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Issue:	2
Date:	02/06/2012
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Level 2

Signalling Design: Module X11 – Level Crossings: Automatic Barrier Crossing Locally Monitored

Endorsement and Authorisation

For endorsement and authorisation, please refer to
NR/L2/SIG/11201

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Issue record

Issue	Date	Comments
1	December 2011	First Issue
2	June 2012	Updated to new ORR guidance

Compliance

This Network Rail standard is mandatory and shall be complied with by Network Rail and its contractors if applicable from 01/12/2012.

When this standard is implemented, it is permissible for all projects that have formally completed GRIP Stage 3 (Option Selection) to continue to comply with the issue of any relevant Network Rail standards current when GRIP Stage 3 was completed and not to comply with requirements contained herein, unless stipulated otherwise in the scope of this standard.

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surface and does not cause glare to approaching trains.

1.1.11 Barriers employed at ABCL crossings shall remain in the raised position in the event of a total power failure.

1.1.12 Before the barriers are allowed to descend automatically, sufficient flashing red road signals shall be functioning. Loss of any further road signals during the descent shall not prevent them fully lowering.

1.1.13 The maximum length of trains permitted to operate over the level crossing shall be documented in the design details.

2 TRAIN DETECTION SYSTEM CONTROLS.

2.1.1 Where a track circuit is used solely for the control of an ABCL, there is no requirement for the track circuit to be failsafe, nor is there a maximum limit placed on residual voltage. Failure of the track circuit to de-energise shall result in the crossing not operating for the approaching train, and the driver's red light (DRL) and driver's white light (DWL) not responding.

2.1.2 Where the residual voltage exceeds 30% of the track relay drop away value, the following note shall be added to the design details for the track circuit: "Note This track circuit does not meet the residual voltage restrictions specified in NR/L2/SIG/110, and shall not be used for any purpose other than the control of AOCL level crossing, unless modified to meet the requirements".

2.1.3 Track sections situated within the crossing control area once occupied shall initiate the crossing operation. The crossing operation shall be maintained (by means of a stick control), until:

- The train has been proved to clear the crossing by sequential operation. Or,
- A suitable time has elapsed after the track has cleared. In this situation, the DWL, having been displayed, shall be extinguished at least thirty seconds before the strike-in controls are released.

2.1.4 Failure of a track section shall result in the following consequences.

2.1.5 If a random track section occupation occurs which subsequently clears, - the operating sequence shall be initiated.

2.1.6 If a random track section occupation occurs which does not subsequently clear, - the operating sequence shall be initiated. At a suitable time after track circuit clearance, (Unless other track sections within the crossing control area are also occupied), the DWL shall be extinguished and the DRL illuminate. After a further 30 seconds the barriers shall raise and the red flashing lights extinguish. The crossing shall not work automatically for any further approaching train until the fault is cleared.

2.1.7 It is not necessary to provide standby power supplies for track sections used solely to control an ABCL for safety purposes, but "standbys" may well be provided for reliability and availability purposes.

3 POSITIONING OF STRIKE-IN POINTS.

3.1.1 The minimum warning time at ABCL crossings shall be 19 seconds for

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crossings up to 15m long. Over this length an additional 1 second warning is required for each additional 3m of crossing length.

NOTE Changes to ORR guidance in 2011 removed the previous minimum of 27 secs which has been used in the vast majority of existing crossings. The requirement is now that "The period between the display of the RTL's and the arrival of the fastest train is sufficiently long to enable road vehicles and pedestrians to clear the crossing". The time taken by an 18.75m long vehicle to cross a 15m crossing at 5mph (2.2m/s), is 16 secs. If this vehicle began to cross at the end of the amber light period, this would be 19 secs from the crossing warning initiating. The figure of 1 sec for every 3m of longer crossings also comes from ORR guidance. In practice other factors in the design of the crossing often mean the warning time is longer than the minimum specified here, but this must be confirmed.

3.1.2 When positioning the strike-in an allowance shall be made for equipment response times. For a conventional relay controlled crossing this normally includes 2 secs for a train to be detected and start the crossing sequence plus a further 2 secs for the flashing RTL's to be proved working before the DWL can illuminate..

3.1.3 For an electronic interlocking or crossing controller, the response times must either be known or worked out before the crossing is designed.

3.1.4 Where there are two or more lines, the strike-in point is also positioned to give the Minimum Road Open Time (MROT). (Nominally 10 seconds.)

3.1.5 The crossing speed may already be fixed by some aspect of the crossing, but if not, it can be calculated and subsequently the strike-in points calculated in accordance with the following procedure.

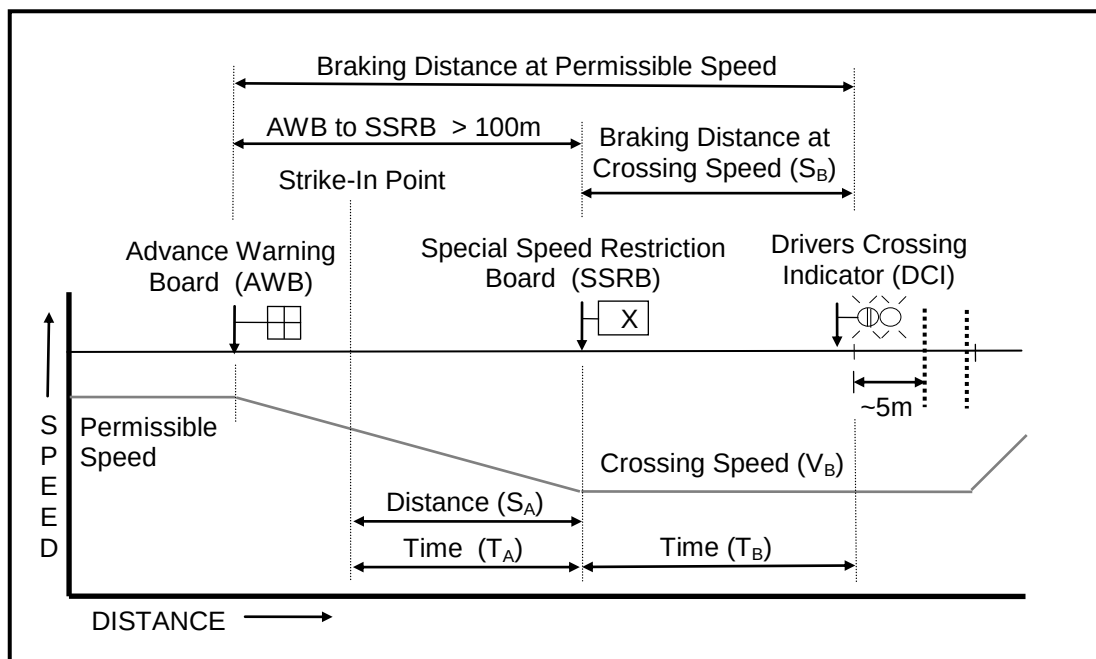


Figure 2 – ABCL Design.

3.1.6 Determine the maximum distance at which the crossing is clearly visible for each rail approach. Position the Special Speed Restriction Board (SSRB) at this point, subject to a maximum of 600m;

3.1.7 From the passenger and composite braking distance tables in GK/RT0075, obtain the speeds rounded to 5mph from which passenger and freight trains can brake to a stand before the crossing from the SSRB position. These speeds become the crossing differential speeds for passenger and freight and are shown on the

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SSRB. Speed is limited to a maximum of 55mph (90kph) and a minimum of 10mph (15kph). Only two differential crossing speeds may be used on the SSRB;

3.1.8 Calculate T_B in the diagram by dividing the distance of the SSRB from the crossing by the passenger speed;

3.1.9 From the composite table in GK/RT0075, obtain the braking distance from the crossing at the permissible speed. As long as this position is at least 100m, on the approach side of the SSRB, then this becomes the position of the advance warning board (AWB). If however this position works out at less than 100m, then the AWB is positioned 100m on the approach to the SSRB;

3.1.10 The DWL is required to illuminate before the train reaches the SSRB. The strike-in point must be set to provide sufficient time for the crossing to respond. This time is shown as T_A in the diagram. For the first train approaching a relay based crossing this time shall normally be 14 secs before reaching the SSRB;

NOTE Based on 2 secs track relay response, 3 secs amber, 5 secs red, 2 secs for barriers to lose up detection and 2 secs to establish DWL = 14 Seconds.

3.1.11 To convert the time to a distance, assume 9%G constant braking occurs from permissible speed to the passenger speed at the SSRB. Assume permissible speed for any portion of the strike-in before braking begins;

3.1.12 With an initial strike-in point derived from the above, the warning time given at the crossing is $T_A + T_B$. Check this is at or above the minimum warning time required. (19 secs plus any increase for crossings over 15m.) If the time is insufficient, move the strike-in further out as necessary to comply with minimum warning time;

3.1.13 if there are two or more tracks over the crossing, then add a further 10 seconds to the strike-in position calculated so far to allow for MROT. This gives the final strike-in position;

3.1.14 Finally check the design allows at least 50% of trains to arrive at the crossing in 50 seconds.

4 OPERATING SEQUENCE AND CONDITIONS.

4.1.1 The operating sequence to close the crossing to users shall be initiated automatically by an approaching train and proceed as follows:

- The amber lights shall be illuminated and the audible warning for pedestrians shall begin to sound. The duration of the amber lights shall be three seconds, after which;
- The red road lights shall begin to flash and the floodlights shall illuminate;
- After between four and six seconds of flashing red road lights, the barriers shall begin to descend and soon afterwards the barrier boom lights shall be illuminated;
- When both barriers have descended below 83° , the appropriate Drivers White Light (DWL) shall illuminate and the Drivers Red Light (DRL) shall be extinguished;