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Mr Andrew Hall
Deputy Chief Inspector of Rail Accidents
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Dear Andrew,

RAIB Report: Collision between a train and a car at Beech Hill level crossing, near Finningley

I write to provide an update¹ on the action taken in respect of recommendation 2 addressed to ORR in the above report, published on 13 September 2013.

The Annex to this letter provides details of the action taken. The status of recommendation 2 is '**Implemented**'. We do not propose to take any further action in respect of this recommendation unless we become aware that any of the information provided becomes inaccurate, in which case I will write to you again.

We will publish this response on the ORR website on 27 April 2016.

Yours sincerely,

Andrew Eyles

¹ In accordance with Regulation 12(2)(b) of the Railways (Accident Investigation and Reporting) Regulations 2005

Recommendation 2

The purpose of this recommendation is to devise a method of assessing the risk of a bright background and glare preventing wig-wags, and other crossing equipment, from being seen and propose means of mitigating this (e.g. higher powered LED wig-wags, barrier skirts or other means of improving barrier conspicuity).

Infrastructure managers should put in place a method of identifying those locations where there is a significant risk from sunlight impairing the visibility of level crossing wig-wags and barriers, propose suitable mitigation measures where appropriate and implement these measures. The method should be based on suitable research and include specific consideration of the possibility of glare, and the wig-wags being seen against a bright background and the barriers against a dark background, taking into account environmental factors and seasonal daytime variations. A programme of training and briefing of the staff carrying out the assessment should be implemented.

ORR decision

1. ORR recognises that it will be a long process to complete the assessments envisaged by the recommendation, as each location will need to be visited in sun glare conditions. ORR is satisfied, however, that Network Rail has introduced a method of identifying and assessing those locations (including providing training to all Level Crossing Managers), and that implementation of any mitigation measures identified through this process (e.g. new brighter LED wig wags (recommendation 3), road countdown markers etc.) will be handled through business as usual with some level of monitoring by ORR. Evidence of this has been seen through recent risk assessments produced by Network Rail in support of its Level crossing Order submissions, where consideration of sun glare has been taken into account and appropriate action taken.

2. Having reviewed the response from Network Rail, ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations, it has:

- taken the recommendation into consideration; and
- taken action to implement it.

Status: Implemented. This concludes the full implementation of this recommendation.

Previously reported to RAIB for Network Rail

3. ORR reported to RAIB on 13 March 2015 that, in respect of this recommendation:

- it had been implemented by Nexus;
- ORR was satisfied with the action taken by the Heritage Railway Association to inform its members; and

- The status of the Network Rail element of the recommendation was 'Implementation ongoing'.

4. In respect of Network Rail it was reported that specialist optical consultants had been engaged to undertake research into the causes of glare from road surfaces at level crossings. This research work was completed in February 2015 and delivered

- a glare scale including a threshold 'just tolerable' level;
- a process for assessing the risk of glare at road crossings, taking the effectiveness of wig- wag signals into account;
- training material for the risk assessment process;
- criteria that could result in level crossings being susceptible to glare, e.g. sun angles, road direction, road gradient and / or characteristics of road surfaces. These have been used to generate a list of crossings which might be susceptible to high levels of glare;
- details of mitigation measures which are suitable, achievable and cost-effective.

5. Work was ongoing at the time to brief Level Crossing Managers (LCMs) on the process for assessing sun glare, which would enable them to assess those public road crossings that are most susceptible to sun glare and determine if any mitigation measures need to be applied.

Update

6. On 18 February 2016 Network Rail provided the following closure statement:

Network Rail engaged the services of specialist optical consultants, OptiConsulting Limited, to undertake research into sun glare risk at public road level crossings. The primary deliverables centred on:

- *analysing the current ALCRM assessment process;*
- *identifying which level crossings are susceptible to high levels of sun glare according to sun angles, road direction, road gradient and/or road surfaces;*
- *providing a methodology for testing for sun glare and determining tolerability levels;*
- *producing a list of viable risk control solutions to reduce the effects of sun glare (including achievable and cost-effective options)*
- *providing a report which details how sun glare might affect the visibility of road traffic light signals and barriers; level crossing conspicuity*

This research is complete and a report detailing the results has been published. The research underpins a new risk assessment methodology to help risk assessors, such as LCMs, assess sun glare susceptibility risk at public road level crossings. In developing the methodology, OptiConsulting applied solar modelling techniques to all public road crossings on Network Rail controlled

infrastructure. For the top 100 highest risk level crossings, based on fatalities and weighted injuries risk ratings, this included:

- determining the position of the sun in the sky throughout the year to identify which months of the year sun glare is likely to be most prevalent;
- taking account of the number of trains which pass over the level crossings during the time window for which sun glare might be significant; and
- the provision of a sun glare rating.

The new sun glare risk assessment process was formally introduced into the business on 1 February 2016 as an integral part of the risk management process of public road crossings.

It now forms an essential part of all risk assessments undertaken from this date and will be additionally incorporated within asset inspection visit to supplement intelligence. The latter is important as the solar modelling process is an indicator of susceptibility risk only. Any effective sun glare assessment will rely heavily on the weather and the environment aligning with the visit of the LCM, if they are to be confident that any issue has been witnessed and actions taken to address the associated risks. This is why the assessment of sun glare risk has to be part of a continual risk management process and why it is important to consider and assess for sun glare during every visit to maximise the window of opportunity to witness glare risk. The risk assessment process has a maximum frequency cycle of 3¼ years. The maximum asset inspection frequency by comparison is 6 months for signal protected full barrier crossings, with automatic half barrier crossings visited every 7 weeks. Automatic half barrier crossings form 54% of the total crossings identified as susceptible to sun glare through solar modelling.

The process consists of an intuitive questionnaire and process map which leads the assessor, Level Crossing Manager, to draw structured conclusions about glare risk. The assessors' decision making is aided further with a Glare Scale to help them determine tolerability levels. The questions focus on elements such as the type of light installed in the road traffic light signal (50w halogen/LED), the witnessed effect of sun glare, the optical complexity of approaches and background scenes and the reflectivity of the road surface. In addition to the robust method to identify locations where sun glare susceptibility is intolerable and unacceptable, a list of glare mitigation measures has been assembled to help reduce the effects. The list includes: high output LED signals, extended backboards and hoods, countdown markers and advanced signage, rumble strips and road surface treatments. The output of the detailed sun glare risk assessment will be included within the narrative risk assessment for the assessed crossing. This will include the observations made and the need for interim and long term mitigation measures; including what they consist of. ALCRM will include risk reduction benefits of sun glare risk reduction measures, so far as they are applicable.

The research report incorporating the sun glare assessment method is provided as supporting evidence. Also provided is the supporting guidance document LCG13 – Risk assessing for sun glare at public road level crossings and the

associated briefing slides. These documents are published on the Network Rail Level Crossing Hub for community access.



Summary Report - LCG - Risk assessing Glare at Level Crossing
LCG - Risk assessing for sun glare at public
LCG 13 Risk assessing for sun glare at public

A formal briefing session for LCMs detailing the findings from the research was held at the Level Crossing Forum at Westwood in June 2015. The session, comprising of a workshop, focused on the sun glare assessment method, its application and the output from the field trials. LCG13 and the briefing slides further support the formal introduction and rollout of the process. [Note: ORR has also been assured by Network Rail that any LCMs not at Westwood on training day have been individually tutored by their Route LCM.]

As referenced, the sun glare risk assessment method is incorporated into the standard level crossing risk assessment process at locations identified as susceptible to the risk of sun glare. This adoption aligns with our continual improvement vision. The sun glare risk assessment process will also be supplemented during asset inspection visits as needed. The process applies to:

- *crossings identified by OptiConsulting as susceptible to sun glare through solar modelling; list contained in LCG13*
- *public road crossings not identified as susceptible to sun glare through solar modelling when:*
 - *sun glare affecting crossing conspicuity is witnessed during a site visit;*
 - *intelligence is received which indicates that sun glare is affecting crossing conspicuity or crossing equipment; and/or*
 - *an incident or accident occurs during which sun glare is or might have been a contributory factor*
- *private road crossings when:*
 - *crossing conspicuity is either known to be or might be compromised by sun glare and where road approaches are fast enough that a vehicle driver might not identify the crossing in sufficient time to control their vehicle speed; and/or*
 - *an incident or accident occurs during which sun glare on the approach road is or might have been a contributory factor*

In terms of mitigation measures implemented, 494 public road level crossings have had their road traffic light signals upgraded from 36W filament bulbs to brighter LEDs in line with Recommendation 1 of the Beech Hill report. Incorporating the sun glare assessment method within our 'business as usual' level crossing risk assessment process, facilitates the continual improvement needed and expected – meeting the intent of the recommendation.