Railway Safety Commission

RSC Compliance Audit –

Following the Partial Collapse of the Broadmeadow Viaduct

March 2010

Revision History:

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Executive Summary

On the evening of Friday 21st August 2009, one pier of the Broadmeadow Viaduct just north of Malahide station collapsed, leaving the Dublin-Belfast Rail way line suspended in mid air. Immediately following the collapse and while on site on the evening of the 21st August, the Commissioner for railway safety requested that Iarnród Éireann (IÉ) identify all other structures vulnerable to scour and arrange that they be inspected. The Acting Chief Civil Engineer of IÉ gave this instruction to his staff and the Railway Safety Commission (RSC) was regularly updated as to progress made.

The RSC also made the decision to investigate this incident in terms of IÉ's compliance with the Railway Safety Act 2005, as amended, ("the Act"). This investigation took the form of a compliance audit focusing on IÉ's inspection regimes for track and structures. The audit comprised a series of interviews with staff from the following departments; Chief Civil Engineer (CCE), New Works and the Training School. (For interview list see appendix A.)

IÉ are required by law to implement a safety management system (SMS) and prepare a 'Safety Case' that the RSC must accept before they are permitted to operate train services. The Safety Case is a high level document that describes the components of their SMS and demonstrates how IÉ has the ability to assess and control risks. IÉ's SMS is comprised of a suite of internal standards. There are 10 company standards, underpinned by Railway Safety Standards, Departmental Standards, a Rule Book and numerous other documents.
Prior to undertaking the audit, the standards pertinent to track and structures were identified and requested from IÉ. They were then reviewed in detail and a series of audit questionnaires produced. These formed the basis of the interviews conducted with IÉ personnel. Interviews were conducted between November 2009 and January 2010. This report presents the findings of this audit. During the course of the audit 4 non-compliances (NC's) were identified;

1. failing to undertake inspections as set out in IÉ standard I-PWY-1307
2. failing to undertake inspections/checks as set out in IÉ standard I-SMS-9021
3. Failing to undertake inspections and use prescribed forms as set out in IÉ standard I-STR-6510
4. failing to implement a competence assessment for all personnel engaged in safety critical roles in accordance with IÉ Railway Safety Standard 67

In addition to these NCs, the RSC have made 16 recommendations. These recommendations have not been assigned to any individual, however, the RSC suggest that all are initially led by the CCE in conjunction with the Principal Engineer – Track & Structures (PETS).

Similarly the RSC has not assigned priorities or timescales to the NCs or recommendations. It is expected that IÉ will advise the RSC by a prescribed date of what actions they will take to address the NCs and recommendations and in what timescale. This notification from IÉ will be in the form of an implementation plan. The RSC will review this plan and subject to it being satisfactory, will track its execution.

Number	Recommendation
1	Review Risk Weightings and Factors used in the Network Wide Risk Model
2	Clarify Safety Responsibilities
3	Review CCE Departmental Safety Management Standards.
4	Review the need for a Coastal Defence Inspector/team.
5	Review the 'Structural Inspections Standard I-STR-6510'
6	Develop a procedure to manage reports of safety related events
7	Check and amend the 'Standards Review & Revision History' on CCE Standards
8	Include Audit on all relevant Infrastructure Standards
9	Re-brief Patrol Gangers and PWIs on their duties under track patrolling standard I-PWY-1307.
10	Review the track patrolling standard I-PWY-1307 forms in Appendices B and C
11	Rationalise Patrol Ganger Lengths
12	Review document management processes
13	Review Patrol Ganger Competence requirements
14	Review the content of the Structural Inspections Course
15	Review the need for the PETS to have structural engineering competence within their team
16	Review structural/coastal monitoring tools/method available

Table i: Recommendations Overview

The RSC would like to acknowledge all IÉ personnel involved in this compliance audit for giving freely of their time and answering all questions without prejudice to the outcome of this process. In some instances documentation was slow in being provided to the RSC, however, the RSC are of the opinion that this was not to frustrate but rather due to the significant volume of documents in existence and the lack of evidence of any document management system.

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Glossary of Terms

Term	Meaning / Definition
CCE	Chief Civil Engineer
CME	Chief Mechanical Engineer
CIÉ	Córas Iompair Éireann
CSSO	Chief Safety & Security Officer
DoT	Department of Transport (Ireland)
Hrs	Hours
IÉ	Iarnród Éireann (subsidiary of CIÉ)
km	kilometre
NC	Non-compliance
NR	Network Rail
SIP	Safety Investment Programme
RSC	Railway Safety Commission
RSP	Railway Safety Programme
CCE	Chief Civil Engineer
CME	Chief Mechanical Engineer
CCE	Chief Civil Engineer
CME	Chief Mechanical Engineer
CIÉ	Córas Iompair Éireann
CSSO	Chief Safety & Security Officer
DoT	Department of Transport (Ireland)

1 Introduction

On the 21st August 2009, two spans of the Broadmeadow Viaduct, just north of Malahide station on the main Dublin to Belfast railway line collapsed into the estuary below. The sequence of events in relation to the RSC is as follows;

a. The driver of the 18.07 hours (hrs) ex. Balbriggan to Dublin Connolly service while traversing the Broadmeadow Viaduct observed that the Dublin-Belfast (down line) over the viaduct had started to subside.
b. The driver upon arriving at Malahide Station (the station immediately south of the viaduct) at approximately 18.25 hrs, contacted the Signalman who closed the line.
c. The Chief Safety & Security Officer (CSSO) notified the RSC's Duty On Call Inspector (DOCI) at 18.45 hrs of the incident and stated that an Assistant Divisional Engineer would be on site by 1900 to assess the situation.
d. The CSSO again contacted the DOCI at 19.30 hrs and stated that a middle pier of the bridge had collapsed and that two spans of the bridge were down with the track hanging in mid-air.
e. The RSC immediately mobilised and were on site at 21.00 hrs and commenced its inspection.
f. It was identified that the 8th pier from the Dublin end of the viaduct had catastrophically failed resulting in the 8th and 9th spans falling into the estuary.

1.1 The Railway Safety Commission (RSC)

The RSC was established on 1st January 2006 under provision of the Railway Safety Act 2005, with responsibility for railway safety regulation and investigation. In the context of the European Directive 2004/49/EC (Railway Safety Directive), the RSC is the National Safety Authority.

In 2008 an additional regulation, S.I. No. 61 of 2008, came into effect, which further defined the position and role of the RSC in Irish law. It also amended some provisions of the 2005 Act to transpose the Railway Safety Directive. Collectively, this makes the RSC responsible for approving new rolling stock and infrastructure and for regulating the industry to ensure it is able to manage its own risk effectively. The RSC also co-ordinates and encourages railway safety initiatives between the industry and external stakeholders.

Following the partial collapse, the RSC made the decision to undertake a compliance audit of IÉ and this report presents the findings of this audit. It is emphasised that this report is not an investigation report into the cause of the partial collapse of the Broadmeadow Viaduct. This audit was undertaken by the RSC to;

- identify any organisational issues, actions or foreseeable technical failures which may have contributed to the event
- determine if there have been any breeches of the Railway Safety Act 2005, (the 'Act')

1.1.1 The Railway Accident Investigation Unit (RAIU)

The Railway Accident Investigation Unit (RAIU) is a functionally independent organisation which shares some of the administrative resources of the RSC. The RAIU are undertaking a 'for cause' investigation into this incident and their report will be issued in due course.
In addition, the incident has been investigated by the railway undertaking, IÉ, in accordance with section 53 of the Railway Safety Act.

1.2 Overview of Audit Report

In Chapter 2, a brief background to the Irish railway network is outlined providing details of network size, infrastructure and an overview of services provided on the network. Some over arching statistics are presented pertaining to structural assets on the Irish Rail network.
In Chapter 3, an overview of the various departments involved in the management of IÉ's infrastructure is provided, in particular focusing on those responsible for the maintenance of track and structures.
In Chapter 4, the findings of the audit are presented while in Chapter 5, conclusions from the audit are summarised, listing the recommendations made throughout the report. Where possible SMART principles are applied to the recommendations, i.e., they are made Specific, Measurable, Achievable, and Realistic. In terms of timing the RSC have not stated when these recommendations should be implemented. The RSC expect IÉ to provide a detailed implementation plan outlining how and by when the recommendations will be addressed. Once in receipt of this plan the RSC will review and when satisfied with it, will monitor its implementation.

1.3 Methodology

To provide some context, basic incident statistical data are presented relating to bridge structures. In terms of catastrophic failure of structures, data is limited due to the very rare occurrence of such events, however, the risk is ever present and the management of structures is fundamental in railway maintenance.
The audit, undertaken following the Malahide incident, included;

1. A review and examination of IÉ's management of structures
2. Identifying IÉ's compliance with their own standards
3. A review the staffing and competence of key inspection personnel

A review of literature pertaining to the area was undertaken and this primarily comprised of IÉ and Network Rail documents. (See section 6 for further details).

1.3.1 Recommendations

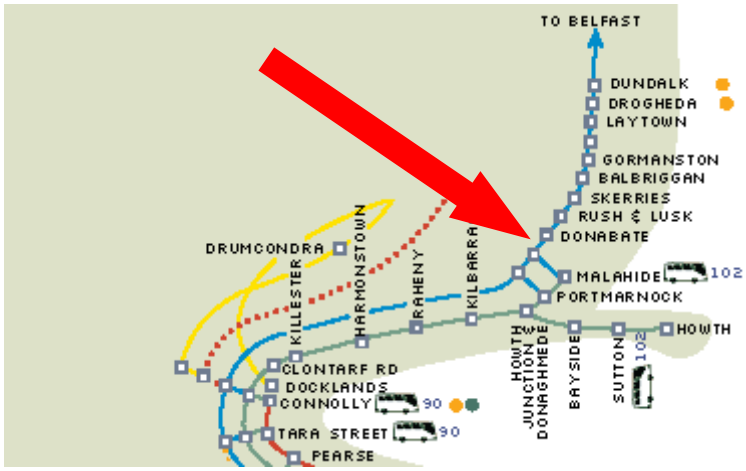
Throughout the text recommendation areas are identified and explained. The format in which recommendations are given is shown below in Table 1.

Number	**Title area** (Explanation of what the recommendation is.) Detail of the recommendation, identifying an area where IÉ are either non-compliant or where there is opportunity for improvement.

Table 1: Recommendation Format

2 Background

The railway network in Ireland extends to 1919 route km and is largely rural in nature with seven routes radiating from the capital's two main railway terminals, i.e., Dublin Connolly Station and Dublin Heuston Station. It is constructed of a mix of continuous welded rail (CWR) on concrete sleepers on the main radial routes from Dublin and jointed track on timber sleepers on the secondary lines such as on parts of the Limerick to Waterford line.



(Courtsey Irish Rail)

Figure 1: Dublin Rail Network (extract)

The Dublin to Cork and the Dublin to Belfast routes are the principal intercity routes and are double track railways. Services on these lines run to a clock-face timetable operating hourly on the Dublin to Cork route and two hourly (approximately) on the Dublin to Belfast route.

The remainder of intercity services operate to provincial cities and towns at varying frequencies on single lines with strategically located passing loops.

Dublin also has a commuter service comprised of what is essentially a Metro, albeit sharing tracks and train paths with main line services, and diesel multiple unit (DMU) commuter rolling stock.

In terms of usage, the Irish railway network has seen significant growth in recent years. In 2000, 31.7 million passenger journeys were made while, in 2008, the figure had risen to 44.6 million passenger journeys (RSC, 2008), representing an increase of approximately 40%. Given the increase in train services and network usage, railway assets have the potential to deteriorate more rapidly over time. Monitoring this deterioration is fundamental in the management of these assets. Structural defects are a phenomena that will always develop due to a number of factors that include fatigue, asset location, usage etc. Therefore a robust monitoring and inspection regime is vital to avoid structural failure. Fortunately, the frequency of catastrophic structural failure is extremely low.

Effective inspection, detection and maintenance will ensure the prolonged life of railway assets and prevent accidents from occurring. RSC records show there have been just two other structural failures, excluding cutting or embankment failures, in the last 15 years, which are listed below:

Date	Details
07-Oct-2003	Cahir Viaduct: Rail over river bridge collapse (following a derailment)
01-Feb-1995	Nenagh (Shalee): Rail over stream bridge Collapse

Table 2: Bridge Structural failures on the IÉ network

The condition of the assets throughout the network varies, however, IÉ have completed a significant volume of work under the first two phases of the Governments 15 year Railway 'Safety Investment programme' (SIP) which is worthy of comment.

The Minister for Transport, in response to the 1998 IRMS Safety Review, established a high level Railway Safety Task Force to address issues raised therein. The SIP was developed and commenced in 1999, with the objective of improving railway safety by upgrading, renewing and modernising of elements of the railway infrastructure in parallel with the installation of robust safety management systems. Table 2, below illustrates the deliverables to date, focusing on infrastructure.

SIP Phase	Asset Area	Infrastructure Change
1999 – 2003 (Phase 1)	Permanent Way (track)	400 Miles installed
	Structures	124 Upgraded or renewed
	Fencing	220 Miles installed
	Safety Critical Buildings	139 Upgraded
	Level Crossings	729 Closed or upgraded
2004-2008 (Phase 2)	Permanent Way (track)	134 Miles installed
	Structures	106 Upgraded or renewed
	Fencing	429 Miles installed
	Level Crossings	160 Closed or upgraded

Table 3: Works completed under phases 1 and 2 of the SIP (Source: IÉ)

2.1 The Broadmeadow Viaduct

The original Broadmeadow Viaduct commenced construction in the 1840s and was a timber structure. It was replaced in 1860 by a wrought iron lattice girder structure supporting the twin track Dublin to Belfast railway on a timber deck. The wrought iron lattice girder beams were supported by 11 stone piers founded on, what we now know is, a stone weir approximately 130ft (39.6m) wide by 30ft (9.1m) wide.

In 1966 work was undertaken to renew the viaduct, replacing the lattice beams with pre-stressed concrete beams resting on bed stones sitting on top of the original stone piers. No further structural works other than routine track maintenance/renewal has taken place on the viaduct since this time.

The viaduct, made up of 12 spans, is 176m long and acts as a weir holding in a significant body of water, the Broadmeadow Estuary. This weir separates the estuary and the Irish Sea and at low tide the difference in height is circa 3.5m (Doyle, 2009).

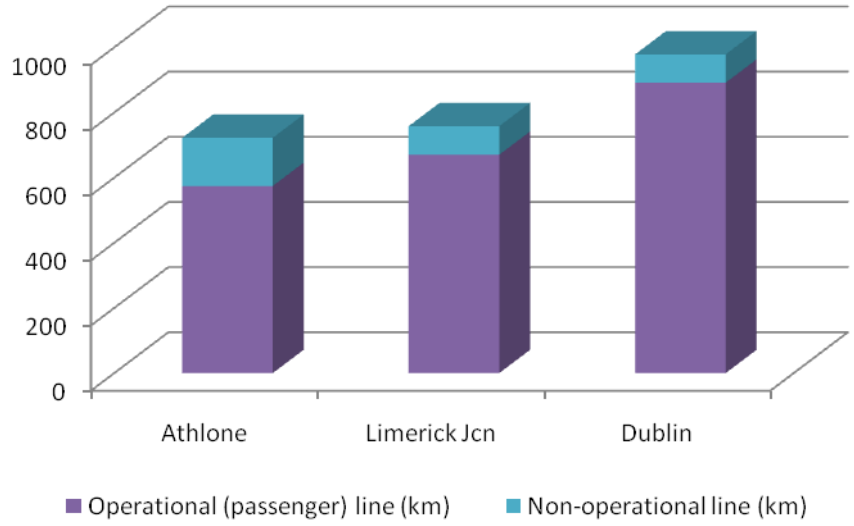
Over the entire period, from the 1840s through to the present day scour had been an issue and thousands of tons of stone and life expired concrete sleepers had been placed in between and around the piers. This is interesting because indications suggest that scour (erosion, due to water flow) of the sea bed (what we now know to be a weir) around pier 8, is the most likely reason for the collapse of that pier and spans 8 and 9. However, as previously stated this report does not investigate the cause of the collapse but focuses on IÉ's compliance with their own standards and whether or not those standards were appropriate.

2.2 Irish Infrastructure Statistics

The Irish railway network is relatively small in length and has suffered few, if any, catastrophic structural failures (excluding landslides). The inspection and maintenance of track and structures is managed by two Divisional Engineers (DEs) covering three geographical areas, under the direction of a Chief Civil Engineer (CCE). There are 1919km of (figure correct as of 31/12/2008) and the geographical spread of the assets across the divisions is illustrated in graph 1.

Divisional engineering staff, specifically, Patrol Gangers, are required by IÉ standard, I-PWY-1307, 'Track Patrolling Standard' to inspect all track a minimum of weekly on Continuously Welded Rail (CWR) track and three times a week on jointed track. This is simply a visual inspection. Nonetheless, defects or changes in asset condition must be reported to the relevant Permanent Way Inspector (PWI). If the PWI considers it necessary they will contact their relevant Assistant Divisional Engineer (ADE) to arrange

further examination, otherwise the PWI will plan the works to be undertaken by their Mobile Gangers.



Graph 1: Track km by maintenance division

In addition to the Patrol Gangers, assets should be inspected by the PWI, ADE and the DE at frequencies and by the methods specified in standard I-PWY-1107, 'Track & Structures Inspection Requirements'. In terms of asset quantity, there are in excess of 6000 safety critical infrastructure assets of which approximately half are bridges. To adequately inspect these, a significantly large team comprising patrolling staff, technicians and Engineers are necessary. Table 4 presents the inspection personnel currently employed by IÉ. The number of competent staff is biased towards the Dublin division due to the fact they have more assets than the other divisions. It should also be noted that the divisional engineering staff have to undertake numerous inspections of several different assets and not just bridges.

Staff	**Dublin Division**	**Athlone Division**	**Limerick Division**
Divisional Engineer	1	0.5	0.5
Asst. Divisional Engineer	3	2	2
Senior Engineer/Engineer	5	1	3
Technical Engineering Staff	7	4	5
PWI (Divisions)	11	7	8
Patrol Gangers	70	51	53
Total	97	65.5	71.5

Table 4: Competent Divisional Engineering Inspection Staff

2.3 Bridge Statistics

There are 1204 over-line bridges, i.e., bridges over the railway and 1926 under-line bridges, i.e., roads, rivers etc under the railway (figures correct as of 15/2/2010). The geographical spread of these bridges across the divisions is illustrated in graph 2.

Graph 2: Number of bridges by maintenance division

IÉ maintain a central bridges register and this database holds detailed information on all the bridges. For example, under-bridge data maintained includes: a unique identification number; asset functional location; divisional responsibility; mileage; construction type; available headroom; whether the railway traversing over the bridge is an operational or non-operational line, i.e., whether passenger train services operate or not etc.

Of the 1926 under-bridges, 41%, or in excess of 780, are bridges over water. Clearly, not all of these are bridges similar in construction, size or complexity to the Broadmeadow Viaduct, however, it serves to illustrate the significant number of assets that must be inspected by IÉ's Engineers. Regardless of whether the bridge/viaduct is located on an operational or non-operational line, divisional engineering staff are required by IÉ's own standards to inspect all bridges every two years.

Following the incident at Malahide, the RSC requested that IÉ identify other bridges with similar characteristics to that of the Broadmeadow Viaduct. IÉ initially identified 88 bridges that they believed were vulnerable to scour and set about inspecting these as a priority. This figure subsequently rose to 103 and all have been inspected to various extents with a small number of underwater inspections to be completed by February 2010.

2.4 Irish Rail Risk Model

The IÉ risk model, developed in 1998, is used as a tool by IÉ Engineers to monitor and assist in managing risk, and to aid the identification of areas where safety investment can provide the greatest return. The risk model measures risk in terms of fatalities and/or of the number of major and minor injuries. The model considers the risk of all activities and represents the risk in terms of equivalent fatality (EF). An EF is calculated as the sum of fatalities and injuries, where 10 serious injuries = 1 fatality and 200 minor injuries = 1 fatality. In terms of relative weightings IÉ use weightings of 0.1 and 0.005 for serious and minor injuries respectively. These are usually applied when evaluating the value for avoiding a fatality. The number of equivalent fatalities should be obtained by adding together the number of fatalities and 0.1 times the number of serious injuries and 0.005 times the number of minor injuries.

For example, 15 serious injuries can be taken as 0.1 x 15 = 1.5 equivalent fatalities, and 40 minor injuries as 0.005 x 40 = 0.2 equivalent fatalities. Thus an accident resulting in an estimated 2 fatalities, 15 serious injuries and 40 minor injuries can be taken as a having a consequence of 2 + 1.5 + 0.2 = 3.7 equivalent fatalities or 3.7 EF.

In 2003 the Iarnród Éireann risk model estimated the risk factor on the railway to be 17.5 Equivalent fatalities (EF) from all accidents. In 2005, the risk model was run again and this figure had reduced to 11.3 EF. Prima face, this reduction suggested that safety was improving. However, an external audit of the system, conducted in 2006 by AD Little (2006), compared the risk rating, normalised by passenger journeys, of the Irish model with that of the UK's. It was found that the 2003 risk values were not comparable, taking into account the sizes of the networks and operations.

However, IÉ made a number of refinements to their model and the AD Little report did find that the 2005 IÉ risk values more closely aligned with that of the UK's. The most recent run of the risk model, in 2007, provided a figure of 9.0 EF which shows improvement in safety terms when benchmarked against the 2005 figure.

Table 5, illustrates the level of risk that exists, network wide, based on all structures and lastly based on the Broadmeadow Viaduct only.

Year	IÉ Overall	Structures	Broadmeadow Viaduct
2003	**17.5 EF**	**1.5 EF**	**7.0×10^{-4} EF**
2005	**11.3 EF**	**0.3 EF**	**3.2×10^{-5} EF**
2007	**9.0 EF**	**0.3 EF**	**8.9×10^{-5} EF**

Table 5: Risk in terms of Equivalent Fatality

The reduction in risk pertaining to the Broadmeadow Viaduct, albeit small is, according to IÉ, as a result of the risk model being recalibrated in 2004-05. The risk model was benchmarked against the UK and Scotland specific risk models. This process resulted in a risk reduction for structural failure.

Table 5 suggests that the predicted risk associated with the Broadmeadow viaduct is very low, i.e., 8.9 x 10-5 EF, which essentially equates to 1 fatality every 10,000 years on this structure. The criteria on which these figures are based have not been validated, however, it would be prudent for IÉ to review their relative weightings and factors that determine these figures. [1]

1	**Review Risk Weightings and Factors in the Network Wide Risk Model** IÉ should undertake a review of the relative weightings and factors they use in the Network Wide Risk Model (NWRM). The figures used in the determination of the level of risk should be verified and validated to ensure the risk model is accurate.

Regardless of the level of risk that exists, all assets including structures must be inspected to laid down frequencies by IÉ staff and the personnel involved in this process are discussed in chapter 3.

[1] At the time of writing IÉ are in the process of re-running their Risk Model.

3 IÉ Departments & internal communications

The Railway Safety Act 2005 established the RSC and, with that, a formal rail regulation process. Article 2 of the Act defines 'railway undertakings' and lists the Irish State railway company, Iarnród Éireann (IÉ) which is a subsidiary of Córas Iompair Éireann (CIÉ), the national transport company.

Unlike railway operations in many European Union (EU) countries, in Ireland IÉ are responsible for both train service operation and infrastructure maintenance. There are some 4845 (IÉ, 2009) employees within IÉ, with operations and engineering staff making up the majority of this figure.

The management of track and structures is the responsibility of the Chief Civil Engineer's (CCE) department in which there are 794 staff (figure correct of 15th Feb 2010). A simplified organisation diagram explains the internal reporting hierarchy.

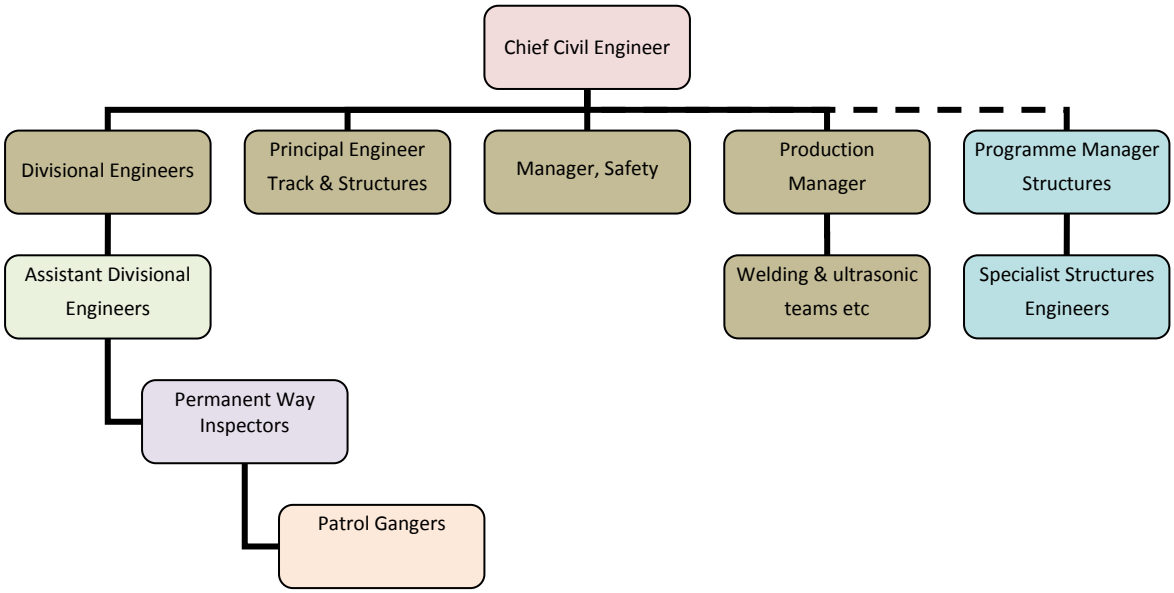


Figure 2: Chief Civil Engineer's Department Structure

3.1 Chief Civil Engineer

The Chief Civil Engineer (CCE) has primary responsibility for the safety of the line and has a number of direct reports that include Divisional Engineers (DEs), the Principal Engineer Track & Structures (PETS), a Production Manager, a Manager Safety and various administrative staff. The CCE meets, with their direct reports, formally, on a monthly basis. At these meeting the management of assets is discussed and this includes asset inspections being undertaken.

3.2 Principal Engineer Track & Structures

The Principal Engineer Track & Structures (PETS) is the professional head of track engineering and structures and is responsible for producing and briefing internal technical standards for the adequate management of railway assets. In addition he/she is responsible for the review of standards and for providing expert advice to the CCE as necessary. In terms of managing structures the PETS has no direct role other than if clarifications are required in terms of the standards.

3.3 Divisional Engineering Staff

3.3.1 Divisional Engineer

As stated earlier there are two Divisional Engineers (DEs), 1 based in Dublin, the other in Limerick Junction. They are responsible for the maintenance of the line and these individuals are supported by a team of engineers and technical staff in addition to a number of Permanent Way Inspectors and track maintenance teams.
In terms of inspection regimes these vary according to what is being inspected. There are a number of standards pertaining to different assets (see chapter 4) specifying what must be inspected and at what frequency.

3.3.2 Assistant Divisional Engineer

The Assistant Divisional Engineer (ADE), of which there are two (excl. Dart Engineer) in each geographical area i.e., Dublin, Athlone and Limerick Junction, reports to their respective DE. Their role and purpose as defined in their job description is, amongst other things, to maintain and renew the infrastructure assets associated with track and structures. This should be achieved by them regularly inspecting, monitoring and auditing the infrastructure assets and resources under their responsibility.

3.3.3 The Permanent Way Inspector

The Permanent Way Inspector (PWI) is responsible for the day to day track inspection and maintenance activities for both track and structures. They must ensure that their Patrol Gangers undertake their inspections to the required frequency and submit defect reports. The PWIs are responsible for planning maintenance activities by assigning work to the Mobile Gangers. Currently there are 26 Divisions, typically with at least one PWI per division. IÉ were unable to provide specific job descriptions or safety responsibility statements during the audit for the PWI post.

In correspondence from the Safety Manager from the CCE Department to the RSC (dated 21/12/06) it was stated that

> *"Safety Responsibility Statements have been issued to all Managers in Infrastructure, to the level of Senior Engineer. In addition, a number of newly appointed Supervisors have been issued with Safety Responsibility Statements and it is planned to have all Supervisors issued with their Safety Responsibility Statements by May 2007 and to all other Safety Critical positions by December 2007."*

Clearly, this remains incomplete, however, it is noted that at the time of writing PWIs are being issued with Job Descriptions and Safety Responsibility Statements.

3.3.4 The Patrol Ganger

The Patrol Ganger is responsible for undertaking inspections of both track and structures. They must ensure that they complete a 'Patrol Gangers Report each week and supply these to their PWI. Depending on the location and the type of track infrastructure the frequency of track patrols can be either once or three times a week.

Currently the post of Patrol Ganger, of which there are 174 in the company, have no specific job description or safety responsibility statement.

3.4 The Programme Manager Structures

The Programme Manager Structures (PMS) reports to the Director New Works and not the CCE. The PMS is responsible for ensuring all planned structural engineering projects are prioritized and completed in line with programme. The Job description for the post of PMS also states that the PMS 'will provide advice to colleagues regarding matters relating to structural support to capital and maintenance projects'. In this regard the PMS essentially provides the 'Divisions' with a service, i.e., structural design and advice and on occasion the PMS and his team procure and project manages specific structural projects.

3.4.1 Specialist Structures Engineer

There are three Specialist Structures Engineers who assist the PMS in ensuring all planned structural engineering projects are prioritized and completed in line with programme. When structural projects commence they are generally on site providing advice to contractors. They also act as a liaison between the New Works department and the Divisions.

4 Audit Findings

As previously stated the audit comprised a series of interviews with various IÉ staff from a number of departments. For each interview an audit protocol was developed and comprised a series of questions that differed depending upon who was interviewed. Question areas included;

- Safety management / policy
- Standards
- Inspections of assets / Document Control
- Training and Competence
- Departmental and inter-departmental communication

In order to produce the audit questions the RSC reviewed numerous documents that included job descriptions, safety responsibility statements, bridge and track inspections reports and standards. The standards that were reviewed are presented in table 3.

Ref.	Title	Issue no.	Release Date
I-PWY-1107	Track and Structure Inspections Requirements	Issue 1.0	05/09/2006
I-PWY-1307	Standard for Track Patrolling	Issue 1.1	05/09/2006
I-STR-6510	Structural Inspections	Issue 1.0	
I-STR-6510	Structural Inspections	Issue 2.0	23/10/2008
I-STR-6510	Structural Inspections	Issue 3.0	01/10/2009
I-SMS-9020	Standard for Safety monitoring	Issue 2.0	03/07/2007
I-SMS-9521	Safety monitoring Guidelines for Divisional Engineering Staff	Issue 2.0	05/06/2007
I-SMS-9501	Safety management System for the CCE department	Issue 2.0	01/08/2008

Table 6: IÉ CCE Standards reviewed

The following sections present the findings pertinent to each of the question areas listed above.

4.1 Safety Management / policy

As part of the evidence collection the RSC requested numerous documents that included Job descriptions (JDs) and Safety Responsibility Statements (SRSs) for various personnel. No such documents were supplied for the position of PWI or Patrol Ganger. The RSC therefore assumes that these documents do not exist. Safety Critical posts such as these should, in the opinion of the RSC, have JDs and SRSs and IÉ should produce and issue these in a timely manner. It should also be emphasised that AD Little report in 2006 also

recommended that IÉ clarify safety responsibilities. Recommendation SMS15 of this report recommended that;

> *"IÉ should ensure that all staff that carry out safety critical and safety related tasks are aware of their safety responsibilities. This should be delivered either through appropriate Job Descriptions/Safety Responsibility Statements or for example through training and assessment against relevant sections of the Rule Book as part of a development of the broader Competence Management system".*

The RSC also wrote separately to the IÉ Chief Safety and Security Officer on the 13th March 2009, reference TB9101, reminding them of this recommendation to which the RSC received no response.

Furthermore, the RSC received correspondence from the Safety Manager of the CCE Department (dated 21/12/06) which stated that;

> *"Safety Responsibility Statements have been issued to all Managers in Infrastructure, to the level of Senior Engineer. In addition, a number of newly appointed Supervisors have been issued with Safety Responsibility Statements and it is planned to have all Supervisors issued with their Safety Responsibility Statements by May 2007 and to all other Safety Critical positions by December 2007."*

Evidence suggests that this target date was not met and remains incomplete.

2	**Clarify Safety Responsibilities** IÉ should ensure that all staff that carry out safety critical and safety related tasks are aware of their safety responsibilities. This should be delivered either through appropriate Job Descriptions/Safety Responsibility Statements or for example through training and assessment against relevant sections of the Rule Book as part of a development of the broader Competence Management system".

It was also noted that the format of JDs and SRSs varied considerably from one post holder to another. In some instances there were two documents, while in others there was only one. It was also noted that some ADEs had no JD or SRS.

4.2 Standards

IÉ as a company have in excess of 200 standards. Company standards, of which there are 10, are the high level standards that provide a basis for IÉ's Safety Management System (SMS). Underpinning these is a suite of Railway Safety Standards, of which there are currently 43. Each department in turn, e.g., Chief Civil Engineer (CCE) has their own specific standards (72 'live' standards as of 15th February 2010) that demonstrate how they comply with the Railway Safety and Company standards.

The RSC do not prescribe or approve IÉ standards, however, a selection of these are audited, in terms of their implementation, annually by the RSC. Regarding this compliance audit, the RSC reviewed a number of standards and any findings relating to these are now presented.

4.2.1 Standard I-PWY-1307

Standard I-PWY-1307 or the 'Standard for Track patrolling' gives the procedure and minimum requirements for track patrolling and supplementary inspections carried out by Patrol Gangers.

Section 3.4.1 of this standard states the minimum frequency that various features are inspected. Rail under-bridges over rivers or waterways should, during flooding, be inspected on each patrol until the river flow is normal. Thereafter, rail under-bridges over rivers or waterways should be inspected once a month. It further states that the bridge is checked underneath for scour at least once a year in a dry weather spell. In interview it was stated that this was not done as it was not possible for the Patrol Ganger to gain access underneath the Viaduct in order to undertake an inspection for scour. This is non compliant with the standard.

IÉ1	**Non-compliance with I-PWY-1307 Section 3.4.1** **The RSC are of the opinion that given the lack of evidence relating to track patrols and specifically inspections for scour, they have not been undertaken as required by this standard.**

4.2.2 Standard I-SMS-9021

Standard I-SMS-9021 'Safety Monitoring Guidelines for Divisional Engineering Staff' describes the methods by which safety monitoring is carried out by divisional engineering staff in the Infrastructure department. It includes the frequency and the groups involved.

Section 3.3 makes reference to the post of the Coastal defence Foreman. In was stated in interview that the coastal defence gang, who worked full time and reported to the

Coastal defence Foreman, were disbanded in 2008 as it was felt that they were not functioning as the company envisaged.

Given this information, the RSC are of the view that this standard is no longer current and should be updated.

3	**Review CCE Departmental Safety Management Standards.** Review relevant safety management standards with regard to the following; • Removal of references to Coastal Defence Foreman I-SMS-9021 Section 3.3 makes reference to a Coastal Defence Foreman. It is believed that this post no longer exists and references to same should be removed from this all standards.

It is interesting to note that in the 1st IRMS, Review of Railway Safety in Ireland, report of 1998, section 6.5.1.7 suggested the authors were of the opinion that having sea defence squads meant that sea defence works were constantly monitored and that because of this the likelihood of a failure was small. In light of this coastal defence failure it might be prudent for IÉ to review its coastal defence management.

4	**Review the need for a Coastal Defence Inspector/team.** IÉ should review the need and possible benefit of either employing/training an in house Coastal Defence Inspector or procuring outside competence to inspect such structures at timescales to suit their complexity and the environment in which they exist.

During interview it also was established that site inspections and safety checks are being done but to varying degrees across the divisions, by key engineering grades. The RSC concluded that the required numbers of inspections, as specified in IÉ's standard, are not being achieved. Furthermore, it also became apparent that the vast majority of checklists have never been used and the high risk activities such as possession arrangements and safety critical communications are rarely checked.

IÉ2	**Non-compliance with I-SMS-9021 Sections 3.8.6 & 3.8.7, 3.9.6 & 3.9.7** **The RSC are of the opinion that given the lack of evidence relating to inspections and safety checks undertaken by Divisional Engineering personnel they have not been undertaken as required by the standard**

4.2.3 Standard I-STR-6510

The Structural Inspections Standard I-STR-6510 is the backbone of IÉ's asset inspection process and is reasonably comprehensive in that all structures from radio masts to culverts are categorised and an inspection regime mandated. A number of forms have been developed for the various types of structure to assist those undertaking the inspections. However, it was established through documentation submitted to the RSC

that the new forms are not been used by all applicable personnel. Historic 'Bridge Cards' continue to be used and the standard to which they are completed varies. It was noted that in a number of cases structures were not being inspected in accordance with the frequency mandated in this IÉ standard.

IÉ3	**Non-compliance with I-STR-6510 Issue 2.0[2] Section 4.2.4** **The RSC are of the opinion that, having reviewed inspection documentation and questioned individuals, structural inspections of bridges have not been undertaken in compliance with IÉ's Structural Inspections standard.**

Early indications suggest that scour was the most likely cause of the bridge collapse. Scour was first referenced in the 1st IRMS report of 1998 section 6.5.1.8 which stated that inspections for scour were not formalised. In response, albeit it some 7 years later (2005), IÉ instigated a 3 year programme of underwater inspections of those bridges identified as being vulnerable to the affects of scour.

Scour was again referenced in the AD Little report of 2006 in section 3.9.3. Recommendation S3 recommended that IÉ develop a flood/scour management system to ensure safety of structures at times of flood, including the conditions under which the track must be closed and may be re-opened. It is recognised that while some good work has been done, the existing flood/scour management system as outlined in the Structural Inspections standard is not adequate.

The RSC reviewed Issue 3.0 of this standard, dated 1/10/2009 and note table 1 under section 2.3.1 which suggests that coastal and river defences, a category C structure, should be monitored by Patrol Gangers in accordance with IÉ standard I-PWY-1307 'Standard for Track patrolling'. The RSC are of the opinion that this should be reviewed as the competence of Patrol Gangers in this area would not be sufficient. (See section 4.4.1 for further details)

IÉ should undertake a further review of this standard to ensure it adequately addresses scour and indeed flooding. (See recommendation 5)

[2] At the time of the incident the applicable Structural Inspections Standard was I-STR-6510 Issue. 2.0. The RSC acknowledge that this standard was superseded in October 2009 by Issue 3.0.

As part of the compliance review process the RSC reviewed the Network Rail (NR) approach to the management of structures and while there are many similarities to the IÉ methodology there are some noticeable differences. One such difference is in relation to the specific definition of a 'Major Structure'. NR standard NR/L1/CIV/032, The Management of Structures, defines a 'Major Structure' as;

"a structure that requires its own bespoke Management Strategy, which defines the specific process and requirements for managing the structure."

NR categorise their structures by virtue of their size, complexity, design, form of construction, accessibility etc. If a structure is designated as a 'Major Structure' a bespoke Management Strategy is devised and implemented. These bespoke Management Strategies for major structures include the following;

- information on, for example, the construction, renewal, maintenance and performance of the structure,
- information on the activities which require a particular regime, technique, knowledge or competency etc, for undertaking an Examination, Assessment or Evaluation,
- the programme of planned Examinations,
- the programme and details of particular requirements for maintaining the structure,
- other information such as particular requirements for accessing the structure, restrictions on use, requirements for water management, and the susceptibility of the structure to extreme weather conditions.

In addition the marking of individual elements of a complex or multi-element structure is undertaken and used to assist in refining inspections and maintenance activities. Similarly this might aid the reporting of issues from third parties.

IÉ's Structural Inspection Standard I-STR-6510 makes similar provision under section 4.1.2 whereby a 'Special Inspection plan' is maintained where appropriate. It was established in interview that no such plan existed for UB30 (the Broadmeadow Viaduct).

IÉ should review both their current practice and this NR standard to establish a similar methodology for all complex structures such as the Malahide Viaduct.

5	**Review the 'Structural Inspections Standard I-STR-6510'** Standard I-STR-6510 should undergo a thorough review to; • Ensure the inspection of coastal structures is addressed and frequencies befitting the environment are mandated. • Ensure the standard adequately addresses the management of scour and flooding. • Consider whether there is merit in assessing structures in term of risk, i.e., should a small culvert on freight only line be inspected at the same frequency as a large viaduct structure on an intercity route. • Consider defining/categorising 'Major Structures' and ensure bespoke management or special inspection plans are developed and implemented.

NR also has a specific standard, NR/WI/CIV/028: 'Management of Reports of Safety Related Events on Earthworks and Structures' that clearly states how they manage reports of safety related events on such structures and this may be a useful source of information for IÉ in terms of ensuring reports from third parties regarding safety aspects are appropriately managed.

6	**Develop a procedure to manage reports of safety related events** IÉ should write and implement a standard or procedure that clearly states how they will manage reports of safety related events from third parties.

4.2.4 General Standards Observations

Having reviewed a number of CCE standards there are a few observations worthy of further discussion. The first is in relation to the revision history or 'Review Procedure' section not being updated when changes have been made to a standard. It was not clear what alterations had been made without cross referencing to the previous issue which were not always readily available.

7	**Check and amend the 'Standards Review & Revision History' on CCE Standards** The CCE should ensure that when a standard is reviewed, regardless of any changes made it should be is stated somewhere within the standard that it has been reviewed. If this is not done, how does once know it has been reviewed. Similarly if a standard is revised and reissued, the revision history is updated. By way of example, it was found that the following standards are not the first issue, yet there is nothing stated as being changed under the 'Revision History' sections. • I-SMS-9501 'Safety Management System for the CCE Department' Issue 2.0 • I-SMS-9020 'Standard for safety monitoring' Issue 2.0 I-SMS-9021 'Safety monitoring guidelines for divisional engineering staff' Issue 2.0

The RSC acknowledge the importance of standards and the second observation is in relation to their implementation. It is appropriate and vital that an organisation monitors the implementation and effectiveness of its standards. Having reviewed a number of IÉ standards, each has a section entitled 'Review Procedure'. Typically standards with the CCE department are reviewed every five years or earlier if required which is a statement the RSC accepts. There is, however, no reference to the audit of infrastructure standards.

The RSC reviewed a sample of Chief Mechanical Engineer (CME), Company and Railway Safety Standards and all included a section on Audit. Typically on standards from these departments it states that the Chief Safety and Security Officer (CSSO) or CME, depending on what the standard is in relation to, will arrange for compliance with this standard to be audited on a regular basis and not less than annually. The RSC reviewed numerous infrastructure inspection report/documents submitted by IÉ and the level to which they are completed varies. The RSC are of the opinion that compliance with, and the effectiveness of, specific infrastructure standards has not been audited internally and this should be addressed.

8	**Include Audit on all relevant Infrastructure Standards** • IÉ should review and amend as necessary its infrastructure standards to include a section on auditing the compliance with these standard • IÉ should consider the need for an audit function within the CCE department to regularly monitor both the effectiveness and compliance with departmental standards.

4.3 Inspection of Assets / Document Control

Part of the audit process included IÉ submitting various inspection reports to the RSC. This included the Patrol Gangers reports (Form No.: IE 38/22) for the 6 months prior to the incident for the length of track that included the Broadmeadow viaduct.

The RSC noted a number of anomalies that included;

1. Section 2 of the form is never completed
2. All defects identified by the Patrol Ganger are marked as urgent
3. Forms were not signed as received by the PWI
4. Defects were not signed off as completed, i.e. after work has taken place
5. No reports were completed for some of the weeks in question

It was later established that the Patrol Ganger who walks the track from the 7½ milepost (MP) to 13¼ MP carried out patrolling on a number of weeks for which reports were not submitted. During the 6 months prior to 21st August 2009, IÉ confirmed that, of the 77 inspections required by the current pattern of patrolling (3 days per week) the length was walked by the appointed Patrol Ganger on 67 occasions.

The RSC received no clarification on the relief patrolling arrangements to establish if the remaining 10 inspections were undertaken. Therefore, the RSC are of the opinion that given the lack of evidence relating to track patrols they have not been undertaken as required by the current pattern of patrolling (3 days per week). However, it is noted that this length of track is constructed using CWR and the frequency of inspection, as set out in the Standard I-PWY-1307, is weekly. Based upon this rationale, the RSC cannot categorically state that IÉ are non-compliant in this regard.

9	**Re-brief Patrol Gangers and PWIs on their duties under track patrolling standard I-PWY-1307.** Patrol Gangers should be re-briefed on how to correctly complete the Patrol Ganger's Report (Form No.: IE 38/22) ensuring that, irrespective of whether a fault/defect has been observed the form is completed, clearly stating the date/s the inspection/s were undertaken. PWIs should be re-briefed on how to correctly complete the applicable sections of form No.: IE 38/22, ensuring that dates defects are removed are entered.

10a	**Review the track patrolling standard I-PWY-1307 forms in Appendices B and C** IÉ should review this standard and the effectiveness of the 'Patrol Gangers Report Form'. In particular the review should consider; • Some form of prioritisation for defects identified and not simply marked 'urgent' or n.b.'. Documents reviewed by the RSC suggest, all defects found are marked 'urgent' and this essentially renders the patrol ineffective as all defects must then be inspected by the PWI which can take some months to do. (PWI required to walk with their Patrol Ganger every 4 months, as per Section 2.2.1 of I-PWY-1107) • The fact that the PWI appears not to complete / incorrectly completes the sections applicable to him/her.

10b	**Review the track patrolling standard I-PWY-1307 forms in Appendices B and C** IÉ should review this standard and the effectiveness of the 'Patrol Length features Form'. In particular the review should consider; • Why there did not appear to be a completed form for the 7 ½ to 13 ¼ MP or Howth Junction patrol lengths.

The geographical areas managed by the Divisional Engineers are further broken down into Permanent Way Inspector (PWI) Divisions of which there are 11 in the Dublin Division. The PWI for Division 1 is responsible for track inspection and maintenance between the 17 ½ MP on the Rosslare line, or just south of Greystones station, and the 9 ½ MP on the Belfast line, or just north of Malahide station. The Broadmeadow viaduct is just outside this division and is under the remit of the Division 5 PWI who is based in Drogheda.

There is, however, an irregularity in that the Patrol Ganger who is responsible for the track inspection that includes the Broadmeadow Viaduct walks from the 7 ½ MP to the 13 ¼ MP and therefore reports to two PWIs. While in principle this can work it would be prudent for IÉ to rationalise the lengths to be inspected by Patrol Gangers.

11	**Rationalise Patrol Ganger Lengths** IÉ should consider rationalising the lengths inspected by track patrolling personnel so that a Patrol Ganger reports to one PWI. By doing so reduces the risk of sections of the line not being patrolled.

4.3.1 Document Control within the Dublin division.

Following the incident the RSC wrote to IÉ and requested numerous documents and historical information relating to the inspection and maintenance of the Broadmeadow viaduct. IÉ made a number of submissions at various stages and it appeared, to the RSC that IÉ's document control and management was somewhat convoluted. Given the importance of record keeping for structural assets and the number of assets IÉ must inspect and maintain (comfortably 6000+), IÉ should consider investing in a Document Management System (DMS) to assist in this process.

12	**Review document management processes** IÉ should undertake a review of its document management processes to ensure, at a minimum, safety critical documents such as structural/asset inspections, renewal and maintenance work are readily accessible to engineering personnel.

4.4 Training & Competence

IÉ have a significant training budget and in 2009 there was in excess of 7900 training days provided, predominantly, in-house to Infrastructure (CCE and New Works) staff. Courses are typically provided by competent trainers and assessors from the IÉ Training School. Training provided in house includes;

- Personal Track Safety and other safety related courses
- Technical Courses such as Bridge Strike Appreciation
- Train Operations and train driver courses
- Business Skills

The training school provides a service to the company in that within its capability it will provide the necessary training as requested of it from the various departments. Courses provided are tailored to the individual needs of those attending

4.4.1 Patrol Ganger Training & Competence

In 2007, IÉ introduced a 2 day in-house Patrol Ganger's Course. The course covers the requirements of the Track Patrolling standard I-PWY-1307. It was stated in interview that the content of the syllabus was written and developed by the training school and approved by the PETS. At the end of the course candidates are assessed by the course trainer using a 25 question multiple choice test. In order to pass this test candidates are required to obtain 80% or 20 correct questions.

The syllabus of the 2 day course was reviewed and it was noted that that there is no information or content relating to coastal structures. Only once is scour mentioned and there is no definition provided. It is evident that greater emphasis could be placed on

structures as part of this training. It was also established that no on-site assessment of competence takes place. This is a non-compliance with IÉ Railway Safety Standard (RSS) 67 - Training, Competence and Fitness which was issued in January 2007 and has applicability across all IÉ departments. The relevant sections of this standard are 3.4.1 and 3.4.2 which state;

> *3.4.1 Departments will establish criteria for competence assessment for all personnel engaged in safety critical roles. Criteria will be approved by the Professional Heads.*
>
> *3.4.2 Competency of personnel engaged in safety critical roles will be assessed on a regular basis*

IÉ4	**Non-compliance with RSS 67 sections 3.4.1 & 3.4.2** **No evidence was provided that would suggest that a competency management system is in place.**

13	**Review Patrol Ganger Competence requirements** • IÉ should consider whether assessments should form part of the process when interviewing for the position of Patrol Ganger. • IÉ should formally identify a designated person/s to internally assess the competency of Patrol Gangers in Patrolling Duties at stated frequencies. This person should be trained to achieve a high level of competency in assessment, for example, City and Guilds Assessor and Verifier qualification. • IÉ should review the role of the Patrol Gangers and whether it is appropriate that they are required to inspect structures / coastal structures.

4.4.2 Engineering Grade Staff Competence

Other than that of the training school, specific training was developed by the Programme Manager Structures (PMS) (formally the Structural Engineer) in parallel with the release of the Structural Inspections Standard, I-STR-6510 in July 2005. It was identified by IÉ in 2002/3 that there was a need to update IÉs standards relating to structures as all that existed up until then was a 1983 document referred to as MW41 or 'Maintenance of Way Technical Information Sheet No. 41, 'Bridges Inspections and Maintenance'.

A comprehensive and intense 3-day course was developed in conjunction with outside consultants and this course was initially delivered by the Structural Engineer to all staff who might undertake structural inspections. Such personnel included Divisional Engineers, their assistants and other technical and engineering grade staff within the divisions. It was not delivered to PWIs or Patrol Gangers.

The content was reviewed and bridge structures and coastal environments are addressed, however, there is no mention of coastal structures such as weirs, hydraulic jumps or the effects of water flow on them.

14	**Review the content of the Structural Inspections Course** IÉ should review, and amend as necessary, the training material used on the Structural Inspections Course to ensure it adequately covers the inspection of coastal structures. In doing so IÉ should consider whether the inspection of complex structures should remain within the remit of in-house engineering personnel or whether external support/consultancy is engaged.

4.5 Departmental Communication

As described in chapter 3, IÉ is a large company with many departments in numerous different locations. Clearly, the management of change and, in particular, organisational change, is an area where problems can arise. To assist in this process, IÉ have a company and railway safety standard that addresses the safety validation of organisational change. In recent years there have been a number of senior management changes and it appears that on one occasion when the new Programme Manager Structures (PMS) was appointed, certain information relating to scour and flooding management may not have been discussed comprehensively.

As outlined in section 3.2 the PETS has responsibility for, amongst other things, structural standards, yet there is no 'Structural Engineer' in his team. The PETS should be the single accountable person within the CCE Department, and under the CCE Safety Management System, for ensuring the appropriateness of, and compliance with, all CCE Standards. This accountability requires that the PETS ensure that the appropriate technical knowledge and technical competence is available to Iarnród Éireann (either internally or from external sources) on all the technical aspects for safely managing all CCE track and structures. Also, the PETS must ensure that any change in organisation is appropriate, that it does not create a safety risk or a risk to an asset.

(Recommendation on next page)

15	**Review the need for the PETS to have structural engineering competence within their team** IÉ should ensure accountability for all CCE technical issues are assigned to a single individual, e.g., the PETS. Furthermore this individual must ensure they have the appropriate technical competence either in-house or have the ability to procure external resource when required.

5 Conclusions

It is fortunate that the incident on the 21st August 2009 did not involve any rolling stock and no injuries were sustained. Oftentimes incidents such as the partial collapse of the Broadmeadow viaduct acts as a catalyst for change and the RSC is confident that IÉ will make the necessary changes to its inspection and maintenance regime to ensure an incident like this does not reoccur.

In terms of breeches of the Railway Safety Act, this Compliance Audit indicates that IE failed to adequately implement its SMS. Consequently the RSC expect IÉ to address its shortcomings over the short to medium term and this will be monitored by the RSC.

5.1 Findings & Recommendations

IÉ has been and continues to be proactive in their approach to managing the risks associated with operating and maintaining the railway. In terms of asset inspection many of the techniques they employ would appear to be 'good' if not 'best practice'. However, this audit has identified a number of areas where improvements could be made, in terms of standards, training and competence, communications and reporting.

5.1.1 Equipment & Monitoring

There are few if any tools used by IÉ in the monitoring of their structures, other than visual inspection, yet there are a wide variety of monitoring tools and equipment available on the market. These range from simple 'Tell Tales' for monitoring crack growth to more sophisticated remote monitoring systems that monitor ground displacement in real time. Aerial photography is another option that IÉ could consider. This could provide additional information relating to changes in water flow around structures.

Currently IÉ do not use any such tools and it would therefore be prudent that IÉ consider all options in assisting with the management of assets.

16	**Review structural/coastal monitoring tools/method available** IÉ should undertake a review of the possible devices and methods that could be used to assist in its monitoring and inspection of structures and where applicable the environment. IÉ should then assess the benefit of installing such devices /adopting such methods on identified structures or lines.

5.1.2 Recommendations

Throughout the text the RSC has identified areas where improvements can be made and developed a number of recommendations. When these recommendations are

implemented, the RSC is confident that the management of structures will be improved. Below is a summary of the non-compliances (NCs) and recommendations identified throughout the course of this audit.

Number	Non-Compliance
IÉ1	Non-compliance with I-PWY-1307 Section 3.4.1
IÉ2	Non-compliance with I-SMS-9021 Sections 3.8.6 & 3.8.7, 3.9.6 & 3.9.7
IÉ3	Non-compliance with I-STR-6510 Issue 2.0[3] Section 4.2.4
IÉ4	Non-compliance with RSS 67 sections 3.4.1 & 3.4.2

Table 7: Non-compliances

Number	Recommendation
1	Review Risk Weightings and Factors used in the Network Wide Risk Model
2	Clarify Safety Responsibilities
3	Review CCE Departmental Safety Management Standards.
4	Review the need for a Coastal Defence Inspector/team.
5	Review the 'Structural Inspections Standard I-STR-6510'
6	Develop a procedure to manage reports of safety related events
7	Check and amend the 'Standards Review & Revision History' on CCE Standards
8	Include Audit on all relevant Infrastructure Standards
9	Re-brief Patrol Gangers and PWIs on their duties under track patrolling standard I-PWY-1307.
10	Review the track patrolling standard I-PWY-1307 forms in Appendices B and C
11	Rationalise Patrol Ganger Lengths
12	Review document management processes
13	Review Patrol Ganger Competence requirements
14	Review the content of the Structural Inspections Course
15	Review the need for the PETS to have structural engineering competence within their team
16	Review structural/coastal monitoring tools/method available

Table 8: Recommendations Summary

[3] At the time of the incident the applicable Structural Inspections Standard was I-STR-6510 Issue. 2.0. The RSC acknowledge that this standard was superseded in October 2009 by Issue 3.0.

5.1.3 What was done well

All interviewees gave freely of their experience and time and it was felt that their answers to questions were candid. Similarly it is hoped that IÉ felt the audit was conducted in an open and transparent way. It was emphasised to all interviewees that it is the RSC's primary remit to "foster and encourage railway safety" and it is again hoped that IÉ appreciate the role the RSC has to play in ensuring a safe railway.

5.2 Next Steps

Clearly, there is much to digest and reflect upon. Having had time to review the report, it would be prudent for IÉ to arrange a workshop with all relevant personnel present to discuss the recommendations and ideally agree on the priorities, timescales for delivery, etc. IÉ should confirm its acceptance of the recommendations made and outline how they will be dealt with.

Regarding the NCs, IÉ shall submit to the RSC an implementation plan, by a prescribed date, clearly defining how it intends to rectify these non-compliances and provide a timescale for doing so. The RSC will review this submission and subject to it being satisfactory will track its implementation. In addition the RSC will follow progress against the recommendations and continue to monitor IÉ's inspection programme ensuring compliance with inspection standards.

5.3 Relevant actions already taken or in progress

In March 2010 IÉ informed the RSC that the CCE had already identified several areas where improvements could be made regarding the implementation of procedures, standards and activities undertaken by the CCE department. A brief overview of these is now provided.

- Standards I-PWY-1307, I-STR-6510 and I-SMS-9021 are all currently being reviewed in conjunction with an in-depth review and rewrite of the CCE's SMS.
- PWIs are being trained as competency assessors and will shortly commence assessing Patrol Gangers.
- A new standard relating to the competence management of Patrol Gangers has been written and is currently being briefed into use.
- Inspections forms and the completion thereof is being re-briefed to all applicable staff.

Given the above and through the meetings already held with the most senior managers from IÉ, the RSC are satisfied that IÉ are committed to address the issues raised in this report and that they will ensure the recommendations are fully implemented.

6 References

6.1 Documents

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IRMS (1998),*"A review of railway Safety in Ireland". International Risk management Services, Knutsford, UK.*

6.2 Web Site Links

1. http://www.irishrail.ie/ - for details relating to operational statistics and maps (Consulted 11th Jan 2010)

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RSC (2006), "Inquiry into the Derailment of a freight Train at Cahir Viaduct on 7th October 2003", Railway Safety Commission, Dublin.

Appendix A : INTERVIEWEES

Chief Civil Engineer (Acting)
Principal Engineer, Track & Structures
Assistant Principal Engineer, Track & Structures
Project Approvals Manager
Facilities & Building Manager
Document Controller (CCE Department)
Technical Executive (PETS Department)
Senior Assistant Engineer (PETS Department)
On-Track Machine Co-ordinator

Programme Manager Structures
Specialist Structures Engineer (Structures Section)

Divisional Engineer (Dublin)
Assistant Divisional Engineer (Dublin)
Assistant Divisional Engineer (Dublin)
Dart Engineer (Dublin)
Assistant Divisional Engineer (Athlone)
Assistant Divisional Engineer (Athlone)
Assistant Divisional Engineer (Limerick Junction)
Assistant Engineer (Dublin Division)

Permanent Way Inspector (Division 1)
Patrol Ganger (Division 1)
Relief Patrol Ganger (Division 1)

Dart Underground Project Manager (Formally Structures Engineer)

Infrastructure Training Executive