by using otherwise wasted waiting time. There is no need to change the timetabled times at Newport and Gloucester or any other station on the whole of the line.

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