Railway Safety Commission

Compliance inspection following a fatality at level crossing XM096,

2 September 2010

Issue	Prepared by	Checked by	Issue date
First draft	MB	DC, GB	25/11/10
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Executive Summary

At 11.13 hrs on 2 September 2010 the 09:30 hrs the Iarnród Éireann (IÉ) Ballina to North Wall IWT Liner train struck a tractor on level crossing XM096, also known as Stanley's No.2 crossing, between Roscommon and Castlerea. The tractor driver was fatally injured.

The RSC was notified by IÉ at approximately 12.00 and two RSC Inspectors immediately departed to the site of the incident. Having attended site and gathered initial evidence the RSC made the decision to undertake a compliance inspection under section 7 of the Railway Safety Act 2005, as amended, ("the Act"). This investigation primarily took the form of a review of IÉ level crossing standards, records of inspections and some meetings with IÉ personnel.

Post incident, the standards pertinent to the specific type of level crossing concerned were requested from IÉ. They were then reviewed in detail in conjunction with records of level crossing surveys undertaken by IÉ. Through the course of this compliance inspection 2 non-compliances (NC's) were identified;

1. Failing to implement level crossing standard MW50 section 2: Views of approaching trains
2. Failing to comply with regulation 5 of S.I. 701 of 2003: Training of rail personnel in the carriage of dangerous goods

It is expected that IÉ will advise the RSC by a prescribed date of what actions they will take to address the NCs and in what timescale. This notification from IÉ will be in the form of an Improvement Plan (Plan) in accordance with section 76 of the Act. The RSC will review this Plan and subject to it being satisfactory, will track its execution.

In addition to these NCs, 7 recommendations for Iarnród Éireann have been made and assigned priorities and timescales. The urgent and high priority recommendations are listed below. (See page 15 for further details).

Number	Area	Priority
RSC1	Advise local authorities of their duties regarding level crossing signage on approaches	High
CCE1	IÉ should ensure that all signs that are required at OP level crossings are in place	Urgent
CCE2	Provide copies of relevant safety documents to known users	High
CCE6	IÉ should ensure risks are mitigated and these should be recorded	High
CCE7	IÉ should reassess risks in their Track & Structures risk registers to ensure compliance with CCE-SMS-006.	High

Table A: Urgent & High Priority Recommendations

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1. Key Facts about the accident at XM096

At 11.13 hrs on 2 September 2010 the 09:30 hrs the Iarnród Éireann (IÉ) Ballina to North Wall IWT Liner train struck a tractor on level crossing XM096, also known as Stanley's No.2 crossing, located between Roscommon and Castlerea. The tractor driver was fatally injured.

2. Purpose of investigation

The Railway Safety Commission (RSC) is concerned with the prevention of accidents and incidents. Following the fatal collision at XM096 on 2 September 2010 the RSC undertook an inspection in accordance with Part 7 of the Railway Safety Act 2005. The purpose of the inspection was to determine the duty holder's compliance with its safety case (Safety Management System) and general duties. This report does not attempt to establish the cause of the collision.

The Railway Accident Investigation Unit (RAIU) investigate 'for cause' and the RSC shall respond to the findings of their investigation once complete, as appropriate.

3. Evidence

3.1. Evidence used in the Inspection

Evidence gathered at site

- Detail of the infrastructure components.
- Detail of the rolling stock and associated paperwork, e.g., Train Manifest
- Photographs taken of the vehicles involved in the collision
- Photographs taken of the level crossing and existing signage

Further evidence gathered / supplied / reviewed

- Copies of Level crossing Surveys undertaken by IÉ in recent years
- Event Recorder Analysis & Line Diagram for collision location
- IÉ Standard: I-PWY-1107 - Track and Structures Inspection Requirements Issue 1.1
- IÉ Standard: MW50 – User Worked Level Crossings
- Copy of the Transport Emergency Card (Tremcard) for dangerous Good UN 1805
- Copy of the Material Safety Data Sheets – *for goods onboard train*
- Notes of conversation with Divisional technical staff
- Internal IÉ e-mails relating to pertinent level crossings

4. Parties Involved

- The tractor driver was a local famer.

- Iarnród Éireann (Irish Rail) is the Railway Undertaking, i.e., the train operator and the employer of the train driver.
- Iarnród Éireann (Irish Rail) is the Infrastructure Manager and is responsible for maintaining the track and level crossing where the accident occurred.
- Roscommon County Council is the local authority responsible for the road on which the accident occurred.
- Iarnród Éireann and RAIU personnel attended the scene of the accident along with Gardaí from Knockcroghery station.

5. Location

Crossing XM096 is located at 103 miles 400 yards from Dublin (Broadstone), on the section between Athlone and Manulla junction. The crossing is designated as an 'OP' crossing by Iarnród Éireann (IÉ) meaning it is a user worked level crossing on a public road. At such crossings responsibility is on the road user to determine if it is safe to cross. Other Key features at this location include;

- The railway at this location is single track with an approximate rising gradient of 1 in 500 on the approach to the level crossing from the Manulla junction side.
- The maximum speed over the crossing is 70 mph for passenger trains and 50 mph for freight trains.
- The roadway at the crossing is a narrow lane with an unsealed surface and crosses the railway line north to south. The railway line runs from north-west to south-east.
- Warning signs and iron gates are located each side of the crossing.

6. The Train

The train (Train ID: K801) involved in the accident consisted of a single locomotive and 18 flat wagons. The train consist was as follows;

- Locomotive 225, cab 2 leading, with fifteen "47-ft 6-inch" & three "42-ft 9-inch" flat wagons.

Fifteen of the 18 wagons were loaded with containers. The train manifest recorded 10 of these wagons as carrying dangerous goods. The locomotive was equipped with an event recorder (TELOC).

7. Analysis of Evidence

7.1.Crossing signage

On the day of the accident, the 2nd of September 2010, the RSC attended site and noted the following signs were provided at the crossing;

- Regulatory STOP sign
- Keep these gates shut (Bylaws)
- "Puffing Billy"
- Danger Railway Crossing
- Beware – STOP LOOK LISTEN
- Have you shut the gates
- Crossing identification number

Figure 1: Signage at XM096 – South of railway line (left) and north (right) Photos taken -2nd September 2010)

It was noted that the advance warning sign on the road to the north of the railway (above right) incorrectly indicated the presence of an open crossing rather than a gated crossing. However, as the tractor was driven from the south, this was not a factor in the accident. IÉ were aware of this anomaly and correspondence was seen by the RSC confirming IÉ had advised the appropriate authority for road signage in the area (Roscommon County Council).

RSC1	**Advise local authorities of their duties regarding level crossing signage on approaches** The RSC should notify Local Authorities of their duties and the requirements for warning signage as specified in the Traffic Signs Manual (2010). This could be supplemented by high-lighting the issue at the Road Rail Safety Working Group (RRSWG), chaired by the RSC.
Priority	High
Timescale	1 month

The RSC also reviewed IÉ's safety assessment of crossing XM096 undertaken by Divisional personnel on 16 December 2009 which recorded that the following signs were not provided at the crossing:

- Warning Pedestrian LC sign (not mandatory)
- Black and Yellow markers (not mandatory)
- Have you shut the gates (note sign in place on 2nd September 2010 – RSC Survey)
- Local authority signs on approach to crossing

CCE1	**IÉ should ensure that all signs that are required at OP level crossings are in place** IÉ should review its most recent level crossing surveys for all OP crossings to identify if any signage required to be erected is not present. Having completed this exercise IÉ should produce an implementation plan to address any shortcoming.
Priority	Urgent
Timescale	3 Months

7.2.Recordings of gates being left open and correspondence with user

Records of misuse at the crossing were requested from IÉ. Records provided showed that the gates had been closed by the Patrol Ganger on 8 June 2009 and 23 August 2010. IÉ have produced a very informative safety document entitled *'The Safe use of unattended railway Level Crossings'* (November 2006). IÉ were asked if this document had been furnished to users of XM096. IÉ was unable to provide evidence that the booklet had been provided to users of XM096. Given the level crossing is very lightly used and the landowners adjacent to the level crossing are known, it would appear reasonably practicable for Irish Rail to provide a hard copy of this publication to these users, and to record this.

CCE2	**Provide copies of relevant safety documents to known users** IÉ should ensure that every effort is made to provide a hard copy of *'The Safe use of unattended railway Level Crossings'* to known users of such crossings where reasonably practicable, and to record that it has done so. This especially true for those level crossings with substandard viewing distances.
Priority	High
Timescale	3 Months

7.3. Surveys and Assessments of the crossing

IÉ advised that their document I-PWY-1107 - 'Track and Structures Inspection Requirements' was the standard applicable regarding the inspection frequencies for level crossings. The latest version, Issue 1.1, of this standard became operative on 12 August 2010. This standard requires an annual Safety Assessment and for views to be measured every five years. Safety assessments and surveys for the crossing in compliance with this requirement were seen by the RSC.

7.3.1. Measurement of viewing distances

Prior to the collision, viewing distance measurements for the crossing were recorded on the 17 June 2005, on the 4 February 2009 and on the 12 August 2009. IÉ also provided the results of a survey undertaken after the incident on 30 September 2010.

The format of the survey forms of 2005, 2009 and 2010 varies, as shown in Figure 2, but essentially contains the same information. Comparison was made with the survey forms used in the Limerick Division. There is currently variance in the survey forms used both over time and between divisions. IÉ Company Safety Standard 1, 'Policy and Principles for Production of Safety Standards and Document Control' (issue 3.3) states that 'Versions of documents and the status of copies of controlled documents will be clearly marked'.

CCE3	**Harmonise level crossing survey forms and make it a controlled document** IÉ should review the current survey formats in use with a view to standardising them. Any new form should ideally be part of a technical standard thereby making it a controlled document.
Priority	Medium
Timescale	3 Months

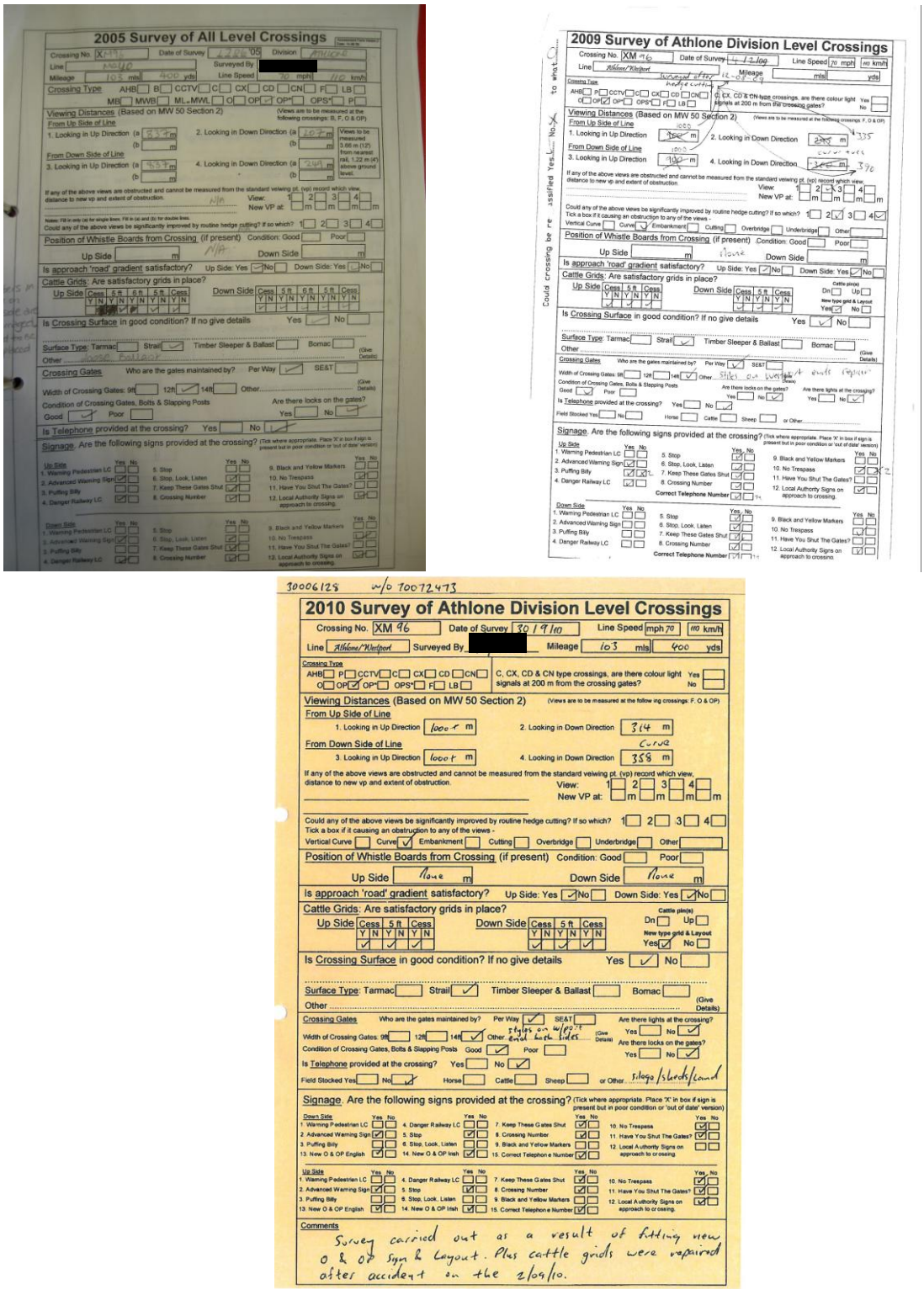


Figure 2: Level Crossing survey forms for 2005, 2009, 2010 for level crossing XM096

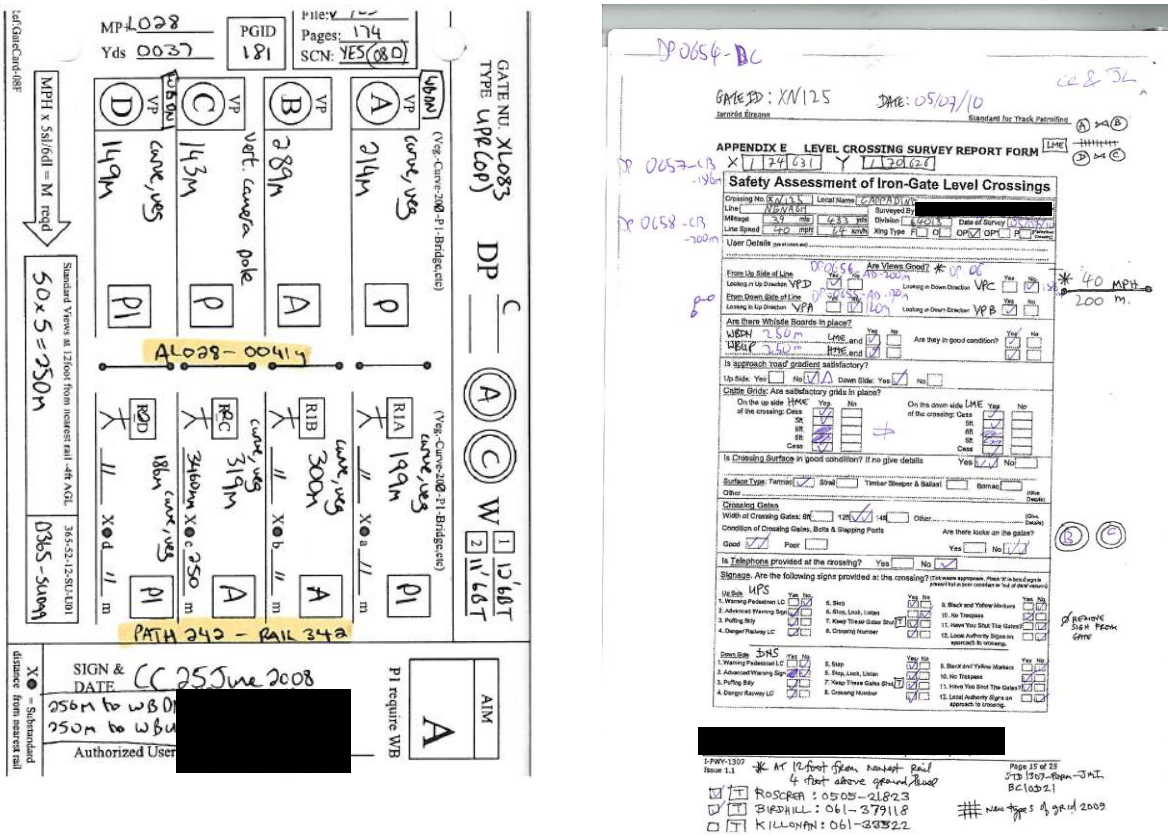


Figure 3: Limerick Division survey forms for 2008 and 2010 (Sample)

IÉ personnel advised that the level crossing standard was currently being amended to require annual surveys of crossings. Evidence was seen by the RSC of all crossings in the Athlone division being surveyed in 2010.

7.3.2. Viewing process for user worked crossings

The process for measuring the viewing distance for crossings in the Athlone Division was observed at crossing XM033 by an RSC Inspector on 22 October 2010. This involved the use of a laser range finder viewing unit. It is noted that there are many means by which views may be measured, i.e., by tape, wheel, theodolite or laser device. It was noted that there was no evidence that the range-finder unit was calibrated as there was no calibration sticker found on the instrument. Similarly, there was no documented evidence of the instrument being calibrated.

However, the IÉ representative was able to describe an internal process for ensuring the unit measured correct distance. Unfortunately there was no formal recording of the process or the results of calibration.

CCE4	**IÉ should ensure survey equipment is calibrated and records kept.** IÉ should review its survey equipment, identifying what equipment needs cyclical calibration and commence & establish a calibration programme. If novel equipment is used, appropriate training of staff should be provided.
Priority	Medium
Timescale	3 Months

7.3.3. Viewing of XM096

The survey form for XM096 dated 17 June 2005 recorded the viewing distance for the upside of the line looking in the down direction as being 207m and from the down side of the line looking in the down direction as being 249m. The line speed was recorded on the form as being 70 mph.

IÉ advised that the standard for determining adequate viewing distances was Maintenance of Way Standard 50 (MW50).

> *MW50 states 'the minimum view necessary for a crossing to be perfectly safe with normal vigilance on the part of the user' is 350m for a train speed of 70 mph on single line track.*

The evidence provided for this inspection (17 June 2005) does not meet this standard. Similarly, the evidence provided in relation to the survey undertaken on the 14 February 2009 does not meet this standard for the observations looking in the down direction looking from both the up and down side of the line.

IÉ advised that cutting of vegetation took place in the vicinity of XM096 in 2009 and that the crossing was resurveyed on 12 August 2009. While the standard viewing distance in the down direction from the down side of the line was achieved at this survey, the viewing distance in the down direction from the up side of the line still did not meet the distance required in Standard MW50 and accordingly whistle boards should have been installed or the line-speed reduced.

IÉ1	**Non-compliance with IÉ Standard MW50 Section 2 : Views of approaching trains** The minimum view necessary for XM096 to be perfectly safe with normal vigilance on the part of the user', taking the normal line speed (70 mph) into account was not met in accordance with the above standard.

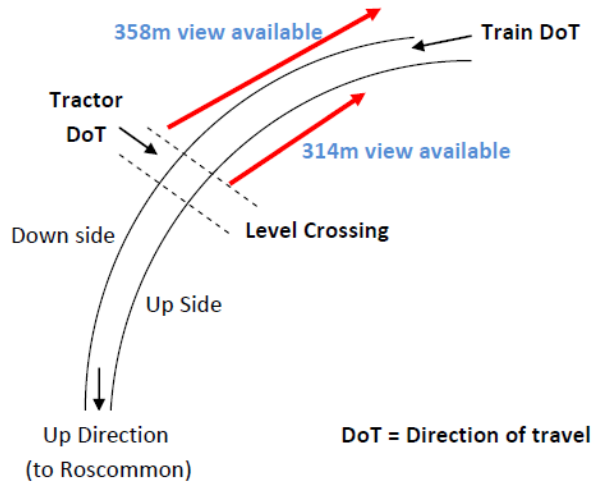
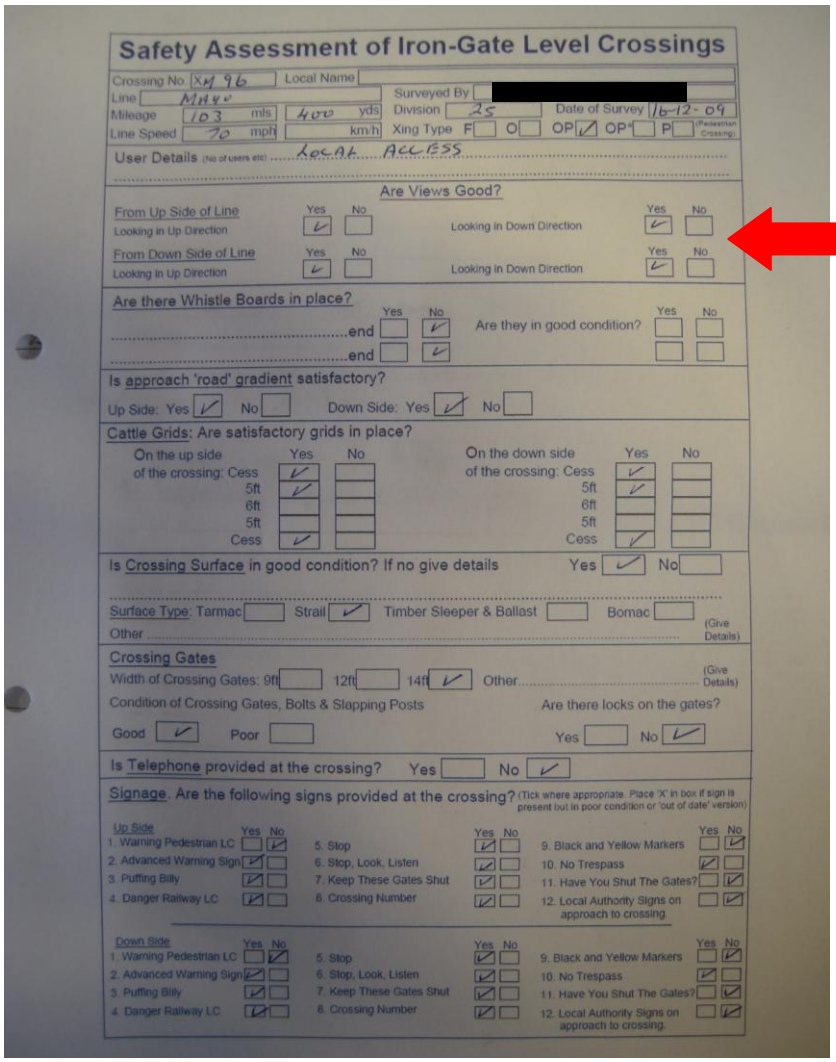


Figure 4: Site Layout with available views (measured 30th Sept 2010)

It is noted that the tractor travelled across the level crossing from the down side to up side and that the available sighting for such a movement met the requirements of the MW50 standard. Equally the RSC is mindful of the fact that the train involved in the collision was a freight train which had a permissible speed of 50 mph and this speed limit was observed.

The crossing was surveyed after the collision, on 30 September 2010, and the viewing distance in the down direction from the up side for the line was recorded as 314m. This is less than that required by Standard MW50 which, as previously stated, requires 350m for a train speed of 70 mph on single line track which is the speed limit for passenger services on this section of track.

The RSC also reviewed the 'Annual Safety Assessment' undertaken on 16 December 2009 which recorded all views as being *'Good'*, see Figure 5. It is appreciated that seasonal vegetation may affect the viewing of the crossing.



Safety Assessment of Iron-Gate Level Crossings

Crossing No XM 96 Local Name
Line MH40 Surveyed By [redacted]
Mileage 103 mls 400 yds Division 25 Date of Survey 16-12-09
Line Speed 70 mph km/h Xing Type F O OP OP P (Pedestrian Crossing)
User Details (No of users etc) LOCAL ACCESS

Are Views Good?

From Up Side of Line — Looking in Up Direction: Yes / No — Looking in Down Direction: Yes / No
From Down Side of Line — Looking in Up Direction: Yes / No — Looking in Down Direction: Yes / No

Are there Whistle Boards in place?
.....end: Yes / No — Are they in good condition? Yes / No
.....end: Yes / No

Is approach 'road' gradient satisfactory?
Up Side: Yes / No Down Side: Yes / No

Cattle Grids: Are satisfactory grids in place?

On the up side of the crossing:	Yes	No	On the down side of the crossing:	Yes	No
Cess	✓		Cess	✓	
5ft	✓		5ft	✓	
6ft			6ft		
5ft			5ft		
Cess	✓		Cess	✓	

Is Crossing Surface in good condition? If no give details Yes ✓ No
Surface Type: Tarmac Strail ✓ Timber Sleeper & Ballast Bomac (Give Details)
Other

Crossing Gates
Width of Crossing Gates: 9ft 12ft 14ft ✓ Other (Give Details)
Condition of Crossing Gates, Bolts & Slapping Posts: Good ✓ Poor
Are there locks on the gates? Yes No ✓

Is Telephone provided at the crossing? Yes No ✓

Signage. Are the following signs provided at the crossing? (Tick where appropriate. Place 'X' in box if sign is present but in poor condition or 'out of date' version)

Up Side	Yes	No
1. Warning Pedestrian LC		✓
2. Advanced Warning Sign	✓	
3. Puffing Billy	✓	
4. Danger Railway LC	✓	
5. Stop	✓	
6. Stop, Look, Listen	✓	
7. Keep These Gates Shut	✓	
8. Crossing Number	✓	
9. Black and Yellow Markers		✓
10. No Trespass	✓	
11. Have You Shut The Gates?		✓
12. Local Authority Signs on approach to crossing		✓

Down Side	Yes	No
1. Warning Pedestrian LC		✓
2. Advanced Warning Sign	✓	
3. Puffing Billy	✓	
4. Danger Railway LC	✓	
5. Stop	✓	
6. Stop, Look, Listen	✓	
7. Keep These Gates Shut	✓	
8. Crossing Number	✓	
9. Black and Yellow Markers		✓
10. No Trespass	✓	
11. Have You Shut The Gates?		✓
12. Local Authority Signs on approach to crossing		✓

Figure 5: December 2009 Safety assessment of XM096

CCE5	**IÉ should ensure level crossing surveys are, whenever possible, undertaken at times when risk to users is greatest.** Seasonal vegetation growth may affect the viewing distances from some level crossings. Similarly, this could coincide with harvesting. IÉ should try to schedule level crossings surveys, particularly for those with sub-standard sighting, to be assessed when most likely to be affected by vegetation.
Priority	Medium
Timescale	3 Months

The RSC reviewed further internal IÉ correspondence relating to level crossings that had been identified as requiring whistle boards. Management were advised of this and rightly gave the instruction to fit whistle boards. However, no whistle boards were in place at XM096 at the time of the accident. It is noted that the absence of whistle boards was not necessarily a contributing factor to the incident given there were sufficient views for this specific road vehicle movement. (Figure 4) Regardless of this fact, whistle boards should have been in place and IÉ failed to mitigate the risk in the interim, i.e., between the time the instruction was given to install whistle boards and the time they would be actually installed.

CCE6	**IÉ should ensure risks are mitigated and these should be recorded** IÉ should ensure there is a process whereby risks are assessed, mitigated and actions recorded. Additionally, suitable interim measures should be considered and undertaken as necessary, if the proposed permanent mitigation will not be implemented for a prolonged period.
Priority	High
Timescale	1 Month

7.3.4. Track & Structures Risk Register

The RSC reviewed extracts from IÉ's 'Athlone Division Risk Register - Track & Structures', in particular entries relating to XM096. An entry dated 18 August 2010 for XM096 with a hazard of '*Substandard sighting'* was noted. The entry further stated *'Whistle board required at 385m approach for Up trains*' and a risk of '*Substandard conditions of level crossing signage prevail that increase the likelihood of a collision between train and user and leave IÉ exposed for not complying with Standard*'.

The mitigation detail included in the risk register is '*Arrange contract to correct signage and implement change*'. The entry in the risk register does not record whether the risk is tolerable or consider the risk control of a speed restriction while the mitigation of arranging a contract is implemented. It would be reasonably practicable for the assessment to have considered the implementation of a temporary speed restriction as mitigation. There appears to be no way of telling from the risk register what controls have been considered but not implemented. Neither is there a way of recording who has undertaken the risk assessment or the assumptions used in determining the frequency and severity of the risk.

IÉ standard CCE-SMS-006 titled 'Hazards and risk assessments' (July 2010) section 4.7 lists the required contents of a 'Track & Structures risk register'. Section 4.7.7 states:

> *'A residual Risk assessment in the form of three "S L R" columns that describe the residual (i.e. after any Risk controls are implemented) risk assessment. The residual Risk Rating is calculated by multiplying the residual Severity by the residual Likelihood. If a Risk control does not succeed to produce a residual Severity that is lower than the initial Severity or a*

residual Likelihood that is lower than the initial Likelihood, then it adds no value and the Senior Track & Structures Engineer must re-consider other more effective Risk controls'.

The calculation of the residual risk was not sighted in the risk register entry dated 18 August 2010, rather a green square had been placed in the column recording 'Current residual risk'.

CCE7	**IÉ should reassess risks in their Track & Structures risk registers to ensure compliance with CCE-SMS-006.** All risks associated with OP level crossings should be re-assessed and whenever possible mitigated. If no mitigation is implemented this should be recorded along with justification.
Priority	High
Timescale	3 Months

7.4.Freight train K801

Details of the locomotive event recorder download were provided by IÉ. The locomotive horn was sounded for crossing XM097 (521 metres before XM096). The horn was then sounded 112 metres before XM096 (5 seconds before the collision) and an emergency brake application made 88m before XM096. At this point the train was travelling at 49.3 mph. The line-speed for freight traffic on this section of line at the time of the accident was 50 mph. The evidence provided showed that the train driver had observed speed limits, had sounded audible warnings. Similarly, evidence suggests the freight train deceleration was to standard.

7.4.1.Carriage of Dangerous Goods

The dangerous goods carried on the train remained contained after the collision. As part of the inspection, a copy of the Transport Emergency Card (TREMcard) for the dangerous goods carried was requested, along with the position that the emergency information is kept in on the train. IÉ advised that the TREMcard is kept in the locomotive, where the driver is. RSC Inspectors did not see the TREMcard on the day, but it was submitted in evidence in the days after the accident.

A summary of the dangerous goods element of IÉ driver training was also requested as part of the inspection. IÉ advised that no specific training element of dangerous goods is included in driver training, though details on the transport of dangerous substances is included in an Section D of the General Appendix (an appendix to IÉ's Working Time Table and books of rules and regulations).
Regulation 5 of Statutory Instrument (SI) 701 of 2003 (European Communities (Transport of Dangerous Goods by Rail) Regulations, 2003) states that;

(1) An employer shall ensure that any person employed by him or her whose duties concern the transport of dangerous goods by rail shall receive training in the requirements governing the transport of such goods appropriate to their responsibilities.

(2) The training required by subparagraph (1) shall be periodically supplemented by the employer with refresher training to take account of changes in RID and in these and other applicable Regulations.

The evidence submitted suggests that IÉ is currently not compliant with this statutory instrument.

IÉ2	**Non-compliance with regulation 5 of S.I. 701 of 2003: Training of rail personnel in the carriage of dangerous goods** Regulation 5 of SI 701 of 2003 requires that an employer shall ensure that any person employed by him or her whose duties concern the transport of dangerous goods by rail shall receive training and periodic refresher training.

8. Occurrences of a similar character

Since 1980, 32 motor collisions between trains and motor vehicles at 'OP' crossings have been recorded by the RSC. There are currently 49 'OP' crossings in Ireland. The last fatal collision between a train and a tractor at an 'OP' crossing occurred at Cuddagh, Co. Laois in 1989. Two years earlier, in 1987, a fatal collision between a car and a train occurred at 'OP' crossing XM101 which is located one and a half miles away from XM096.

9. Recommendations

It is apparent that the compliance issues identified are not the direct cause of this fatal accident. However, this compliance inspection has highlighted areas where Iarnród Éireann is non-compliant with their standards and to address these and other issues the RSC have made a number of recommendations. The format in which recommendations have been made is as follows;

Number	**Title area** (Explanation of what the recommendation is.)
CCE1	**Priority** Urgent – action needed immediately to avoid unacceptable risk High – action needed to control a safety risk (commence within 3 month) Medium – action needed to control a safety risk (commence within 6 months) Low – action suggested to support longer term improvement in safety management (commence within 12 months)
Timescale	For project completion, i.e., once the activity has commenced it is expected that it is concluded within the specified timeframe.

Table 1: Recommendation Format

The tables below summarise the findings and tabulate the recommendations.

Number	**Area**
IÉ1	Non-compliance with MW50 section 2: **:** Views of approaching trains
IÉ2	Non-compliance with regulation 5 of S.I. 701 of 2003: Training of rail personnel in the carriage of dangerous goods

Table 2: Non-compliance summary

Number	**Area**	**Priority**
RSC1	Advise local authorities of their duties regarding level crossing signage on approaches	High
CCE1	IÉ should ensure that all signs that are required at OP level crossings are in place	Urgent
CCE2	Provide copies of relevant safety documents to known users	High
CCE3	Harmonise level crossing survey forms and make it a controlled document	Medium
CCE4	IÉ should ensure survey equipment is calibrated and records kept.	Medium
CCE5	IÉ should ensure level crossing surveys are, whenever possible, undertaken at times when risk to users is greatest.	Medium
CCE6	IÉ should ensure risks are mitigated and these should be recorded	High
CCE7	IÉ should reassess risks in their Track & Structures risk registers to ensure compliance with CCE-SMS-006.	High

Table 3: Recommendations summary

10. Relevant actions already taken or in progress

On the 4th March 2011, IÉ's Chief Civil Engineer advised that the following had already been undertaken;

- A whistle board was erected on the approach to crossing XM096 from the up direction on 2nd October 2010 in accordance with the Technical Information Sheet MW50, Section 4.

- Phase II of the new 'O' & 'OP' signs were installed to crossing XM096 on 15th September 2010.

- A review of the viewing distances at all unattended level crossings on the Mayo line was undertaken. Where deficiencies were identified, whistle boards were erected in accordance with Technical Information Sheet MW50, Section 4.4.

- A programme of view improvements has been initiated at user worked crossings along the route. This has led to a further reduction in the risk rankings at the crossings.

- A Works Order has been generated to cut the vegetation on the land of a third party that will improve the view looking in the Down direction from the Up side. The landowner gave consent for the work.

11. Next Steps

In accordance with section 76 of the Railway Safety Act, to ensure deficiencies in the process for controlling risks at user work crossings are addressed, IÉ shall submit an Improvement Plan (Plan) to the RSC.

IÉ shall submit the Plan to the RSC, by a prescribed date, clearly defining how it intends to rectify the SMS deficiencies (non-compliances) identified and provide a timescale for doing so. The RSC will review this submission and subject to it being satisfactory will track its implementation.

Similarly, IÉ should also produce a plan to address the recommendations made in the report which will also be tracked by the RSC.