

*A Report Prepared by International Risk Management Services
On Behalf of The Department of Public Enterprise*



**A Review of Railway Safety in
Ireland - Implementation Review**

In Association with:

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EXECUTIVE SUMMARY

International Risk Management Services (IRMS), in association with its partner consultants, were commissioned in 1998 by the Department of Public Enterprise (the Department) to conduct a Railway Safety Study of the Iarnród Éireann (IE) network. The study was completed in October 1998 and a report “*A Review of Railway Safety In Ireland*” issued.

Approximately 12 months after issue of this report, IRMS and its partner consultants have been commissioned by the Department to carry out a review of progress being made by IE and the Government against the recommendations contained in the original report. This report contains the results, conclusions and recommendations arising from the review.

The objectives of the implementation review study were to carry out a review of:

- the programme and actions contained in IE’s Railway Safety Programme against the recommendations contained in the IRMS’ previous report;
- IE’s actual implementation of the study recommendations.

As previously, the complete IE railway system including the DART suburban system and freight traffic was included in the scope of the study. Since this was primarily an audit study, a sample set of locations was prepared by the Consultants and discussed with IE for site visits to inspect aspects of the infrastructure and rolling stock. This took account of previously identified unreasonable risks and those items of the infrastructure which required immediate attention.

The review has considered the following topics:

- the safety adequacy of infrastructure and rolling stock;
- developments in IE’s Safety Management Systems;
- the Risk Model developed for the initial Railway Safety Study was updated to reflect changes in the condition of the infrastructure;
- consideration of changes to Railway Safety Regulation, addressing both a review of the roles and responsibilities of the Railway Inspecting Officer and consideration of relevant EU Directives Implementation.

Overall, the review has found that a great deal has been done by IE over the last twelve months to reduce risk on the railway and many encouraging initiatives have been started. However, much further work remains to be undertaken and/or completed across a range of key areas.

With respect to IE’s Railway Safety Programme, the identified funding is broadly in line with that recommended in IRMS’ initial report and tasks and actions within the Programme have generally been correctly identified. However, it is noted that the funding allocated to Signalling and Telecommunications does not allow for some essential signalling renewals or the increased expenditure associated with the delays to the implementation of the mini CTC system. Monies allocated to Permanent Way appear to be in excess of those required to make the railway safe. It is also noted that some of the previously identified unreasonable risks reported within the Programme as completed were in fact not fully actioned.

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With regards to the safety adequacy of the infrastructure, it was found that significant progress had been made by IE in a number of areas, but it was noted that very few of the previously reported unreasonable risks can be unambiguously reported as fully resolved. In addition, a number of further unreasonable risks were identified during the site visits. All of these risks require to be addressed and mitigated immediately. Following the original study, IE were strongly recommended to prepare and conduct their own programme of site visits to identify faults and failures in the infrastructure. It is evident from the continuing number of unreasonable risks identified that this is yet to occur.

With regards to engineering systems, standards, procedures and instructions are currently being prepared by all Departments. However, it was evident that with the exception of Signalling and Telecommunications that the documentation was not always appropriate to the function of the relevant Department or the railway. These problems have been exaggerated by the large volume of work and the ambitious timescales for their production. There is also no evidence to date of a risk based approach to planning and works activities which in turn means there is no objective basis for IE to prioritise safety activities and expenditure. There is a pressing need for IE to establish an in-house capability to develop and co-ordinate IE's risk management activities. These deficiencies must be rectified as a matter of priority. It was also noted that with one exception, five year plans were not available. These will be required to justify, plan, finance and prioritise the long term work of the railway. The control and management of contractors and third parties is being progressed by the production of a Company Standard which is awaiting issue. Given the large amount of work being carried out by the railway, this issue requires urgent resolution and implementation.

With regards to Human Resources issues, it is evident that there continues to be a lack of resources, particularly relating to skilled staff in the engineering and electrical disciplines. This has resulted in some staff having to work very long hours. In many areas consultants are being used to provide the necessary input of manpower and skills. Where this is being undertaken, it is important that IE put sufficient managerial resources in place to manage the work. A large amount of training is in progress or planned for the near future. However, improvements are required to ensure that it meets appropriate organisational and personal training objectives.

It is also important to note that the continuing poor Industrial Relations within IE is a major stumbling block to further safety improvement and must be addressed as a major priority issue.

There is also significant evidence that the tremendous amount of activity on safety is in danger of creating a resistance to the required changes. IRMS consider that there is a real danger of IE trying to do too much, too quickly and not consolidating upon safety improvements in a methodical and robust manner. This issue is exacerbated by the absence of a dedicated Project Manager to strengthen the co-ordination and prioritisation of the safety programme.

With regards to railway regulation issues, the Department of Public Enterprise has taken a number of steps towards meeting the recommendations of the first report. The professional strength of the Railway Inspectorate has been increased, although not yet its administrative strength. Better liaison with the HSA has commenced and the Minister has announced a wide-ranging package of reforms in railway safety regulation which are currently being developed for implementation. It was also found that the Department is adequately represented in

Europe so far as railway policy matters are concerned and has adopted into Irish law the two European Directives referred to in the previous IRMS report.

In summary, much has been done to improve safety on the railway and there is significant awareness of the changes in safety culture required to achieve a safe railway for staff, passengers and the public. However, there are a number of critical areas to be addressed by IE if continuing and sustainable improvements in safety are to be achieved. These include:

- IE to close out all identified unreasonable risks and to prepare and implement an audit programme to identify faults and failures across the infrastructure;
- development of a well managed risk management programme to prioritise future expenditure, supported by appropriate risk modelling techniques;
- ensuring the proper management of the activities of all third parties working on the railway;
- recruitment of staff with the necessary skills and expertise;
- resolution of outstanding Industrial Relations concerns;
- ensuring the effectiveness of each initiative by ensuring they are undertaken in a structured, methodical fashion. This in turn requires the future work programme to be prioritised to ensure that IE do not try to do too much, too quickly.

This audit has clearly revealed that, in addition to those identified in the first report, many additional unreasonable risks continue to exist on the railway infrastructure. This in turn provides strong evidence that it is highly likely that each future audit conducted on behalf of the Department will continue to identify new unreasonable risks unless additional management controls are implemented by IE. These controls need to comprise a system by which IE undertake their own rolling programme of audits to identify such deficiencies, combined with a risk-based process to prioritise future investment programmes.

Once such systems are in place, it will then be possible for future audits conducted on behalf of the Department to focus on the adequacy and effective operation of management controls rather than a detailed investigation of infrastructure conditions.

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1. INTRODUCTION

International Risk Management Services (IRMS), in association with its partner consultants, were commissioned in 1998 by the Department of Public Enterprise (the Department) to conduct a Railway Safety Study of the Iarnród Éireann (IE) network. The study was completed in October 1998 and a report “*A Review of Railway Safety In Ireland*” [1] issued.

Approximately 12 months after issue of this report, IRMS and its partner consultants have been commissioned by the Department to carry out a review and audit of progress being made by IE and the Government against the recommendations contained in the original report [1]. IRMS’ partners were MHA Systems Limited (formerly Michael Hamlyn Associates Ltd.), Holmes Davies Partnership and PB Power Ltd. (previously Merz and McLellan)

The Consultants wish to acknowledge the continued assistance and co-operation given by the Department, Córas Iompar Éireann (CIE) and IE managers and staff throughout the various studies.

Although further recommendations are made within this report to continue the improvement in the management of safety on the Irish rail network, the Consultants acknowledge that many of the necessary changes have now been put in place to institute the systems that will lead to improved safety performance and a reduction of risk to those using the railway.

This report brings together the results, conclusions and recommendations from an audit covering progress towards improving safety of existing physical assets (both infrastructure and rolling stock) the safety management systems (SMS) of IE and the railway safety regulation imposed by the Irish Government.

This report represents the audit referred to in Section 12.4 of [1].

2. BACKGROUND

IE is a wholly owned subsidiary of the state owned public transport company Coras Iompar Éireann (CIE). IE operates a range of mainline and commuter passenger services, and freight services and is responsible for the maintenance and renewal of the railway infrastructure. IE has statutory responsibility for the safe operation of the national railway system.

International Risk Management Services (IRMS), in association with its partner consultants, were commissioned by the Department of Public Enterprise (the Department) to conduct a Railway Safety Study of the Iarnród Éireann (IE) network. The key objective of the study was to carry out a strategic review of all aspects of the safety of IE's railway system.

The Railway Safety Study was successfully completed between April and October 1998. This study included:

- a review of IE's Safety Management System (SMS);
- the safety adequacy of its infrastructure and rolling stock;
- an assessment of the risks on the system and criteria by which their control should be judged;
- a review of the railway safety regulation system and;
- an assessment of the implications for safety regulation from the implementation of EU Directives on railway open access.

A report was issued (*A Review of Railway Safety in Ireland* [1]) which brought together the results, conclusions and recommendations from the analysis covering the recent safety performance of IE, the safety of existing physical assets (both infrastructure and rolling stock), the safety management systems (SMS) of IE, and the impact and sufficiency of railway safety regulation imposed by the Irish Government.

Following consideration of the report, the Irish Government established a High Level Task Force which prepared the *Railway Safety Programme 1999-2003* [2] to implement the recommendations contained in the report.

A key recommendation from the original study [1] was that external audits are carried out after 6 months and 18 months of the Action Plans and progress respectively.

In August 1999, Bert Hope, David Maidment, and Anthony Pickett from the Consultant's consortium were commissioned by the Department to carry out a brief Pre-Audit of progress by IE and the Government. This study was completed in September 1999 and a *Pre-Audit Report* [3] was issued. This provided initial indicators of progress and any barriers identified, and enabled the full audit to be configured to suit current initiatives.

This study and the report herein constitute the first audit, although it was actually completed approximately 10-12 months after publication of the Report [1].

3. OBJECTIVES AND SCOPE

3.1 Objectives

The original Review of Railway Safety in Ireland report [1] contained a large number of recommendations covering both 'soft' safety management systems, as well as the rectification of 'hard' infrastructure and rolling stock defects.

These recommendations were broadly divided up into the timescales against which they should be commenced.

The key purpose of this audit study was to confirm whether the recommendations contained within the original final report [1] were adequately reflected with IE's own Railway Safety Programme [2], and thence to confirm whether the recommendations are actually being implemented in practice against the final report [1] and/or IE's programme [2].

Hence the objectives of the implementation review study were to carry out:

- a review of the programme and actions contained in Railway Safety Programme [2] against the recommendations contained in the final report [1], and
- a review and progress report of IE's actual implementation of the study recommendations.

3.2 Scope

As previously, the complete IE railway system including the DART suburban system and freight traffic was included in the scope of the study.

Since this was primarily an audit study, a sample set of locations was prepared by the Consultants and discussed with IE for site visits to inspect aspects of the infrastructure and rolling stock. This took account of previously identified unreasonable risks and those items of the infrastructure which required immediate attention.

The audit was conducted during October 1999 - December 1999. Progress is generally reported up to and including these dates. However it is noted that in many areas progress is rapid, and further actions may have been completed before the issue of this report.

Terrorism and security matters were again excluded from the scope of the studies.

4. APPROACH

4.1 General

The approach to this study was based on an audit function, with the main aim of the study to audit progress being made by IE and the Government in addressing the recommendations.

Progress has been reported individually against each recommendation, with a commentary, where appropriate, as to the degree and type of progress. However, at this early stage in the implementation programme, it was not the main purpose of the study to review in detail the effectiveness or proficiency of the actions being carried out, or the systems/documentation being produced. Hence the existence of new standards or procedures has been noted, but they have not been reviewed in detail. This can be undertaken during later audits.

4.2 Safety Adequacy of Infrastructure & Rolling Stock

The infrastructure and rolling stock were considered to include operations, design and maintenance aspects of:

- signalling/telecoms systems;
- level crossings;
- permanent way;
- railway civil infrastructure (including bridges, cuttings, embankments, stations, buildings and platforms);
- rolling stock;
- electrification (DART).

An integral part of this assessment was the undertaking of an update of the assessment of the risks arising in each of the above areas, as a result of any identified design, operations or maintenance deficiencies.

The safety adequacy audit was intended to concentrate on a review of progress against rectifying deficiencies identified during the original reviews especially unreasonable risks which required immediate rectification. However, as part of this audit, any new deficiencies or unreasonable risks that were identified during the site visits were recorded and notified to IE.

To re-assess the risks, a new series of site visits were proposed by the Consultants. The programme of the site surveys was to revisit places which previously during the original safety study in 1998 either exhibited unreasonable risks or else the infrastructure was in a particularly poor condition at that location. Since this was only an audit, a representative selection of sites were selected, including those that contained many of the original unreasonable risks. In addition, a number of new sites were visited that were not surveyed during the original safety study in 1998. The

purpose for this was to discover whether unreasonable risks existed elsewhere that IE had not themselves identified, and also to detect whether concentration by IE on rectifying the unreasonable risks and infrastructure deficiencies highlighted by IRMS [1] had resulted in other parts of the network being neglected.

The lists of sites visited is given in Section 6 of this report.

Using data and information collected as part of these short series of new site inspections, the adequacy from a safety viewpoint of the following railway systems and services was re-reviewed. Any updated or revised system design, operational and maintenance information was requested and obtained from IE and reviewed in their offices.

4.3 Safety Management System (SMS) Review

The adequacy of IE's safety policy, systems, rules and procedures as embodied in their SMS was re-assessed. This review was based upon previous experience of Safety Management Systems implementation in the railway industry, industry best practice, and relevant codes, standards and guidance documents.

Based on the previous SMS audit carried out by the Consultants, the questionnaire produced previously was subsequently re-scored. Senior managers of CIE and IE were interviewed and audits were carried out at ground level through visits by the Consultants to depots, stations, installations and train riding on sampled parts of the system.

In addition to re-scoring the questionnaire, the previous SMS recommendations were reviewed individually, and an audit of progress was undertaken in terms of the production of plans, procedures, etc.

4.4 Risk Assessment

A key element of the original strategic review was to provide clear, precise, quantified and objective advice on whether the overall level of railway safety is adequate. This was completed by the creation of a Risk Model.

Based upon the recent site audit visits to review the condition of the infrastructure and rolling stock, the Risk Model was updated to reflect the improvements in the condition of the infrastructure (particularly signalling and permanent way). The risk statistics (number of accidents, number of casualties and individual risk) were thence recalculated.

In addition, those lines or route segments that previously had high risks were recalculated on the basis that recent risk mitigation initiatives had been implemented on those lines. This gave a measure of the possible risk reductions that can be achieved by the implementation of quite modest mitigation measures.

4.5 Railway Safety Regulation

Railway Safety Regulation covered both the Railway Inspecting Officer Review and consideration of relevant EU Directives Implementation.

A review of progress against the implementation of previous recommendations for the roles, responsibilities, functions and reporting arrangements of the Department's Railway Inspecting Officer was carried out. This study was combined with a review of the implementation of the EU Directives 91/440, 95/18 and 95/19. These Directives relate to the promotion of combined goods transport, developing EU railways and the opening up of access to railways in Member States.

4.6 Best Practice Forum

The results from the above studies were considered by a team of transport safety experts from the IRMS led consortium and compared with their experience of good practice on other comparable railway systems. The Department was given the opportunity to attend this forum.

5. IE RAILWAY SAFETY PROGRAMME 1999-2003

5.1 Background

A High Level Task Force was established by the Minister for Public Enterprise to prepare a report with prioritised recommendations to address the issues identified in the IRMS report [1]. The Task Force agreed to address those terms of reference by recommending a prioritised safety investment and implementation programme for the period 1999 to 2003 and making recommendations as to funding arrangements for that programme. The Task Force requested IE to prepare the Safety Programme because it has responsibility for railway safety and because it will be responsible for implementing the programme.

The *Railway Safety Programme 1999-2003* [2] was produced and issued in early 1999. It is noted by IRMS that whilst it is 'based on the IRMS recommendations' it also 'takes account of safety studies conducted for Iarnród Éireann' (namely studies by Arthur D Little).

5.2 Review of Railway Safety Programme

As part of this study, IRMS have briefly reviewed the Programme to confirm that the task, actions and timescales comply in principle to the recommendations and programme contained in the IRMS final report [1]. It was however noted that, by necessity, the Programme is a high level document and does not contain the same level of detail as contained in [1].

Where appropriate, progress by IE against their own internal programme has been noted.

5.2.1 Signalling and Telecommunications

Information related to previous signalling, electrical and telecommunications recommendations was primarily contained in Section 2.2.1 of the Programme.

“Section 2.2.1 Improved Signalling/Telecoms Maintenance Provision”

The following perceived deficiencies in the programme are noted:

1. There is no mention of the provision of a safety case for any new works;
2. There is no overall prioritisation of the programme by means of risk assessment;
3. The plan does not include provision for an appropriate increased level of expenditure on essential signalling renewals;
4. There is no explicit item for Claremorris;
5. The delay in the introduction of Mini CTC will require an increase in expenditure above that identified on signalling renewals on the lines affected;

6. The level of expenditure required for the extremely important measure of renewal of interlocking frames is not explicitly included.

It is noted that the proposed programme of funds directed to Level Crossings is considerably in excess of that originally identified by IRMS, and it is assumed that the majority of this additional money is directed at addressing issues raised by IE's consultants. IE should review to consider whether these funds are disproportionate to monies spent elsewhere on other risk amelioration works.

5.2.2 Permanent Way

Information related to previous permanent way recommendations was primarily contained in Section 2.1 of the Programme.

“Section 2.1 Permanent Way (Track)”

“Track Renewal”

Good progress has been achieved by IE in 1999, very much in line with the planned programme.

“Track maintenance”

The increase in the size of maintenance manpower under each permanent way inspector has now been achieved.

“Section 2.7 (a) Unreasonable Risks”

This audit study demonstrated that of the unreasonable risks identified in 1998 that were sampled in November 1999, all had received some attention and in all cases the risks had been reduced or eliminated. However, this study identified new items in the unreasonable risk category and so there is no room for complacency.

“Section 3.0 Safety Management Systems”

This is the area where least progress is visible with the delivery workforce. This is addressed in detail in Section 6.2 of this report.

5.2.3 Structures

Information related to previous structures recommendations was primarily contained in Section 2.3 of the Programme.

Although a review of budgets specifically in terms of planned financial expenditure was not undertaken, based upon programmes of work for particular activities seen and reviewed, a reasonable comparison with the IE Safety Management Programme can be undertaken.

“Section 2.3 Structures and Fencing”

“Structures: Cast iron bridges”

A programme to remove all cast iron bridges is in place and funding secured over five years as recommended in IRMS report.

“Structures: DART footbridges”

All Dart footbridges have been assessed and a programme of replacement where required has commenced with closure of the most vulnerable prior to reconstruction as recommended in the IRMS report.

“Structures: Other bridges”

Although not reviewed in detail, IE are putting together a bridge painting programme that will ensure many more are painted than have been currently. This was not a specific IRMS recommendation, however comment on the general condition of bridges in the IRMS report was made.

“Structures: Embankments, cuttings and sea defences”

The initial network wide survey and risk assessment of these structures has been done as recommended in the IRMS report and noted as planned in the IE Safety Management Programme. At this stage little significant financial provision for physical works has been sought or made as further evaluation is required.

“Fencing”

No review of fencing was undertaken on this occasion although it was apparent that work had taken place recently in some locations particularly the Dublin conurbation.

“Section 2.7 Unreasonable Risks”

In general good progress has been made addressing these, many have been removed and others are in the process of being dealt with.

The fact that new unreasonable risks were found must be a matter of concern in terms of IE proactively managing risk themselves. Section 7 of this report provides a complete review of each unreasonable risk identified in the initial IRMS report and some new ones from this recent audit visits.

“Section 3.0 Safety Management Systems”

Some Departmental standards (as opposed to Corporate) are beginning to be produced in draft, however this is at an early stage with effective implementation on the ground some way off. Good progress was seen at local Divisional Engineer’s Offices with the development of a structures database. The resources to achieve the forthcoming standards requirements need to be borne in mind when planning their implementation. It is early days in respect of this area.

5.2.4 Electrification

Information related to previous electrification recommendations was primarily contained in Section 2.2.3 of the Programme..

“Section 2.2.3 Electrification”

This recognises the need to increase overhead line staffing and has allocated an additional staffing budget of £0.2m per annum to cover this. As detailed in this audit report, the recruitment process has now started.

In paragraph 2.2.3, IE has declared a 1999 budget allocation of £0.8m to cover the cost of new overhead line access plant. Again, significant progress is being made towards identifying and procuring suitable plant, with the aim of having it delivered by May 2000.

“Section 3.0 Safety Management Systems”

This acknowledges the need to provide considerable resources towards the development of safety management systems, and has estimated the cost to be £51.2m over the five years. A start has been made in the Electrification field by consultants on the evolution of technical standards, operation and safety standards, and personnel training and certification programmes, although this is still at an early data-gathering stage.

“Appendix B”

Appendix B of the Programme lists the ‘unreasonable risks’ and offers programmes for their mitigation. The list correctly identifies the only such risk in the Electrification discipline as being the overhead line access platform issue. An immediate interim control has been applied (December 1999) to mitigate the safety risks arising from the use of the present converted coach for overhead access, during the procurement period for replacement access plant.

5.2.5 Rolling Stock

Information related to previous rolling stock recommendations was primarily contained in Section 2.5 of the Programme.

“Section 2.5 Rolling Stock”

The financial values detailed appear realistic and are commensurate with the values detailed in the IRMS Report [1]. The budgetary provisions detailed should be reassessed following the completion of the studies being undertaken by external consultants.

Certain key elements (viz. fitting secondary locking on Mark II coaches) have not been completed.

As prescribed, the risk assessment to ascertain the safety benefits of fitting secondary locking on Mark II coaches should be completed and formally presented.

The cost-benefit and safety suitability for refurbishment of Craven carriages should be reviewed. The CME needs to recognise that it is essential that the refurbishment of the craven carriages is controlled in accordance with a safety validation regime.

Reference should also be made to Section 6.5 of this report for further commentary.

5.2.6 Safety Management Systems

The SMS section of the Railway Safety Plan has been reviewed and is broadly in line with the recommendations made in the final report [1].

High level initiatives for improvement and strengthening of the IE SMS in support of the infrastructure investment are set out, underpinned by new standards, procedures and training.

Specific comments and observations are listed below.

Many of the comments demonstrate the lack of a formal risk management approach being adopted by IE (see also Section 8 for further information).

“Section 3.2 Development of Safety Management Systems”

The development of enhanced procedures, standards and training are welcomed. However elsewhere in this report it is noted that these need to be appropriate to Ireland, IE, and the Department or Division concerned. In addition, training and training plans need to be carefully tailored to the requirements of the individuals, and suitably briefed-in beforehand.

“Section 3.2.1 Responsibility”

In Section 11 of [1], IRMS recommended that a ‘full time Implementation Project Manager will be required to lead the implementation plans ...’

IE decided that this role would be ‘unworkable’[2]. However, as reported in Section 10.2.5, the absence of a single Project Manager, and the lack of time available to the Safety Manager, has resulted in a lack of co-ordination between Departments and Divisions with the effect that examples of good practice exhibited at Department level are not being promulgated around the Company. Furthermore, the Safety Manager is unable to progress some of his own actions and initiatives.

“Appendix D - 1999 Action Plan”

IRMS Recommendation 12.5.1.3 relating to the production of 5 Year Plans is missing and has no associated Action within the programme. The absence of 5 Year Plans has been noted elsewhere during the Infrastructure audits.

Item 5 (risk assessments) has not been carried out in 1999. This significant exclusion is commented on further in Section 8.

Items 14 & 15 (incident and accident reporting, and asset databases) have not been completed during 1999. This has been delayed pending company wide IT

implementation and introduction of the SYNERGI model. Further comments are contained in Sections 8.

Item 16 (risk model). It is noted that this is planned for mid 2000. To date no progress has been made on the development or introduction of a risk model. Further comments are contained in Section 8.

Items 18 & 19 (contractors and procurement) have been delayed by the delayed issuing of the Company Standard for Procurement and Contractors.

Item 20 (prioritisation of safety objectives). Although not due for development until early 2000, there is no evidence of this being carried out or developed yet.

Item 21 (safety monitoring) has been delayed by the implementation of SYNERGI which will provide a tool to managers for monitoring safety performance and setting targets.

There are no Action Plans for Long Term Recommendations, i.e. greater than 12 months.

To summarise, although most of IRMS recommendations were reflected in the Safety Programme (with the exception of 5 year plans), the majority of them have not yet been fully actioned.

6. SAFETY ADEQUACY OF INFRASTRUCTURE AND ROLLING STOCK

As discussed previously, the primary purpose of this study was to carry out a review and audit of the progress being made by IE (and the Department) in implementing the recommendations made previously [1]. However as part of the recent site visits and interviews with staff and managers, a number of additional or new issues were identified. These have been reported below.

The list of sites visited by the infrastructure experts is detailed below against each discipline. Most of the surveying was carried out by means of a saloon inspection car provided by IE and shared by the experts.

Further recommendations are made against each discipline. These either strengthen recommendations made previously, or are aimed at supporting initiatives made by IE.

6.1 Signalling and Telecommunications

6.1.1 Sites Visited

An inspection tour of the infrastructure was undertaken at the following locations:

1. Heuston to Limerick (cab ride), 3rd November 1999.
 - Limerick North Jn Signal cabin.
 - Limerick Signal cabin.
 - Heuston Signal Cabin.
2. Dublin Connolly to Howth (cab ride), 4th November 1999.
 - Malahide Relay Room.
 - Maynooth Signal Cabin.
3. EirCom Infrastructure, 4th and 9th November 1999.
 - Maynooth ETS (internal inspection).
 - Roscommon Telephone Exchange.
 - Cable Routes.
 - Pole Routes.
4. Connolly to Longford (saloon inspection), 9th November 1999.
 - Clonsilla Signal cabin
 - Enfield Signal cabin
 - Edgeworthstown (Mostrim) Signal cabin
 - Longford Signal cabin
 - Mullingar Signal cabin
5. Galway to Tullamore (saloon inspection), 10th November 1999.
 - Galway Signal cabin
 - Athenry Signal cabin
 - Athlone Signal cabin
 - Woodlawn Signal Cabin and New Relay Room
 - Ballinasloe Signal cabin

- Clara Relay Room
- Tullamore Relay Room

6.1.2 Progress Against Previous Recommendations

Reference should be made to Section 6.3.2 and 6.3.3 of [1].

The following specific recommendations were made, against which progress is reported.

6.1.2.1 “Already Implemented”

“Correction of infrastructure faults needing urgent remedial action discovered during previous inspection;”

- Longford Facing Point Lock equipment was tested and passed the gauge test. However, two others failed the gauge test due to defective permanent way.

6.1.2.2 “Immediate, Without Delay”

“IE must ensure that rigorous measures are taken to ensure the security and fire safety of its staff and safety critical equipment in signal boxes”

- The under part of most Mechanical Signal Cabins inspected had been cleared of rubbish and fire hazards.
- Fire Safety was still not good in safety areas which were not under the direct control of SE&T staff, e.g. operating floors, entrance to safety equipment areas and emergency control panel areas.

“A detailed asset database and infrastructure fault monitoring system should be developed by IE”

- A new IT system is awaited for a detailed asset database and infrastructure fault monitoring system.

“IE should implement an interim rigorous safe working system for route sections for which the signalling is in particularly poor condition, until essential investment takes place”

- SE&T have implemented a safety system for degraded infrastructure at certain sites. However this requires to be considerably strengthened. In addition, the delay in the introduction of Mini-CTC means that some infrastructure will remain in a degraded condition for longer than originally planned further emphasising the need for a rigorous safety management system.

6.1.2.3 “Medium Term”

“Appropriate standards must be developed for all aspects of maintenance, design installation, modification and subsequent hand-over of safety critical equipment. This should include technical documentation, operating instructions and procedures for the production, issue and amendment of drawings”

- Documentation procedures are being professionally managed within SE&T. There was version control and a process for review of standards. This should be considered as best practice within the Infrastructure group and promulgated to other divisions and departments.
- Those standards being adopted from other railway administrations (e.g. UK Railway Group Standards) were being reviewed to ensure they are valid and appropriate (see comment against P-way however).

“A planned maintenance regime with appropriate standards must be introduced for all safety critical work”

- Maintenance procedures and specifications will be produced consequent upon the issue of SE&T high level standards. As a result, a planned maintenance regime has not been introduced, though certain safety critical issues have been addressed.
- Locations on the DART and Portarlinton-Athlone line have been surveyed and maintenance action lists provided. These are being used to prioritise maintenance activities.
- A draft maintenance specification has been prepared for lineside telephone equipment.
- Facing Point Lock (FPL) testing is now carried out by IE on a 3 monthly frequency, i.e. at twice the previous frequency. Site tests by IRMS as part of the site visits, however, demonstrated that test failures are still sometimes occurring soon after a 3 monthly test is carried out. The reason for failure on test is that the permanent way is moving at the toe of the points, thus demonstrating the need for an infrastructure approach.

“Appropriate training and certification should be provided for all staff engaged on safety critical work”

- Training and certification are now being provided for SE&T technicians engaged on safety critical work.

“A system of independent technical audit should be developed for all safety critical systems”

- A system of independent technical audit has not yet been developed for SE&T safety critical systems.

“There must be rigorous implementation of the practice of cutting back redundant wires, insulating and securing them so that there is no risk of wires coming into contact with working circuitry”

- The practice of cutting back redundant wires, insulating and securing them so that there is no risk of wires coming into contact with working circuitry has now been introduced.

“There should be a special exercise to replace or remove all defective and worn signalling, electrical and telecommunications equipment”

-
- There is evidence that worn and defective signalling and telecommunications equipment is being replaced.
 - There have however been procurement delays in obtaining new materials for renewals and maintenance.
 - Renewal of defective signalling equipment and fittings found on the previous inspection is underway.
 - During 1999, Mk I rail point clamp lock installations were converted to Mk II equipment.
 - A programme to replace the obsolete and unsafe lineside Signal Post Telephone (SPT) exchanges is to be introduced.
 - Authority has been obtained for replacement of all train radio base stations and 40 of the oldest train radio mobile units over the next two years.
 - Observations made indicate that steady progress is being made on removal of redundant wiring.

“Specifically, all mechanical interlocking frames should be tested and repaired where necessary”

- There is evidence that worn and defective signalling and telecommunications equipment is being replaced.
- Mechanical interlocking frames are now subject to test and repair.
- Renewal of defective signalling equipment and fittings found on the previous inspection is underway.
- During 1999, Mk1 rail point clamp lock installations were converted to Mk II equipment.
- A programme to replace the obsolete and unsafe lineside Signal Post Telephone (SPT) exchanges is to be introduced.
- Authority has been obtained for replacement of all train radio base stations and 40 of the oldest train radio mobile units over the next two years.

“Level crossing signs, road marking, sighting for road users and trains, communication and signal protection should be improved where necessary”

- Little evidence was observed of any improvement in level crossing signs, road markings and sighting for road users and trains.
- Distant signal marker boards have been tested and a temporary solution has been proposed for improving braking distances at level crossings. This involves positioning a reflectorised marker board at the braking distance from a crossing. It is proposed to install marker boards at all level crossings which are deemed to be sub-standard in respect of braking distance.

“Iron gates level crossings should be provided with safety bays”

- There is no evidence of safety bays being provided at any iron gates level crossing viewed on this inspection.

“A safe and ergonomically sound working environment should be provided in all signal boxes”

- A joint SE&T/Operations inspection team has been set up to study ergonomic factors relating to signal cabin operating floors. The work will be carried forward into Emergency Control Panel Rooms and Emergency Level Crossing Console Housings.

6.1.2.4 “At End of 6 Months”

Reference should be made to Table 9.1 [4].

“Frame repairs and other renewals on the Galway line were intended to last until elimination of the life expired existing signalling by introduction of new signalling, i.e. Mini CTC”

- Mini-CTC is now running to an extended and uncertain timescale. Therefore equipment previously in a poor state is expected to remain in service for a longer period. The safety consequences of this must be established to determine whether short term mitigation is required in advance of CTC implementation.
- A robust Safety Management System is required for Heuston and Claremorris Signal box areas.

6.1.2.5 “6 - 12 Months”

Reference should be made to Table 9.1 [4].

EirCom Issues

“Regular servicing of instruments is essential, as required in the Code of Practice”

- Though there is an obvious desire to comply with the agreed code of practice and to deal professionally with all recommendations; within EirCom, there does not appear to be a full understanding of the safety critical requirements for Railway Signalling.
- In order to address the issues arising from the report, EirCom appointed a National ETS Project Manager and during that time a moderate improvement in maintenance of ETS equipment has been achieved.
- Training and certification are given to all staff engaged on ETS maintenance.
- EirCom is not working towards achievement of ISO 9000, though ETS maintenance standards are now to EirCom National Fault Management Standard, and top ‘Priority A’ status has been given to ETS equipment. This does not, however, address the more fundamental issues in regard to a full understanding of the safety critical nature of the ETS equipment, e.g. the method of re-servicing equipment.

SE&T Issues

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Issue No: 03
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“The safety management of the ETS System by Telecom Eireann should be audited”

- IE carry out an annual review of internal audits carried out by EirCom on the ETS system. They do not carry out their own audit. This annual review is considered insufficient.

“Improve telephone instrument maintenance”

- A survey is underway to establish the condition of operational telephones and systems. It is the intention to modernise the network by replacing operational telephones with an approved vandal resistant type which will be centrally monitored.

6.1.3 General Progress

6.1.3.1 *General*

Within the SE&T Department, there is a professional approach being taken to implementation of the recommendations of the IRMS report. Evidence of this was found in most aspects audited. Where a shortfall has been identified, this may often be attributed to lack of skilled resources.

The Signal Engineering Group (SEG), which is a working committee of the senior engineers in SE&T, monitors and direct progress on all aspects of the recommendations applicable to signalling, electrical, telecommunications and controlled level crossings infrastructure.

Detailed progress is reported below against the generic headings used in Section 12 [1] and [4].

6.1.3.2 *“Infrastructure and Rolling Stock Improvements”*

Examples of a purposeful and innovative approach taken to achieve a reduction of risk were found throughout the audit. These included:

- New design documentation will take cognisance of the risks established on mechanical signals.
- Design of “Go/No Go” gauge will incorporate checking of fouling bar and rail point clamp lock tolerances in addition to the standard Facing Point Lock (FPL) checks.
- ‘Proof of rail alignment’, utilising a form of contactless detector is being investigated for use on the Barrow Bridge, taking cognisance of the stresses on a conventional FPL solution applied to a structure with its mass and inertia.

6.1.3.3 *“Engineering Systems, Standards and Documentation”*

Whilst carrying out the audit of SE&T Department, it was noted that there was no evidence within Infrastructure Division in general of briefings of the Safety Plan 1999 objectives onward into the Infrastructure functions. Nor was there any clear method of prioritisation of risk associated with implementation of the objectives.

SE&T are working towards the production of 18 high level signalling standards by the end of 1999. 6 have reached level 0.3 and are ready for issue, 6 are at level 0.2 and have undergone first review and 6 are at level 0.1 in course of preparation, i.e. draft stage. Consultants are being sought to assist with the production of telecoms standards.

6.1.3.4 “Safety Culture and Occupational Safety”

Within SE&T, there is some physical evidence of an improved safety culture, although overall progress was considered insufficient:

- Fire risks had been removed from the underpart of most signal cabins;
- The working environment within the underpart of signal cabins had been improved.

In regard to human factors associated with a changing safety culture, there was a less conspicuous change.

- Within the Dublin area, the staff are wary of management commitment to a safe system of work, e.g. additional resources for look-out protection;
- Outwith the Dublin area, there is more acceptance of change and a willingness to participate, i.e. less of a ‘them and us’ culture;
- The Intercity Manager has taken ownership of a working party with consideration of human factor risks during degraded infrastructure conditions. SE&T are represented on the working party.

6.1.3.5 “Accident and Equipment Performance Information Systems”

In order to determine whether there is a readily available IT system that could be acquired for use within Infrastructure, a review is in progress of all IT systems already in use both within the CIE group of companies, and in a wide field outwith CIE.

In the interim, a decision has been taken to concentrate SE&T effort into recording of signalling failures in the existing Infrastructure Incident Reporting System and continued use of the manual telecoms fault recording system.

6.1.3.6 “Human Resources Systems and Training”

With respect to staff recruitment, there is still a severe shortage of skilled Signalling and Operational Telecoms staff on the Divisions and at HQ despite a recruitment drive:

- One additional staff member has been recruited to the Divisions but staff wastage continues;
- Additional staff have been recruited in Operational Telecoms but staff wastage continues.

An exercise has commenced to register all SE&T posts into a project management system which will be used to track progress and identify critical paths on all infrastructure work. When complete, the system will provide information on Infrastructure project resource requirements.

The anticipated organisational structure will permit use of external skills suppliers, e.g. level crossing design.

6.1.3.7 “Management of Contractors & Third Parties”

A company standard is in course of preparation but has not yet been issued.

Consultants have been appointed in this role to manage new signalling contracts on behalf of Iarnród Éireann.

On certain other signalling projects already in hand, the opportunity has been taken to introduce the use of method statements. Whilst, in principle, the use of method statements is acceptable, the quality of the method statements was not able to be reviewed during this brief audit study.

6.1.3.8 “Within Normal Organisational Resources”

Development of Job Descriptions and Safety Responsibility Statements for key managerial posts within SE&T (and IE in general) has been completed. Remaining JDs and SRSs for subsequent levels within SE&T are in hand throughout the functions.

Within SE&T, Job Descriptions have been prepared for new entrants and for promoted staff into the new Technical Assistant, Technical Executive and Senior Technical Executive positions. Draft material has been prepared for Supervisory Job Descriptions.

An infrastructure asset & activity/responsibility matrix is being developed to ensure that Safety Responsibility Statements embrace all critical areas.

6.1.3.9 Regulation (previously titled “Department of Public Enterprise”)

It is noted that legislation, principles, regulations and standards unique to Ireland, on which the design or design development of a railway system and equipment is based, are not yet available to Iarnród Éireann.

Iarnród Éireann is, however, in course of implementing Company Standard No. 6 relating to Validation of Changes in Plant, Equipment, Infrastructure or Operations. Although not mandatory for projects commenced before its inception date, the requirements for validation are being adopted wherever possible for all relevant project phases.

SE&T staff have participated in formalised change processes relating to the following:

- Introduction into service of new Diesel Multiple Unit trains;
- Temporary ‘out of service’ of CAWS track circuit coding between Malahide and Donabate.

SE&T are engaged in the validation of safety cases for the following:

- The introduction of existing DART EMU's into service with the SSI installation at Greystones;
- Introduction of Alstom and Mitsui built EMUs over the extended DART network.

6.1.4 New Issues and Risks Identified

Reference should also be made to Appendix III for a summary of new Unreasonable Risks identified.

6.1.4.1 *Colour Light Signals*

A design failing that could lead to safety critical failure in colour-light signals, which was found at Wicklow, is common to many signalling circuits in use on IE. This was identified during the pre-audit in September 1999.

6.1.4.2 *Facing Point Locks*

In the previous report [1], unreasonable risks were identified with failures of facing point locking tests. Although not a new issue, further points when inspected failed the test (see above). This has identified an issue of co-ordination with p-way and the setting of correct standards and tolerances.

6.1.5 Summary

There was evidence of best practice within SE&T with respect to the production of documentation and procedures, not seen elsewhere within the Infrastructure Division.

There is no single person in overall charge of fire safety within or in the environs of most buildings housing safety critical equipment.

At the interface between functions within the Infrastructure department, positive action is required to ensure that problems are addressed and resolved on a joint (infrastructure) basis, e.g. testing of facing points.

There is little progress on the recommendation to risk assess the arrangements to safeguard safety during degraded or abnormal conditions.

The delay in implementation of Mini-CTC has allowed potentially unsafe conditions to arise. Experience on other railways shows that accidents often occur during the implementation of infrastructure improvement schemes or during equipment failure situations pending that improvement. The management of change applies as much to the implementation process as it does to design and project plan.

Despite the best efforts of all concerned, the lack of resources in SE&T is causing delay in implementation of recommendations.

EirCom does not have specific railway signalling expertise and there is a danger of misinterpretation of the requirements of recommendations made.

6.1.6 Recommendations

The following specific recommendations are made. IE should determine the relative priorities and timescales for these recommendation utilising a risk based approach.

1. Evidence of best practice within SE&T with respect to standards, documentation and training should be promulgated throughout IE.
2. The timescale for the introduction of the new IT system is not acceptable, and an alternative should be immediately explored;
3. The safety systems for the management of degraded infrastructure are not robust and should be improved;
4. A solution for the design failing of the colour-light signal at Wicklow should be approved and implemented without delay;
5. A methodology for a periodic joint Permanent Way/Signalling maintenance routine should be agreed and implemented by the Infrastructure Engineer. This is now a matter of some urgency;
6. A system of independent to IE audit for SE&T safety critical systems should be developed;
7. A monitored comprehensive action plan is required for the replacement of all SE&T assets;
8. The marker board solution for improving braking distances should be subjected to risk assessment and an independent safety assessment of this procedure is recommended;
9. The Infrastructure Engineer should plan for the commencement of iron gates safety bays;
10. In the light of Mini CTC delays, renewal requirements should be re-appraised on the Galway line, together with those other lines affected;
11. Procurement delays in obtaining new materials for renewals and maintenance should be resolved;
12. The Safety Management System should, in particular, address all safety issues arising during new works, degraded works or alterations to infrastructure at these sites;
13. EirCom should seek professional advice on the safety critical standards and procedures required for ETS equipment;
14. An independent audit of EirCom procedures should be carried out;
15. A record of all Safety Plan briefings should be maintained;

16. An appropriate system for recording of signalling failures should be found and implemented;
17. The recruitment of skilled staff should be given the highest priority;
18. A Fire Warden with overall responsibility for fire safety should be appointed at each site;
19. IE should give immediate attention to risk assessments for safety arrangements during degraded or abnormal conditions.

6.2 Permanent Way

6.2.1 Sites Visited

An inspection tour of the infrastructure was undertaken at the following locations during November 1999:

1. Dublin Area (including Sandycove to Dun Laoghaire and Glenageary)
2. Dublin Connolly - Islandbridge Junction - Portarlinton - Portlaoise
3. Dublin Connolly - Mullingar - Longford
4. Galway - Athlone - Portarlinton

6.2.2 Progress Against Previous Recommendations

Reference should be made to Section 9.3 of [4].

6.2.2.1 *“Continue to Deal with the Known Blackspots”*

The track defects identified in the PW site inspection report are very much reduced in number from 1998. However, they still require remedial action with a degree of urgency befitting their risk rating. This may take the form of either a short term palliative or a long term solution. It is again noted that only a sample of locations on the network was visited and statistically it is likely that other similar or possibly even more serious defects exist elsewhere.

6.2.2.2 *“Amend Existing Staffing”*

Good progress has been made in this area to provide additional staff where the need is greatest.

6.2.2.3 *“Understanding of the Risks and their Ranking”*

A continuing problem is that there does not seem to be a full understanding of the risks being controlled by each element of permanent way maintenance activity. Although the work items themselves are known, how they rank in importance and affect the overall level of risk is not. This should not be a big task, a day’s brainstorming by a good cross section of managers/supervisors and track staff should deliver the basic goods. This

will then need to be developed as credible statistical information on infrastructure condition and performance is gathered.

One key problem area is with facing points and the inter relation with signalling equipment. It is suggested that joint inspections of facing points be introduced allowing the each of the two disciplines to become familiar with the others problems. Applicable, achievable standards should be developed to help understanding.

6.2.2.4 “Development and Application of Suitable and Achievable Controls”

There has been some progress on this issue but little output to the production workforce.

The recommendation relates to the means by which each risk is to be controlled. The process will identify methods of control leading to physical work items, such as visual track inspection. It will also demonstrate where standards are required to be set.

Many of the required standards are in existence in IE but are not widely known, used or understood. They should be extracted and compared to industry best practice and formalised in a controlled manner. It is important that staff at all levels have an understanding, and ideally ownership, of the standards. Above all they need to be achievable if progress is to be made.

This ownership should result in the standards being applied rigorously. It will be easy for staff to drop back into bad practice with the view that it was all right before. This is a particular problem with long stretches of new CWR that should be kept in first rate order with some regular attention to detail.

Each standard should have a clear target audience. This will enable the drafters to use an appropriate level of language complexity. It is unwise to use terms and phrases that require a university degree level education to understand fully.

The development of new standards appears to propose changes to current working practices. It is strongly suggested that the existing disparate standards and instructions be consolidated into a unified, understood system before wholesale change is implemented.

Part of this review should be the IE Rule Book which contains both technical and occupational health and safety instructions. It is recommended that site safety arrangements and the duties of lookouts be assessed for robustness. On a site with multiple lookouts it is not clear which one of them gives permission for staff to return to the track from a position of safety.

It is still not considered appropriate for IE to import and use standards from other administrations without review, such as UK Railway Group Standards. Some will be inappropriate and it will not necessarily be clear what risks are being addressed. Some will also have been written to address specific problems that might not be common with Ireland.

6.2.2.5 “Training and Selection of Staff”

Little formal progress has been made on this issue. A formal “training needs analysis” remains the first step in the exercise so that training can be correctly targeted. This should cover both technical and occupational health and safety matters.

Ways of training staff in good practice need to be developed in conjunction with the new standards. Any industrial relations problems with regard to assessment of competence should be addressed. Alongside this staff selection processes should still be reviewed.

Overall technical and safety training remains unstructured and inadequate. However, examples of best practice do exist within p-way (for example simple system to close the loop between work identification and completion seen at Kildare) and elsewhere within IE and these need to be shared. Too much reliance still appears to be placed on staff learning on the job from others. This tends to perpetuate bad practice and stifle new ideas and methods.

6.2.2.6 “Budget and Resource”

Considerable progress has been made on this issue with the budget process for 2000 taking account of the new requirements.

6.2.2.7 “Monitoring”

Little formal progress has been achieved in this area. The procedures and organisation should be monitored by a regular process of technical audit. This has the added advantage of giving feedback on their effectiveness and enable best practice to be identified and spread.

6.2.2.8 “Fitness for Purpose of the Permanent Way Infrastructure”

Considerable progress has been made in the evaluation of the adequacy of the track structure. A track renewal programme is underway that addresses this issue in priority order.

6.2.3 Management Systems

Reference should be made to 8.1.3 of [1]

6.2.3.1 “Organisation”

At Divisional level, the permanent way organisation has been revised since summer 1998 to put the Assistant Divisional Engineers (ADEs) in the line. The Division has been divided into an area of responsibility for each ADE and he then directs the Permanent Way Inspectors (PWIs) for that area. Unfortunately no organisation charts were available to allow a full understanding of these revisions. It also appeared to be the case that the revisions had not been formally implemented because of difficulty with safety validation. Nonetheless the organisation is working in practice. The Chief

Permanent Way Inspector (CPWI) is still not in the line with responsibility for PWIs and it is not clear who responds to him and how he reports.

It is understood that it is proposed to commit additional resource to the DEs for safety, finance and human resource. These are sensible additions but again this change is delayed by safety validation.

There is no dedicated resource at DE level for dealing with outside parties, for example members of the public, local politicians and local authorities. This is evidently a very significant workload and can divert the DE from more important safety of line activity.

It is a concern that the Chief Engineer, DEs and ADEs appear to work very long hours on a regular basis. This is not sustainable and is in the long term prejudicial to good performance and safety. The long hours were as a result of a very large workload, a significant portion of which was due to the safety programme. It is also believed that some long hours were worked because of higher management.

A typical Division has 12 PWIs each responsible for approximately 50 single track miles. Each Inspector typically has 7 patrol gangers responsible for approximately 7 miles of track, 2 mobile maintenance gangs of 6 men each and a summer seasonal supplementary gang of approximately 10. Staffing has been increased in the last year with an additional 12 men per PWI for jointed track divisions and a smaller number, usually 6, for CWR divisions. The patrol ganger being responsible to the PWI and the PWI to the ADE and the ADE to the DE provides management of safety of line. There is now a dedicated resource for track renewal at Divisional level but there still remains a significant workload on the PWI when renewal activity is underway.

The staffing levels under each PWI have been adjusted to take account of track age and condition. However, no formal exercise of matching resources to needs has been undertaken and staffing levels are still related to the 1978 complement. The effect of this is that staff reduction benefit is still not being obtained from the heavy investment in new track over many parts of the network.

The overall level of staffing under the DEs for track maintenance has been enhanced and should be adequate. However, the resources are still not used to best effect. The heavy requirements for the provision of lookout men, which is outwith the control of the PWI and often at short notice, continue to be problematic in the effective allocation of manpower. The inspection regime is also wasteful of resource in particular where track has been totally renewed. A reduction to one high quality inspection per week is considered appropriate with the patrol ganger resource available for maintenance work for the remainder of time.

Formal job descriptions for the key safety posts of DE and PWI were not available but a draft for the DE was examined. The draft is still in development but will place wide ranging responsibility on the DE. As a contemporaneous task it is important to confirm that the resultant personal workload is identified and confirmed as achievable by an individual. Staff at the lower levels are still not consistently clear as to where safety of line responsibility lies.

There are several key staff, particularly at HQ level, whose experience is unique and whose loss would create great difficulty. There was some evidence of succession planning and this is an important advance.

6.2.3.2 “Engineering Systems”

The Strategic Technical Review of permanent way activity demonstrates whether the generic systems for permanent way maintenance are present and adequate. With few exceptions those that exist are still lacking in formality and widespread knowledge among those who need to know remains poor.

There is no system for the issue and control of documents, instructions, procedures, etc. related to the permanent way. Staff work to a variety of documents and letters from the Chief Engineer but they have no means of knowing if they are up to date. Since 1998 these have increased in number and there is widespread confusion about the status of many. For example, the recently issued instructions on ‘track-recording-coach’ urgent action defects were thought by many to be a draft even though the document itself appears to be a final issue.

No evidence was found of any formal analysis of the risks involved in the management of the permanent way. As a consequence the control measures in place are mainly those which have existed historically together with those imported from other railway administrations as examples of best practice.

Although there are systems in place to capture data on permanent way related incidents they are still not robust.

6.2.3.3 “Standards and Documentation”

IE is in the process of putting in place a system for the development, issue, control and briefing of instructions, standards and procedures. Help has been bought in from UK and Irish consultants for this task. The documents are being produced in a hierarchy of levels:

1. Company Standards that cover all activities in Iarnrod Eireann.
2. Departmental Standards that comply with the framework set by the Company Standards but apply only Departmentally, for example Infrastructure.
3. Work Instructions, department wide.
4. Divisional Instructions.

These will replace, insofar as Permanent Way is concerned, the documented procedures that exist today at two levels:

1. National procedures owned by the Chief Engineer.
2. Local procedures owned by the DE.

The national procedures are themselves in three forms:

- “Maintenance of Way” (MW) instructions which date from the early 1980s. These form the backbone of the information required but they are mainly in code of practice form with little mandatory content. They were primarily produced from the British Rail suite of Civil Engineering Handbooks that existed at the time but with amendments to suit local practice and engineering taste. Although well used by technical staff they remain untouched on the shelves of PWI offices.
- Specific handbooks or instructions. These are generally for specialised tasks such as track welding and ultrasonic testing. These have been produced by outside parties for IE and it is not clear of the procedure for receiving updates.
- Letters from the Chief Engineer. Much information is hidden away in letters and instructions, some of which date back many years. They have not been collected together and their status is often unclear. If in doubt staff “work to the last instruction” on the assumption that someone will tell them if they are getting it wrong.

Local instructions are produced and distributed by the DE. These tend to have a much better degree of control in terms of issue status and distribution. However, these distribution systems are not robust. Many national instructions are “topped and tailed” by the DE and issued for local consumption. This may result in staff on the ground being unaware of the original author and status.

To date six Company Standards have been issued and are mandatory from the date of issue. However briefing in of the requirements does not appear to have been carried out and application is causing problems, for example with safety validation of organisational change.

The production programme indicates that 20 Track Departmental standards and 18 work instructions will have been written by the end of 1999. The track patrolling example was examined. There are several points that arise in consideration of the new system that were not answered convincingly:

- Who owns each standard? Each document will require a professional owner to confirm the content, answer queries that will certainly arise in use and review and update when necessary.
- How are the standards consulted upon? How is ownership of the whole department obtained? Any consultation process must include interested parties at all levels and be in sufficient time to allow full consideration of the comments that arise.
- What is the distribution and control system and how is it to be managed?
- How are the documents to be kept? Will they form a small set of folders or will they be a library? Is there an index?
- What is the target audience for each standard? Is patrolling for example aimed at the DE, the ADE, the PWI or the Patrol Ganger? There is no clue in the standard itself save for the comment that the responsibility for compliance rests with the DE
- What complexity of language is appropriate? If a standard is aimed at PWIs and patrol gangers it should be written in simple and clear terms. Legal niceties will be lost on the middle and lower ranks and may lead to confusion.

- The standards, when issued, will presumably supersede old instructions, notes, letters, MW instructions. How are these to be withdrawn? If the new documents are a change from existing practice the superseded documents must be clear.
- How are changes from existing practice to be identified? If the new documents are a change they must be briefed in thoroughly and the changes clearly identified.

There are already standards for many of the items that are expected of a permanent way organisation. However, these are not in a controlled form, have not been reviewed for some 15 years and are not in the format necessary for mandatory instructions. It is considered that the best way to proceed is to consolidate what exists into the new standards, changing the minimum so as to avoid confusion. Once consolidated change can then be introduced in a controlled manner.

The procedures for data capture on permanent way related incidents remain unreliable. This is a cultural as well as procedural issue.

The basic foundation for effective maintenance of permanent way is to have a robust inspection system that identifies and reports defects for attention. There is still no one clear definition of what a patrol ganger should report other than Section O.1 of the Rule Book and this is only a very brief resume.

6.2.3.4 Safety Culture

As before the absence of widely known, understood and controlled written instructions has not led to potentially dangerous situations developing as quickly as might be expected. This is because experienced engineers and technicians, competent in their sphere of activity remain within IE. Examples of local practice were again found which could be spread across the network as “best practice”. However, the actual conditions on the ground in many locations remain poor.

Staff still work very hard to “keep things going” and in doing so are taking risks with safety that may lead to incidents. The number of locations where these risks occur has reduced as a result of the heavy investment in track renewal but is still significant. An example of this was observed at Athenry where a class one rail defect, requiring mandatory removal within 24 hours, was still running without any additional controls 6 days after discovery. Although this is a low speed area and the crack was well supported by blocks and bolts and so was unlikely to fail catastrophically (hence the likelihood rating of 4), this was in complete contravention of IE’s own requirements and no one had taken any action!

The culture of safety has still not taken root in the staff at ground level. They continue to work in hazardous conditions on the trackside with relatively poor protection arrangements. The fact that staff numbers have increased and that a higher proportion are relatively inexperienced will have increased the risk.

Examination of track patrolling records showed that certain patrol gangers continue never to file a weekly report. The reason why certain safety critical staff never compile such a report requires careful review. The non-filing of these reports is unacceptable and should be rectified.

As in 1998, at several locations the track gauge was checked at toes of switches. This is a critical area if the signalling equipment is to function correctly. Normally such locations have a “soleplate” which is a steel plate, pre-drilled to exact dimensions to ensure accuracy of gauge. Many were found to be wide to gauge by up to 15 mm, which would be unacceptable in the UK. Signalling detection was not reliably achieved. The problems appear to arise from incorrect soleplates, incorrect size holding down screws or fangs and poor designs of soleplate. It is recommended that this problem be the subject of a cross functional working group.

6.2.3.5 *Safety Inadequacy Scores*

Safety inadequacy scores for management systems are given in Appendix II.

It is evident that in many areas the Safety Inadequacy Scores are very high, indicating that many safety critical tasks still have no written instructions or standards leading to wide variation in work practices and quality.

6.2.4 New Issues and Risks Identified

Reference should also be made to Appendix III for a summary of new unreasonable risks identified.

6.2.4.1 *Formalise the Organisation*

It is necessary to confirm the new organisation with the safety validation process. Then organisation charts and job descriptions can be produced and briefed so that everyone knows their role and responsibility. It should be ensured that all activities have an owner, in particular new tasks such as training. All jobs should be confirmed as reasonably achievable. Hours of work need to be driven down to acceptable levels.

6.2.4.2 *Facing Points*

The gauge at facing points and the inter-relation with signalling equipment was a regular cause of problems. It is recommended that this be the subject of a cross functional working group.

6.2.4.3 *Site Visit Defects*

During the site visits (Dublin-Portlaoise, Dublin-Longford, & Galway-Portarlington) a number of additional defects or examples of bad practice were identified including further unreasonable risks. Their Safety Inadequacy has been scored and is reported in Appendix II. The new unreasonable risks are summarised in Appendix III.

Three particular high risk hazards are reported below.

Portlaoise (Passenger)

A train loaded with new concrete sleepers was observed departing from the depot. The sleepers were not restrained on the flat bed wagons except by friction. The top layer in

particular appeared vulnerable to displacement in transit. It is recommended that consideration be given to restraining straps or similar. (New Unreasonable Risk)

Enfield

Down loop is a mixture of 1898/1900 94 flat bottom track and bull head of undetermined date. Many joints are wide, with bolt holes very close to rail ends and bolts are missing. Decayed and indented sleepers were also noted in the platform area.

Ultrasonic defects were noted within the station area, at least 11 class 2s counted but there is no serviceable rail available for replacement. A correlation with the DE's list of defective rails was unsuccessful and it was discovered that the list is not comprehensive due to a computer or programme fault.

Athenry

A class one rail defect, requiring mandatory removal within 24 hours, was still running without any additional controls 6 days after discovery.

6.2.5 Summary

Considerable progress has been made in the past year to implement the recommendations from the previous audit.

Unreasonable risks have either been eliminated or are the subject of work to control and reduce them. However, the audit did reveal a number of new and unreasonable risks.

The development of standards to be applied and onward staff training has made some progress at high level but had little impact on the ground. The new risks identified on the site inspections confirmed the continuing need for progress on these issues

Problems and barriers to continued progress have been identified, although Iarnród Éireann are aware of many them and are taking what steps they can to address them.

Major issues are as follows:

- The track inspection, work identification, prioritisation and completion systems are still not robust and continued effort is needed in this important area.
- The availability of meaningful and understood standards that address the risks to IE, in particular at the level of PW Inspector and below needs to be addressed.
- Staff selection and training to ensure competence in undertaking allocated duties needs to be put in place.
- Maintenance of the areas not yet touched by track renewal activity remains a priority. Delays in Mini CTC are a significant problem in this regard.
- In all activities feedback loops to allow monitoring and confirmation of achievement need to be robust.

- Overwork and consequent stress to senior managers should be controlled for the Safety Plan to be a success.

6.2.6 Recommendations

Specific recommendations are listed below:

1. The problems of lightweight and obsolete rails are being addressed by total track renewal. However, there remain many locations that will not be renewed for several years and the safe management of the ageing track infrastructure is vital. It is recommended that the rail and fishplates now available by cascade from relaying sites be used to effect replacement of ultrasonic defects and badly drilled rail ends. It is important that this is done to eliminate the defect backlog.
2. The site inspections continue to identify examples of defects which would be quite unacceptable in the rest of Europe, albeit the numbers have reduced. Staff are still used to working with poor track, particularly at stations and passing loops. It is recommended that standards are produced and briefed to staff on the ground so that they are clear what is required and are therefore able to make objective judgements.
3. The workload of the PWI has changed little and still needs to be reviewed. He spends at least one full day a week on basic clerical duties. To this work the PWI is unsuited. The PWI devotes a considerable amount of his time to renewal activity for which he is not adequately resourced despite the introduction of new staff at DE level. It is recommended that the workload of the PWI be reviewed.
4. The fleet of plant available for permanent way operations is still not adequate in two key respects:
 - A decent fleet of modern ballast hoppers allowing staff to place stone where it is needed and obviate the need to plough;
 - Materials handling equipment to allow the removal of scrap and serviceable material from the lineside for sale or reuse.

If anything the problems arising from this inadequacy have increased with the new level of track renewals being undertaken. It is recommended that the plant be procured and put into effective service without delay.

5. Training of the PWIs' staff in their duties remains at a low level. New employees are taken on and given initial safety training only. After this it is the responsibility of the PWI and his gangers to train the new staff on the job. The only tests of competence are by the CPWI when he examines staff in lookout and handsignal duties. It would also appear that the CPWI is himself not trained in this critical activity but has just learned it from his predecessor. Patrol Ganger training is understood to have commenced in some locations but was not reported throughout. It is also understood that staff are unwilling to be assessed in competence following training and certification to date is purely for course attendance and not achievement. It is recommended that training at all levels in the permanent way organisation be reviewed.

6. The lack of standards continues to leave staff unaware of what is correct. For example, on the basic subject of the overlap setting of adjustment switches there was a disparity of responses from senior staff. The dimension varied from 660 mm to 630 mm with answers in between. The MW instructions do not contain the answer but some staff have hand written the requirements and filed them in the MW booklet. It is recommended that appropriate standards be produced without delay.
7. Again the potential for confusion includes the new, believed standard, IBJ arrangement with the joint being positioned over the face of the sleeper on the running on end. This is inappropriate for single lines and yet is in widespread use. It is also in contravention of the MW instructions, number 17, that requires joints to be centrally located between sleepers. It is recommended that as part of the process of producing new standards all existing controls are reviewed to establish if they are adequate or whether additional controls should be introduced
8. Maintenance of life expired track is now mainly undertaken by total renewal in new CWR. This gives a very good standard of finish but it is a concern that unless staff begin to understand the standards to work to the track may be allowed to deteriorate. This could lead to a steady slow erosion of safety until it again reaches an unacceptable level. It is recommended that newly installed track be maintained to a good standard by ensuring that those responsible know what is required of them.

6.3 Structures

6.3.1 Sites Visited

An inspection tour of the infrastructure was undertaken at the following locations during November 1999:

1. Connolly to Longford (inspection car)
2. Galway to Tullamore (inspection car)
3. Limerick Junction - Dublin (various sites by car)
4. Bray - Graystones (various sites by car)

6.3.2 Progress Against Previous Recommendations

Reference should be made to Section 6.5.1 of [1].

6.3.2.1 *“Bridges and Bridge Maintenance”*

Bridge Maintenance

The condition of the masonry bridges was generally good whereas steel bridges are more mixed with some having relatively good paint condition and others severe corrosion.

It was noted that many wing walls and to a lesser degree abutments were covered in ivy and other vegetation. Apart from damage to the structure that the vegetation will

cause, the obscuring of the masonry or brickwork makes meaningful examination difficult.

The beginnings of bridge management databases were seen at all Divisional Engineers (DEs) offices. Once these are used for prioritising defects and work required then it is hoped that a more systematic and improved approach to bridge maintenance will result. Those at Dublin and Limerick Junction showed particular promise to assist with maintenance planning and examination programme management.

As a result of the increase in the reconstruction works the resources of the DEs to carryout the smaller preventative maintenance will be squeezed. It is unclear how the substantial up turn in workload for the bridge gangs (1 at each of Athlone and Limerick Junction, and 2 at Dublin, plus 2 national gangs) will cope to keep on top of the workload. This is a potential problem that may emerge and affect the infrastructure in general not just structures.

A similar concern applies to the engineering and technical staff who are facing sudden increases in work load. Dublin DE for instance has provisional plans to reconstruct 30 bridges in 2000. Some of the bridges which are planned to be reconstructed are relatively small, for example minor cattle creeps which will be rebuilt as part of the track renewals. However the task of reconstructing a much larger number of bridges than has been routine for many years will be for such few staff, even allowing for the fact that contractors will be employed to carry out part of the work.

The timber walkways at three large bridges spanning water (No. 106 Athlone, No. 171 Galway and No. 125 Ballinasloe) were noted as being poor although part replacement had taken place at the Shannon river bridge, Athlone. If these are typical of similar bridges then a concerted effort to make the walkways safe is required.

As a result of widespread track relaying the track has been raised extensively. It was noted that ballast walls and handrails have been provided to prevent ballast loss and track staff from falling off the bridge from the cess at many locations. However there were quite a number where this upgrade was still required.

At some overbridges it was noted that the parapet arrangements were very lightweight in particular bridge no. 452 at Longford only has handrailing. While this is perfectly adequate for preventing pedestrians from falling off the bridge it would not prevent a vehicle from crashing through on to the track below. The most obvious hazard is to the driver but the consequences for a train would be much greater if it struck the vehicle and derailed. It is understood that a container lorry recently went through a parapet and obstructed the Dublin – Cork line.

Cast Iron Bridges

An exercise has been carried out by the Structural Engineer to identify all cast iron bridges and risk assess them to allow prioritisation for replacement in the next five years. A programme has been drawn up and funding secured. The programme shows nine bridges to be rebuilt in 1999. This will not be achieved and the programme will clearly fall behind schedule. The reasons given include problems with local authorities

agreeing revised road profiles. Where bridges have to be reconstructed they are often built with a greater deck thickness, or IE wish to raise the level of the soffit to allow greater clearance for trains. Both of these have the effect of raising the road surface level. Thus where a bridge is already a hump back, its longitudinal profile will be made more severe after reconstruction. This is objected to by the Local Authorities as they want to improve road geometry rather than worsen it. It is unclear how this should be resolved. If it is a problem in 12 months time then IE need to start doing something but until then there are plenty of other bridges to rebuild.

In discussion it was unclear whether all cast iron jack arch overbridges had been included in the exercise. Bridges on 'abandoned' lines for which IE still has responsibility were not rigorously accounted for. It is apparent that the list of bridges to be reconstructed is not necessarily definitive. There was at least one bridge on the Dublin division containing cast iron which was not on the 'reconstruction' list. From the observations at Mulligar, bridge 387 also appeared to contain cast iron girders but again it was not listed for reconstruction. The issue of cast iron bridges was raised previously as an unreasonable risk.

DART Footbridges

An inspection and assessment of all footbridges along the DART has been concluded by the Structural Engineer. This involved removing sections of cladding to the parapets and examination of the quality of welding where extensions to the supports were made to raise the bridge. At least one bridge has already been removed due to its condition. A programme for replacement has been produced and at least four footbridges are due to be rebuilt in 2000.

Other Footbridges

Between ten and fifteen footbridges were inspected at various station locations. The condition varied widely. However, a frequently observed condition was that of severe rust and corrosion to the underside of the steps where painting and preparation was poor in the past. These bridges will be approaching the point where maintenance will become uneconomic and they will require replacement if they are to continue to provide a safe means of crossing the line.

There has been recent (past 5 years) painting of most station footbridges as part of station refurbishment works. In many cases this has not adequately dealt with the areas of metal which are in a distressed state.

6.3.2.2 "Retaining Walls"

There has been no change in the situation since the original IRMS audit. It is recommended that retaining walls, amongst other structures, should receive routine examination.

6.3.2.3 "Platforms, Public Access, Stations and Buildings"

There is a division of responsibility between the Building Maintenance Engineers (BMEs) and the DEs at the joint between the platform coping and the rest of the

surface. This has led to widespread neglect of that joint leading to a maintenance problem and more significantly a tripping hazard for people boarding and alighting from trains.

Following the IRMS recommendations concerning security etc. at signalboxes, relay cabins and other buildings housing significant operational equipment the Chief Engineer Infrastructure advised that a survey of the network has been carried out by consultants for IE. This considered the fabric, the wiring, the security and the use of the building and fire hazards. The Chief Architect has a prioritised list of about 60 buildings requiring work and plans to let contracts with a view to work starting in March/April 2000. The report was not reviewed during the recent visit, but should be included during a more detailed subsequent audit.

6.3.2.4 “*Embankments and Cutting Slopes*”

Only passing observation was undertaken during this review while travelling on the inspection car. No particular problem sites were seen. As a result of the previous IRMS report a major exercise has been undertaken by consultants Carl Bro examining the earthworks and assessing their condition. A draft report was presented to IE this autumn. Its recommendations are far reaching and have substantial cost implications. IE are considering how to take this report forward in the most reasonable manner.

The report identifies a series of unreasonable risks. The Chief Engineer Infrastructure has advised that the majority have been dealt with already. A few require further investigation before the appropriate work can be done.

The damage caused by laying the ESAT cable identified in the report will require a large amount of work to rectify and is the subject of a wider discussion about how to take this issue forward within IE. The cable has been ploughed in and has caused damage to the stability of the embankments and cuttings, and in places it has not been properly back filled leaving uncompacted ground. It has also been laid too close to the track in places making track/ballast maintenance difficult in the future. The reason for this appears to be the cable laying operation has not been carried out to appropriate standards. The consequences are the jeopardising of the stability of the earthworks which could in turn undermine the support for the track with obvious consequences for the safe running of trains. In addition, where it has disturbed the ballast shoulder the resistance to the track buckling in hot weather will have been reduced. The likely impact is costly remedial works over the forthcoming years as problems occur.

The report provides a sound basis on which to develop a management regime for the embankments and cuttings, although the recommendations are extensive and may be tempered by financial constraint.

6.3.2.5 “*Lineside Conditions*”

Lineside conditions were not specifically audited. Comments on this item are included where necessary against other headings.

6.3.2.6 “Coastal and Estuarial Defences”

Following the IRMS recommendations from the previous report, IE commissioned consultants Carl Bro to report on coastal defences. They have produced a prioritised list of works that are required. IE are considering how to take the recommendations forward in the most appropriate manner possible and will be commissioning feasibility studies where appropriate.

The report identifies certain works as priority items at Bray Head and at Greystones. The potential scale of some proposals can be judged by the option of realigning the track at Rosslare which would require planning permission and a railway works order in addition to considerable expenditure and would require several years of planning before physical work could be started.

The report provides a sound basis on which to develop a management regime for the coastal defences.

6.3.2.7 “Scour”

There are a large number of bridges that have piers or abutments that are affected by flowing water in rivers. Examples of underwater examinations were seen although they were quite old (8 years). Examples of scour protection works were also seen on site.

Bearing in mind the large number of bridges that could potentially be affected by scour, a structured approach to its management is needed. It is noted that scour is the subject of one of the standards that IE’s consultants GNC (Gibb, Nifast and Curry & Brown) will be producing. This should address not just the assessment of vulnerability of a structure to scour and its routine examination but also how times of flood are dealt with.

6.3.2.8 “Outside Parties”

The draft standard produced by GNC has been reviewed and is now being reworked as a result of feedback from the DE’s.

No outside parties sites were visited, however, evidence of the general public’s encroachment on railway land was seen on two occasions. Firstly the owner of a former station building was painting his windows from a ladder footed on railway land at the rear of his building. Secondly workers from a building site putting up a wall close to or on the boundary with the railway were casually walking across the track. In neither case was the Assistant Divisional Engineer (ADE) aware of any planned work that would involve the outside parties to be on railway operational land.

Examples of contractors’ method statements were seen, however they contained very little information on control of construction activity that may encroach such as plant.

The normal IE site supervision of a ‘lookout’ is questionable since on private parties’ sites there should be no one on the track anyhow as the sites are fenced. The IE site presence has a different role and should not be called a ‘look out’. It undermines the

clarity of understanding when that role is called 'look out' when it patently does not act as a warning to staff to get out of the way of a train. The IE presence is there to observe the construction activity to ensure it adheres to any agreed method statement and to prevent anything occurring that may endanger the safe passage of trains. In other words they are protecting IE from the construction work and not the work from the trains.

In general the supervision of technical activity such as construction of foundations near the track was undertaken by visits from the ADE. The time that an ADE is able to give this work when there is such an increase in track and bridge renewal should be reviewed.

6.3.3 Management Systems

6.3.3.1 *General*

As previously identified by IRMS the management systems are weak. There is heavy dependence upon local knowledge and the fact that many staff have worked in a particular geographical area for a long time. The fact that bridge inspections are so overdue in some parts of the network is testament to both the time pressures that ADE's have and the lack of simple programme management systems.

There is little training in structures management. A number of staff did attend a BR style structures examiners course some years ago. However, the staff who attended the course do not carry out bridge examinations. It is believed they are involved as site workers on bridge repairs and reconstructions.

As discussed in the previous IRMS report the bridge cards system of reporting allows for the recording of very little information. While this may be adequate for a simple cattle-creep underbridge it is inadequate for reporting on and monitoring the condition of larger structures such as the Shannon river bridge. The quality of reporting is extremely varied with sparse comments such as 'OK' seen on some cards.

As part of the structures management project it would be valuable to consider the way in which structures condition is monitored and priorities for maintenance decided. It is a time consuming activity for an ADE to visit all of the bridges let alone any other structures that may be included in any future inspection regime. Many bridges are in good condition and are unlikely to decay rapidly so that their condition remains pretty constant from year to year. Delegation of much of this inspection work could release time to allow the ADE to concentrate on those structures requiring a higher level of engineering input.

The nature of the inspection leaves something to be desired particularly for bigger bridges where simple visual observation from the ground is inadequate without a closer periodical hands on examination. It was noted that Athlone DE had used a road rail 'guzunda' inspection vehicle to allow access to high underbridges with success. This improved approach is welcomed.

6.3.3.2 Standards/Procedures

To date no new standards or procedures have been implemented. The GNC team are managing production of at least eight standards that will fit below the ten high level IE wide standards. At least one, that dealing with Processing of Outside Party proposals, has been circulated in draft and is now being reworked following comments from the DEs to make the standard more appropriate to the needs of IE. Carl Bro have produced three draft standards for management of tunnels, management of coastal defences, and management of cuttings and embankments. They are very much first drafts and have not been considered by IE yet.

It is very important to consider the risks and real physical conditions under which IE operate. Much of the railway is a lightly trafficked rural one whereas there are some intensive sections e.g. DART and sections of relatively high speed route e.g. Dublin – Cork. Standards need to reflect what is appropriate for the particular situation and what is required to control those risks. If standards are too onerous there must be some doubt as to whether they will be implemented on the ground and they will result in unnecessary expenditure.

6.3.3.3 Bridge/Structures Management

The Structural Engineer at HQ has started to examine off-the-shelf software packages used by various other railways to manage bridges and structures. The entire project has been titled 'The bridge management system' to pull together the various strands of the management processes which involve bridges. The production of standards will form other elements of the system. Currently only bridges receive routine inspection. It will be necessary to ensure that all significant structures are listed and subject to examination. A particular deficiency is that there is no engineering examination of tunnels, substantial retaining walls and major signalling or OHLE structures. The scope of the projects should include other structures which constitute the infrastructure.

6.3.4 Safety Adequacy Scores

As part of the site visits, a series of system check sheets were used at North Wall and Dublin (Pearce Station), Athlone and Limerick Junction Divisional Engineers' (DE) offices. These utilised check sheets to score against a series of subjects, as a review of the existence of procedural controls and management systems to govern and record the activities of the division. A summary of the scores obtained is provided in Appendix II, with 100% representing full safety adequacy and 0% representing full safety inadequacy.

The following observations include a summary score against each of the subjects.

6.3.4.1 Management/ Examination of Structures

Athlone DE Office 32%

There are gaps in the standard in particular there is no requirement laid down for inspection of tunnels, retaining walls or 'minor structures' such as signal or OHLE

structures. Simple programmes of bridges examination would assist in keeping to the standard 2 yearly frequency. There is quite a backlog of bridge examinations that needs making up.

Limerick Junction DE Office 65%

There are gaps in the standard in particular there is no requirement laid down for inspection of tunnels, retaining walls or 'minor structures' such as signal or OHLE structures. The lack of routine tunnel examinations is a serious omission.

6.3.4.2 Examination of Structures – Records

Athlone 30% & Limerick Junction DE Offices 19%

There is no listing of structures requiring more frequent inspections than the laid down two years, the system would benefit from such a list together with records of those inspections. The database could be usefully adapted to allow programme management of structures examination as it could allow a 'sort' facility on the examination date. A simple programme of inspections would allow more robust programming of inspections. Generally the inspections are keeping up although the records need completing on the bridge cards. It was noted that the PWI annual inspections are not recorded where they are carried out. The omission of tunnels from inspection is a serious risk. An improvement in the achievement of the required 2 yearly frequency was noted together with the standard of the report.

6.3.4.3 Structural Examination Arrangements

Athlone 20% & Limerick Junction DE Offices 53%

The process of prioritising and programming remedial work is informal with little traceability of work required having been reported back as complete although the recording of work needed in the database and the regular review meetings with the foreman should improve that. The bridge cards should be kept up to date and records transferred from site notes quickly. The need to send such an experienced and valuable resource as the ADE or his assistant to examine all bridges every two years should be questioned. Many bridges seen on the Division are in very good condition and the requirement to see approximately 900 bridges every two years by an engineer cannot be regarded as best use of resources

6.3.4.4 Outside Parties Construction work

Athlone DE Office 60%

Although no outside parties sites were visited this seems a loosely managed activity. Clarity is needed about the name and role of the IE presence on site. That person is referred to as a 'lookout' however their duties do not generally include looking out. It is questionable to what degree the technical supervision can be effectively carried out by the ADE when there are so many other tasks they have to do. Depending upon the nature of the construction work a trained but more junior person could easily perform the site inspection to ensure adherence to the agreed method statement.

6.3.4.5 Bridge/ Structure Scour

Athlone 17% & Limerick Junction DE Offices 11%

Although no major problems have been experienced at Athlone with scour, there are quite a number of bridges that are potentially liable to scour. There should be an exercise undertaken to risk assess all such structures for susceptibility of the foundations being undermined. Based on the results of the risk assessment an inspection & management regime should be put in place that would include underwater inspection where the condition of the structure cannot be determined during a dry summer inspection where appropriate. Monitoring of the behaviour of the river bed should be included in the management regime. Precautionary measures such as line closure at a given water level and follow up examination should be identified at times of flood in conjunction with flood management generally.

It was noted that some bridges in the Limerick Jcn. region have shown some signs of minor scour.

6.3.4.6 Bridge bashing

Athlone 27% & Limerick Junction DE Offices 24%

This is an area of substantial risk and weakness in terms of the management of that risk. The number of strikes is climbing and the consequent risk is greater. There are no authorised staff or approved conditions for opening bridges following a strike. IE are actually unaware of most strikes!

6.3.4.7 Coastal and Sea Defences

North Wall and Dublin DE Office 33%

The Carl Bro study should be the starting point for the strategy within IE for management of coastal defences. There is clearly a need to formalise the inspection regime, albeit that the existing one needs relatively little supplementing it.

6.3.4.8 Embankments and Cuttings

Athlone DE Office and North Wall 17%

The Carl Bro exercise is a very comprehensive one and should be the starting point for the strategy within IE for management of embankments and cuttings.

6.3.4.9 Flood Warning Procedures

Athlone 9% & Limerick Junction DE Offices 9%

As the areas are crossed by a large number of rivers it is recommended that the approach to managing the risk to the infrastructure is formalised with vulnerable locations including river bridges listed and intervention actions provided when the flooding reaches given levels. For example that the line is closed when the water level reaches the underside of a bridge deck. Criteria should be laid down for reopening the

line as well. IE should take a country wide approach to the principles of this recommendation to ensure consistent implementation but ensure the assessment and identification of locations is carried out locally to utilise local knowledge and experience. It would be beneficial if flood warnings were sent directly to the DE office rather than via HQ.

6.3.5 New Issues and Risks Identified

Reference should be made to Appendix III for a summary of new unreasonable risks identified.

6.3.5.1 *Footbridges*

A particularly serious hazard was noted at Maynooth station footbridge where there is a gap in the vertical railings that form the parapet. This is at the top of both flights of steps and is large enough for a young child to climb through and fall to the ground with potentially fatal consequences. (This has been included as a new unreasonable risk).

6.3.5.2 *Bridge Strike Management*

From site inspections it is clear that bridge strikes pose a serious threat to IE. Large numbers of underbridges appear to be struck regularly. As the economy accelerates and the number and size of vehicles on the roads increases, this will be a growing problem. It is obvious from comparison of IE record cards with bridge conditions identified by IRMS, that the number of strikes actually reported to IE is nowhere near the actual number that occur.

Some very substantial steel girder 'goal posts' were seen at several bridges which have been effective in protecting the bridges from road vehicles.

No instruction to the signalman about what to do in the event of a bridge strike was found. It seems that the signalman will block the line through common sense until advised that it is safe to reopen the line by a member of the civil engineering department. There are no standards about who within the DEs organisation should assess a bridge after a strike to determine whether it is capable of being reopened.

There is no training or assessment of competency of patrol staff or PWI who are often the first to be on site and therefore often responsible for advising the signalman that the line is safe to reopen. There are no limits to the damage that can be allowed prior to reopening. The whole approach relies on local knowledge of the signalman knowing the civil engineering person as someone who he can trust. The more junior staff will make a decision based on their experience and their level of confidence on that day.

A system of authorised staff approved to hand back the line after assessment is required. As signalling is centralised, the controlling signalman is becoming increasingly geographically remote.

In discussion with DE staff they feel that junior staff will generally call upon the ADE to inspect the structure if they are in any doubt as to its capability of carrying trains,

and therefore there is relatively little risk in not have laid down limits of damage for civil engineering staff who do not have a structures background. However if there is a pressure to reduce train delays imposed upon the person on site there is an increased risk that they could feel pressured in to making a decision they are not confident about.

An exercise has been undertaken by the Structural Engineer to update that done in 1991 to assess which bridges were most at risk. The Structural Engineer will be verifying that outcome by site visits shortly. Once that is complete, a programme of physical works will be developed and funding sought. However it must be borne in mind that raising the bridge may not be the most cost effective way of doing this particularly where the track raising costs may be substantial.

From what was seen, and the reasons quoted above, this is likely to be an increasing risk area for IE and one which has resulted in a fatal derailment in the past and another derailment at Longford more recently. It is one which IE cannot solve on its own and one which cannot be solved by hard engineering alone.

It was noted that one of the structures standards to be developed by GNC is bridge strike management.

6.3.5.3 *Disused Lines*

There is a lack of clarity amongst DE staff about which 'disused' lines IE still retains responsibility for. Indeed it is not clear what responsibilities IE has for those routes. While the failure of an over bridge carrying a road over a now disused track bed would not pose any risk to IE staff or passengers it could have serious consequences for any road user and result in a costly claim against IE. This issue is highlighted particularly by the cast iron bridge exercise. (Note: A new recommendation and unreasonable risk have been identified).

6.3.5.4 *Stations and Buildings*

Beyond the issues raised in the previous IRMS report [1] it became apparent that the Building Maintenance Executives (BME) of which there are three and who have responsibility for buildings do not carry out any form of routine inspection of the engineering structures for which they have responsibility. The principal structures noted are station roofs with large spans such as Heuston and Galway. These are substantial structures and require regular examination to prevent the possibility of corrosion causing sudden collapse on to the platforms or tracks that they span.

There are generally no routine inspections carried out of buildings as the condition of the glass in the canopy at Bray station revealed. Broken glass was noted over areas which passengers use everyday at this busy station. (Note: this has been identified as a new unreasonable risk).

6.3.6 Summary

IE have made considerable efforts and progress in addressing many of the issues identified in the previous IRMS report. The principal areas are:

- Dart Footbridges;
- Cast Iron bridges;
- Coastal defences;
- Embankments and Cuttings;
- Tunnels.

In the case of the DART footbridges detailed inspections have been carried out and a programme of remedial or reconstruction works is being put in place. It is not clear at present how far ahead funding is available, although funding has been committed to replace all cast iron bridges over the next five years. Thus those risks are being managed in a structured manner.

Coastal defences, tunnels, embankments and cuttings have been subject to a consultancy study and IE are now considering how to take forward the resulting recommendations.

The unreasonable risks previously identified have been investigated. In most cases where physical action has been necessary it has been taken either to remove the risk or control it until further more permanent work, i.e. reconstruction, can be undertaken. Some unreasonable risks will require longer term programmes which are being developed on a simple risk assessed basis.

Several new areas of risk have been highlighted in particular:

- Bridge strikes;
- Disused railway lines;
- Interface of between IE departments in the management of buildings;
- Management of engineering structures within buildings.

There has been some development in terms of standards. Although little has actually reached the end users, early drafts of some were evident.

The local development of bridge databases at Divisional offices in advance of an IE wide system is welcomed as providing a solid foundation for the systems needed to manage the structures assets. It will also assist with specifying what the users want from the planned IE wide system.

There still needs to be more consideration of how structures inspection is carried out. A real understanding of the risks associated with all structures and not just bridges needs to be developed and appropriate systems, staff competencies and resources provided. This may not necessarily involve greater activity, in some instances such as the frequency of inspection of bridges by highly experienced and qualified engineering staff, it may involve less. However, the current gaps need assessing and strategies to close them developing.

IE should always hold in mind when developing new standards and systems that they need to be appropriate to the risks and environment within which IE operate.

6.3.7 Recommendations

6.3.7.1 *General*

Major issues are as follows:

- The bridge management project should encompass all structures or where it does not, an alternative management regime should be developed for them. The appropriateness of staff and their competence to carry out inspection should be included within that exercise.
- Standards and systems being developed should be appropriate for the risks which IE operates within
- Responsibilities for disused lines should be clarified and acted on.
- Bridge strikes present a major risk and their management needs thorough review.
- The physical interface between the Infrastructure department and Buildings Executive needs clarifying and the engineering structures within buildings need management.
- Progress on the management of coastal defences, embankments and cuttings should be monitored and a plan developed once the strategy is clear.

Management of Outside Parties is still a risk area, the standard should reflect local needs and conditions.

Specific recommendations are shown below.

6.3.7.2 *Specific Recommendations*

Bridge and Structures Management

1. Ensure that the scope of the bridge management project includes more than just bridges i.e. all significant structures are listed and subject to examination. Particular deficiencies noted are that there is no engineering examination of tunnels, substantial retaining walls and major signalling or OHLE structures
2. Those structures not included in the bridge management project have alternative management systems developed for them.
3. As part of the bridge management project the entire process of condition monitoring should be reviewed and appropriate changes made to improve the quality of the process, the achievements of the standard and the use of appropriate staff.

Cast Iron Bridges

4. Revisit identification exercise and identify possible structures that may have been omitted during the initial exercise.
5. Revise programme to reflect likely reconstruction schedule
6. Develop project management process to track project through its implementation

Disused Lines

7. Determine what IE's responsibilities for 'disused' lines are and identify all of those lines.
8. Identify the structures along the routes and instigate an appropriate inspection and management regime for them.

Bridge Strike Management

9. That IE develops a comprehensive strategy to reduce the incidents of bridge strikes involving external parties such as the Gardai in pursuing prosecutions of offending drivers, the haulage industry bodies in awareness campaigns amongst drivers and local authorities to sign alternative routes
10. That a training and assessment package is developed for staff such as patrol gangers and PWIs to develop competence in dealing with defined damage levels to struck bridges.
11. That increased reporting of strikes is enabled by fixing information plates to bridges with unique identification and telephone number within IE to get trains stopped as quickly as possible
12. Provide signal staff with instructions about what action to take when dealing with a bridge strike.
13. Implement a programme of physical works to bridges, either protection works or raising decks where appropriate.

Bridge Maintenance

14. Embark on a comprehensive devegetation programme of all structures to allow effective examination.
15. Provide ballast walls and handrails where track laying has created the requirement for improvements
16. Review parapet adequacy at overbridges on a risk based approach to identifying those requiring upgrading

Stations and Buildings

17. Develop appropriate standards for the inspection of buildings which contain engineering structures and implement them.
18. In the interim carryout a one off inspection of all engineering structures within stations which the BMEs have responsibility.
19. Agree and document the maintenance responsibility for the boundary between platform copings and the rest of the surface.
20. Repair all substandard platform coping/surface joints to remove tripping hazards.

Private/ Outside Parties Control

21. Give consideration to the role, capabilities and name of the IE presence on site as part of the standard writing process.

New Unreasonable Risks

Reference should be made to Appendix III for a summary of new unreasonable risks identified.

The first three listed below have been included in the 'unreasonable' category; it is believed they can be corrected within 6 months. There are not very many engineering structures within the Building Executive's area of responsibility (probably less than 30). There are not many disused lines that are IE's responsibility as many have apparently been sold or given to other bodies such as the local authorities. The actual work to the platforms is very quick to carryout, taking a day per platform where it is required at most locations. It involves putting down additional tarmac in most cases.

22. Identify and carryout a one off examination of all engineering structures within stations which the Building Maintenance Executives have responsibility for, prior to a routine inspection programme being put in place.
23. Ensure that structures on disused, abandoned routes for which IE has responsibility are listed, examined and managed.
24. Carryout remedial repairs to the joint between platform copings and platform surfacing as it is commonly failing and presents a tripping hazard at numerous stations.
25. Review Bridge 387 at Mullingar to determine whether it does contain cast iron girders and also provide adequate protection to Sligo side footpath span from road vehicle penetration of the deck.
26. Finish renewal of timber walkway boards at Shannon River Bridge 106 at Athlone (approx. 40%) complete to date.
27. Renew timber walkway boards at the Lough Atalia Bridge 171 Galway which are rotten and loose also at Bridge 125 over the River Suck at Ballinasloe.
28. Close gap in footbridge railings at top of steps at Maynooth station to prevent a child from falling through the railings.
29. Check for all similar footbridges as that at Maynooth and close gaps on those.
30. Remove broken glazing from canopy roof at Bray station which poses a risk to passengers who could be struck by falling glass

6.4 Electrification

6.4.1 Sites Visited

During this visit, audit inspections were carried out at the following locations:

1. Connolly Electrical Control Room (ECR)
2. Fairview Depot (OLE)
3. Bray Substation (new)
4. OLE (Graystones – new)

6.4.2 Progress Against Previous Recommendations

Reference should be made to Section 6.6 of [1].

“New OLE maintenance/repair access equipment & plant”

- In progress. Budget allocated, selection of plant in progress, to be procured by May 2000. (See below for details).

“Familiarise staff with new electrification equipment on Graystones and Malahide DART extensions”

- No progress other than for ECR staff. Stalled owing to industrial dispute

“Prove voltage testing devices before and after each verification”

- In progress. Implemented for OLE, to be added into procedures.

“Log in and out of substations with Control”

- Not yet implemented.

“Prove OLE sections dead before earthing”

- In progress. New testing devices procured, and procedure introduced. To be added into procedures.

“Use ‘Caution Notices’ at locked-off points of isolation”

- In progress. Form and wording of notice under consideration.

“Provide delineation of safe working limits at Depot centre walkway for half-road isolations”

- Debated, and not to be pursued, subject to revision of Depot Procedures. To be audited.

“Use multiple padlocking facility on Depot OLE lock-off boxes”

- In progress. Debated and agreed.

“Provide and use ‘open door key release’ interlock key on Depot high-level access gantry”

- Debated, but agreed unnecessary if above recommendation on multiple padlocking is implemented. Closed.

“Add ‘limits of isolation’ graphics to DART signalling mimics”

- In progress. Awaiting new signalling mimic.

6.4.3 Equipment

6.4.3.1 *Substations and Switch-houses*

The operational 1500 V dc overhead line system remains as it was at the time of the original study.

6.4.3.2 *Overhead Line Equipment*

There have been few changes on the overhead line equipment on the existing DART since the original report was issued. Some minor modifications have been carried out, partly by ADtranz under contract, and partly by IE, to accommodate the longer platforms currently being prepared for longer EMU formations.

IRMS are pleased to confirm that a considerable budget allocation (£800k) has been allocated to the choice and procurement of road and rail mounted OLE access and maintenance specialist plant. Consultants have been appointed to assist with this. Some limitations are apparent due to IE's non-standard track gauge. Some 10 firms have responded positively, and a final selection of equipment types is being made by IE prior to going out to tender. The aim is to have plant delivered by May 2000.

Some experience has been gained from ADtranz' use of access plant on the extensions, but there have been industrial relations limitations. Reasonable progress is apparent with this important item; final equipment choice will be made following a visit by IE representatives to UK in January 2000, during which further discussion will take place with the consultant, and typical plant will be inspected on Railtrack and on Tyne and Wear Metro.

A series of contact wire thickness measurements has been undertaken, in order to estimate when sections of wire will need to be renewed due to wear. The thickness limit is 9.4 mm, and this is likely to be reached in places by the year 2003.

6.4.4 Management Systems

6.4.4.1 *General*

During the November 1999 audit visit, a large and positive shift in attitude and enthusiasm concerning the management soft issues raised in the initial Report was noted:

- There is now an acceptance of the need to enhance both the quantity and calibre of IE staffing in certain areas of work. Positive recruitment moves have been taken in relation to OLE staffing. There are however concerns about the level of success IE may expect in attracting new staff, owing to the booming Dublin economy and correspondingly high wages being offered in the private sector; conversely, there is evidence of existing experienced staff being attracted away from the railway;
- There is a realisation that the IE establishment does not at present include a 'Head of Profession' for Electrification, which is causing concern in relation to the impending formalisation of electrical training, competency and certification;

- Consultants Gibb have been brought in to deal with electrification-related Standards and operation and maintenance management procedures; at present this is still at the data-gathering stage, and as yet there is no output to inspect.

6.4.4.2 Substation Staff

The establishment is stable at one Foreman, 4 electricians and 4 mates for substation and general electrical services work, and one electrician solely for Ticket Issuing Machines. Staff duties, rostering and transport arrangements remain as recorded in the original report. Cover for holidays and sickness will be considered as part of the settlement of the present industrial relations dispute.

IE does not consider it necessary to increase the staffing level to undertake the extra maintenance work-load imposed by the three new substations and two new switch-houses about to be handed over on the Greystones and Malahide extensions to DART. IE is however concerned that there is an under-provision of training allowed for in the contract, as three courses are required to cover the three shifts, rather than the single course offered. In any case, the training has at present stalled owing to the industrial dispute.

6.4.4.3 Overhead Line Staff

At the time of the original inspection, a serious shortfall in overhead line staffing levels was reported. The situation reported was that, although overhead line was the maintenance responsibility of the Technical Assistant, 90% of his time was spent on other duties. Responsible to him was the Overhead Line Supervisor, who in turn was responsible for 5 linesmen. The linesmen normally work day shift (0800-1700); there is no rostered evening nor night cover, nor are linesmen on call. To cover night inspection work, staff were re-rostered on to night shift for two weeks every three months.

Encouraging progress towards increasing overhead line staffing resources in line with our earlier recommendations can now be reported:

- The Technical Assistant is to be relieved of his other duties, so as to be able to concentrate on overhead line responsibilities;
- Authority has been granted to take on 6 additional overhead linesmen, which would take the total to 11. The posts will be advertised during December 1999, with interviews in January 2000;
- IRMS recommendation called for 12 linesmen (6 teams of 2). IE are to consider the 12th linesman's post and a second Inspector, once manning levels have been established following completion of new maintenance management schedules, and once industrial relations problems have been resolved concerning training on the new equipment installed on the DART extensions.

IE are also considering the IRMS recommendation for relocation of the overhead line stores, which suffer at present from inaccessibility by road and rail vehicles, and from a lack of workshop facilities.

During the audit interviews IE were encouraged to share views on its overhead line maintenance staffing levels and practices with similar undertakings in the UK, Tyne and Wear Metro being the most similar in characteristics. PB Power offered to make the necessary introductions and a visit to Tyne and Wear is now arranged to take place in January 2000.

There are still have concerns about the level of responsibility shouldered by the Technical Assistant. Although his job will become easier with the increased staffing levels, two aspects of his responsibilities will remain unsustainable:

- Technical and operational responsibility for the equipment (particularly when Competency Certification is introduced) should rest at a more senior management level, under a recognised Electrical Engineering qualification;
- At present, the Technical Assistant is 'on call' virtually continuously. This is an unnecessarily harsh burden, which should be shared by others on a roster basis.

Owing to continuing industrial relations problems, the overhead line staff have had no opportunity as yet to train on the new equipment installed on the DART extensions (see commentary below), and the contractor has now left site.

6.4.4.4 *Electrical Control Staff*

The original report found the staffing level, management and general running of the Electrical Control Room very satisfactory. It remains so.

Unlike the substation and overhead line staff, the ECOs have been able to take advantage of familiarisation training on the SCADA operation of the substation and switch-house equipment installed on the new DART extensions, as the new SCADA equipment now also controls the existing substation equipment. The new SCADA system is more user-friendly and more comprehensive than its predecessor. It seems to be popular with the control staff, who have quickly become adept in its use.

Further physical changes will occur in the control room arising from the forthcoming replacement of the signalling panel. This will increase the area of the room, which is at present rather cramped.

Consideration is being given to the installation of a repeat SCADA printer at Pearse offices, so that electrification system faults can be monitored by Engineering staff.

Although not part of the evolving document management system, a revision (August 1999) of the Electrified Lines Working Instructions 'Yellow Book' has been issued, as well as revised Isolation Documents which include the two DART extension.

6.4.4.5 *Overhead Line Work Procedures*

Since carrying out the original safety audit, which identified procedural shortfalls of only a minor nature, a number of remedial changes have been put in hand:

- Five additional Siemens voltage detection devices have been obtained, and the linesmen trained in their use; they are now instructed to prove a line dead before earthing it (see comment on E5);
- The above detectors are provided with proving units; linesmen are now instructed to prove that the detector is operating correctly before and after each line test (see comment on E3); and
- Progress has been made on the use of Caution Notices to signify an isolator locked off for safety purposes; the form of the notice is being investigated by IE (see comment on E6).

6.4.4.6 *Electrical Control Procedures*

As stated in the original report the DART electrical control procedures are comprehensive and well managed. The ECR and its staff are currently preparing to take over responsibility for the DART extensions, and are already using the new SCADA system which covers the whole electrified network. Consideration is being given to the installation of a repeat SCADA printer at Pearse offices, so that electrification system faults can be monitored by Engineering staff.

Although not part of the evolving document management system, a revision (August 1999) of the Electrified Lines Working Instructions 'Yellow Book' has been issued, as well as revised Isolation Documents which include the two DART extension.

The addition of 'limits of isolation' graphics to the signalling mimics is considered to be a sound idea, and will be incorporated when the signalling panel is renewed (see comment on E10).

6.4.4.7 *Fairview Depot Isolation Procedures*

Since the original audit inspection and report, the Depot management team have considered the three minor safety suggestions put to them, discussed them with the electrical switching staff, and amended the Depot Procedures accordingly:

- After due consideration, the team decided that delineation of the safe working limit at high level is unnecessary and may indeed cause confusion. As there is only one section insulator at the half-way point of each road, different limits would apply depending on which half road was isolated. In any case, Depot staff never work on car roofs other than off the access gantries. If outside contractors come in to work on the building roof structure, a whole-road isolation is taken, which removes the hazard totally. This principle is to be added to the Depot Procedures; IRMS agree with this logic, and will close out the risk item.
- The team agreed to the use of individual personal padlocks on Depot isolation key safes. This is now to be implemented, and added into the procedure at present under revision.
- The team discussed the addition of a removable 'lock-out' key on the high-level access gantry. They argued that the gantry was very short in relation to those at other depots, so it is virtually impossible for someone to become trapped on the gantry during re-energisation of the line. Also, the agreed implementation of

recommendation above (re. personal padlocks) will prevent re-energisation taking place until all personal padlocks are removed from the key safe. IRMS agree with this logic, and will close out the risk item.

6.4.5 New Issues and Risks Identified

6.4.5.1 *New DART Extension -Sub-Stations*

The equipment for the two DART extensions is complete and commissioned, but remains out of use pending resolution of the present industrial dispute. The Graystones extension is fed from new substations at Bray (replacing a switch-house) and Graystones, with a switch-house at Bray Head. The Malahide extension is fed from a new substation at Malahide, with an intermediate switch-house also named Malahide. At each substation, 38 kV ac supplies are taken from ESB, transformed and rectified to 1500 V dc via 3 MW rectifiers, and fed to the OLE via feeder circuit breakers and trackside mast-mounted isolators. The negative pole of the dc supply is taken through a negative isolator to the negative busbar, from where it is connected to the traction return rails via impedance bonds. A Soule voltage limiting device is fitted between the negative busbar and earth, in order to limit touch and accessible voltages during fault clearance.

The new equipment is manufactured by ADtranz (earlier equipment is by Siemens). All switching and isolating of substation equipment is fully mechanically interlocked, in order to impose a fixed sequence of switching operations. The equipment is specified, constructed and installed to a high standard, and gives no general cause for concern from the safety viewpoint.

6.4.5.2 *New DART Extension -Overhead Line Equipment*

IRMS have to report a very disappointing situation concerning familiarisation with the two extensions to the DART electrification – from Bray to Graystones, and from Howth Junction to Malahide. The contractor, ADtranz, completed the installation of the equipment in September, but was unable to test and commission it owing to a continuing IE drivers' dispute. This cascaded on to the OLE and Substation staff, who have therefore had no familiarisation and training on the equipment. No specialist tools and equipment have yet been handed over, and ADtranz have left site. The CTC Electrical Control Operators have however inspected the new equipment, and the new SCADA system is in use. The new power supply equipment is however not yet energised.

6.4.5.3 *New DART Extension -Auto-Reclose Circuit Breakers*

An operational query must be raised concerning the provision of load-measuring auto reclose equipment on the feeder dc circuit breakers. In the event of a short circuit tripping, the equipment makes an assessment of the loop impedance of the circuit (i.e. whether the fault still exists); and, if favourable, attempts to reclose the breaker. It will try to do this three times, and if unsuccessful will then lock out. As configured at present, this state requires a substation visit to reset the lock-out before further attempts can be made to reclose the breaker. DART are initiating a modification with the Contractor to remove this lock-out feature. In the UK, HM Railway Inspectorate

has moved away from auto-reclose, considering that safety is enhanced if the decision to reclose a circuit breaker is entrusted to the ECO.

The Railway Inspectorate should be consulted to determine whether he finds the provision of auto-reclose acceptable.

6.4.5.4 *New DART Extension -Design Concerns*

While accepting the fact that the OLE on the extensions has not yet been handed over to IE for operation, nor has it yet been fully commissioned, IRMS have a number of concerns:

- Corrosion is already apparent, according to DART OLE staff, on some overhead line fittings in the tunnels on the Greystones extension (this is ADtranz's problem under their contract);
- There are exposed mains voltage terminals in the motorised isolator cubicles when open for manual operation (this item is on the ADtranz snagging list); and
- The section of contact wire used on the extensions is different from that elsewhere on the electrification system. This is most unfortunate, and could have been avoided at the start of the ADtranz contract. Under the new Cenelec standard EN 50149, there are two 'standard' wire cross sections, both of 107 sq. mm area, referred to as AC-107 and BC-107. The two sections are of separate national origin (AC-107 from France and BC-107 from Germany), both have equal standing, and one is not likely to supplant the other. The AC-107 wire has a narrower top lobe than the BC-107, requiring different mid-span splices and section insulator end-fittings. There is a potential risk of a wire parting if the wrong splice or end fitting is used. This risk did not exist before, and has now been added to the current list of risks. This new risk can be managed, by clearly segregating and marking (perhaps by different colours) drums of spare wire and associated fittings, and allocating these as section 'A' for the original DART and 'B' for the extensions. It also means that when the time comes to renew contact wire, the section must be used appropriate to the location, without mixing sections anywhere on the system.

6.4.5.5 *Substation Work Procedures*

During the audit visit, an inspection was made of one of the new substations on the Greystones extension (Bray Substation). The equipment is described elsewhere in this report, and raises no safety queries at this stage; it must be noted however that the equipment is not yet taken over from the contractor. IRMS suggest however that the following points be noted, and checked at the next audit inspection:

- The comprehensive range of safety equipment available in each of the original DART substation buildings needs to be considered for the new substations. It is recognised that the requirements may be different, in view of the metal-clad construction of the new equipment;
- IRMS recommended in the original report that a Substation Log Book be kept in each substation and switch-room, and that times and details of personnel entry and exit be entered, with a corresponding entry in the ECR Log. This should be

established in the new substations and switch-rooms, and the procedure extended to the existing buildings; and

- IRMS understand that the operation and maintenance manuals for the equipment supplied by ADtranz will be made formally available to IE at the taking over of the equipment. It is believed that consultants Gibb are including these documents as part of their work on maintenance management standards.
- The operation and maintenance manuals should be reviewed at the next audit.

6.4.5.6 Overhead Line Work Procedures

As detailed elsewhere in this report, the new OLE on the two extensions has not yet been taken over by IE, nor has the contracted familiarisation training yet taken place. New Isolation Diagrams have however been produced covering the extensions. IRMS wish to pursue the following safety queries, which have arisen concerning the new OLE, at the next audit:

- OLE connections are crimped rather than bolted, but at present no specialist tools have been provided to IE, nor any instructions received on their use;
- The contractor has provided draft O&M instructions for the new OLE, which need to be reviewed; for example, these call for a 'flick' test to be carried out before earthing a line – this is in contravention of safe practice, and of IRMS previous recommendation.

6.4.6 Summary

The November 1999 Safety Audit has identified that there is measurable, and in some cases significant, progress on the mitigation of Electrification risks reported at the original survey. There was only one 'unreasonable risk' identified – that of the continuing use of out-dated overhead line access equipment – and that is receiving active procurement attention.

There has been significant progress too on the elimination of the more minor risks identified in the original report, although it unfortunately appears as though some of the details of these minor risks have not filtered down in the IE organisation to those who have every-day management responsibility. This lack of communication was however corrected during the present audit interviews, and considerable progress made with these minor mitigation measures.

There were three general management recommendations in the original report resulting from the first safety audit:

- A review of the adequacy of maintenance staffing numbers;
- The introduction of documented maintenance and fault-reporting systems; and
- The introduction of formal training, and certification of electrical staff.

These issues were discussed during the November 1999 audit visit, and are summarised as follows:

1. Overall, the staffing and Industrial Relations outlook is not at present encouraging. The buoyant economy of Ireland, and Dublin in particular, has sent house prices rocketing, and is providing many highly paid jobs. This, coupled with IE's industrial relations problems and outdated practices, is attracting labour away from the railway. Specific to DART, however, the situation is more encouraging, as authority has now been obtained to increase the overhead line staffing levels in accordance with our recommendations. This is being progressed immediately.
2. There is little progress to report so far on the establishment of standards, maintenance and quality systems. Work has however started, and a considerable budget has been allocated. Consultants have been appointed; Gibb in the case of the DART electrification, and Gibb has made a good start with data collection.
3. The need for formal training, competency assessment and certification of Authorised Persons on the DART electrification system is recognised by IE, and is being addressed as part of the overall management process review. There is now a realisation that the IE establishment does not at present include a 'Head of Profession' for Electrification, which is causing concern in relation to this subject.

6.4.7 Recommendations

Progress on the following tasks, identified in the original report [1], should be continued:

- corrections identified under minor risks;
- staffing levels;
- the establishment of standards, quality and maintenance management systems.

The following new specific recommendations are made:

1. The operation and maintenance manuals for the new DART extensions relating to OLE should be reviewed at the next audit by the Consultants;
2. The use of crimped rather than bolted connections, and instructions for their use, should be reviewed at the next audit by the Consultants;
3. Monitor the good progress now being made on the acquisition of overhead line access equipment;
4. Urge the familiarisation of staff with the new electrification equipment installed on the Graystones and Malahide DART extensions;
5. Discuss with the Railway Inspectorate the safety implications of the load-measuring auto-reclose facility installed on the 1500Vdc feeder circuit breakers for the new DART extensions (see below re new risk);
6. Discuss the procedure required to manage out the risks arising from the inadvertent use of OLE splices and end-fittings which may be incompatible with one or other of the two contact wire cross-sections now in use on DART (see below re new risk);

7. Urge the Contractor for the electrification equipment on the new extensions to remedy exposed live terminals in the motorised isolator mechanism boxes (see below re new risk);
8. Continue to work towards the establishment and maintenance of formal training, competency assessment and certification procedures for electrical operations staff, and consider the need for a nominated 'Head of Profession' for the electrification system.
9. The following new risks have been identified and must be managed.
 - Use of load-measuring auto-reclose on Extensions feeder circuit breakers: Discuss application with RI.
 - Incompatibility of two contact wire sections now in use: Risk of mechanical failure at splices. Manage out the risk by marking drums etc.
 - Exposed terminals in Extension motorised isolators: Contractor to rectify as defect.

6.5 Rolling Stock

6.5.1 Progress Against Previous 'Immediate' Recommendations

Reference should be made to Section 6.7.3 of [1].

It was noted that none of the recommendations have yet been completed. Given the limited scope of the recommendations, and the low number of rolling stock defects, this is considered to be disappointing.

Further details are given below.

6.5.1.1 *5 Year Plans*

"IE to Develop 5 Year Plans."

5 year plans have not yet been developed, although it has been partially completed by the implementation of a 4 year plan.

The CME has developed and issued a Departmental Safety Plan (based on the objectives set in the Corporate Safety Plan) which outlines the safety-related targets set by the department. The Plan is designed to build on the existing safety culture by introducing Departmental standards based on those developed at a company level.

A review of the Departmental Safety Plan was undertaken with the following key observations:

- The Safety Plan presented should be regarded as a safety action plan (or checklist) only rather than a detailed 5 year plan as recommended by the Consultants. The action plan detailed activities over a 4-year period. This was considered a positive step forward with the initiative being to address all issues within a 4 year period.

- The Safety Plan addressed broader issues as well as those specifically recommended for the CME. The plan cross-references the appropriate recommendations detailed in the original review.
- Although the plan sets targets until the year 2003, on the basis of what can be comfortably achieved, the timescales could be regarded as being conservative.
- Currently progress made is commensurate with that detailed in the plan.
- Although a detailed review of the budgetary provisions was not undertaken. It is believed that the sums identified in the IE investment plan (as prescribed in Section 2.5 of the IE Railway Safety Programme [2]) are currently adequate for the initiatives proposed within the CME safety plan (assuming that the values identified excludes the cost associated with secondary door locking and the initiatives being explored for the Craven carriages (see below). It was noted that the values identified are commensurate with the values detailed in the IRMS Report [1].
- It is suggested that these values are revisited following the completion of the CME commissioned studies currently being undertaken by external consultants to reassess the validity of the financial estimates proposed.

The CME has taken positive steps in appointing a Project Manager and two others in support. Although the Project Manager is attempting to manage and prioritise the actions it will be comes increasingly difficult to deliver the plan without further resource being made available. It is noted that where possible support is being sought from external consultants to support IE in areas where additional competence or experience is required. It should be recognised that integration of any output, recommendations etc. needs to be carefully managed by CME.

Implementation of a management structure viz. a Departmental Steering Group to monitor progress and define strategy. This forum is constituted of the CME, Departmental Managers, and other Senior Managers as necessary. This was considered by the Consultants as a positive action and demonstrated their commitment.

It was demonstrated that Steering Group Meetings are convened and minuted. It was noted that the 'IRMS' Project Manager prepares a project report detailing progress with both soft and hard issues. It was observed however that the reports only detailed progress and did not discuss or benchmark risks and/or threats associated with delivering the action plan.

It is recommended that in order for the Steering Group to maintain appropriate focus that the reports detail areas of risk, conflict, and treats as well as programme progress.

6.5.1.2 Class 201 Wipers

“The significant risk associated with defective windscreen wipers on Class 201 diesel locomotives should be closed out satisfactorily.”

Since the original audit, General Electric (GE) has implemented 2 different windscreen modifications to the Class 201 locomotives (on a trial basis) which have proved

unsuccessful. Due to the failure of the GE initiatives, CME have now detailed their own modification which is currently fitted to one locomotive on a trial basis.

CME confirmed that that if this trial proved successful then a fleet modification would follow.

It was noted that it had currently taken IE three attempts to propose a robust and functional solution to the defective windscreen wiper issue with only one trial locomotive in the field.

Although progress has been made in the auditors opinion the progress made is unacceptably slow.

CME should make every effort to prioritise safety related modifications and ensure that (based on application of risk assessment techniques) their implementation is prioritised. Implementation timescales should be commensurate with the risk detailed.

6.5.1.3 Fleet Inspection

“a more detailed inspection of a 15% of the fleet should be undertaken to assess condition and maintenance quality.”

CME have commissioned Interfleet Technology (IFT) to undertake a detailed inspection of the fleet to assess condition and maintenance quality. CME advised that only 7% of the fleet had been currently considered compared to the target of 15%..

CME advised that an interim report had been received from IFT and that its content was currently being reviewed internally.

On review of the IFT report it was noted that although the report identified a number of inadequacies in all areas of review the IFT inspectors did not regard any of them to be currently safety critical issues. The report concentrated on the areas of Maintenance Documentation, Maintenance Management, and Vehicle Condition.

The following issues were identified

- Maintenance documentation inadequate in many areas
- Inadequate control within the maintenance management function, a perceived lack of understanding of what is necessary for a robust management system.
- No clear means of analysing trends, incident management, investigating new issues etc.
- Level of technical support to the vehicle managers is inadequate.
- Physical condition of the fleet in the main is good and the maintenance is conducted to a high standard. Although the report identified a number of specific areas on a variety of stock where special attentions was required.

Although progress has been made IE should make every effort to complete the remainder of the fleet inspection and move towards a decision of how they intend to

improve documentation control and maintenance management. In particular due cognisance should be given to the implementation of a maintenance policy to encompass maintenance and control, incident management, defect repair and control. Benchmarking the configuration status of the stock should be come a priority.

6.5.1.4 Operational Instructions

“A review should be undertaken of the relationship between Operational Instructions and Rolling Stock documentation, bringing together all of the various “notes”, etc.”

CME confirmed that no specific progress had been made in this area as it was recognised that the output from the Interfleet Technology would discuss the integration of Operational Instructions.

6.5.1.5 Documentation

“Rationalisation of the maintenance documentation should be undertaken to ensure frequencies and examination content are understood and controlled.”

Ditto comment made against Section 6.5.1.4 above.

6.5.2 Progress Against Previous ‘Medium Term’ Recommendations

Reference should be made to Section 6.7.3 of [1].

6.5.2.1 Independent Inspections

“Independent inspections on major maintenance and repairs be started.”

CME confirmed that no progress had been made in this area.

6.5.2.2 Safety Specifications

“Requirements for the safety specification of new rolling stock should be included within performance based contracts.”

CME advised that for their new rolling stock currently being procured a number of detailed requirements had been invoked in the technical specifications and in particular those for signalling compatibility.

For all other areas, the Projects would be invoking Standard No. 6 (Standard for Safety Validation for Changes in Plant, Equipment, Infrastructure and Operations)

Following detailed discussions with the CME Technical Manager the following became evident.

- Although other than in a number of specific cases, there was no specific emphasis towards the invoking of safety requirements within the procurement progress. The intent and application of safety-related requirements are piece meal. No evidence was available to demonstrate application to project other than new vehicles.

- A number of key areas need to be addressed in particularly verification of safe design, hazard identification and management, application of risk assessment, and practical verification as necessary.
- Implementation of the key safety processes would be difficult particularly with a lack of 'safety infrastructure' within CME.
- The invoking of procedure No 6 was considered by the Consultants to be inappropriate in its current format and would cause confusion and difficulty for contractors in identifying what the deliverable was

6.5.3 Standards

A review of the each of the Departmental procedures in turn was undertaken with the following key observations:

Standard No.1: Standard for Production of Standards and Procedures

This procedure is based directly on the associated Company procedure and details the methodology, verification and implementation of standards within the CME. No specific comments were raised.

Standard No.2: Standard for Safety Monitoring

This procedure is based directly on the associated Company procedure and details the methodologies to be employed within CME for safety monitoring. In particularly the following elements are detailed:

- A timetable for safety tours and checks for all departments within CME.
- A timetable of verification tours by Senior Executives and Managers up to Chief Executive level.
- Periodic external verification.

Following review of the procedure and its implementation it was noted that the procedure has been implemented and safety tours have been undertaken by individual Departmental Managers. No verification tours had been conducted.

It was noted that although issues identified at individual safety tours are addressed at a local level no process existed for feedback of issues, lessons learnt etc. to other Departmental managers and that this needs to be considered. Also the integration of safety tours with those processes required as part of the ISRS methodologies needs to be considered. It was noted that the implementation of this procedure is in its infancy and will require revisions and optimisation with time.

Standard No.3: Standard for Safety Validation of Organisational Change

This procedure is a direct copy of the Company procedure and details the methodologies to be employed in the safety validation of any organisational change. It was explained that this procedure has not been 'tested' as it has not been necessary to invoke any organisational changes since its inception.

It was identified that a considerable amount of effort had been concentrated in benchmarking the safety criticality, competence and training requirements of all members of staff within the CME. It was recognised by CME that completion of this work would allow 'shortfalls' to be readily identified and managed.

It was noted that for those staff that had been identified as holding 'safety critical' posts that safety responsibility statements (SRS) had been issued. It was recommended that:

- a number of good housekeeping measures should be implemented viz. tracking list, maintaining copies of signed SRSs on file, periodic update of staff matrix, etc.;
- the spreadsheet developed to hold this information should be formalised and controlled as a formal document'
- some of the organisational trees within the procedure were incorrect and should be updated.

Standard No.4: Standard for Reporting and Investigation of Accidents and Incidents

This procedure is a direct copy of the Company procedure and has not been Departmentalised. A considerable amount of work now needs to be done to develop a robust Departmental procedure.

Efforts need to be focused on how to develop procedures that are adequately integrated with each other.

The value of formally issuing a procedure which could not be worked to at Departmental level is questioned.

Standard No.5: Standard for Management of Risk

This procedure is a direct copy of the Company procedure and has not been Departmentalised. The procedure details and outlines basic risk assessment techniques and their application. In its current format (which reads like a text book) it is questioned as to its purpose at Departmental level and how it fits into the overall safety process being developed. In discussions, it become evident that CME needed to consider how it intended to integrate risk assessment within its processes and how it would benchmark a suitable point in time to implement it, i.e. when the configuration status of rolling stock, systems etc. are fully and adequately defined.

The following areas need to be considered by the CME:

- Are individuals adequately trained in the use and application of risk assessment techniques?
- How are the 'infrastructure' issues (viz. risk register, hazard log etc.) to be put in place within CME and how are cross functional issues managed?
- How are these techniques to be applied holistically? This is a very important issue and applies to the complete railway and IE.

It is questioned as to the value of formally issuing a procedure which could not be worked to at Departmental level.

Standard No.6: Standard for Safety Validation for Changes in Plant, Equipment, Infrastructure and Operations (PEIO)

This procedure is a direct copy of the Company procedure and has not been Departmentalised. The procedure is evolved around a number of key principles and in particular:

- Identification of an Owner and Project Manager.
- Application of hazard analysis and the management of risk at various phases in the project life cycle.
- Validation of 'cross discipline' changes.
- Collation of supporting documentation.
- Issue of a 'Certificate of Completion' to the owner to demonstrate that the equipment is fit for its intended purpose and is compatible with its operating environment.
- Transfer of responsibility from project to 'owner' to maintain throughout life.

Following a detailed review of the procedure the following concerns were identified:

1. The procedure as presented is inadequate as a Departmental procedure and does not clearly identify what are the key deliverables when providing safety validation;
2. Consideration needs to be given on how the implementation of the emerging procedure will be integrated within the other procedures and processes;
3. Consideration needs to be given to the development of a safety validation methodology within CME for both new rolling stock and the maintenance of the existing asset. Due cognisance needs to be taken of how and when the procedures could be robustly implemented (i.e. benchmarking of vehicle configuration and implementation of robust maintenance procedures and configuration management)
4. Departmental and cross functional relationships need to be identified and a proactive approach with other functions needs to be taken to ensure adequate integration of similar emerging procedure from other departments;
5. Specification of safety validation requirements to subcontractors (i.e. car builders) is inadequate and undertaken in a piece meal fashion.
6. Integration and possible duplication with Procedures 5 and 6 need to be carefully considered.

6.5.4 New Issues and Risks Identified

6.5.4.1 *Mark II Coach Door Locking*

It was noted that the requirements to undertake a risk assessment to ascertain the safety benefits of fitting secondary locking on Mark II coaches was included within the 4 year plan (as prescribed in Section 2.5 of the IE Railway Safety Programme [[2]).

This study has not been completed. It is recognised by CME that it is not possible to finalise and 'ring-fence' investment provisions until this assessment has been satisfactorily completed.

6.5.4.2 Craven Carriage Refurbishment

In the previous study [1], no mention was made by the Consultants to the programme or initiatives being employed for the replacement of Craven carriages (as prescribed in Section 2.5 of the IE Railway Safety Programme [2]).

In the recent audit, it was noted from discussions and following a workshop visit, that IE had now embarked on a refurbishment programme for the Craven carriages.

It could not be demonstrated by CME that a detailed cost-benefit and risk assessment had been undertaken to support the validity and safety suitability of the refurbishment option over that of new vehicles.

It should be recognised by the CME that it is essential that the refurbishment of these coaches should be controlled in accordance with a safety validation regime.

6.5.5 Summary

The CME has taken positive steps to undertake and work towards adequately addressing the comment and concerns detailed in the IRMS Report [1]. This commitment has been demonstrated in the following manner:

- Widening of the scope to encompass not only those issues identified during the original audit, but to embrace other issues known to the CME.
- Implementation and development of a 4 year Action Plan, focused towards meeting the widened scope set by the Chief Mechanical Engineer.
- Development of a structured management process to monitor, and strategically manage within the CME, the delivery of the action plan. This is achieved by the establishment of a 'IRMS' Steering Group and a programme of lower level management meeting. This is underpinned by the appointment of a dedicated 'IRMS' Project Manager within the CME to co-ordinate activities. The 'IRMS' Project Manager responding directly to the Chief Mechanical Engineer.
- The 4 year plan has been developed (or broken down further) into an annual 'safety plan' (or perhaps more correctly an action plan or check list). The scope of the annual plan attempts to detail and benchmarks only that can be achieved within reasonable timescales. In this regard there is a clear recognition by CME that there is a significant amount to be undertaken, and due to the potential 'cultural' inertia within CME it should only be undertaken in manageable elements. Although this approach is sensible, the resultant action plan could be regarded as being somewhat conservative.

Although a number of elements from the CME action plan have been addressed, progress is slow and there are still a significant number of areas to be addressed before a robust and coherent safety culture is in place.

The issue of how the standard for the management of risk is to be applied holistically must be considered both within CME and IE.

Certain key elements as prescribed in the IE Railway Safety Programme [2] (e.g. fitting secondary locking on Mark II coaches) have not been completed

The safety justification for refurbishment of Craven carriages needs further consideration.

The financial values detailed [2] appear realistic and are commensurate with the values detailed in the IRMS Report [1].

Corporately IE have developed a series of safety related Company Standards. A total of 10 are proposed, of which only 6 have been formally issued. It is intended that these procedures are 'cascaded' down to Departmental level across IE. Within CME only two procedures have been Departmentalised, the other issued CME procedures have not been adequately Departmentalised. This has a considerable impact on the timely 'delivery' of the desired safety culture particularly regarding the safety validation of change which is currently inadequate.

None of the recommendations from the previous review have been addressed in full. However the CME are currently seeking guidance from a number of consultants on how best to address the initial audit recommendations raised.

6.5.6 Recommendations

1. It is recommended that a further review is undertaken after a further 6 months period to audit in detail the implementation of the complete suite of Company procedures (and developed Departmental procedures) and to monitor the progress in addressing original audit recommendations.
2. Due cognisance should be taken by CME to the implementation of the various recommendations detailed within the main body of this report and in particular:
 - Project reporting by the IRMS Project Manager should be enhanced to discuss threats and risks.
 - Benchmarking of configuration status is a key issue and a strategy (or action plan) needs to be developed.
 - The safety validation regime (for both organisational changes and engineering changes) needs to be considered at some length within CME.
 - Completion of the safety justification supporting the refurbishment of Craven carriages.
 - Completion of the secondary door locking risk assessment.
3. Particular attention should be focused on the validation of the management of maintenance and related other activities and the development and verification of safety within the ongoing rolling stock procurement activities.

4. CME should take particular due cognisance of the need to prioritise the development of a robust and coherent safety management system and the implementation of the appropriate systems and support within the department.

7. PROGRESS ON PREVIOUS UNREASONABLE RISKS

7.1 General

The Consultants were required to identify “*any matters which will give rise to an unreasonable risk and require urgent remedial action*”.

‘Unreasonable’ risks were broadly categorised as those items of the infrastructure, systems, or processes that either posed an immediate risk (of fatality or injury) to passengers, public and/or staff, or represented practice that fell far short of that expected as ‘Best Practice’.

7.2 Progress

Unreasonable risks and items requiring urgent remedial action had previously been reported by IE as already ‘in hand’ or ‘completed’.

IE have put into action a plan to address and rectify the unreasonable risks outlined in the IRMS Report and these are closely monitored by management. The monitoring document was made available during this audit and the reported position checked.

Appendix I contains details of each Unreasonable Risk identified against each of the infrastructure disciplines and locations. Progress as at November 1999 is reported in this Appendix.

7.3 Summary

Whilst each Unreasonable Risk has been progressed to some extent, it is disappointing to note that very few of the risks can be unambiguously reported as fully resolved. Many have been partially resolved though.

Of the 6 track risks re-inspected, 4 had been mitigated by complete replacement with CWR track rather than rectification.

In some cases the particular risks have been addressed, but not the generic deficiency indicated by that risk. These include general track defects and interlocking failures, although it is accepted that many of these will require an extended period to address on a network wide basis.

This emphasises the requirement for a risk management process to determine the priority risks and locations.

With reference to Appendix I, it is recommended that some of the proposed mitigation measures, especially those related to signalling, are subject to further review or independent assessment to confirm their acceptability.

8. RISK MANAGEMENT

Inherent in all the recommendations made previously by IRMS [1], and underpinning the list of specific tasks and their programme, was the expectation that IE would adopt and implement a risk based approach across the overall Company for the management of safety.

Such an approach acknowledges that absolute safety is not achievable in practice and what is therefore required is the maintenance of cost-effective, acceptable levels of safety. This requires that:

- all reasonably foreseeable hazards are identified and their associated risks assessed;
- the acceptability of these risks is determined against relevant criteria;
- potential areas for risk reduction are identified, prioritised and resolved through management action;
- continued performance improvement is ensured through the monitoring of hazards and associated management action initiatives.

As proposed previously by IRMS, fundamental to the adoption of a risk based approach to safety management is the principle of *reasonable practicability*. Hence IE should take into account the costs of undertaking safety initiatives in order to ensure that they are not grossly disproportionate to the benefits gained. Thus risk analyses and cost/benefit studies need to be conducted to determine the practicability of risk reduction measures.

The risk based approach to safety assessment was initially developed within the US nuclear industry, and was a major theme during the UK 'Sizewell B' Pressurised Water Reactor Public Inquiry in 1986. Since then it has substantially evolved and is now being applied to many industries throughout the world. As pointed out in [1], such an approach is now generally accepted as best practice for railway organisations around the world.

IE have recently issued three Company Standards which relate to safety and risk management:

- #3: Safety Validation of Organisational Change; and
- #5: Management of Risk;
- #6: Safety Validation of Changes in Plant, Equipment, Infrastructure or Operations

These three standards consider the specific application of risk and safety management techniques to be applied under certain circumstances. However they must fit into an overall Company Policy and Objective which considers and integrates risk management in a holistic manner.

There is no evidence yet that IE are utilising any of the risk management techniques, although as discussed previously, in the absence of risk assessment and prioritisation a reasoned approach is having to be used.

Specific recommendations that were made previously include:

1. repair or renew infrastructure where risks are established as unreasonable;
2. carry out risk assessment of abnormal or degraded operations, including assessment of human factors;
3. adoption of a safety case type regime for the validation of management and technical change;
4. maintenance of a database of all incidents and accidents to measure performance, set standards and for use as a management tool;
5. maintenance of a global performance and fault database for infrastructure and rolling stock equipment;
6. development of the risk model prepared by IRMS to include a wider range of hazards, to include human factors, and movement/non movement accidents.

With the exception of Item 1, and the issue of Company Standard #6, no significant progress has been made on these recommendations yet. Even with Item 1, IE are only addressing those risks identified by the Consultants as unreasonable. Apart from civil structures, they have not yet carried out their own comprehensive surveys to identify the full list of risks on the network, as opposed to the Consultants audit list. Hence the identification of new unreasonable risks.

The subject of risk assessment of abnormal or degraded operations is now urgent, as demonstrated by the recent derailment of a cement train, and 2 level crossing collisions with road vehicles. In addition, the delay in the implementation of the mini CTC means that deficient equipment due for imminent replacement will remain in service. Risk assessment should be used to determine whether other remedial measures will be required in the interim.

It is disappointing that the risk model, or its equivalent, has not been adopted by IE to assist in determining the priority for mitigation measures, and to measure their effectiveness. As shown below in Section 9.2, it can only be beneficial to IE to publicise that current initiatives have already improved safety by up to 50% on some lines, and to show the cost effectiveness of their works.

The continuing absence of a rigorous computerised database of accidents and equipment failures will hinder risk assessments, although the necessary information is often available in hardcopy. It is hoped that the SYNERGI database will shortly be available and will prove a useful tool in the future.

IE should currently be in the process of identifying all potential hazards to passengers, staff and members of the public resulting from its various operations, with an accompanying assessment of their associated risks. It is suggested that IE should strengthen their Safety Plan to include data on these risks, both the current situation as shown by historical evidence, and targets for reductions of the risks within stated, realistic timescales.

The intention of the Safety and Risk Assessment Plan should be to help provide a strategic direction to this process and to link safety initiatives to Corporate Business

Planning activities. The plan should be updated on an annual basis to reflect changing priorities within the overall requirement for continuous safety performance improvement.

The continued absence of such a Plan means that within IE the large expenditure currently needed, and proposed, may not always be spent to the greatest benefit. In addition, the absence of targets (and at present adequate recording systems) means that safety programmes cannot be monitored and their benefit measured and demonstrated to 'stakeholders'. This latter term is intended to include all those personally affected by railway safety and its cost, which in the big picture is all the taxpayers in Ireland but more directly includes the passengers and staff of IE and the public who are affected by it, such as users of level crossings.

9. REVISED RISK ASSESSMENT

9.1 Safety Inadequacy Scores - Infrastructure and Rolling Stock

9.1.1 Results

The scores arising from the Signalling, Telecommunications and Level Crossings, Permanent Way, Rolling Stock, Electrification and Structures site surveys were previously summarised in Appendix VIII of [1]. The results were presented as Safety Inadequacy scores both for generic types of equipment and specific locations.

A score of 0% (safe) was considered to be the ideal or the target, whereas 5% was considered to be 'best practice'. A score in excess of that indicated a decrease in safety below that of 'best practice'. For example a frequency of failure score of 4 and a consequence score of 7 would give an aggregate of 28 out of a possible 40 (5x8). This would indicate a safety inadequacy for that item of 70% (28/40)

As part of the recent site visits, previously visited infrastructure was re-scored following the application of mitigation measures, maintenance actions, or in the case of permanent way, complete replacement.

The revised scores are shown in Appendix II. The recent scores can be compared to the original score to give a measure of the improvement in the infrastructure.

Typically the permanent way was scored at a particular location for a particular deficiency, e.g. level crossings, rail defects, sleeper condition, etc. Signalling equipment, however, was scored according to the generic type (electrical signals, coded track circuits, points machines, etc.), irrespective of location, unless a particular location differed from the others (e.g. Boyle signal) in which case a specific score was assigned.

For signalling and permanent way, the scores relate only to those items of that type of equipment that were inspected on the recent site visits and have been subject to improvement or rectification. Unless otherwise stated, it will not necessarily apply across the complete network. Thence it only indicates a measure of potential improvement. Reference should be made to Section 9.2.5 of this report for the risk mitigation implications to passengers and staff.

For site visits to areas not previously inspected, a new score has been assigned, and a new safety inadequacy calculated.

Whilst these scores provide indicative information as to the condition of the infrastructure and the deviation from Best Practice, they do not provide the objective quantified information as to the resultant level of safety of the railway network. For instance, whilst the permanent way score was very poor on some sub-sections, this tended to apply to tracks with low traffic density, whereas a mediocre signalling score on a highly utilised section of track will have worse safety consequences.

9.1.2 Summary

The results for the infrastructure show improvement in many areas. The maximum safety inadequacy score for signalling has reduced from 65% to 40%, and for permanent way from 80% to 60%. For those areas of permanent way subject to complete replacement to CWR, the score has decreased to zero. For other areas, the improvement has been smaller.

For signalling, the largest improvements are in clamp lock points, mechanical interlocking and the swing bridge, although there is still scope for further improvement.

It should be noted that the majority of scores are still well above what is considered best practice, and there is evidence from the new permanent way scoring of infrastructure not previously visited, that the remainder of the network is also in a poor state, with additional unreasonable risks.

The implications of poor infrastructure on risks to passengers and staff are developed below.

9.2 **Risk Model Assessment**

9.2.1 Introduction

A risk model was developed as part of the previous safety study [5] based upon the infrastructure site surveys and scoring discussed above.

The risk model allowed the condition and number of assets in each section to be considered, in addition to the specific train frequency and passenger loading data. Risks results were subsequently summarised according to the type of equipment giving rise to the risk and the line location.

Subsequently the number of casualties was predicted on a line by line basis for passengers, staff and public. Then, based on the typical number of passengers and staff, individual risk levels are calculated and compared to the acceptable limits.

Reference should also be made to Section 7 and Appendix IX of [1].

This chapter details the revised risk assessment carried out on the signalling, telecommunications, and permanent way systems to estimate the new likelihood of casualties arising from equipment failures within these system after the implementation of risk mitigation measures and safety improvements completed over the last 12 months.

9.2.2 Key Risk Improvements

As a result of the new infrastructure site survey results, the risk scores for the following signalling equipment were revised downwards:

- electrical signals;

- mechanical interlocking;
- block/token interlocking;
- clamp lock points;
- Barrow Bridge track lock.

Examples of improvements included elimination of bare wires, specific mitigation measures, better training, improved housekeeping and fire safety, improved maintenance, etc. Note however that not all of these factors will impact upon the risk model which considers collisions and derailments.

With respect to the continuing problems with mechanical points (facing point locks), despite the increased risk score assigned as a result of the recent visits, the risk model was not modified to reflect this perceived worse situation.

For permanent way, the replacement of defective jointed track with CWR has eliminated the previously identified hazards on those upgraded lines and substantially reduced the risk of derailment.

It must be reiterated that whilst permanent way contributes to the accident frequency on those lines with jointed track in a poor condition, overall it makes little contribution to risk levels (previously only 8%) because the busy lines are already CWR, and the consequences of derailment are much less severe than collisions.

9.2.3 Locations

As reported in Section 4.2, the sections of track travelled and audited by both signalling and permanent way consultants included: Dublin (Connolly) - Mullingar - Longford

This coincides with risk model routes:

- Sub-Section 29 (Connolly - Mullingar) and;
- Sub-Section 30 (Mullingar - Carrick on Shannon)

In addition, with respect to the Barrow Bridge track lock only, the following route was considered:

- Sub-Section 37 (Waterford - Rosslare Europort)

9.2.4 Railway Operational Statistics

The risk model necessarily contains details of the number of trains operating over each route of the network, and the number of passengers transported. As part of this study, IE provided the Consultants with revised data on train services and passenger statistics. These indicated that train frequencies had increased on a few lines, but that passenger flows had increased on many lines, by up to 25% in one instance.

Whilst these new values can and should be built into the risk model, for the purpose of providing risk comparisons resulting directly from infrastructure improvements, it was

decided to leave the train and passenger levels unchanged to avoid complicating the statistics.

Typically however, if more trains and more passengers are travelling on the network, the potential number of accidents and casualties could rise assuming no change in the infrastructure.

9.2.5 Results

Utilising the new equipment scores, the risk model was re-run for the three lines in question, and the predicted annual train accident frequency, collective risk (number of persons injured per year) and individual risk recalculated.

For clarity, the information below shows the percentage improvement (i.e. reduction) in these values as a result of the infrastructure improvements.

9.2.5.1 *Sub-Section 29 Connolly - Clonsilla - Maynooth - Enfield - Killucan - Mullingar*

Accident Frequency	reduced by 19%
Collective Risk (passengers)	reduced by 29%
Individual Risk (passengers)	reduced by 29%

9.2.5.2 *Sub-Section 30 Mullingar - Edgworthstown - Longford - Dromod - Carrick on Shannon*

(Note, the site inspection car only travelled as far as Longford. However for risk model illustration purposes, it was assumed that all improvements observed were carried out on the complete line to Carrick)

Accident Frequency	reduced by 43%
Collective Risk (passengers)	reduced by 49%
Individual Risk (passengers)	reduced by 49%

9.2.5.3 *Sub-Section 37 Waterford - Belview - Bridgetown - Rosslare Strand - Rosslare Europort*

(The risk reduction relates to risk mitigation measures at the Barrow Bridge. No account has been taken of any other changes to the infrastructure on this line of route)

Accident Frequency	reduced by 51%
Collective Risk (passengers)	reduced by 51%
Individual Risk (passengers)	reduced by 51%

9.2.6 Potential Risk Reduction

The above risk reduction calculations reflect actual observed improvements in the infrastructure during the recent site visits.

For illustration, the following indicative calculations indicate the potential risk reduction possible assuming that the same signalling infrastructure improvements have also been implemented elsewhere.

The two lines chosen as examples previously had high train accident frequencies and high individual risk values.

9.2.6.1 *Sub-Section 11 Portarlinton - Portlaoise - Ballybrophy*

Accident Frequency	potential reduction of 12%
Collective Risk (passengers)	potential reduction of 25%
Individual Risk (passengers)	potential reduction of 25%

9.2.6.2 *Sub-Section 34 Howth Jcn. - Malahide - Laytown - Drogheda*

Accident Frequency	potential reduction of 11%
Collective Risk (passengers)	potential reduction of 33%
Individual Risk (passengers)	potential reduction of 32%

9.2.7 Summary

This section demonstrates two important points, one actual and one potential. Revisiting the lines previously assessed, and taking account of the engineering improvements made, shows that the risk to persons from train accidents has been reduced by up to 50% on those lines. This dramatic improvement has been achieved simply by better attention to the detail and quality of maintenance of the existing assets, mainly in the field of signalling equipment. The calculations also show the potential improvement of up to around 30% which is available on some other lines in return for a similar level of attention to maintenance quality. This should provide significant encouragement towards the completion of the many other 'soft' recommendations in this report, in general the development of standards and knowledge to achieve consistently high standards in the maintenance of safety-related assets.

The other point to be made is that this analysis shows the potential for measuring the effects of safety-enhancement programmes, both as an aid to planning resources and priorities, as well as measuring afterwards whether or not the intended objective has been achieved. Assuming that objectives will usually be met, this information is also potentially useful to the railways 'stakeholders' to demonstrate the shift in safety levels in a positive way, as opposed to the more traditional negative and retrospective measure of how many accidents occur.

Finally, the limitations of the present approach must be emphasised. The analysis presented so far restricts itself to risk resulting from train collisions or derailments caused by infrastructure defects only. Therefore it could be developed to include rolling stock defects and human error (e.g. by drivers or signalmen) in the list of potential accident causes. In addition, similar analytical techniques can be applied to non-train-accident injuries, such as falling on platforms or stairs, and staff occupational hazards, including the risk of being struck by a train.

9.2.8 Recommendations

In principle the recommendation in the first report [1] must be reiterated here:

IE needs to develop a technique, or suite of techniques, to quantify the risks to all those who are subject to hazards from its operations. The resulting analyses may be used:-

- To provide baseline information as to the magnitude of various risks
- To prioritise effort and cost of safety programmes to maximise their return
- To measure the effects of safety programmes implemented, and hence -
- To inform and reassure all those potentially affected that progress is being made

Sufficient resources need to be brought to bear to implement such a system, to win the financial advantages it offers as well as to satisfy any moral or legal imperatives.

10. SAFETY MANAGEMENT SYSTEMS

10.1 Safety Management Audit

10.1.1 Audit Results

The Safety Management Audit Questionnaire used previously was re-scored on the basis of the interviews and ground level observations and discussions and compared with the initial Safety Review results identified by IRMS. The revised overall score was 69% compared with the first result of 64%, an improvement of 5% in aggregate score, but included within this are 7-9% improvements in some areas compared with the earlier score, which is a significant achievement in a year. In addition, it is clear that some safety system initiatives are improving the depth and quality of systems previously existing for which there is no provision in the audit scoring system to give additional credit.

The sections of the new audit were scored as follows:

1. Management Commitment	78%	(+ 9%)
2. Communications	62%	(+ 7%)
3. Safety Arrangements	59%	(+ 3%)
4. Safety Policy & Procedures	88%	(+ 1%)
5. Safety Systems	77%	(+ 4%)
6. Training & Development	39%	(+ 7%)
7. Emergency Planning	74%	(+ 3%)
8. Contractor Safety	64%	(No change identified)
9. Purchasing	76%	(No change identified)
10. Regulatory Interface	63%	(No change identified)

(Note: Item 10 relates to the internal roles and responsibilities of IE, not the Department.)

There is still, as one would expect in the early stages of a new initiative, a considerable gap between the planned managerial intention, the documented systems, and the reality at ground level. This gap was estimated in the original study [1] at 22% (the ground level score estimated was 42%). It is very difficult to put a revised figure on the current ground level performance, as the progression towards a new safety culture varied considerably between the different areas and functions observed, although the feel of the IRMS team is that, overall, the gap has narrowed.

10.1.2 Summary

The main areas of improvement reflected in the above changed scores are:

-
- allocation of funding and budgets for safety improvement (Management Commitment);
 - production of Departmental versions of Company Safety Plan (Management Commitment);
 - greater involvement of supervisors with local staff safety meetings (Management Commitment);
 - More formal staff safety meetings and election of new safety representatives (Communications);
 - contracting of consultants to carry out communications training for supervisors and a start in the programme (Communications);
 - progress in issuing Job Descriptions and Safety Responsibility Statements (Safety Arrangements);
 - production and issuing company standard on management of change (Safety Systems);
 - provision of a substantial budget for training (Training & Development);
 - commencement of supervisory communications training (Training & Development);
 - provision of programme of vocational/skill training (Training & Development);
 - some emergency drills undertaken (Emergency Planning).

10.1.3 Long Term Options

The scores achieved during the audit and the questionnaire responses were reviewed to identify those areas which still have lower scores, indicating less than best practice. The main areas which still require improvement or new initiatives to make a further significant score improvement are shown below.

However it must be emphasised that whilst progress on these items will substantially improve the Audit score, they are not issues on which IRMS have previously made priority recommendations and they should only be considered in the long term when the current priority recommendations have been addressed. They purely reflect areas which, in the longer run, would refine IE's SMS.

1. Safety target/objective setting by Government/CIE, cascaded through the Divisions;
2. Improved trend analysis used as a basis for target setting;
3. Setting of safety objectives for supervisors / teams;
4. Involvement of staff in proactively participating in safety improvement through teamwork;
5. Improvement of informal communication systems, briefings, tool-box talks;
6. More evidence that supervisors ensure and test compliance with rules and standards (and more work needs doing on standards and rules before this can be fully productive);

7. Formal statements in Job Descriptions and other policy documents that places safety as equal in importance to cost, quality etc.;
8. Evidence of regular updating of safety documents and JDs, SRSs.;
9. Institution of formal appraisal systems of safety performance and giving feedback;
10. Safety inspections to have a numerate basis for assessing performance and improvement;
11. Training on safety management to be provided routinely across all levels and to have regular evaluation that affects future training strategies;
12. Wider use of emergency drills with the civil authorities;
13. More evidence of rigorous audit of contractors and subcontractors;
14. Evidence of safety audits of procured goods and suppliers;
15. Closer and more regular contact with the Railway Inspectorate and occupational safety regulators (requires adequate resources by the state authorities).

Given the lack of progress in some areas, and the concern that in some areas and divisions progress is possibly too fast, it is suggested that these issues are included in the long term planning.

10.2 Safety Management Systems

10.2.1 Progress

There is undoubtedly a very significant awareness of the changes in safety culture required and this is being fostered by the involvement of newly elected Safety Representatives - those met were impressive in their commitment, training undertaken and support for the new initiative - although there are some gaps in Safety Representative cover.

The IE Safety Plan was well known to all employees encountered although there was varying understanding of the specific elements that applied to them personally.

There was evidence of training starting at ground level and the provision of a safety budget for local managers to address occupational safety issues was clearly having a beneficial effect.

However, there were several major areas where the safety initiative could be undermined at ground level. These are described further below.

10.2.2 Industrial Relations

The first and most important of these is the current state of industrial relations in IE, stemming from the long drawn out negotiations over restructuring to address the culture of low basic pay and long overtime hours, the company's viability plans, and other initiatives requiring trade union agreement which have become embroiled in the general unrest over basic pay. Excessive hours worked are themselves safety hazards. The poor morale engendered by these unresolved issues does not provide a good

backdrop for a safety initiative, and indeed poor morale can create a poor safety culture. There was evidence in some areas of activity that the poor management / employee relationships was becoming a hindrance to the successful involvement of the staff necessary to create impetus to the safety improvement programme.

Whilst the progress of negotiations between trade unions and management on general pay and conditions is outside the scope of this audit, other than noting its impact on morale and staff attitudes on safety, there was seen to be concern that certain safety issues were being caught up in the trade union / management negotiations and used as bargaining tools. If actions necessary to ensure the safety of the public, passengers or staff are being inhibited in this way, then this is unacceptable and management (and those frustrating their actions) could be held responsible should an accident occur through lack of a safety measure delayed in this way.

There are issues such as communication systems for shunting, use of new track repair machines, the checking that trains observe line speeds, the analysis of causes of SPADs and adoption of clear policies to avoid accidents caused by alcohol or drugs abuse, that need speedy resolution outside the confrontational bargaining processes between management and trade unions. IRMS are not prescribing any particular solution to these issues, but are clear that all concerned should have a common aim to establish procedures that will ensure that risk is reduced as far as reasonably practicable. These issues cannot be shirked and if their resolution in a specific way is necessary in management's judgement to assure safety, they must enforce their decisions or face justified criticism and legal liability should an accident occur.

10.2.3 Resources

The second issue of concern is the sufficiency of resources to implement the safety improvements. The necessary funding has been assured and authorities given to the executive managers to progress all the IRMS recommendations and other objectives within the IE Safety Plan. Some of these initiatives require the recruitment of staff and this has proved difficult in some areas, especially skilled staff in the engineering and electrical disciplines. In fact, in some areas staff are still being lost. The combination of shift work and poor basic pay compared with other employment opportunities in the booming Irish economy makes it difficult to recruit and hold the staff necessary. It is to be hoped that the resolution of the various company restructuring plans will help to overcome this handicap. Where consultants are being used to provide the necessary input of manpower and skills, it is important for IE to put sufficient managerial resources in place to manage this work to IE objectives and standards.

10.2.4 Programme of Work

A key issue noted by IRMS was a fear that the enormous amount of activity on safety, particularly in addressing the IRMS recommendations, was in danger of creating a resistance in ground level staff, some of whom felt overwhelmed by the sheer quantity of paperwork and briefing emanating from management. Most employees welcomed the safety initiatives and saw immediate improvements, but several expressed a fear that there were too many competing issues demanding their attention, that new plans, procedures and instructions were not always expressed in terms relevant to their

immediate activities and there was a need to consolidate the understanding of new standards and procedures before moving on to the next. There was a degree of cynicism amongst a few staff that the management activity on safety was more geared to dealing with immediate political criticisms and pressures rather than ensuring long term safety improvement. IRMS consider that there is a danger of IE trying to do too much, too quickly, and not consolidating the safety improvements in depth. This is especially true of the Infrastructure Division which has had the largest workload, and the most to do, and less of a problem with respect to Operations.

10.2.5 Co-ordination

One of the underlying needs is to strengthen the co-ordination and prioritisation of the IE safety programme, so that all Divisions are pursuing a similar line and to a broadly similar depth as far as is sensible. The setting up of several teams to progress the IRMS recommendations has engendered the energy and activity required, but the decision not to appoint an overall Co-ordinator has left this role to the Safety Manager and the Safety Review Group. As reported in the August Pre-Audit Report [3], the Safety Department has a large increase in workload and has lost a key individual to the Railway Inspectorate. Therefore aspects of the co-ordination role are not being fulfilled, as well as Departmental tasks, including risk management (see above.)

There are aspects of safety development (e.g. risk assessment model development and application, human factors and safety culture research and evaluation) which need specialist support within the Safety Department. If the Safety Manager is also to be the focal point for the Safety Plan's implementation, more help is also needed in the day to day management of the section, as the new safety initiatives are engendering an increase in workload in any case. The proposed new emphasis on new works and projects will require its own safety specialist expertise.

11. RAILWAY SAFETY REGULATION

11.1 Introduction

The IRMS Review of Railway Safety in Ireland [1] dealt with the statutory regulation of railway safety in two parts. Section 9.2 of that report addressed solely Irish issues relating to the Railway Inspectorate (RI) and the law under which it operates, whilst Section 9.3 addressed issues of safety regulation arising from EU Directives on railway matters.

The recommendations in Section 9.2 included some about revising Irish railway safety legislation whilst the recommendations in Section 9.3 were mainly about the contents of future legislation to satisfy EU Directives.

Since it is acceptable, where convenient, to make legislation which embraces both internal objectives and those derived from Europe, and the Department is working to this end, this audit review will not differentiate between the former Sections 9.2 and 9.3, but will treat the recommendations from each as part of the same package of work facing the Irish Government.

Throughout the period of this review, roughly through October to Christmas 1999, significant decisions were being taken as to the future systems of railway safety regulation in Ireland. The situation reported on was constantly moving forward, but the results presented are effectively complete to the end of 1999.

11.2 Results

11.2.1 General

In the report [1], recommendations were repeated in Section 12 where they were divided into suggested time scales. Several of the recommendations for the Department necessitated quite a radical programme of new legislation. Some of this is so far-reaching that the Department, understandably, has preferred firstly to think through all the objectives to be met and the ramifications of different steps before launching on a drafting process. With the firm lead given by the Minister's recent announcement in December 1999 it is probably true to say that the department is at the threshold of the drafting process. In terms of previously suggested time scales it would appear that the Department is lagging, but it is believed that considerable progress can now be made in the next 12 months.

Significant progress has been made on a number of other recommendations and the Department has clearly picked up not only the specific recommendations made previously, but the spirit of re-establishing and re-equipping the Railway Inspectorate in a manner appropriate for the new century. For these reasons this review, apart from using some subject headings seen below, will report back 'in the round', on the major issues, progress and constraints, rather than adopting an item by item check-list summary of progress. Having done so, a summary of progress so far and some recommendations as to the next steps are given later.

11.2.2 Staffing of the Railway Inspectorate

The Department has run an open competition for two more Railway Inspecting Officers (RIOs). One is in post and already usefully relieving the previous sole incumbent of the difficulties of being needed in more than one place at once. The second selected from the same interview panel should be on the strength in January/February 2000. This will have discharged the first, and most urgent, recommendation for the Department.

The previous RIO has been up-graded and is now called the Chief Railway Inspecting Officer (CRIO) in recognition of his need to lead and direct the work of others and act as the principal spokesperson for the Inspectorate. In addition the Railway Inspectorate (RI) now has a statement of its strategic objectives and written job descriptions both of the RIOs and the CRIO showing his managerial and leadership duties. No doubt these will require revision in response to changes in organisation and legislation, but an important first step was to record the present situation in this way.

Most surprising and disappointing is the fact that dedicated administration support has not yet been provided to RI, as previously recommended. There is at present a notional allocation of half a staff officer who also has duties in another part of the Department. The new recruit RIOs will themselves generate a further need for clerical work such as keeping records of their visits and investigations, tracking correspondence to generate reminders, and so on. The shortage of administration back-up inevitably means that the best value will not be gained from the high-quality persons who have just been recruited. Some examples of the nature of work to be done are given above. The CRIO should compile an extensive list from which the needs will be even more evident. It has been suggested this need will, at some future time, be taken into account in a wider-ranging review of staffing within the Department, which is taking place.

IRMS is here reiterating its recommendation that the administration support suggested should be provided in a short timescale, in advance of any long time-scale more fundamental changes.

11.2.3 Continuing Professional Development

The need to ensure that personal development opportunities are afforded to RIOs was highlighted in the initial report. To a large extent programmes need to be developed on a personal basis, depending on the previous knowledge and experience of the individual Inspectors. There is evidence that this need, which in turn will ensure the best quality work from the Inspectors, is well accepted by the Department. The new CRIO will need to take care that his personal needs do not get by-passed in providing facilities for the development of his subordinates, but in general this matter is clearly being addressed.

A second part of this recommendation was that in the absence of sufficient expertise there should be a facility to call up external independent advice as necessary. This facility is not in place yet but both these linked recommendations are acknowledged by one of the CRIO's newly listed duties which requires him to ensure sufficient skills are

available either internally or through consultancy support. The facilities for doing the latter still need to be developed.

11.2.4 Dealing with Railway Staff Safety Matters

With respect to the broadening of RI's remit to enforce the Safety, Health & Welfare at Work Act 1989 (SHWA), its implementation is not something that can be done unilaterally by the Department since another Government body, the Health & Safety Authority (HSA) currently enforces this legislation so far as railway employees are concerned.

Two exploratory meetings about this have been held between representatives of the Department and HSA. It is understood that the meetings were constructive and reflected a desire for co-ordination and clarity of roles. It was recognised that are benefits in avoiding the need for 'dual inspections'. The primary concern of both bodies was to ensure that, whatever mechanism may be agreed, there would be no diminution in the monitoring and enforcement of occupational safety, health and welfare.

One possible option which will be explored further is an Agency Agreement between both bodies which would provide that the RI would take over some of the occupational safety, health and welfare functions, whilst including a suitable mechanism for HSA to retain an appropriate oversight of this function.

The CRIO must now try to finalise this matter in the short term whilst also working with others on the long term strategy for inspection and enforcement.

11.2.5 High-level Mandate for RI and its Placement in the Governmental Structure

The previous report, having recommended the immediate strengthening of RI referred to above, went on to recommend a more radical review of RI over a longer time-scale. The report also acknowledged that the matter could only be finalised when the question of revised railway safety legislation was also dealt with. The two issues are inextricably linked. But a useful interim stage now in place is that the new CRIO does not report managerially to the Principal Officer responsible for CIE/IE funding, but, standing alongside him, reports directly to the Assistant Secretary General of the Department.

The text of Section 9.2 of the initial report set out a range of options for the location of RI within the Governmental structure, offering advantages and disadvantages for each. IRMS concluded that the balance of advantage in the short term probably lay in remaining within the Department, but the case was by no means overwhelming. However the Minister recently announced a more radical approach of separating RI entirely from the Department. Although initially more difficult to implement, such a move is to be welcomed in principle. At the time of this review, proposals as to organisation, location, and funding of this newly independent body have still to be developed. The Minister's statement went on to say that RI would be strengthened in numbers (now partly implemented) and given wider powers of inspection, investigation

and enforcement, all of which is welcome news entirely within the spirit of IRMS' earlier recommendations.

11.2.6 Safety Regulation – Short-term

Section 9.2 and 9.3 of the initial report together called for a root-and-branch renewal of railway safety legislation within Ireland to bring forward, if necessary, any relevant legislation from over a century ago and blend it with new legislation derived from the EU. Such a thorough revision is clearly not a simple task, but until it is done RI must attempt to monitor, and where necessary influence or guide, standards of railway safety in Ireland with inadequate or inappropriate powers.

Some retraction of information flows from IE is apparent arising from the Freedom of Information Act by which information in government's hands may be scrutinised by the public. IE is moving towards providing RI only with that which it is obliged to do, rather than freely sharing personal and internal information as hitherto. The CRIO believes that by developing and maintaining an open dialogue with senior officers in IE he will be able to secure sufficient co-operation from them to ensure the effectiveness of his inspection team in advance of new law. This IRMS review, whilst welcoming the positive message of this judgement, believes it may be true for a 'honeymoon period' whilst the safety of IE is so much under the spotlight, but in due course tensions could develop which will need the strength of statute law, rather than mutual goodwill and respect, to resolve. These observations reinforce the message that revised powers for RI should be introduced as soon as possible.

It has also been decided that as an administrative requirement, IE will henceforward be required to present an analysis of the safety implications of any investment submissions it puts to the Department. Matters such as this will also need to be put into statute law when possible.

A specific part of the legislation which was particularly out of step with other systems was the duty on the railway to report accidents to the Department. By a relatively simple process of creating a Statutory Instrument, the accident and incident reporting duties can be revised to ensure common reporting thresholds, and hence some comparability of data, between the railway and other industries. This is to be welcomed as a first step.

11.2.7 Safety Regulation – Long Term

The Department clearly accepted the spirit of IRMS wide-ranging recommendations regarding new legislation and considerable internal discussions have taken place. The key features of a proposed new railway safety regime were outlined in the Minister's statement early in December. In addition to actions in relation to RI, summarised above, the Minister has proposed that there will be a duty on IE (and any other railway operators) to prepare a formal statement of their safety arrangements, set out in a 'Safety Case'. This will be considered by RI to assess its rigour and adequacy, but it is emphasised that the fundamental responsibility for safety would still remain with the railway operator.

In addition the Minister has proposed establishing a Railway Safety Advisory Council which would:

“bring together rail operators, trades unions and representatives of public interest to consider safety matters. Such a forum would also exist for addressing railway safety issues out of an industrial relations context”.

The exact constitution and powers of such a body have yet to be determined. Care will be needed to avoid the Council seeming to direct the actions either of IE or RI, although inevitably such a group’s deliberations would be noted and taken into account by both those bodies.

That general industrial relations issues are tending to impair progress on safety has been identified as an obstacle in other parts of this report. So an attempt to lower this barrier is to be welcomed in principle but it will be difficult in a forum including but separate from IE. As acknowledged by the Minister, there has been and will continue to be a significant programme of consultation with interested parties in the development and implementation of these proposals.

IRMS does not see this Advisory Council as a vital part, but rather a supportive part, of the new railway safety regime. No further comment can be offered now as the proposals at this stage are too tenuous to be effectively analysed.

A plan for railway safety regulation in Ireland has been outlined. Inevitably much groundwork has been done; it is now imperative to keep up the momentum. The task is not a simple one, nor one which can be done without considerable consultation. But the fact that it is complex and potentially open to wide-ranging opinions, means that it needs to be started as soon as possible and pursued with vigour to avoid drifting into a protracted time-scale. In the meanwhile, the new strength of the RI is operating without appropriate and modern legislation underpinning its work.

It is believed that a challenging but possible timescale would be to complete this work by the end of the year 2000 with a view to its implementation early in 2001. It is intended to have a ‘heads of Bill’ by mid 2000. Additional dedicated support to the Department has already been provided to assist in this work.

If sufficient internal resources cannot be brought to bear for this ‘hump’ of work, it may be that external assistance could enable it to be progressed at an appropriate rate without being delayed by recruitment processes. This principle has been established previously.

11.2.8 Guidance and Standards

RI is, and is likely to remain, small enough in numbers to enable easy communication about standards between its members. However the new safety regime is likely to require railway operators to demonstrate that their proposals are adequately safe. Therefore they will need to know where the ‘goal-posts’ are so RI, as the regulator, will almost certainly need to make available some guidance as to what safety case, or safety justifications should be submitted or standards to be achieved.

What might appear in any such guidance will be partly determined by the exact scope of the new legislation. It should as far as possible be high-level and goal-setting rather than prescriptive, although examples of current good practice might be used for illustration.

Consideration is also being given by the RI to the production of more specific guidance in the form of Safety Principles and Guidance documents. Whilst it is attractive in terms of resources to adopt standards already applied in other countries, if this course is followed care must be taken to ensure that they are appropriate and relevant to railways in Ireland.

No more specific recommendations can be made at present; this section is simply a reminder of the need for a parallel task to drafting the legislation.

11.2.9 European Directives

Section 9.3 of the previous report [1] summarised the main issues that the Department would need to address in implementing several EU Directives which had a bearing on railway safety, in particular two existing directives 95/18/EC and 95/19/EC. The general tone of these is to allow, and fairly regulate, open access and the safe operation of one party's trains over others' infrastructure, although the review noted that in Ireland the opportunities for access by other train operators is more limited than in mainland Europe. It went on to discuss options and make recommendations as to how the safety regulation might best be achieved.

The two EU Directives mentioned above have now been adopted into Irish law by the making of relevant Statutory Instruments, namely The European Communities (Licensing of Railway Undertakings) Regulations 1999 (SI No 238 of 1999) and The European Communities (Allocation of Railway Infrastructure Capacity and Charging of Infrastructure Fees) Regulations 1999 (SI No 281 of 1999). Both these Statutory Instruments set out the essentials necessary to adopt their relevant directives, and generally vest all power to licence railway undertakings, to allocate capacity and arrangements for fees with the Minister for Public Enterprise.

The above approach is satisfactory from a legal standpoint but the Minister will clearly need to have available adequate expert and advisory resources to enable informed decision making. Such demands will in part fall to the Railway Inspectorate and need to be planned for in its structure and organisation. Also since the legislation listed above has no detail as to the scope of documentation which applicants must submit to demonstrate their competence, there is an evident need for Guidance to be provided on these issues. Inevitably this will also, at least in part, fall to RI to draft or be closely consulted. Both this 'start-up' mode for the new regime and the ongoing management and monitoring of it have resource implications for RI which need to be considered in planning its future.

A number of the more detailed issues needing to be addressed were discussed in Section 9.3 of the original report [1].

The present situation is that although the EU Directives in theory are now implemented in Irish Law, there remains a good deal of administrative work to be done before either can in practice be applied. In addition, the scope and content of any future package of legislation will require to reflect these two Directives.

Another earlier recommendation that the Department should 'look-ahead' to EU legislation in the pipeline is quite adequately covered. The Department represents Ireland at EU discussions in connection with EU railway policy including proposals for market liberalisation and developments in connection with EU-wide railway safety matters.

11.3 Summary

The Department quickly grasped the nettle of under-resourcing of its inspection team and, will shortly have the two recommended additional inspectors in place. The duties of the RIOs and the CRIO have been recorded and the issue of professional development also appears to be well accepted. However, it is disappointing that the need for administrative, or clerical, support to these professionals has not been so readily achieved. IRMS believes there remains a strong case for it as a matter of urgency, to aid the greatest efficiency from its new inspection team.

Liaison with the HSA has commenced and a degree of mutual understanding reached. An agency agreement still needs to be drafted and agreed. Another interim step expected soon is a revision of the railways duty to report accidents to the Department. These will be small but welcome steps in advance of the major revisions to be made later this year.

The incorporation into Irish law of the two EU directives is now complete, but the systems for implementing them are not fully developed. Their requirements also need to be dovetailed with, or fully amalgamated into, the wider raft of railway legislation under consideration.

The Minister has announced a set of measures to better regulate railway safety in future. The proposals include measures broadly in line with, but going farther than, IRMS earlier recommendations. Introducing the new regimes will be a major, but valuable, task.

In parallel with drafting new legislation the potential need for supportive guidance needs to be considered. RI cannot be as effective as it could or should be whilst operating under the limited powers of existing legislation, so the revisions proposed need to be scheduled and resourced for completion as soon as possible, preferably by the end of the year 2000. The use of external resources has not been ruled out.

11.4 Recommendations

The following further recommendations are derived from this review:-

1. The need for administrative support to the railway inspectors is reiterated and strengthened;

2. An agreement with the HSA about occupational health, safety and welfare needs to be finalised;
3. Facilities for the CRIO to call up external assistance need to be developed;
4. The CRIO needs to consider potential guidance to parallel new legislation;
5. Most importantly, and largest in scope by far, the Department needs to vigorously progress the necessary new legislation derived from IRMS recommendations, and from the Minister's policy.

12. SUMMARY OF PROGRESS AGAINST RECOMMENDATIONS

Section 12 of the Review of Railway Safety [1] contained a summary of all recommendations included within that report. The recommendations were grouped by broad timescale, were cross referenced to the Section of the report where that recommendation was made, and each one was assigned to an organisation to action.

The Pre-Audit Report [3] gave an brief initial progress update against each recommendation. Following the more detailed recent audit, changes, further progress, or amplification where necessary, are given below.

For clarity, each of the original recommendations has been repeated together with a summary of progress observed against that recommendation during the audits. The same titles and section numbers have also been used to allow easy cross referencing.

When recommendations were made to specific infrastructure items, reference has generally been made during the audit to progress made by the S&T Department. The problems originally exhibited by the signalling and telecommunications equipment typified the technical and hardware issues experienced by IE and represented some of the worst safety concerns. During the recent audit, typically S&T now demonstrated best practice observed within IE to many of the issues.

Instances where the progress by other departments deviated from S&T can be found in Section 6 against each of the other disciplines.

It should be noted that IRMS in their Final Report [1] suggested timescales during which activities under certain headings should be started - not completion dates, as in many instances these recommendations should lead to ongoing actions over many months and years.

12.1 “Already Implemented”

1. *“Correction of infrastructure faults needing urgent remedial action discovered during inspection”*
 - Unreasonable risks and items requiring urgent remedial action had previously been reported by IE as already ‘in hand’ or ‘completed’. Hence the section was titled ‘Already Implemented’.
 - IE have put into action a plan to address and rectify the unreasonable risks outlined in the IRMS Report. These are closely monitored by management. The monitoring document was made available during the 6-month audit and the reported position checked.
 - However, there was evidence during both the Pre-Audit and this audit study that some items had not been fully completed. In addition, further unreasonable risks were identified during the recent audits.

- Reference should also be made to Section 7, Appendix I and Appendix III respectively for details of progress against specific unreasonable risks, and the new Unreasonable Risks identified.

12.2 “Immediate (within 3 months of publication)”

1. *“Agreement between the Department, CIE, IE on Action Plans and responsibilities to implement”*
 - see below
2. *“Agreement between the Department, CIE, IE on capital and revenue costs necessary to make the railway acceptably safe and to put in place the required underpinning management systems”*
 - (Items 1 & 2). These actions were completed by the issue of the IE Railway Safety Programme 1999-2003 [2] (reviewed in Section 5) and the creation of a Joint Task Force.
 - The Exchequer allocation for 1999 was £76 million (representing IE’s actual safety spend). This was paid before Christmas 1999. The amount allocated in the budget for 2000 is £100 million.

12.3 “First 6 Months”

1. *“Repair or renew infrastructure and assets where risks have been established as unreasonable, and/or establish documented safe working practices until the necessary investment can be undertaken”*
 - See 12.1.1 above.
2. *“Set up project teams to review and develop key areas of proposals and recommendations”*
 - The project teams have been set up and full and part time staff made available to develop and implement the recommendations. No full time overall co-ordinator has been appointed as suggested in Chapter 11 of the Final Report [1] as each subject area has its own Project Manager and there is co-ordination by IE’s Safety Review Group chaired by the Safety Manager. Comment has been made previously about whether this is seen as fully effective.
3. *“Strengthen the capabilities of the present sole Inspecting Officer, by recruiting two more Inspectors and one dedicated administrative support person now”*
 - Accomplished in part. By January/February 2000 the two additional Inspectors will be in post but an administrative support post has still not been advertised.

12.4 “At End of 6 Months”

1. “External Audit of Action Plans”

- This has been completed by IRMS on behalf of the Department as evidenced by this study and report.

12.5 “6 - 12 Months”

12.5.1 “Engineering Systems, Standards & Documentation”

1. “Review the structure, resources and technical skills available, and their deployment, in all the engineering functions, so that the achievement of robust maintenance standards can support the value of investment and upgrading of infrastructure on an ongoing basis”

- SE&T Engineering has been restructured and the former Technical Assistant grades now consist of three new grades, viz. Technical Assistant, Technical Executive and Senior Technical Executive.
- Recruitment and interviews to fill vacancies are now ongoing.
- A major exercise is currently underway to log all SE&T jobs in a project management system.
- The anticipated structure will permit of an increased use of external skills suppliers.
- It is anticipated that this kind of relationship will be used for future projects.

2. “Develop and document engineering standards, planned maintenance and inspection programmes, and equipment testing regimes in all engineering departments”

- IE have been preparing 18 high level standards for introduction before the end of 1999.
- 6 of these are almost ready for release.
- A further 6 are at draft 0.2 (having undergone first review). These include: “Failure Reporting, Investigation and Monitoring”.
- The following are at draft 0.1:
 - “Degraded Mode Operation and Requirements”.
 - “Interface Management”.
 - “Asset Management for Safety and Performance”.
 - “Principles of Changing Permissible Speeds Validation and Verification Requirements”.
- When issued, these standards will require to be fully briefed in to all staff required to use them.

- In addition, pilot maintenance specifications will be prepared, drawing on the lessons learned during the first phase as well as point machine training programme undertaken earlier this year.
 - Company Standards, particularly No. 6 relating to Changes in Plant, Equipment, Infrastructure or Operations, are being implemented.
 - Although not mandatory for projects commenced before its inception date, the requirements for validation are being adopted wherever possible for all relevant project phases.
 - As part of the follow-on phase, suitable consultants are being sought to assist with the production of Telecoms Standards.
 - It should be noted that these standards have not been reviewed by the Consultants with respect to the quality or effectiveness. This can be carried out in future audits.
3. *“5 year plans should be prepared (with a further 5 year outline estimate) for the infrastructure investment necessary to maintain a safe railway at the line speeds required for optimum business results to identify strategic options for CIE/Government decision-making, taking recent IE studies and the findings elsewhere in this DPE Railway Safety Study into account”*
- It was reported that a 5 Year Plan is in course of preparation within the company, though this specific document has not been produced.
 - No Action Plan is included in [2] for the production of these plans.
4. *“Given the current standard of existing infrastructure and the frequency of failures, undertake a risk assessment to identify whether the human factors risks associated with abnormal or degraded operating conditions (both planned and emergency) will be tolerable, until essential investment is implemented”*
- The Manager Intercity has taken ownership of this process in its early phase.
 - SE&T are represented in the working party which is currently identifying the key issues and factors to be addressed in local degraded conditions assessments.
 - In the interim, the Signal Engineers’ Group have initiated several actions such as interim works and complexity reduction at Claremorris and more frequent testing of FPL points on passenger lines.
 - However there is still some lack of full understanding on what is required to undertake a risk assessment of train and staff working associated with abnormal or degraded operating conditions, given the frequency of infrastructure faults and the size of the investment programme now being implemented. Although there have been some Departmental actions on specific activities and the Safety Department is seeking consultancy advice currently, it is necessary to ensure that all risks associated with abnormal and degraded operating conditions have been identified and evaluated sufficiently to indicate priority areas for risk control or reduction measures.

12.5.2 “Safety Culture & Occupational Safety”

1. *“Maintain resources available at local station/depot management level for the correction of health and safety hazards, in conjunction with priorities agreed with local supervisors and safety representatives”*
 - Local managers now have access to resources to correct unsafe conditions and staff elected Safety Representatives are involved with management and supervisors in prioritising action. District Managers have been allocated budgets of IR£30,000 to address past failures and current problems in this area, and there is evidence that this has been a factor in convincing IE staff that management is serious about improving IE’s safety culture.
2. *“Strengthen the arrangements for giving staff feedback on safety complaints and suggestions to improve confidence of the staff in existing systems”*
 - One of the strongest areas of criticism by IE staff identified by IRMS in the Final Report [1] was the lack of feedback to staff on criticisms or suggestions on safety. New documentation and procedures have been put in place to correct this failing and there are early signs that this is addressing the problem, although there is still some staff cynicism as to whether this interest and feedback will be maintained. Reporting of unsafe conditions is much improved because management is now seen to have the resources to make repairs (see 12.5.2.1 above).
 - The new hazard reporting system is not yet fully operational in the Infrastructure Division.

12.5.3 “Management of Contractors”

1. *“Review the safety management of contractors’ staff undertaking work on the IE system, clarifying IE and contractor responsibilities and their effective implementation”*
 - A company standard is in preparation and the matter is also being dealt with centrally by the Infrastructure Department
 - Pending the introduction of criteria, major signalling contractors for projects such as the Malahide Resignalling have been required to submit method statements.
 - The topic of contractor management, particularly in the context of minor on-track works, lookouts, persons-in-charge etc. have been to the forefront of the very successful series of Safety Culture workshops being conducted currently with all grades of staff.
 - SET grades have participated actively in these two day workshops, which have been facilitated by a human factors safety specialist.
 - New systems for the selection and management of contractors have been put in place but there is still concern as to how this is operating at ground level

12.5.4 “Within Normal Organisational Resources”

1. *“Revise the terms of reference of the CIE Safety Committee concerning its authorities and accountability and clarify the route by which CIE decisions with safety implications are discussed with or delegated to IE”*
 - The formal terms of reference of the CIE Board Safety Committee have not been augmented as recommended but the problem identified of the formal lines of command for agreeing and implementing its recommendations has been solved through the CIE Board (Group Chief Executive and 3 Managing Directors of subsidiary companies) now considering safety issues as well as financial and resourcing concerns and decisions on safety being promulgated down the proper line chains of command. The appointment of IE’s Chief Executive as Managing Director on the IE and CIE Board has also improved the decision-making line of command as far as IE safety issues are concerned.
2. *“Extend the provision of Job Descriptions and Safety Responsibility Statements to all safety critical management and supervisory posts and update these on a stipulated regular basis”*
 - There is evidence that Job Descriptions now exist or are in advanced stages of production for all safety critical management and supervisory posts. Safety Responsibility Statements are also being produced as recommended.
 - Job Descriptions have been prepared for new entrants and for promotions to the new TA, TE and STE positions.
 - Draft material has been prepared for Supervisory Job Descriptions.
 - An Infrastructure asset & activity/responsibility matrix is being developed to ensure that Safety Responsibility Statements embrace all critical areas.

12.5.5 “Department of Public Enterprise”

1. *“Ensure that a programme of Continuing Professional Development for the RIOs provides the technical knowledge necessary to understand and interpret modern safety assessment and management techniques, with the ability for them to call upon independent advice as and when necessary”*
 - Accomplished in part. Opportunities are being made available for the Inspectors to extend their skills and knowledge, but there is not a readily accessible facility to call upon external advice when needed.
2. *“Government should nominate as soon as possible an appropriate body to issue and manage Safety Certificates and Licences to railway undertakings requiring access to the Irish railway network. This should be the DPE (Railway Inspectorate)”*
 - see below
3. *“Railway undertakings wishing for access to the Irish railway network should be required to submit a Safety Case or Plan to the Railway Infrastructure Controller (currently IE)”*

- see below
4. *“IE should be required to submit approved Safety Cases or Plans to the DPE for acceptance and issue of Safety Certificates and Licences”*
 - see below
 5. *“Legislation should be prepared which implements the requirement of undertakings applying for access to the IE network to:*
 - *demonstrate safety of the specific activity and route and its compatibility with IE infrastructure and SMS ;*
 - *be appraised against safety criteria agreed with the DPE for the national railway system;*
 - *address relevant safety issues concerning competence of personnel and organisation, the company’s SMS, rolling stock, insurance and interface arrangements with the Infrastructure Controller”*
 - see below
 6. *“The Infrastructure Controller should be required to audit compliance by the undertaking with its Safety Case or Plan, and the DPE (or appointed Government Authority) should have the powers to enact its own independent check audit, with further powers to revoke an undertaking’s Safety Certificate and Licence”*
 - (Items 2-6) Not yet accomplished. All of these recommendations are being taken forward together in a wide-ranging package of reforms, with the major drafting work scheduled during the year 2000.
 7. *“The Department should check that EC legislation in the pipeline does not impact on the proposals for safety regulation of rail traffic that could access the existing IE network”*
 - Position is satisfactory. The Department is represented on the EU committee which considers railway commercial, operational and safety policy matters.

12.6 “12 - 18 Months”

Section 12.6 [1] recommended that action should start within 12-18 months of the Final Report’s acceptance. Although 12 months have barely elapsed, many of the recommendations in this section have been addressed as indicated below.

12.6.1 “Engineering Systems, Standards & Documentation”

1. *“Implement a formal process (Safety Case or Plan) for the management of change at the appropriate level of detail for all organisational and technical changes of significance - either to the existing system or new works (IE)”*
 - Company Standard No. 6 relating to Validation of Changes in Plant, Equipment, Infrastructure or Operations, has been produced by consultants

working for the Safety Manager and this is currently being briefed into the relevant departments.

- Although not mandatory for projects commenced before its inception date, the requirements for validation are being adopted wherever possible for all relevant project phases.
 - It will take some time for risk assessment expertise to develop but, to date, SE&T staff have been involved in formalised change processes relating to the introduction to service of new Diesel Multiple Unit trains, the proposed introduction of DART services over Bray Head to Greystones and the temporary taking out of service of CAWS track circuit coding between Malahide and Donabate for approximately 3 weeks.
 - With the use of consultants, SE&T are involved in the review of safety case validation for both the introduction of existing DART EMU's into service with the SSI installation at Greystones and the introduction of both Alstom and Mitsui built EMUs over the extended DART network.
2. *“Institute a further 15% sample inspection of rolling stock condition and maintenance standards”*
- A contract has been awarded to Consultants to carry out this task, but to date only 7% rather than 15% has been completed.

12.6.2 “Safety Culture & Occupational Safety”

1. *“Develop a programme to improve safety culture and supervisory/staff commitment to safety and audit its implementation”*
- The Safety Manager is reviewing ways in which a programme on safety culture could be developed and has arrangements for regular staff attitude surveys on safety in hand.
2. *“Strengthen and consistently maintain a system of briefing all staff at ground level on safety matters on a regular basis by their supervisors/local managers, encouraging two-way communication and the upwards progressing of safety improvement suggestions”*
- The need to train supervisors in communication techniques to facilitate effective staff briefing and tool box talks has been recognised and the Human Resources department has a contracted programme to deliver the training which has just commenced. There are a few teething problems with the extensive training commitment as is to be expected, primarily in the area of ensuring staff attending these courses and their managers are briefed and fully understand the aims of the training. There is also a need to ensure the training is appropriate to the needs of individuals, as there was some evidence that some staff had been sent on courses they considered unnecessary or inappropriate.

12.6.3 “Accident & Equipment Performance Information Systems”

1. *“Develop and install suitable software to maintain a full database of accidents and incidents that can be quickly and easily analysed for CIE and*

IE senior management, functional management and ground level managers, supervisors and staff, and revise reporting instructions to include ‘near miss’”

- The Safety Department has developed the SYNERGI system to implement this recommendation and has made considerable progress in developing this to the implementation trial stage.
2. *“Develop and install a performance and fault database for all infrastructure and rolling stock equipment”*
 - All IT systems available to, and appropriate for, use by the Infrastructure Department are being reviewed.
 - The remit requires that systems already in use within the CIE group of companies, and available externally are reviewed.
 - This has placed in abeyance the introduction of a new fault reporting system.
 - Concentration of effort during the interim period is into recording of signal faults into the Infrastructure Incident Reporting system and the existing manual telecoms reporting system.
 3. *“Develop the risk model prepared by the consultants to encompass a wider range of hazards than those arising solely from infrastructure and equipment failures, to include staff error, movement and non-movement accidents and occupational safety concerns”*
 - The IRMS risk model has not yet been developed or used by IE and there will need to be resource appointed in house to manage this activity if it is to become part of the normal IE method of managing safety.

12.6.4 “Human Resource Systems & Training”

1. *“Prepare individually tailored Training Plans for all IE management and supervisory staff, after carrying out a training needs analysis, which will incorporate the safety management and communication skills required, which can be costed and budget provision made”*
 - A start has been made on the huge task of producing training plans for all departments and levels of staff. A significant training budget has been agreed and priority areas of vocational skill training and supervisory communications training are under way.

12.6.5 “Management of Contractors & Third Parties”

1. *“Implement the recently approved procurement safety policies and performance procedures as necessary criteria in the selection of IE contractors and suppliers and strengthen the requirements for feedback and audit”*
 - see below
2. *“Develop a performance based procurement process for all engineering equipment”*

- (Items 1 & 2) There was no evidence seen during the audit that these areas of recommendation had yet been addressed in any significant way.

12.6.6 “Within Normal Organisational Resources”

1. *“Develop a system for integrating and prioritising safety objectives with other key business objectives, incorporating safety cost benefit analysis”*
 - see below
2. *“Supplement the regular existing ISRS safety audits with compliance audits against the requirements of the IE SMS issued 2.4.98 and IE operating rules and engineering standards, at all strata of the organisation including ground level”*
 - (Items 1 & 2) There was no evidence seen during the audit that these areas of recommendation had yet been addressed in any significant way.

12.6.7 “Department of Public Enterprise”

1. *“Reconsider the interpretation of the public safety clause in the SHW Act, or draft new legislation such that inspection of public safety issues on railways can be conducted with similar powers to the inspection of employee safety issues”*
 - Not yet accomplished. This issue will be addressed within the major revision of railway safety legislation now in progress for 2000.
2. *“Require railway investment proposals to include a statement of the safety implications”*
 - This is now part of Department policy, and will need to be incorporated into the new legislative provisions.
3. *“Revise existing railway safety legislation to provide that which is relevant to the late 20th century and beyond”*
 - see below
4. *“Within such revised legislation, address the scope of New Works safety assessment, including rolling stock, ensuring also that the duties and responsibilities on the railway remain entirely clear. In particular, the legislation should require IE to submit a formal safety justification for any significant amendments or additions to the network for RIO approval”*
 - (Items 3 & 4) Not yet accomplished. Both these items will be absorbed by the new legislative package being developed.
5. *“Revise railway accident and dangerous occurrence reporting legislation to ensure common standards between railway and other industries”*
 - Reporting thresholds can be revised to ensure compatibility by the simple creation of a Statutory Instrument.

6. *“The Department should allocate the necessary funds to achieve the necessary revision of railway safety legislation, including the provision of the railway licensing procedure, demanded by EU Directives”*

- At the time of review the resources necessary were still under consideration.

12.7 “Long Term (within 1 - 2 years)”

There has been some appreciation of the actions required to address some of the long term recommendations in the Final report section 12.7.

12.7.1 “Engineering Systems, Standards & Documentation”

1. *“Institute an ISO9000 Quality Assurance regime for all systems and procedures that impact on safety in all engineering functions”*

- Not accomplished.

12.7.2 “Safety Culture & Occupational Safety”

1. *“Establish regular research into staff morale, and underlying reasons for trends and changes, in respect of activities and grades of staff that impact on safety”*

- Proposals to carry out regular staff attitude surveys are under development. A questionnaire based upon the previous one distributed by IRMS has been produced but is awaiting issue. Morale on IE is currently at a low level because of industrial relations problems around pay and hours.

12.7.3 “Human Resource Systems & Training”

1. *“Develop and introduce a Performance Appraisal Process for all senior and middle managers, incorporating safety performance against targets where relevant, and develop a simplified appraisal system against safety objectives for other managers and supervisors in safety critical posts”*

- Under consideration but not accomplished.

12.7.4 “Special Joint Project Team”

1. *“The pay and productivity structure, hours of duty and conditions of service, for staff grades that are safety critical, and outstanding issues between the Trade Unions and management on safety discipline and techniques to ensure public and staff safety, should be reviewed with a view to joint action that will benefit both and lead towards a common and agreed approach on safety issues”*

- The need to resolve the low basic pay and high overtime culture endemic in IE is seen as even more urgent than when the Final Report was issued. Other safety issues are caught up in the IR difficulties and the resolution of these is necessary. This issue was expanded in the paragraphs above relating to key issues.

12.7.5 “Within Normal Organisational Resources”

1. *“Strategic safety objectives should be set for IE in conjunction with the CIE and IE Boards, with awareness of the financial and service consequences”*
 - Not yet accomplished.

12.7.6 “Department of Public Enterprise”

1. *“Make one Railway Inspectorate within the Department responsible for monitoring all railway safety issues, including those concerning employees as well as passengers and other public”*
 - see below
2. *“Prepare a new mandate for the Railway Inspectorate from which its optimal size, structure and position within the Department can be decided (Ultimately this will be dependent on new legislation, but there will be natural phases en-route)”*
 - (Items 1 & 2) Not yet accomplished, but much groundwork has been done towards the future of the Railway Inspectorate, which may after all be outside the Department.

13. CONCLUSIONS

13.1 General

Reference should be made to each of the relevant sections in the main body of the report above for the detailed summaries against the key areas.

The sections below briefly summarise the key findings.

13.2 Railway Safety Programme

Reference should be made to Section 5 of this report.

With the exception of funds allocated to Signalling and Telecommunications, the monies identified are broadly in line with, or in excess of, those recommended in the original report [1].

With respect to SE&T, it is noted that the programme does not allow for some essential signalling renewals, including interlocking frames. In addition, delays to the implementation of mini CTC will require increased expenditure on lines affected. The monies allocated to level crossings should be reviewed on a risk based approach and compared to monies allocated to other essential works to ensure that they are not disproportionate.

Monies allocated to permanent way are in excess of those recommended purely to mitigate the identified risks and make the railway acceptably safe. They allow for complete replacement with CWR rather than localised repair on many route sections.

Tasks and actions have generally been correctly identified, but it is noted that progress on the safety management systems (including standards, procedures and instructions) was mixed, with better progress in SE&T than in other infrastructure disciplines (see comments below).

Many of the safety management system tasks identified in Appendix D have been delayed or not yet fully implemented, although the production of 5 year plans was excluded for the list.

It was noted that some of the unreasonable risks previously reported as 'completed' were in fact not fully actioned.

13.3 Infrastructure

Reference should be made to Section 6 of this report.

13.3.1 Engineering Systems, Standards & Documentation

13.3.1.1 *Standards and Procedures*

Standards, procedures and instructions are being written by all Departments. These have either been cascaded from the 6 Corporate Standards and Procedures that have been issued; consolidated from existing custom and practice; or adopted from other railway authorities. These standard were not reviewed in detail, but it was evident that, with the exception of SE&T, the documentation was not always appropriate to the function of the department or the railway. In addition, the standards require to be fully briefed-in to those concerned. Examples of best practice in SE&T were not being promulgated within IE.

The problems of standards and documentation have been exaggerated by the large volume of work to create best practice systems, and the ambitious timescales for their production.

13.3.1.2 *Risk Assessment*

There was no evidence yet of a risk based approach to planning and works within the Division, nor the use of any risk modelling. These essential techniques should be in use to prioritise remedial and upgrading works, to assess their effectiveness, and to manage the degraded infrastructure in the interim phases. They should also be used on areas affected by the delayed mini-CTC implementation to determine whether interim remediation is required.

In the absence of a valid risk management strategy, a reasoned approach is having to be used.

A Company Standard for the Management of Risk has been issued but its implementation is not yet in evidence. Appropriate training will be required for Departmental Managers as well as additional resources to the Safety Department if this Standard is to be comprehensively applied.

13.3.1.3 *5 year Plans*

With the exception of a 4 year action plan within CME, 5 year plans were not available. These will be required to justify, plan, finance and prioritise the long term work of the Division and Departments.

13.3.1.4 *Safety Validation*

A new Company Standard related to the safety validation of changes in plant, equipment, infrastructure and operations has been issued and is now in the course of being implemented. To be successful, this Standard will require suitable and sufficient risk assessment to be completed (Standard #5) and necessary responsibilities to be cascaded to the relevant contractors (Standard #8). The latter Standard has not yet been issued.

The adoption of a safety case type regime for the validation and approval of new and modified works will require to be linked to recent initiatives by the Railway Inspectorate.

13.3.2 Safety Culture & Occupational Safety

A great deal has been done in the last 6 -12 months by IE to reduce risk, and many encouraging initiatives have been started, to improve safety culture. However there was still evidence that safety culture requires further improvement as demonstrated by approaches to track safety (e.g. lookouts); occupational health and safety (e.g. fire risks); and risks posed by poor permanent way (un-rectified rail defects).

13.3.3 Accident and Equipment Performance Information Systems

The implementation of an infrastructure database has been delayed pending Company IT considerations. In the interim SE&T are continuing to use their own incident reporting system, whereas some Civils DEs have developed their own customised system.

13.3.4 Human Resources and Training

A large amount of training is in progress or planned for the near future. However training was not always tailored to the requirements of the railway and the attendees, and that the latter were not always briefed as to the aims, purpose and content of the training.

Again, the standard and quality of training appeared to be better in SE&T. Hence examples of best practice in SE&T should be promulgated within IE.

It was noted that on occasions industrial relations issues has hampered training attendance or assessment of competency following training (see comments below).

It is evident that in many areas, a lack of resources is causing timescales to extend. This has resulted in some staff having to work very long hours. In other areas, qualified staff are frustrated, carrying out clerical or trivial tasks.

13.3.5 Management of Contractors and Third Parties

The control and management of contractors and 3rd parties is being progressed by the production of a Company Standard which is awaiting issue. In the interim, SE&T have been carrying out successful Safety Workshops to improve safety culture, and require Contractors to produce Method Statements.

This issue is also linked to the availability and provision of lookouts.

With the large amount of work being carried out on the railway by IE, Consultants and Contractors, this issue requires urgent resolution.

13.3.6 Infrastructure Adequacy

With respect to the hard issues, progress has been made by IE in a number of areas, but it was noted that in some areas unreasonable risks still require further attention (see Section 13.4 below).

Specific failures, infrastructure deficiencies and issues identified during the recent audit included:

- poor fire safety in essential equipment rooms and occupied areas;
- delays in implementation of Mini-CTC and interim signalling renewals;
- failure of facing point lock testing and tolerances;
- no progress on safety bays at level crossings;
- Eircom unclear responsibilities for safety critical equipment;
- unclear responsibility for disused lines;
- lack of adequate bridge strike management;
- inability to complete familiarisation and commissioning of new DART extensions equipment (especially OLE); and
- pending justifications and reviews of new rolling stock works (door locking and craven car refurbishment).

Problems and barriers to continued progress have been identified, although IE are aware of many them and are taking what steps they can to address them.

13.4 **Unreasonable Risks**

Reference should be made to Appendix I and Appendix III for progress on the previous unreasonable risks and new unreasonable risks identified during the recent audits, respectively.

Whilst each of the unreasonable risk identified previously has been progressed to some extent, it is disappointing to note that very few of the risks can be unambiguously reported as fully resolved. Many have been partially resolved though.

During the site visits, a number of additional 'unreasonable' risks were identified associated with the condition of the infrastructure. All of these risks require to be addressed and mitigated immediately.

Following the original study, IE were strongly recommended to carry out their own site visits and to prepare a comprehensive list of all faults and failures in the infrastructure. In doing so, they could then prepare their own list of unreasonable risks requiring rectification. The list produced by the Consultants was necessarily only an audit sample and not considered to be comprehensive.

It is evident from the continuing number of Unreasonable Risks identified that these comprehensive site surveys have not yet occurred.

13.5 Risk Management & Risk Assessment

There are aspects of safety development (e.g. risk assessment model development and application, human factors and safety culture research and evaluation) which need specialist support within the Safety Department.

If the Safety Manager is to be the focal point for the Safety Plan's implementation, more help is also needed in the day to day management of the section, as the new safety initiatives are engendering an increase in workload in any case. The proposed new emphasis on new works and projects will require its own safety specialist expertise, as well as Departmental tasks such as risk management (see above), excluding the pre-existing work load and any new work arising from CIE/IE developmental initiatives.

The audit team believe that there is a pressing need for a central unit either with an in-house capability to develop and co-ordinate IE's efforts towards risk management, or the ability to manage appropriate consultancy contracts, or a combination of both strategies. At present adequate resources do not appear to be in place or proposed.

13.6 Safety Management

There is a significant awareness of the changes in safety culture required to achieve a safe railway for staff, passengers and the public.

The IE Safety Plan was well known to all employees encountered although there was varying understanding of the specific elements that applied to them personally. This was partially due to insufficient briefing-in, especially in the Infrastructure Division.

There was evidence of training starting at ground level.

The provision of a safety budget for local managers to address occupational safety issues has had a beneficial effect.

There were however several major areas identified which are currently acting as barriers to continuing improvements in safety culture, as described below.

13.7 Industrial Relations

IE are working towards overcoming a culture of low basic pay and long overtime hours. However, the Company's viability plans, and other initiatives requiring trade union agreement, have now become embroiled in the general unrest over basic pay. The poor morale resulting from these unresolved issues is not providing a good environment for the required safety initiatives.

There was evidence in some areas that the poor relationships was becoming an actual hindrance to the successful involvement of the staff which is necessary to create impetus to the safety improvement programme.

Whilst the progress of negotiations between trade unions and management on general pay and conditions is outside the scope of this audit, there was seen to be concern that certain safety issues were being caught up in the trade union / management negotiations and used as bargaining tools. If actions necessary to ensure the safety of the public, passengers or staff are being inhibited in this way, then this is unacceptable and management (and those frustrating their actions) could be held responsible should an accident occur through lack of a safety measure delayed in this way.

For example, the following issues need speedy resolution outside the confrontational bargaining processes between management and trade unions:

- communication systems for shunting;
- use of new track repair machines;
- the checking that trains observe line speeds;
- the analysis of causes of SPADs; and
- adoption of clear policies to avoid accidents caused by alcohol or drugs abuse.

IRMS are not prescribing any particular solution to these issues, but are clear that all concerned should have a common aim to establish procedures that will ensure that risks are reduced as far as reasonably practicable.

These issues cannot be shirked and if their resolution in a specific way is necessary in management's judgement to assure safety, they must enforce their decisions or face justified criticism and legal liability should an accident occur.

13.8 Resources

The necessary financial funding has been assured and authorities given to the executive managers to progress all the IRMS recommendations and other objectives within the IE Safety Plan.

However some of these initiatives require additional staff to be recruited and this has proved extremely difficult in some areas, especially skilled staff in the engineering and electrical disciplines (such as SE&T). In fact, in some areas, staff are still being lost.

It is to be hoped that the eventual resolution of the various company restructuring plans will help to overcome this handicap.

It should be noted that where consultants are being used to provide the necessary input of manpower and skills, it is important for IE to put sufficient managerial resources in place to manage this work to IE objectives and standards.

13.9 Programme of Work

The tremendous amount of activity on safety is in danger of creating a resistance in ground level staff, some of whom feel overwhelmed by the sheer quantity of paperwork and briefings emanating from management.

Whilst most employees welcomed the safety initiatives, several expressed a fear that there were too many competing issues demanding their attention. Compounding this, new plans, procedures, and instructions were not always expressed in terms relevant to their immediate activities. It is necessary to fully consolidate the understanding of new standards and procedures before moving on to the next.

IRMS consider that there is a danger of IE trying to do too much, too quickly, and not consolidating the safety improvements in depth.

13.10 Co-ordination

The setting up of several teams to progress the IRMS recommendations has engendered the necessary energy and activity, however the role of overall co-ordination was left to the Safety Manager and the Safety Review Group.

As reported in the August Pre-Audit Report [3], the Safety Department, and thence the Safety Manager, has already had a large increase in workload directly arising from the IRMS recommendations. Therefore, aspects of the co-ordination role are not being adequately fulfilled.

It is evident in all areas of IE that there is now a need to strengthen the co-ordination and prioritisation of the IE Safety Programme, so that all Divisions are pursuing a similar approach and to a broadly similar depth as appropriate.

13.11 Railway Regulation

The Department has taken a number of steps towards meeting the recommendations of the first report. The professional strength of the Railway Inspectorate has been increased, although not yet its administrative strength. Better liaison with the HSA has commenced and the Minister has announced a wide-ranging package of reforms in railway safety regulation which are currently being developed for implementation. This work includes the thorough overhaul of railway safety legislation which is now in progress, with additional resources being allocated for the purpose.

The Department is adequately represented in Europe so far as railway policy matters are concerned and has adopted into Irish law the two directives referred to in the first report, which were then due for implementation.

A further requirement, not explicitly stated in the first report, is that it will also be necessary to provide some high-level guidance as to how to implement the new railway safety legislation, in parallel with its introduction. Much of this work will probably need to be done by RI.

13.12 The Future

This audit has clearly revealed that, in addition to those identified in the first report, many additional unreasonable risks continue to exist on the railway infrastructure. This in turn provides strong evidence that it is highly likely that each future audit conducted on behalf of the Department will continue to identify new unreasonable

risks unless additional management controls are implemented by IE. These controls need to comprise a system by which IE undertake their own rolling programme of audits to identify such deficiencies, combined with a risk-based process to prioritise future investment programmes.

Once such systems are in place, it will then be possible for future audits conducted on behalf of the Department to focus on the adequacy and effective operation of management controls rather than a detailed investigation of infrastructure conditions.

14. SUMMARY OF RECOMMENDATIONS

Initially it was intended that this review would simply report factually on progress made on the recommendations of the first report [1]. The current position is a complex one, reflecting varying levels of achievement within the separate departments of IE. Some new recommendations arise but a number of them depend upon the promulgation of best practice, and more liaison, between the different parts of IE. Clearly those recommendations in the first report [1] which are reported as incomplete in this one need to be carried forward and these are reiterated in general below, but reference must be made to the appropriate chapters for supporting detail.

In order to assist the initiation of the necessary actions, the first report [1] suggested some time scales for the initiation of its recommendations. This one does not, both because most of the actions are already in the course of implementation, rather than needing to be started, and it is now time that IE used some or all of the recommended risk management techniques to set its own appropriate agenda and priorities. The exception to this is the fresh list of 'Unreasonable Risks' (Appendix III) which should either already have been fixed or are in a most-urgent programme to do so.

This summary of recommendations mainly uses the same general topic headings as the summary of conclusions (Chapter 12) Most of these topic areas were first introduced in Chapter 11 of the original report [1].

14.1 Engineering Systems, Standards & Documentation

1. The need to develop and implement appropriate standards remains, and must continue, in many fields. But progress should also be guided by the following considerations:-
 - To avoid so overwhelming the recipients and users of the standards that their attitude turns negative and hostile instead of positive and welcoming;
 - To ensure by consultation or other participation that standards and instructions are relevant and comprehensible to the intended users;
 - To establish, where appropriate, cross-Departmental liaison to ensure standards are appropriate at interfaces (e.g. P Way/SE&T, P-Way/Rolling stock etc);
 - To adopt a more consistent and better quality approach than at present by the promulgation of good practice within IE. (SE&T probably leads on quality);
 - To set standards based on a risk-management strategy originating at corporate level (not yet available, but it should not form a block on the general process.);
 - The need for standards covering acceptable use and risk-mitigation in a degraded situation is seen as a particularly high priority.
2. The planning and prioritisation of works still needs to incorporate a formal assessment of the safety implications, ultimately in the form of a project safety case or similar document.

3. There remains a need to produce a long term safety plan looking at least 5 years ahead.
4. The earlier recommendation to work towards a Quality Assurance Standard remains; all of the actions above are complementary to such a system.

14.2 Safety Culture & Occupational Safety

1. The earlier recommendation to carry out a further staff attitude survey is reiterated.
2. Efforts must continue by word and deed to convince all staff that safety matters and that unsafe actions or conditions will not condoned or ignored in future.
3. Where necessary, special efforts based on best practice within the company should be applied to improve attitude and morale. (e.g. Dublin area as opposed to rural areas).

14.3 Accident and Equipment Performance Information Systems

All of the previous recommendations must be brought forward, since none have yet been implemented. In summary they are:-

1. Adopt a database and suitable software to record, and analyse, accident and incident data
2. Adopt suitable database(s) to record and analyse the performance and fault details of all infrastructure and rolling stock equipment
3. Refine, develop, and hence adopt as a planning tool, the risk model used by IRMS in this study

14.4 Human Resources and Training

As to resources:-

1. It must be ensured that sufficient staff are available to implement these safety programmes without a few having to work excessively long hours. The resources implied here include the management of external contractors or consultants, as well as in-house safety enhancement programmes.
2. Consideration needs to be given to rationalising, and where appropriate arranging delegation of parts, of the workload of technical professional staff (e.g. DEs & bridge examinations)
3. Every effort must be sustained to recruit and retain suitably qualified staff at all levels

As to training (and competence):-

4. There remains a significant need to specify training needs for given tasks and then to deliver the necessary training to the appropriate staff.
5. Inter-Departmental liaison in the matter of training management is also recommended to ensure best practice is adopted across IE.

6. The formal examination and recording of competence in safety-critical activities needs to be adopted (but it is noted this issue is within current industrial relations difficulties)

14.5 Management of Contractors and Third Parties

1. The issue, and consequent adoption, of a new Company Standard on the control and management of contractors is now urgently needed. (But note that it may have resource implications as noted in 14.4 above).
2. A culture of intolerance towards unauthorised intrusion on the railway should be encouraged.
3. As a particular issue, there is a need to ensure that the standards and quality of the work of EirCom on the safety-vital ETS equipment are adequate and appropriate.

14.6 Infrastructure Adequacy

This summary of recommendations will not exhaustively list the many detailed, sometimes site-specific, recommendations within the technical-topic parts of the report, but the following deserve special emphasis:-

1. Items on the original list of 'Unreasonable Risks' (Appendix 1), and items on the new list (Appendix III) must be corrected just as soon as the necessary resources can be brought to bear on them.
2. Most importantly, technical departments must themselves scrutinise their assets to determine where else than the locations identified by IRMS comparable conditions exist
3. The implementation of Mini CTC needs special attention on two counts:
 - Funds need to be directed to signalling and p-way assets already sub-standard but still in use because of the delays to Mini CTC;
 - The actual implementation programme of Mini CTC needs to be planned, e.g. by a 'safety case' approach, to minimise risk before and during change.

Some particular issues for SE&T, not already included, are:

4. A solution to a colour-light signal design failing must be developed and implemented.
5. Resources are needed on mechanical interlockings still in poor condition.
6. Attention is needed to safety matters at iron-gates crossings.
7. Joint inspection with p-way of some track-based assets is required (e.g. FPLs).
8. Special attention to the quality of EirCom work on STS is required (also in 14.5).

Some particular issues for Civil Engineering are:

9. A system to cascade servicable track components from relaying sites to lesser lines is needed.

10. The need to introduce modern engineering equipment (wagons and plant) is urgent
11. The planned safety assessment of structures must be extended from solely bridges to include other major structures (e.g. tunnels, retaining walls, station roofs etc)
12. The status of and responsibility for disused lines needs to be clarified.
13. Lines of demarcation (e.g. between P-Way and Structures) need to be agreed to avoid misunderstanding leading to omission of action (e.g. at platform edges).
14. P-Way to co-operate with SE&T on inspection and maintenance of Facing Point Locks.

Issues in the DART electrification are:

15. Take into use new high-level safe access equipment.
16. Implement the necessary training of maintenance staff on the equipment of the extension (noted that this is within an industrial relations dispute).

The CME needs to take special account of:

17. Customise corporate standards so they are relevant and practical in the department.
18. Systematically analyse the safety issues raised by the refurbishment of the Craven carriages.
19. Complete a formal risk assessment of the secondary door locking proposal.

14.7 Safety Management System

An adequately resourced central service is needed to better co-ordinate safety standards and initiatives, including the following:

1. Develop the IRMS, or another, overall risk model to inform and guide the corporate safety plan.
2. Facilitate the spread of good practice in one department for the guidance of others.
3. Provide guidance on safety objectives and the prioritisation of safety programmes.
4. Steer or facilitate the completion of IT systems needed for the management of safety.
5. Provide central monitoring and auditing of the progress of the safety management arrangements.

14.8 Other Issues for IE

1. No doubt IE and the trades unions wish to resolve the present industrial relations issues for a range of reasons, but within this report it must be reiterated that some safety initiatives are being delayed or stifled by the present impasse, which is bad for morale and for actual safety of workers and the system.

14.9 Department of Public Enterprise

1. The Department to consolidate role, resources and reporting lines of Railway Inspectorate.
2. The Department to finalise new railway safety legislation.
3. RI to ensure appropriate targets and standards are promulgated to the industry.

15. REFERENCES

1. “A Review of Railway Safety in Ireland”, IRMS Report 2045.10, October 1998.
2. “Railway Safety Programme 1999 - 2003”, IE, 1999.
3. “Pre-Audit Report”, IRMS Report 2045.13.01, September 1999.
4. “Iarnrod Eireann Safety Adequacy Review Report”, IRMS Report 2045.04, August 1998.
5. “Infrastructure Adequacy Risk Assessment Report”, IRMS Report 2045.06, October 1998.

Appendix I

Progress on Previous Unreasonable Risks

The table below details the “unreasonable risks” highlighted in IRMS Report no.2045.10, dated October 1998: *A Review of Railway Safety in Ireland*. All deficiencies were recommended to be actioned within six months.

Discipline	Location	Deficiency	Audit Results - November 1999	Resolved
Signalling	Sligo.	Interlocking protruding from locking tray.	Sligo Frame lock boxes have been supported with a prop- intended to last until elimination of the cabin by introduction of new signalling i.e. Mini CTC. Mini-CTC is now running to an extended and uncertain timeframe. Consequently monitoring of this problem has resulted in a reappraisal of the situation.	See audit results
Signalling	Boyle.	Starting signal to Sligo (from down loop) stuck in the OFF (or proceed) position. This was due to signal arm catching on signal post fittings. This type of tubular semaphore post should be redesigned.	Divisional staff have surveyed all such installations and these results will be incorporated into the infrastructure asset register. Any structure where the swept path of any signal arm from horizontal to 75 deg. below passes within 300mm (in front or behind) of any fixed object or structure must be considered “at-risk”. Periodic inspection will be carried out by Div. Staff. The SEG are confident that a design review is not currently called for and that the risk can be controlled through the maintenance process. It is very unlikely that any new such signals will be manufactured. If they are, this will be done to new design documentation which will incorporate consideration of this risk. <i>An independent assessment is required of this decision.</i>	See audit results

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Discipline	Location	Deficiency	Audit Results - November 1999	Resolved
Signalling	Drumod	Facing point lockbar damaged and rendered useless due to incorrect installation. This type of mechanism should be redesigned. Some may require replacement by track circuit.	These have been examined in the immediate term, and dimensional data collected. Remedial work, where required, is in hand and progress is being monitored by Divisional staff. Technical Manager, with responsibility for track, is in discussion with SET staff regarding flange width and depth tolerance information to allow for correct determination of assessment criteria for application to collected data. This information will also be used for the design of a "Go / No Go" gauge for point fouling bars There have been some procurement delays in obtaining new fouling bar brackets. <i>This must be resolved without delay.</i>	See audit results
Signalling	Castlerea.	Wrongside failure of interlocking	This site was not examined.	Not audited.
Signalling	Wicklow.	Wrongside failure of signal indication (occurred after signalling alterations).	This wrongside (or safety critical) failure had been cleared. However, a design failing that could lead to safety critical failure in colourlight signals was found. The deficiency is such that the design is not fail-safe. <i>Further audit activity is recommended to ascertain the scope of the problem identified .</i>	See audit results.

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Discipline	Location	Deficiency	Audit Results - November 1999	Resolved
Signalling	Rosslare Strand	Interlocking protruding from locking tray.	<p>Locking Defects will be rectified or which were planned to be complete by the end of October.</p> <p>Ongoing delays with the Mini CTC project, however, have prompted a reassessment of the risk criteria relating to mechanical locking.</p> <p>Remaining mechanical signal cabins have now been prioritised for attention on a ranking determined by the number of potentially conflicting passenger train movements per week, with a qualitative component to embrace known concerns with defect histories at particular locations.</p>	See audit results.
Signalling	Longford.	Facing point lock failed gauge test.	<p>Points tested and correct.</p> <p>Two others failed gauge test due to defective permanent way</p> <p>Gauges have been approved and are in manufacture. Instructions for their use are currently being drafted.</p> <p>When cleared for issue by the SEG, they will be briefed in to all linemen.</p>	See audit results.
Signalling	All mechanical facing points.	Special exercise to retest all facing point lock equipment in respect of lock notch width. Rectify where required.	<p>No 10 points at Wicklow failed the facing point lock gauge test.</p> <p>No.11 points failed to close to the reverse position.</p> <p>Two others also failed FPL test.</p> <p><i>Further audit activity is urgently recommended to ascertain the scope of the problem identified .</i></p>	No.
Signalling	Heuston SB.	Lack of effective safety management system to control degraded interlocking.	<p>Original SMS is still in place but not robust in respect of planned works and further degradation of wiring.</p> <p>A contract has now been awarded to Westinghouse Signals Ltd., for the replacement of signalling equipment at Heuston.</p> <p>The phasing of both the track and signalling aspects of this project has been designed to ensure that stagework intervention with the existing signalling equipment is reduced to an absolute minimum.</p> <p><i>An independent assessment should be carried out.</i></p> <p><i>A Full Safety Management System (SMS) is required.</i></p>	No.

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Discipline	Location	Deficiency	Audit Results - November 1999	Resolved
Signalling	Claremorris SB.	Lack of effective safety management system to control degraded interlocking.	<p>The SMS is not robust.</p> <p>Divisional signalling staff completed a survey of the yard with local operational management and obtained agreement regarding the withdrawal of certain facilities.</p> <p>The number of potential conflicting moves has been greatly reduced.</p> <p>Plans will be prepared by HQ to show a rationalised track, signalling and track circuit layout for Claremorris.</p> <p>As an immediate risk reduction measure, a new cable duct is being provided on overground supports, to afford improved protection for the existing local cable runs.</p> <p>Heavily corroded metallic location cases have been provided with short term outer timber protection boxes.</p> <p><i>Full SMS required.</i></p>	No.
Signalling	Barrow Bridge	No facing point lock fitted on track over swing bridge.	<p>The Provision of a Locking Device was targeted for completion by the end of 1999.</p> <p>There is serious concern that any form of conventional FPL plunger arrangement would be damaged by movements of a structure with the inertia of the Barrow bridge.</p> <p>An assured proof-of-rail-alignment detection by a form of contactless detection together with position proving of the existing blocks and associated bridge elements is now being considered..</p> <p>In the short term the Track Patrol Ganger inspects the rail alignment and related features of the Barrow Bridge as part of his regular patrols.</p> <p><i>An independent assessment is recommended.</i></p>	No.

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Discipline	Location	Deficiency	Audit Results - November 1999	Resolved
Signalling	Locations, equipment rooms (including TE premises), and signalboxes.	Cut back redundant wires, insulating and securing them so that there is no risk of wires coming into contact with working circuitry.	<p>Observations made indicate that good progress has been made on this item.</p> <p>Survey and remedial action is well advanced on Belfast and Cork lines.</p> <p>Checklists are being compiled and Divisional staff are monitoring progress.</p> <p>The next priority will be the protection of Telecomms cores in general termination areas.</p> <p>Telecomms staff checking MDF and IDF terminations using a formal checklist approach. 60 MDF frames have been checked to date.</p> <p>A Telecomms site log book is being introduced for each building containing Telecomms infrastructure.</p> <p>The connection from the vital FDM equipment for level crossings on the DART to the telecoms MDF is presently made via a signalling termination link box with a 2 pair cable to the MDF joined into the main telecoms cable using a connector and taped over with insulating tape.</p> <p>It has been decided to make this connection a permanent feature.</p> <p><i>Independent assessment of these proposals is recommended.</i></p>	In progress.

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Discipline	Location	Deficiency	Audit Results - November 1999	Resolved
Signalling	Equipment rooms including underpart of signalboxes.	<p>Take measures to ensure fire safety and security for staff and customers.</p> <p>Remove rubbish and all stored materials.</p>	<p>Under part of Mechanical Signal Cabins inspected had been cleared of rubbish and fire hazards.</p> <p>Dublin CTC and Pearse Relay Room entrance were unchanged in respect of fire hazards.</p> <p>No evidence seen of increased security as yet.</p> <p>Rubbish and stored materials removed from mechanical signalboxes and most relay rooms.</p> <p>Dublin CTC had materials stored in cardboard boxes within the main equipment room.</p> <p>Fire and Security Survey of Equip. Rooms and Signal Boxes has been conducted by the Chief Architect and Designer, who is prioritising their findings.</p> <p>Provision has been made in the yr2000 budget for resulting work. Any work required to remedy urgent requirements will be specially authorised in 1999 expenditure.</p> <p>Specific station yards have been targeted for housekeeping attention, and this has been carried out.</p> <p>Currently, new telecommunications equipment rooms are being supplied to the Railtrack (ex BR) Spec. 1615D.</p>	No.
Signalling	All controlled level crossings.	<p>Check braking distance of protecting signals, including overlaps and take appropriate action.</p> <p>Check road markings and take appropriate action.</p>	<p>It is proposed to install marker boards at braking distance at all defective crossings.</p> <p>Surveys have been carried out.</p> <p>Marker Boards have been tested and Quotations have been received from manufacturers and award of initial supply contract is imminent.</p> <p><i>As this is an interim measure, an independent assessment is suggested.</i></p>	In progress.
Signalling	Pole routes	Remove redundant poles. Ensure pole routes are in sound condition.	Little progress is evident from the sample on the lines inspected.	In progress.

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Discipline	Location	Deficiency	Audit Results - November 1999	Resolved
Signalling	Telecom Eireann ETS infrastructure	Ensure agreed code of practice is met with regard to ETS equipment.	<p>ETS instruments have not been re-serviced.</p> <p>ETS cable is still terminated within the signal cabin operating area.</p> <p>The Roscommon EirCom Telephone exchange was inspected and, though the ETS connections had been separated, the written instructions and circuit identification were not to an acceptable standard.</p> <p>There is not a full understanding of safety critical requirements for Railway Signalling.</p> <p>This appears to be the general position, though amended standards and a new code of practice were agreed between EirCom and IE.</p> <p><i>Further audit activity is recommended to ascertain the scope of the problem identified .</i></p>	No.
Signalling	All mechanical interlockings	Full mechanical interlocking test at every cabin.	<p>Evidence seen of progress on this item at Gorey Signal Box.</p> <p>Verbal assurance was given of progress at a number of other sites, though severe difficulties had occurred which were hampering completion of this safety critical task.</p> <p><i>Further audit activity is recommended to ascertain the scope of the problems identified .</i></p>	In progress.

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Discipline	Location	Deficiency	Audit Results - November 1999	Resolved
P-Way	Liffey Bridge & Junction area.	Very poor condition of permanent way over the lattice girder viaduct, results in little gauge retention and an unacceptably high risk of derailment at a very vulnerable location.	<p>A lattice girder viaduct high above the river bridges the Liffey. The track is supported on longitudinal timbers in troughs on a plate deck. The timbers have had all fastenings replaced with Vossloh. The timbers at the extremities where they are deepest have had tie bars and transoms installed. These have allowed much better control of gauge and the widest noted was +14 mm with negligible dynamic movement. The timbers themselves have not been replaced pending a decision about the future track form. They should give approximately 12 to 18 months life from now. Guard rails are still desirable but the measures taken so far have significantly reduced the risk.</p> <p>At Liffey Bridge Junction there is a flat bottom double junction layout. The main ironwork items have been secured by locally produced Vossloh baseplates to very satisfactory effect. Most of the decayed timbers have been replaced with hardwood and local reballasting has been undertaken. There is still gauge variation of up to +20 mm but dynamic movement is under control. The measures taken so far have significantly reduced the risk.</p>	Partially.
P-Way	Porterstown LC	Very poor pair of insulated joints: the rail ends are badly matched giving rise to impact as a wheel passes over. The joint is out of square and the fishbolt holes have been incorrectly drilled.	Total track renewal in CWR has been undertaken since 1998. Level Crossing is also now a Strail with a good roadway surface. A new IBJ installed in concrete bearers with the running on rail end supported. It is understood that this is standard practice for new IBJs but is in contravention with MW17 that mandates joints to be centrally located between sleepers. Such joints are also inappropriate for single lines.	Partially.
P-Way	Porterstown LC to Clonsilla	Large number of squat defects present. Many have been protected by the installation of a pair of fishplates with the back holes drilled and bolted. However, several are very close to joints and there are also many examples of multiple defects in single rails. All these together present a highly undesirable situation. (the track is the subject of a daily patrol).	Total track renewal in new CWR has eliminated the risk.	Yes.

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Discipline	Location	Deficiency	Audit Results - November 1999	Resolved
P-Way	Clonsilla	<p>There is a bull head crossover whose check rails are retained solely by conventional steel keys. With this arrangement there is a risk of the check becoming displaced with potential for a derailment in a passenger line.</p> <p>The up line on the Dublin side of Clonsilla crossing has rails which are peppered with squat defects, many are multiple within one rail and adjacent to joints and the fishplates are thin and worn and are not adequate for present day traffic and axleloads.</p>	<p>The risks identified in 1998 concerning the plain line track and level crossing have all been rectified by complete renewal.</p> <p>A new crossover is on site awaiting installation, IE P15 switch with an 18½ crossing. The old bull head crossover is still in situ with check rails not retained by blocks and bolts. However, "Panlock" has replaced the conventional steel keys and these should remain in place much more reliably.</p> <p>It was claimed that check rail security is not a feature of the BS drawings, which date from the 1920s, from which the layout was manufactured. It is accepted that the crossover when installed was correctly manufactured but the standards of 80 years ago are no longer necessarily relevant to the risks of today.</p>	Partially.
P-Way	Culleen Level Crossing	A joint was discovered that had settled very much more than the one opposite giving rise to a crosslevel error of 20mm, equal to a twist of 1 in 135 over a 2.7m wheelbase (the draft immediate action level is 1 in 150).	This site was not examined.	Not audited.
P-Way	Lake Level Crossing: Partial Sleeper Replacement	Decaying sleepers result in gauge that was very variable and measurements of 10 to 20mm wide were common. Because only about 1 in 3 sleepers were being renewed it was not possible to bring the track back to correct gauge and so new sleepers were being installed regularly 10mm wide. The rail section is very lightweight for modern day traffic and axleloads, with several locations being outwith the maximum rail wear. Very many examples were noted on this curved section where the wheel flanges are striking fishplates.	Total track renewal in new CWR has eliminated the risk.	Yes.

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Discipline	Location	Deficiency	Audit Results - November 1999	Resolved
P-Way	Longford	Several joints were in poor condition as a result of poor ballast conditions and sleepers becoming decayed and split. One joint was staggered with a mixture of 92 and 95lb rail sections: it is in a state of collapse, the sleepers being unserviceable, founded on failed ballast, supporting badly matched rails with missing fishbolts.	The switch and crossing layouts are very much as observed in 1998 with some improvement to the extreme defects. The joint where one rail had part of the foot broken away has been rectified. Several joints are still in poor condition as a result of poor ballast conditions and sleepers becoming decayed and split. Joint maintenance appears to continue to be a problem.	Partially.
P-Way	Claremorris Permanent Way Section	Section has some 24 miles of 85lb track that has 268 class 2 ultrasonic defects, mostly horizontal, upper fillet radius cracks.	This site was not examined.	Not audited.
P-Way	Castlerea to Claremorris (patching between 117¼ and 118miles)	The sleepers were in very poor condition and gauge was generally 10 to 16mm wide with obvious dynamic movement of at least 5mm.	This site was not examined.	Not audited.
P-Way	Claremorris (54 points)	The timbers were decayed and splitting, gauge being retained by tie bars. At one point the gauge was 20mm wide with a single tie bar with signs that before its installation there had been at least 20mm additional movement under traffic. There is a high risk of failure of one tie bar, which is taking the whole of the gauge spreading force, and a derailment would be a likely outcome.	This site was not examined.	Not audited.
P-Way	Navan Branch	Top and line throughout are very poor and inadequate for the present speed limit of 40mph. Main problems arise from decayed softwood sleepers giving rise to gauge variations and abysmal ballast conditions making the maintenance of adequate top almost impossible. This route is not the subject of any ultrasonic rail flaw detection and there is therefore a high risk of unknown defects existing.	This site was not examined.	Not audited.

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Discipline	Location	Deficiency	Audit Results - November 1999	Resolved
Civils & Structures	3 rd Party Work - general	Control systems for private parties work to be reviewed and new procedures to be put in place.	The GNC consultants managing the Safety management project within IE Infrastructure have identified the area as one requiring a standard. A draft standard has been produced but following circulation within IE requires substantial rework. At DE level an informal approach continues although the ADE have a good appreciation of most requirements	In progress.
Civils & Structures	DART footbridges	Parapet structures for all DART footbridges are to be exposed and inspected.	The Structural Engineer based at HQ has carried out a survey of the DART footbridges that included partial removal of the cladding on parapets. The survey also examined the welding where extensions were added to raise the footbridge at the time of electrification. Based upon the results of that survey a prioritised list of replacement or repairs has been produced. One bridge has already been removed. 4 of the 8 listed for replacement are included in Dublin DE programme for bridge renewal in 2000.	Survey complete.
Civils & Structures	DART footbridges	The methods of raising all DART footbridges are to be reviewed and structural implications on footbridges assessed.	See above comments	As above.
Civils & Structures	Cuttings and Embankment - general	Assess stability of cuttings and embankments especially those where slips have occurred and put in place programme for trimming and stabilising.	A major exercise has been undertaken by consultants Carl Bro and a draft report presented to IE this autumn. Its recommendations are far reaching and have substantial cost implications. IE are considering how to take this report forward in the most reasonable manner. Most of the unreasonable risks identified in the Carl Bro report have been dealt with already. A few require further investigation. The damage caused by laying the ESAT cable identified in the report will require a large amount of work to rectify and is the subject of a wider discussion about how to take this issue forward within IE.	Survey complete.

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Discipline	Location	Deficiency	Audit Results - November 1999	Resolved
Civils & Structures	Coastal Defences - general	Assess condition of coastal defences and repair as required.	As part of the Carl Bro report into embankments and cuttings they have examined coastal defences. They have produced a prioritised list of works that are required. Once again IE are considering how to take the recommendations forward in the most reasonable manner possible and will be commissioning feasibility studies where appropriate. Certain works have been identified as priority items at Brayhead and Greystones. The proposals for realigning the track at Rosslare would require planning permission and a railway works order and not be possible quickly if that option were to be selected. Repair works were seen underway at Rampart D, Brayhead	Survey complete.
Civils & Structures	Cast iron bridges - general	Increase frequency of inspection of cast iron bridges.	The Chief Engineer Infrastructure has written to the DEs instructing them to examine all cast iron bridges annually. Review at the DEs offices showed that this was being carried out to some extent. However in some instances the period since examination was substantially more than 12 months and where examinations had taken place they were not always recorded on the bridge card. It is unclear whether all cast iron bridges have actually been identified as bridge number 387 at Mullingar appeared to have some cast iron girders within the structure but is not listed as such in the survey carried out by the Structural Engineer. There is also a lack of clarity about whether cast iron bridges on closed lines for which IE still have responsibility have been included. A programme for removal of all 36 cast iron bridges has been agreed and funding is in place. The programme extends over 5 years but already has some slippage this year.	See audit results.
Civils & Structures	Workshops - general	Increase tidiness of workshops and improve standards for handling power tools.	No inspections of workshops were undertaken as part of this visit. However the Chief Engineer Infrastructure advised that a survey was undertaken by the DEs which has resulted in some workshops being closed and activity relocated (Heuston), others have had additional storage space provided and there is a programme of building new improved workshops in 2000. The intention is to introduce a level 1 check system within the DE organisations to ensure monitoring of workshop conditions in the future.	Not audited.
Civils & Structures	Refuges - general	Remove all debris and obstructions from tunnel and viaduct safety refuges.	Bray No. 1 tunnel was walked through and had no debris in it. There were no refuges within it to be examined.	See audit results.

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Discipline	Location	Deficiency	Audit Results - November 1999	Resolved
Civils & Structures	Connolly CTC	Fire safety at Dublin Connolly CTC to be reviewed and adequate safety to be provided for staff in the event of fire.	This site was not visited. However the Chief Engineer Infrastructure advised that the Chief Architect has put a proposal to the board to expand the Connolly CTC facility in general and has taken into consideration the fire safety issue in the proposal	Not audited.
Civils & Structures	Dublin - Rosslare Main Line MP 92	Investigate suspected scour under track.	This site was not visited. DE Dublin advised that the site was visited by an engineer at low water to determine whether there was a problem with the foundation. No problems were found	Not audited.
Civils & Structures	Dublin - Rosslare Main Line MP 4.5 - 5.5	Investigate cause of track lateral movement.	This site was not visited. Dublin DE advised that the track was dug out and drained, there is a rock out crop at the location that may be contributing to the problem. As a control measure it is walked daily. A geotechnical investigation is being tendered at the moment to determine the underlying cause and recommend remedial action.	Not audited.
Civils & Structures	Rosslare	Enclose frame of Rosslare strand signal box for security.	This site was not visited. However a survey of all signal boxes, relay cabins and other buildings housing significant operational equipment has been carried out by consultants for IE. This survey considered the fabric, the wiring, the security, the use of the building and fire hazards. The Chief Architect has a prioritised list of about 60 buildings requiring work and plans to let tenders with a view work starting in March/April 2000.	Not audited.
Civils & Structures	Dublin-Wexford Line Overbridge 99 (south of Sandycove):	Ensure that weight restriction is being observed or close bridge to traffic.	This bridge is on the Dublin-Wexford line at Dun Laoghaire. The site was visited and weight restriction signs observed. The bridge is planned for reconstruction in 2000. In discussion with the DE he advised that he has talked to the local police who are endeavouring to monitor the traffic travelling over it.	Yes.
Civils & Structures	Dublin - Wexford Line 0/B 98	Prevent traffic accessing side span until assessment can be carried out.	This bridge is on the Dublin-Wexford line at Dun Laoghaire. The site was visited and kerbing has been laid to prevent road vehicles using the side span. Until a longer term action plan is decided upon this represents an adequate control measure.	Yes.

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Discipline	Location	Deficiency	Audit Results - November 1999	Resolved
Electrification	Overhead Line Maintenance Access Vehicle	<p>Fumes from the locomotive present an unacceptable health risk to staff.</p> <p>The practice of working from the roofs of wiring trains is no longer considered safe, to the extent that it has been totally outlawed now in the UK following an inquiry into a fatal accident to a linesman working on the West Yorkshire electrification project.</p> <p>Present arrangements could not cope with a major overhead line incident (reliability issue).</p> <p>Road/rail self-propelled access vehicle with crew cab/workshop, a pantograph wagon and a wire/cable drum carrier wagon should be procured.</p>	In Progress. Budget allocated, selection of plant in progress to be procured by May 2000.	No.
Rolling Stock	n/a	Loss of Visibility to Driver: Unreliability of Class 201 wiper motors	It was noted that it had currently taken CME three attempts to propose a robust and functional solution to the defective windscreen wiper issue. This initiative has unfortunately resulted in only one trial locomotive in the field. Although some progress has being made this is unacceptably slow.	No.

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Appendix II

Safety Inadequacy Scores

Location or Route Section	Original Safety Inadequacy (%)	Revised Safety Inadequacy (%)
Clonsilla (general PW)	80	60
Liffey Bridge Junction (Freight / Passenger) (Liffey Bridge)	80	40
Liffey Bridge Junction (Freight / Passenger) (Switches & crossings)	80	40
Porterstown Level Crossing	80	0
Porterstown Level Crossing to Clonsilla	80	0
Lake Level Crossing (Passenger)	80	0
Longford (collapsed joint)	75	60
Sandycove to Glenageary	60	30
Church Road Junction to East Wall Junction (ultrasonic defects)	60	30
Kildare	60	0
Leixlip Louisa Bridge to Blakestown Level Crossing	60	0
Maynooth	60	0
Ferns Lock Level Crossing	60	0
Church Road Junction to East Wall Junction (Switches & Crossings)	50	40
Church Road Junction to East Wall Junction (Missing fishbolts)	45	30
East Wall Junction (Passenger)	45	30
East Wall Junction to Dublin Connolly	45	30
Mullingar to Longford (Passenger)	40	0
Islandbridge Junction (Passenger) (Main lines)	30	40 (Score Increased)
Sallins	30	20

Table A1: Revised Permanent Way Safety Inadequacy Scores

Location or Route Section	Safety Inadequacy (%)
Portlaoise (Loading of sleeper carrying wagons)	80 *
Enfield (Passengers)	75*
Mullingar (Passengers)	60
Edgeworthstown (Passengers)	60
Galway (Passenger) (foot boards)	60
Athenry (Passenger)	60
Ballinasloe (Passenger) (plain line)	60
Hazelhatch (Passengers)	45
Kildare to Portlaoise (Passengers)	45
Galway (Passenger) (S&C)	45
Ballinasloe (Passenger) (River Suck bridge)	45
Athlone (Passenger) (River Shannon Bridge)	45
Portarlinton (Passengers)	40
Ashtown and Coolmine (Passenger) (station works)	40
Coolmine (Passenger) (track renewal)	40
Galway to Athenry (Passenger)	40
Cherryville Junction	30
Drumcondra to Glasnevin (Passenger)	30
Athlone (Passenger)	30

**Table A2: New Permanent Way Safety Inadequacy Scores
(Locations not previously visited)**

* : New unreasonable risk

Section	Checklist	Actual % Score (Compliance)	Safety Inadequacy (Risk)
1	Divisional Engineer - Technical Self Check Procedures	0%	25%
2	Instructions To Local Staff	0%	25%
3	Cab Riding	33%	80%
4	Track Inspection: Divisional Engineer	58%	40%
5	Track Inspection: PW Inspectors*	40%	80%
6	Track Inspection: Patrol Gangers*	19%	80%
7	Track Recording Coach	0%	80%
8	C.W.R. Maintenance	8%	80%
9	Hot Weather Precautions - Track	8%	80%
10	Ultrasonic Examination Of Rails	33%	80%
11	Ultrasonic Examination Of Rails Testing Equipment, Training & Performance	13%	80%
12	Defective / Broken Rails, Broken Fishplates, Derailments And Track Buckle Reporting	0%	20%
13	Defective Or Broken Rails Procedure	15%	80%
14	Welders Competency - Alumino Thermic	65%	60%
15	Structural Clearances	20%	30%
16	Track Renewal And Design	65%	38%
17	Rail Sidewear (Plain Line)	11%	20%
18	Raising / Removing Temporary Speed Restrictions	0%	100%
19	Non-ballasted Track on Bridges	0%	100%
Total		21%	62%

* Score is average of more than one location

Table A3: Permanent Way Procedural Controls and Management Systems Audit Scores

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Subject	Athlone %	Limerick Jcn. %	Other %	Notes
Management/ Examination of Structures	32	65		
Examination of Structures – Records	30	19		
Structural Examination Arrangements	20	53		
Outside Parties Construction work	60	-		
Bridge/ Structure Scour	17	11		
Bridge Bashing	27	24		
Coastal and Sea Defences	-	-	33	Partly done at Dublin and partly at North Wall Quay
Embankments and Cuttings	17	-	17	Partly done at Athlone and partly at North Wall Quay
Flood Warning Procedures	9	9		

Table A4: Summary of Scores from Structures Management Systems Checks

Equipment: DART	Original Safety Inadequacy (%)	Revised Safety Inadequacy (%)
Power Supplies	46	N/A
Interlocking - relay	44	39
Signalling control panel	33	N/A
Cab Radio	32	N/A
Signals - electrical	31	25
Points - clamp locks	29	16
Operational Telecomms	29	N/A
Track circuits - coded	23	N/A
Level crossings - CCTV	23	N/A

Table A5: Revised Signalling Safety Inadequacy Scores (DART)

N/A: Not Audited

Equipment: Other Passenger Lines	Original Safety Inadequacy (%)	Revised Safety Inadequacy (%)
Swing Bridge	65	40
Interlocking - Mechanical (Heuston and Claremorris)	51	N/A
Interlocking - Mechanical (general)	49	33
Power Supplies	46	N/A
Interlocking Relay-Based	44	39
Signals - Mechanical (general)	43	35
Interlocking - Mechanical (Limerick South)	42	N/A
Interlocking - Block instruments	40	28
Signalling Operating Floor	35	N/A
Signals - mechanical (Boyle)	34	12
Signalling Control Panel	33	N/A
Interlocking - Electronic (Drogheda and Waterford)	32	N/A
Interlocking - Mechanical (Sligo signal box)	32	N/A
Cab Radio	32	N/A
Track Circuits - d.c.	31	N/A
Signals - Electrical	31	25
Points - Clamp locks	29	16
Operational Telecommunications	29	N/A
Points - Mechanical (Sligo)	29	N/A
Points - Mechanical (General)	25	N/A
Track Circuits - Coded	23	N/A
Points - Electrical	19	16
Points - Electro-pneumatic	18	17
Cab Signalling	15	9

Table A6: Revised Signalling Safety Inadequacy Scores (Passenger Lines)

N/A: Not Audited

Appendix III

New Unreasonable Risks

Discipline	Location	Deficiency
Signalling	Wicklow	Design failing that could lead to safety critical failure in colour light signals.
Signalling	Facing Points Locks	2 facing points failed gauge test due to defective permanent way.
P-Way	Portlaoise	A train loaded with new concrete sleepers was observed departing from the depot. The sleepers were not restrained on the flat bed wagons except by friction. The top layer in particular appeared vulnerable to displacement in transit. It is recommended that consideration be given to restraining straps or similar.
P-Way	Enfield	<p>Down loop is a mixture of 1898/1900 94 flat bottom track and bull head of undetermined date. Many joints are wide, with bolt holes very close to rail ends and bolts are missing. Decayed and indented sleepers were also noted in the platform area.</p> <p>Ultrasonic defects were noted within the station area, at least 11 class 2s counted but there is no serviceable rail available for replacement. A correlation with the DE's list of defective rails was unsuccessful and it was discovered that the list is not comprehensive due to a computer or programme fault.</p>
P-Way	Athenry	Class one rail defect, requiring mandatory removal within 24 hours, was still running without any additional controls 6 days after discovery.
Civils & Structures	Mullingar	Review Bridge 387 to determine whether it does contain cast iron girders and also provide adequate protection to Sligo side footpath span from road vehicle penetration of the deck.
Civils & Structures	Shannon River Bridge	Finish renewal of timber walkway boards at Bridge 106 at Athlone (approx. 40%) complete to date.
Civils & Structures	Lough Atalia Bridge	Renew timber walkway boards at Bridge 171 Galway which are rotten and loose
Civils & Structures	Ballinasloe	Renew timber walkway boards at Bridge 125 over the River Suck which are rotten and loose.

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Discipline	Location	Deficiency
Civils & Structures	Maynooth	Close gap in footbridge railings at top of steps at station to prevent a child from falling through the railings. Check for all similar footbridges as that at Maynooth and close gaps on those.
Civils & Structures	Bray	Remove broken glazing from canopy roof at station which poses a risk to passengers who could be struck by falling glass

Table A5: New Unreasonable Risks Identified During Audit