ISSUE DETAILS

Reference	ENG/01	**Issue No.**	1	**Issue Date:**	12/01/2015
Title	Engineering Assurance Handbook				
Status	New Issue				
Compliance Date	01/02/2015				
Document Owner	Engineering Director				

BRIEFING REQUIREMENTS

The following table defines how revised issues of this document are briefed to existing employees according to related specific responsibilities.

This is determined using the 'RACI' principle. Those roles identified as 'Responsible' and 'Accountable' should receive a formal awareness briefing facilitated by the Document Owner.

Role	RACI	Type of briefing
Business Improvement & Assurance Director	Informed	Information only
CEM	Accountable	Awareness
CRE	Accountable	Awareness
Director of Major Projects	Informed	Information only
Director of Specialist Business's	Informed	Information only
Engineering Director	Accountable	Awareness
Engineering Manager	Accountable	Awareness
General Manager's	Informed	Awareness
HSQE Director	Informed	Information only
Pre-Contract Director	Informed	Information only
Professional Heads	Responsible	Awareness
Project Engineers	Responsible	Awareness
Project Managers	Informed	Awareness

PURPOSE

This handbook describes the requirements for Engineering Assurance of all projects on VolkerRail contracts. The arrangements will ensure that appropriate engineering management is applied to all projects undertaken by VolkerRail to achieve compliance with Statutory, National, International, Client and Internal standards and to facilitate a right first time, every time, safely ethos that maximises contribution and reputation.

This handbook does not cover any project management or commercial issues, it is intended to support and compliment these activities which are covered in detail in the Project Management System Procedures (PMS/01) and the Commercial Manual (COM/01).

SCOPE

This handbook and its supporting documentation applies to all VolkerRail projects and covers the full project lifecycle from pre contract to final handover and close out. The use of this handbook is not reserved solely for engineers and should be used by all staff engaged in the Engineering Management of Projects from pre contract to final handover / handback to the Client

Compliance with this handbook and its associated documentation is mandatory across all VolkerRail Contracts regardless of the Client we are working for. This is produced to ensure that VolkerRail engineering management practice is maintained in accordance with client standards and industry good practice. It underpins the commitments made in the company's Integrated Management System (IMS).

WHAT HAS CHANGED IN THIS LATEST ISSUE AND WHY

This is a new document and replaced existing VolkerRail Standard AI/903 in its entirety.

This handbook has been structured to provide the reader with a high level overview of the VolkerRail Engineering Assurance processes. Below is a summary of the areas covered by the document:

Corporate Engineering support

- Role and contribution of the Professional Heads
- How industry standards are reviewed and briefed to projects
- Training and competence of staff and engineering development
- Supply chain management and approved supplier list

Project Specific engineering assurance arrangements

- Summary of the key engineering deliverables through the 4 project phases
- Details of key engineering appointments
- Design integration management
- Responsibilities of the key engineering roles
- Management of interfaces between disciplines

This handbook shall be augmented by subject specific engineering assurance modules which detail the specific arrangements to be applied to ensure projects are delivered to the right quality right first time, every time safely.

The first module, ENG/01/M001 Appointment of CEM and CREs, is being issued at the same time as first issue of main Handbook document. This module details the internal VolkerRail process for the nomination, competence assessment and authorisation CEMs and CREs prior to the submission to the client.

ISSUE RECORD

Issue No.	Date	Summary of changes
1	12/01/2015	New issue

IMS AUTHORISATION

Approval	Name	Role
Document Owner	Jack Pendle	Engineering Director
Approval for IMS	Emma Glenc	Assurance Manager
Approval for IMS	Chris Leek	Head of Quality & Environment

1. PURPOSE

1.1 Background

The rail industry has seen many significant changes since privatisation in the mid-1990s including the formation and dissolving of Railtrack and, the creation of its successor Network Rail in October 2002. Network Rail has undergone many changes to its management structure for both maintenance of the rail network and its delivery of infrastructure investment projects.

A significant element of that change has seen the introduction of new client standards for Engineering Assurance to ensure that infrastructure investment projects are managed and controlled to comply with all statutory and mandatory requirements and be fit for purpose. That is, that they are specified correctly in the first place, the design is right and they are built right, first time and are delivered safely. Engineering Assurance is at the very core of the rail industry and is a vital component in ensuring safe operation of trains and ultimate safety of both passengers and staff.

As a multi-disciplined rail infrastructure contractor, our engineering capability is fundamental to delivering a quality service to our customers and joint venture/alliance partners, and of equal importance generating profits and increased value to our shareholders.

Engineering excellence begins with highly trained competent staff. At VolkerRail we have invested considerable resources in ensuring that our staff and workforce are fully prepared and supported to equip them to meet the Client's aspirations for successful and sustained project delivery.

This handbook has been developed with the aim of providing a point of reference for our engineers in the application of Engineering Assurance which are essential for the successful delivery of the project maintaining the VolkerRail ethos of 'Right First Time, Every Time, Safely'.

1.2 Introduction

This handbook describes the requirements for Engineering Assurance of all projects on VolkerRail contracts. The arrangements will ensure that appropriate engineering management is applied to all projects undertaken by VolkerRail to achieve compliance with Statutory, National, International, Client and Internal standards and to facilitate a right first time, every time, safely ethos that maximises contribution and reputation.

This handbook does not cover any project management or commercial issues, it is intended to support and compliment these activities which are covered in detail in the Project Management System Procedures (PMS/01) and the Commercial Manual (COM/01).

1.3 Consequences of Poor Engineering Management

Poor engineering management can have serious consequences for a Company and can result in severe financial penalties due to time delay to the programme, train delay caused by possession overrun, impact of serious incident or wrong side failure including time and cost to investigate, the need to revisit site to undertake rework etc.

In addition to any financial penalty there is also the damage to the company's reputation which can have a severe impact on the company's ability to be considered for work in the future with that client. As the rail industry is extremely incestuous, bad news has a habit of travelling very quickly and a poor reputation for engineering delivery can spread to other clients.

It is therefore, vitally important that we adopt good engineering management practice on all our projects and ensure that we maintain the VolkerRail ethos of 'Right First Time, Every Time, Safely'. We want to be remembered as the organisation that delivers a quality job, on time and to budget, thereby ensuring our inclusion on future tender lists and delivering a healthy return to our shareholders.

1.4 Structure of the Handbook

This handbook has been structured to provide the reader with a high level overview of the VolkerRail Engineering Assurance processes. It is mandatory across all VolkerRail Contracts regardless of the Client we are working for. The use of this handbook is not reserved solely for engineers and should be used by all employees involved in projects from pre contract to final handover / handback to the Client where engineering assurance can be affected. The handbook underpins VolkerRail's Integrated Management System (IMS)

This handbook shall be augmented by subject specific Engineering Assurance modules which detail the specific arrangements to be applied to ensure projects are delivered to the right quality right first time, every time safely.

2. SCOPE

This manual and its supporting documentation applies to all VolkerRail projects and covers the full project lifecycle from pre contract to final handover and close out. It applies to all staff engaged in the Engineering Management of Projects.

Compliance with this handbook and its associated documentation is mandatory to ensure that VolkerRail engineering management practice is maintained in accordance with client standards and industry good practice. It underpins the commitments made in the company's Integrated Management System (IMS).

3. REFERENCES (INPUTS) / RELATED DOCUMENTS

3.1 Statutory Requirements

- Health and Safety at Work Act 1974
- The Railways (Interoperability) Regulations 2011
- Construction (Design and Management) Regulations 2007
- Railways and Other Guided Transportation Systems (Safety) Regulations 2006
- European Commission Regulation (EC) 352/2009 (the CSM for risk evaluation and assessment
- Electricity at Work Regulations 1989
- Management of Health and Safety at Work Regulations 1999

3.2 VolkerRail Internal Documents

- Integrated Management System (IMS)
- Project Management System Procedures (PMS/01)
- Commercial Manual (COM/01)

3.3 Network Rail Standards

- NR/L1/INI/PM/GRIP/100 – Governance for Railway Investment Projects (GRIP) – Policy Manual
- NR/L2/CIV/003 – Engineering Assurance of Design and Construction of Building and Civil Engineering Infrastructure
- NR/L2/EBM/088 – Arrangements for Maintenance of New and Changed Assets
- NR/L2/EBM/STP001 – Network Rail Standards Management – Process Requirements
- NR/L2/ELP/27311 – Technical Approval of Electrical Power Asset Design
- NR/L2/INI/02009 – Engineering Management for Projects
- NR/L2/INI/30041 – EMC Assurance Process
- NR/L2/INI/CP0047 – Application of the Construction, Design and Management Regulations to Network Rail Construction Works
- NR/L2/INI/CP0069 – Route Requirements Management of Project Requirement Specifications (PRS)
- NR/L2/INI/CP0075 – Procedure for the Entry into Operational Service of Railway Infrastructure
- NR/L2/INI/PM/GRIP/101 – Governance for Railway Investment Projects (GRIP) – Project Management
- NR/L2/SIG/30003 – Engineering Assurance Arrangements for Signalling Engineering Schemes
- NR/L2/TEL/30022 – Engineering Assurance Arrangements for Communications
- NR/L2/TRK/2500 – Engineering Assurance Arrangements for Track Engineering Projects
- NR/L3/EBM/089 – Asset Management Plan
- NR/L3/INI/CP0044 – Work Package Planning
- NR/L3/INI/CP0064 – Delivering Work Within Possessions
- NR/L3/INI/CP0077 – Signalling Pre-Commissioning Verification Requirements
- NR/L3/MTC/RCS0216 – Risk Control Manual
- NR/L3/RSE/0001 – Safety Verification

4. DEFINITIONS

Engineering Assurance	A process that when applied correctly will inspire confidence that work will be delivered compliantly, to Client requirements, first time and be fit for purpose.
Project	Any planned work resulting in a material change to a Client's asset including new construction, relocation and alteration, refurbishment, renewal, decommissioning and recovery and demolition. This excludes maintenance activities. Work to protect a Client's asset when an Outside Party carries out work, on, over or under such asset. A project can consist of a number of similar or different individual work items that are independent from each other as may be detailed in the appropriate Engineering Management Plan.
Project Lifecycle	To enable more effective management of a project, the activities that are to be performed during delivery are normally grouped into phases, which may be divided and sub-divided further. Integrating these phases into the overall project timescale defines the project life cycle. The life cycle must be appropriate to the business and the project products being delivered.

5. PROCESS

5.1 Engineering Assurance Arrangements - Corporate

5.1.1 Professional Heads

It is VolkerRail's policy to adopt and implement professional engineering management principles, requirements of UK standards framework including client and industry guidance to achieve engineering assurance. This includes the processes related to production, management and inspection.

VolkerRail Group's Engineering Strategy, Policy and Delivery requirements shall be led by the Engineering Director.

This shall be supported through the underpinning Track, Civil Engineering, Overhead Line, Signalling and Plant & Equipment standards.

The Engineering Director is supported by Professional Heads covering the following disciplines:

Professional Head Authorising	Discipline
Professional Head of Track Engineering	Track Engineering Track Design
Professional Head of Civil Engineering	Civil Engineering Civil Engineering Design Earthworks Earthworks Engineering Design Structures Engineering Structures Design
Professional Head of Signalling	Signalling Design Signalling Engineering Signalling Testing & Commissioning Telecommunications Design (informed buyer) Telecommunications Engineering (informed buyer)
Professional Head of M & EE	Building Services Electrification Engineering Electrification Design Fixed Plant Engineering Fixed Plant Design HV Traction Distribution Engineering

The Professional Heads are the discipline leads for their area of responsibility and ensure that Engineering Assurance arrangements are in place for the following corporate activities:

- Standards
  - Review
  - Briefing cascade
  - Development of internal standards
- Legislation
- Training and Competency
- Audit
- Supply Chain Management and Approval
- Accident/Incident Investigation
- Recruitment (Engineering Personnel)
- Engineers Development
- Safety Validation of Organisational Change
- Technical Change
- Industry Participation
- Briefing Cascade

5.1.2 Standards

a) Standards Review

The Professional Heads have responsibility for undertaking reviews of all client issued standards to assess the impact of those standards on the business. The review process is managed by the IMS Steering Group chaired by the Assurance Manager; the group meet every two months in alignment with Network Rail and RSSB Standards Catalogue issue. The purpose of this group is to allocate new/revised standards requiring review to the most appropriate person in the organisation, to determine priorities and to track progress. It is incumbent on the standards owners to undertake reviews in a timely manner and to disseminate that information to users to ensure compliance is achieved.

b) Standards Briefing

The Professional Heads will undertake companywide briefs on a three monthly cycle to ensure users are aware of any changes to standards and understand the actions required to ensure compliance. Contractors Engineering Managers (CEM) shall be included in briefings to ensure continuity and compliance on all projects.

c) Internal Standards / Instructions / Alerts

The Professional Heads shall determine the need for additional internally generated media to support compliance with client standards; this may involve the creation of an internal standard, engineering instruction or Alert.

5.1.3 Legislation

The Professional Heads shall review all new and revised legislation that affects their sphere of responsibility. They shall assess the impact of the legislation on the company and ensure that controls are put in place to ensure compliance.

5.1.4 Training and Competence

Competence and training of staff in a particular discipline is the responsibility of the Professional Head to define and the Business to specify who shall undertake the tasks requiring the competence. The Professional Heads shall produce and maintain a competency profile for each post within their sphere of responsibility; the General/Business Managers shall determine individuals within their organisation who they require to have that competence ensuring that they have sufficient availability to satisfy demand. The Professional Heads are members of the Competence Steering Group which is chaired by the Training and Competence Manager.

Training and Competency requirements are laid down in CMS/001 owned by the Training and Competence Manager, but with Technical input from the Professional Heads. The Professional Heads are responsible for defining the remit for all “VolkerRail specific (in house)” training and competency application via Training and Assessment Procedures (TAPS). The Professional Heads shall confirm the vocational competency of all internal trainers.

All external training material required to deliver client specific competencies shall be received at a single point of entry into the company, the Professional Heads shall review external training material and confirm its suitability to ensure compliance with appropriate standards and legislation.

5.1.5 Audit

The management of audit is the responsibility of the Head of Quality and Environment. The Professional Heads are members of the Audit Working Group which is chaired by the Head of Quality and Environment. This is the forum responsible for developing the audit programme for VolkerRail and covers both process and procedural checks to monitor the effectiveness of standards and quality of work. The group determines what activities to be audited including the setting of priorities based on risk.

5.1.6 Supply Chain Management and Approval

VolkerRail will manage its supply chain through the maintenance of qualification criteria’s based on current industry systems such as Link-Up, RISAS and ISO standards. The company will only use suppliers who have met the relevant qualification criteria through audit appropriate to their scope of supply/operations.

The company will, as part of this policy, maintain a mechanism to manage supplier assurance in order to ensure compliance with current industry standards and VolkerRail’s safety certificate/operating licence commitments and arrangements.

The Commercial Director is responsible for the establishment of supply chain contract conditions in liaison with the HSQE Director and the company’s professional heads who will provide the technical/HSQE/competence requirements. The technical/HSQE/competence requirements will be in accordance with current legislation and industry standards requirements.

Professional Heads shall review all requests for inclusion on VolkerRail's approved supplier list within their sphere of responsibility. They are responsible for signing off potential suppliers as suitable for inclusion on the list, where it is deemed that approval can only be granted following audit the Professional Heads shall in conjunction with the Supplier Assurance Manager lead the audit.

5.1.7 Accident / Incident Investigation

Accident/Incident investigation is carried out in accordance with the requirements laid down in SAF/04 'Reporting and Investigation'. The Professional Heads shall lead and/or direct the undertaking of investigations into incidents and irregularities within their discipline, liaising as necessary with S&C Managers and take appropriate actions at the conclusion of events.

5.1.8 Recruitment (Engineering Personnel)

The Professional Heads shall support the business in the recruitment process for new engineering entrants to the business either as a result of a new position or an existing vacant position. This shall include preparation and maintenance of Job Descriptions/Safety Responsibility Statements and participation in interviews.

The Professional Heads shall also support the business in the recruitment processes for new engineering entrants via the graduate, foundation degree and apprentice schemes. This shall include input to work placements and advice on professional progression with the engineering institutions and the Engineering Council.

The Engineering Director shall agree and sign off all Senior Engineering appointments at Engineering Manager level and above.

5.1.9 Engineers Development

The quality of the engineers we employ is what differentiates us from our competition, it is without doubt one of our Unique Selling Points (USP) when it comes to bidding for new work. The retention of these engineers in an industry that already has a shortfall is absolutely paramount, the Professional Heads have a responsibility to participate in the Engineers Development programme and provide the necessary coaching, encouragement and mentoring to promote engineering as a worthwhile profession and career.

5.1.10 Safety Validation of Organisational Change

VolkerRail will maintain an organisation adequately resourced to deliver the commitments and arrangements specified within the company Safety Certificate, the Integrated Management System (IMS) and its operating licences. Validation exercises will ensure any relevant risks associated with management structure/system structure changes are assessed for their effect prior to implementation. VolkerRail standard SAF/09 has been produced to specify the management responsibilities and arrangements. The Professional Heads will when required participate in reviews of organisational change to ensure engineering responsibilities can be adequately discharged.

5.1.11 Technical Changes

It is a requirement that, when making any technical system or operational changes which could impact on the safety of the operational railway or VolkerRail's business, the procedure set down in SAF/09 'Risk Evaluation and Assessment of Change' is followed. The Professional Heads shall provide the input necessary to allow a full review of the impact of change to be made in order to achieve compliance.

5.1.12 Industry Participation

The Professional Heads shall where appropriate represent the business on industry, national and International committees. They shall participate in working groups developing best industry practice.

5.2 Engineering Assurance Arrangements – Project Specific

5.2.1 General

VolkerRail projects follow a four stage lifecycle model comprising:

- Pre Contract phase
- Mobilisation phase
- Delivery phase
- Close phase

Engineering Assurance applies throughout the project lifecycle with engineering deliverables required at each phase of the project. The following section briefly details the four different phases and the engineering deliverables required at each phase.

5.2.2 Pre-Contract

This is the first phase in the VolkerRail project lifecycle which focuses on identifying and securing future works. It encompasses: responding to pre-qualification questionnaires (PQQ) and expressions of interest (EOI), the decision to bid, compilation and submission of the bid and the appropriate approval points.

The involvement of engineering at this stage of the process is important to ensure we give prospective clients confidence that we have robust arrangements in place for engineering assurance that facilitate our 'right first time, every time safely ethos.

The pre-contract phase ends when the award of the contract is known; on winning the contract a formal tender handover meeting is initiated to transfer the bid details to the project manager and the project team.

Key Engineering Deliverables:

- Input to the PQQ regarding key engineering resource to discharge roles of Contractors Engineering Manager and discipline specific Contractors Responsible Engineers
- Review of the proposed organisation to deliver the works and ensure that arrangements for robust Engineering Assurance are included
- Engineering review of ITT, Technical Workscope
- Input to bid process regarding methodologies
- Preparation of key tender documentation including Engineering Management Plan
- Advice on selection of sub-contract organisations for design and delivery phases

5.2.3 Mobilisation

The Mobilisation phase commences when the contract has been awarded and requires decisions to be taken regarding detailed design, optioneering, technical engineering, resources, required goods & services and the commercial and organisational elements of the project. The mobilisation phase ends when designs are complete and/or the physical construction activities are formally agreed. Please note however that the mobilisation and construction phases can run in tandem where phased design and construction methods are in place.

Management approvals are required for certain activities in this phase which are achieved through review meetings. Approvals are required for design output, procurement strategy, staffing requirements, construction methods, project processes and budget review prior to making financial and/or contractual commitments.

Key Engineering Deliverables:

- Participation in tender handover meeting and agreement of engineering resource to deliver Engineering Assurance
- Standards Briefings as required
- Identification of TNC or derogation required

- Engineering Director to authorise CEM nomination
- CEM to authorises CRE nominations
- Design Management including design reviews with designer
- Interdisciplinary Check (IDC)
- Approved for Construction Design (AFC) sign off by CEM
- Input into Construction Phase Plan
- Production of Engineering Management Plan
- Production of Work Package Plans (survey)
- Production of Inspection and Test strategy and schedule
- Production of Template for Inspection and Test Plans
- Production of Template for Health and Safety File information
- Assess competence of in-house and sub-contract labour

5.2.4 Delivery

The delivery phase commences when approved designs are in place, during this phase, management against a detailed programme is necessary to ensure that the project is executed as effectively as possible and delivers to the specified requirements of the client. Maximisation of revenue is sought through the identification of opportunities and through professional change control processes. Close monitoring of progress and cost control ensure increased margin generation.

Key Engineering Deliverables:

- Participation in project reviews as required
- Attendance at Factory Acceptance Testing (FAT) as required
- Implementation of Inspection and Test Plans for completion at end of each shift
- Review of completed I & T Plans
- Identification of non-conformances
- Standards Briefings as required
- Identification of TNC or derogation required
- Collection of key project information for inclusion into Health and Safety File
- Production of Commissioning Strategy including Entry into Service (EIS) requirements
- Completion of Engineering Compliance Certificates
- Preparation of Work Package Plans
- Preparation of lift plans as required
- Preparation of ALO documentation as required

5.2.5 Close

This phase seeks to ensure the project is handed back to the satisfaction of the client and other key stakeholders and that all hand-back documentation is completed, audited and provided to the client.

All resources are demobilised and final accounts are agreed with the client and relevant supply chain and subcontractors used throughout the contract. Document management facilities and IT systems are closed and archived as relevant.

The project performance is formally reviewed and lessons learned communicated with the wider organisation.

Key Engineering Deliverables:

- Handover documentation including:
  - Inspection and Test documentation
  - Health and Safety File documentation
  - Entry into Service documentation
  - Engineering Certificates of Completion
  - As built drawings and records

- Participate in lessons learnt reviews as required

5.3 Engineering Management for Projects

5.3.1 Management Arrangements

a) Background to Requirements

Only one organisation can be in control of an element of the infrastructure at any one time. This shall normally be laid down in the Asset Management Plan by the client.

As a competent contractor, VolkerRail has to ensure that the engineering product is delivered to the correct Specification, Design, Technical Standards and Quality. This shall include processes that will not cause damage to the installed infrastructure leading to potential latent defects which have the potential to cause failure at some time in the future. This is a safety critical responsibility.

VolkerRail requires competent engineers (previously approved internally) to be identified and proposed for acceptance by the client. These people are called CEM's and CRE's. This handbook identifies how this shall be undertaken within VolkerRail, prior to onward submission of nominees to the clients Designated Project Engineer (DPE) for approval. It is VolkerRail mandated policy that Project Managers shall utilise equivalent and appropriate arrangements on projects for other clients.

5.3.2 Appointment to Key Engineering Roles

a) Background to Requirements

The Engineering Director/Professional Head shall agree the individuals who are to be appointed to CEM and CRE roles. Whereas it is desirable to have the minimum number of CRE's commensurate with the scope of work, it may well be that additional appointments are necessary to ensure the relevant elements are correctly discharged. As an example, it is unlikely that a CRE (Signalling Design) would have the competence (or availability) to undertake the role of CRE (Signalling Construction).

Disciplines:

Design	Construction	Scope (Or Sub Disciplines or Specialities)
Building Services	Building Services	Mechanical/Electrical
Civils	Civils	Structures/ / Earthworks /Buildings/ Other
DC Conductor Rail	DC Conductor Rail	Track/Electrification
Electrification	Electrification	Contact systems /Traction Power Distribution/DC/AC/SCADA
Track	Track	Plain Line or Switch & Crossings
Plant (M & EE)	Plant (M & EE)	Fixed Plant, Switch Heating, Signalling Power Supplies
Signalling	Signalling	Lineside equipment, Interlockings and Systems
Telecoms	Telecoms	Operational and Retail Telecommunications

5.3.3 Design and Delivery Phases

NR/L2/INI/02009 details a number of different delivery models dependent on the type of project being undertaken and the engineering interface management requirements. The appointment of CEM/CRE shall be made in accordance with the relevant delivery model as detailed below.

NR/L2/INI/02009 requires that design produced by any designer integrates correctly with that of all other designers and the design of all existing infrastructure. NR/L2/INI/02009 requires that all Design Organisations coordinate their design and co-operate with each other in order to achieve this and to eliminate incompatibilities.

A key part of the integration process is the Interdisciplinary Check (IDC). NR/L2/INI/02009 requires that the method of design integration including the method of implementing the IDC is agreed and documented between all appropriate Design Organisations and included in all Contracts as appropriate.

The CEM/CRE should participate in the Design Phase IDC particularly with a view to a Constructability Review.

5.3.4 Design Integration Management

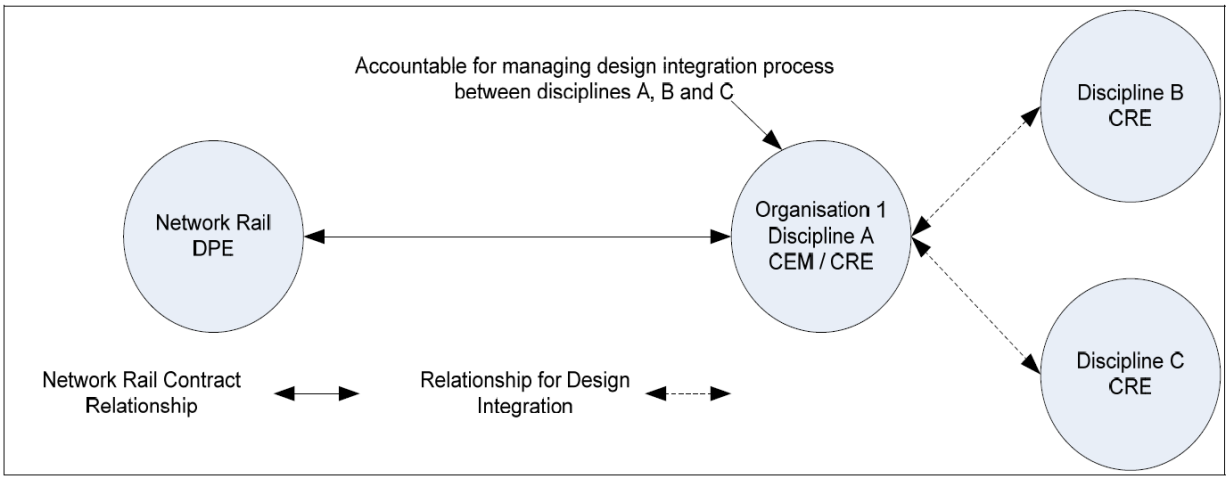
The CDM Regulations recognise that a Client may appoint several designers; listed below are the principal options available to projects in order to achieve an integrated design; however further options may be considered subject to all parties coming to a complete understanding of the methodology to be employed. The three principal options are:

a) Design Integration Option 1 – Single Organisation's CEM manages and integrates design;
b) Design Integration Option 2 – DPE integrates design;
c) Design Integration Option 3 – A 'Lead' Design Organisation is appointed to integrate design.

Design Option 1 is where a single organisation is allocated responsibility by Network Rail for management of all design associated with a project therefore that organisation is accountable for co-ordinating the output from and managing co-operation between all Design Organisations producing design for the project.

The CEM for the single organisation is accountable for the implementation of the process that integrates all the design for a project. This includes the management of the IDC process. The DPE supports the process as appropriate and verifies that co-ordination and integration takes place.

The CEM and all CREs retain full responsibility for their design including its capability to interface correctly with other designs and submit to Network Rail for Acceptance.



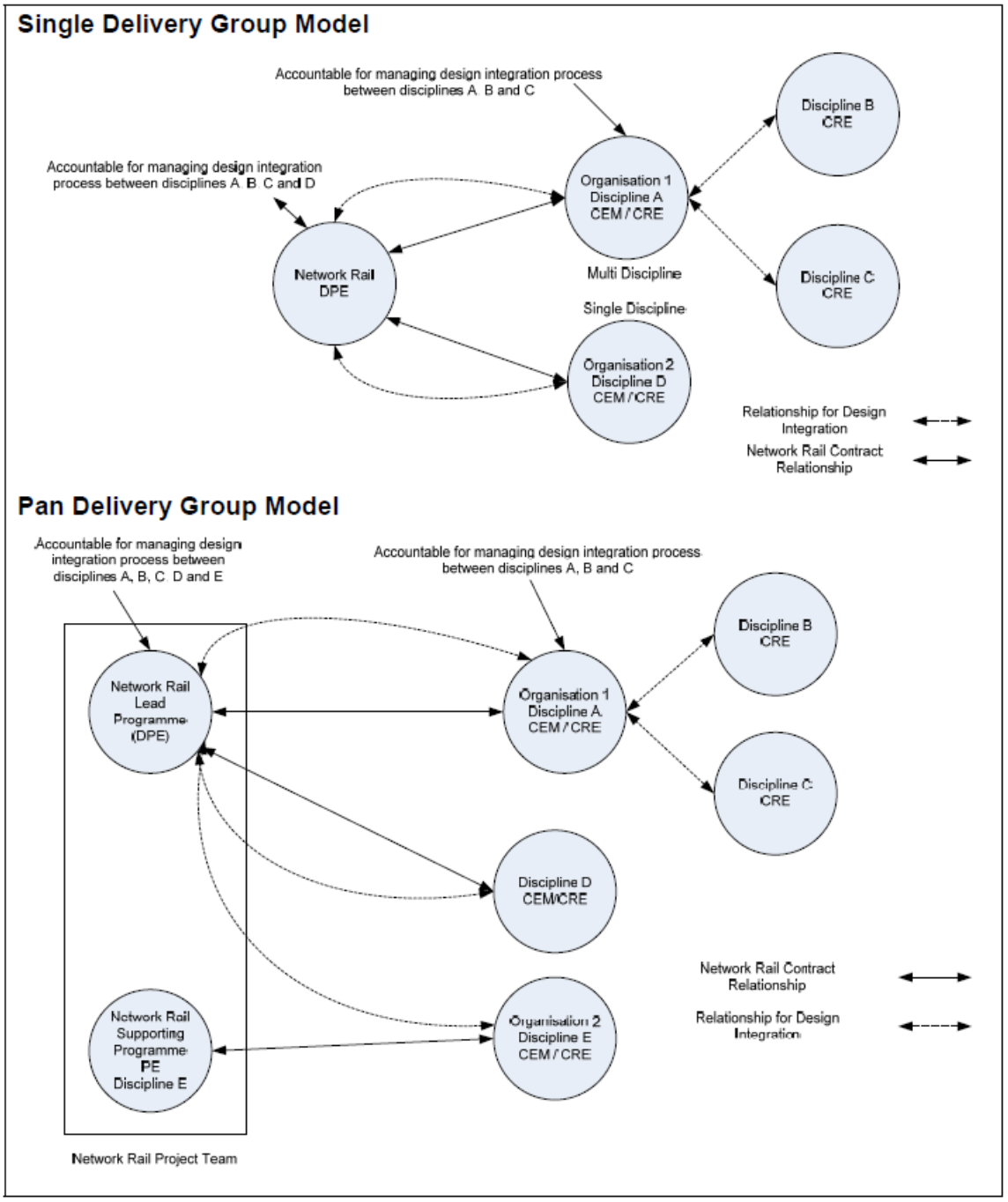
Option 1 Single Organisation's CEM manages and integrates design

Design Option 2 is where Network Rail allocates direct responsibility to a number of Design Organisations for the Design associated with a project.

The Client PM is accountable for co-ordinating the output from and managing co-operation between all Design Organisations producing design for the project.

The DPE for the project is accountable for the implementation of the process that integrates all the design for a project; this includes the facilitation of the IDC (or a joint IDC / IDR) process. All Design Organisations attend the IDC (or joint IDC / IDR) arranged as applicable to the design under consideration.

Each CEM retains full accountability for the design including its capability to interface correctly with other designs and its submission to Network Rail for Acceptance.



Option 2 DPE Integrates Design

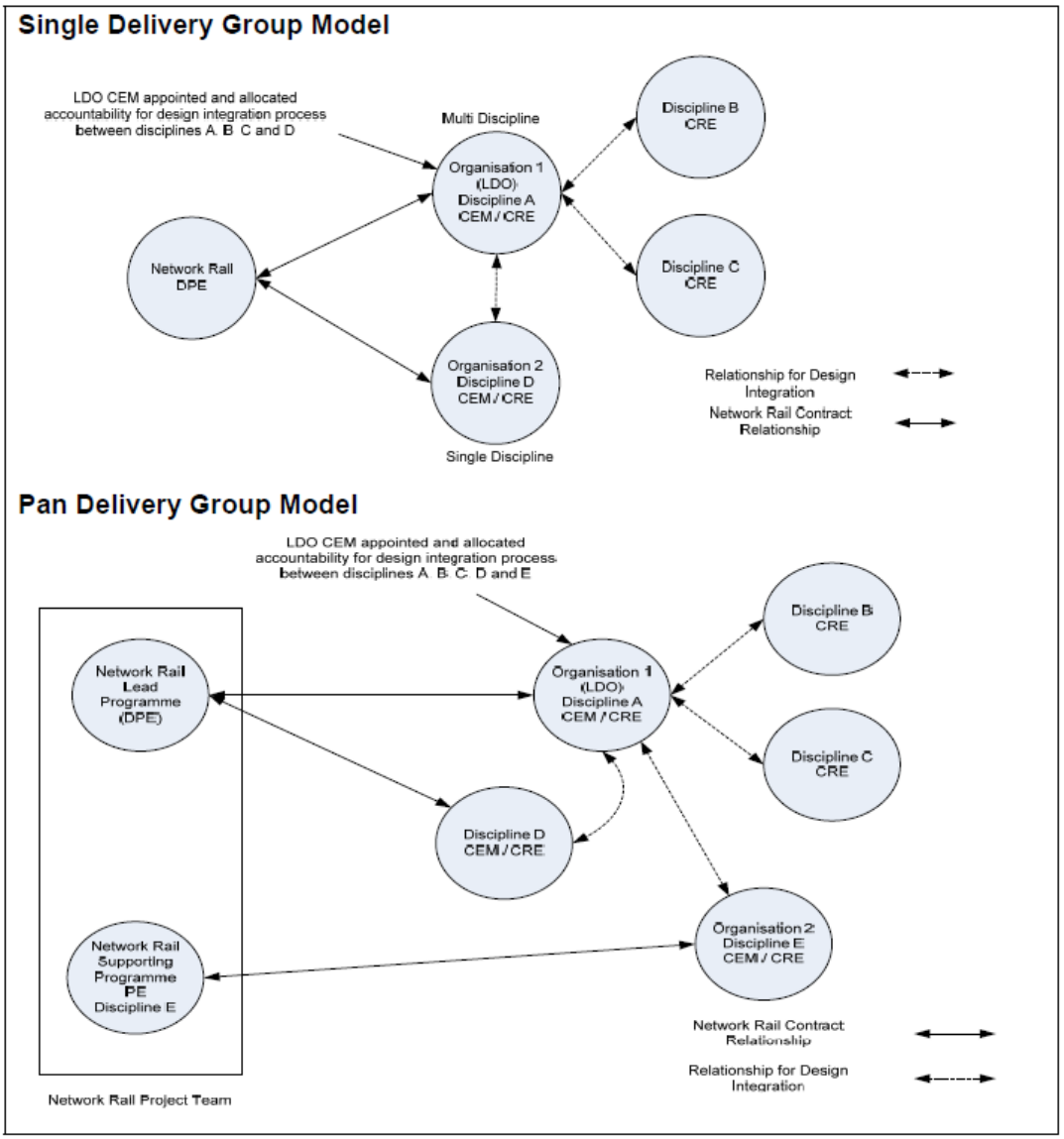
Design Option 3 is where Network Rail allocates responsibility to a number of Design Organisations for the Design associated with a project. One Design Organisation is appointed as a Lead Design Organisation and the CEM in that Design Organisation is therefore accountable for co-ordinating the output from and managing co-operation between all Design Organisations producing design for the project.

If this option is implemented then the appointment as a Lead Design Organisation is recorded and included in the specification issued for the works and therefore included in any Contract.

The CEM for the Lead Design Organisation is accountable for the implementation of the process that integrates all the design for a project; this includes the management of the IDC process. The DPE supports the process as appropriate and undertakes IDR to review that co-ordination and integration takes place.

The CEM and CREs retain full responsibility for their design including its capability to interface correctly with other designs and submit to Network Rail for Acceptance.

This option will also apply where Network Rail appoint a Design Coordinating Organisation who are not producing any design. In this instance Discipline A will be considered as one of the other Design Organisations in Figure A.3.



Option 3 A Lead Design Organisation is appointed to Integrate Design

5.3.5 Handover Between CEM's and CRE's

When the CEM and CRE for design and construction are separate people, a formal effective handover of documentation and knowledge between the CEM and CRE's on the design and construction phases shall be undertaken. This is to ensure there is a clear understanding of the 'Approved for Construction' design and the identified risks which shall be managed to ALARP.

5.3.6 Alliance Arrangements

Where VolkerRail is working under an Alliance arrangement with the client and other competent contractors, the CEM shall determine from other members of the Alliance their CRE's and reciprocate with details of VolkerRail CRE's and communicate these to the VolkerRail Project Team. It will be deemed, from the contract arrangements that these other contractors working in the alliance team are competent and there will be no requirement for VolkerRail to formally approve these CRE's. The PM shall arrange processes for these people to satisfactorily discharge interdisciplinary roles and responsibilities.

5.3.7 Joint Venture Arrangements

A clear understanding needs to be established by the VR Project Manager (or other Senior Manager if no Project Manager), similar to that in 5.3.6.

5.3.8 Appointment to Key Engineering Roles

a) Appointment of CEM

The Project Manager shall propose to the Engineering Director an individual to undertake the role of CEM. The Engineering Director is responsible for authorising the CEM. This shall be done by reviewing the individual's record of work experience, competency and interview. This review can be recorded using an appropriate checklist.

The CEM shall normally have Chartered Engineer status with the Engineering Council and be registered with an appropriate professional engineering institution. Other auditable qualifications appropriate to the work being undertaken may be acceptable subject to agreement with the Engineering Director.

b) Appointment of CRE

The CEM shall propose an individual to undertake the role of CRE. The CEM shall review the individual's record of work experience and competence and assess his availability to undertake the role. Where necessary the CEM shall conduct an interview with the proposed CRE to confirm suitability and availability. This review can be recorded using an appropriate checklist. The Professional Heads / Discipline Engineering Managers are consulted on all individuals proposed to undertake the role of CRE for their specific discipline, and approve the proposal. The CEM is responsible for authorising the CRE appointment.

The CRE will ideally be a member of the relevant professional engineering institution and be registered (C Eng. or I Eng.) with the Engineering Council. Individuals with lower Professional Qualifications but with extensive experience shall be considered for the role by the CEM appointed for the project.

c) CEM / CRE Register

The Engineering Director shall maintain a register of all individuals who have been interviewed and established as competent to act as CEM and CRE for their particular discipline. This shall be maintained electronically on the VolkerRail Intranet.

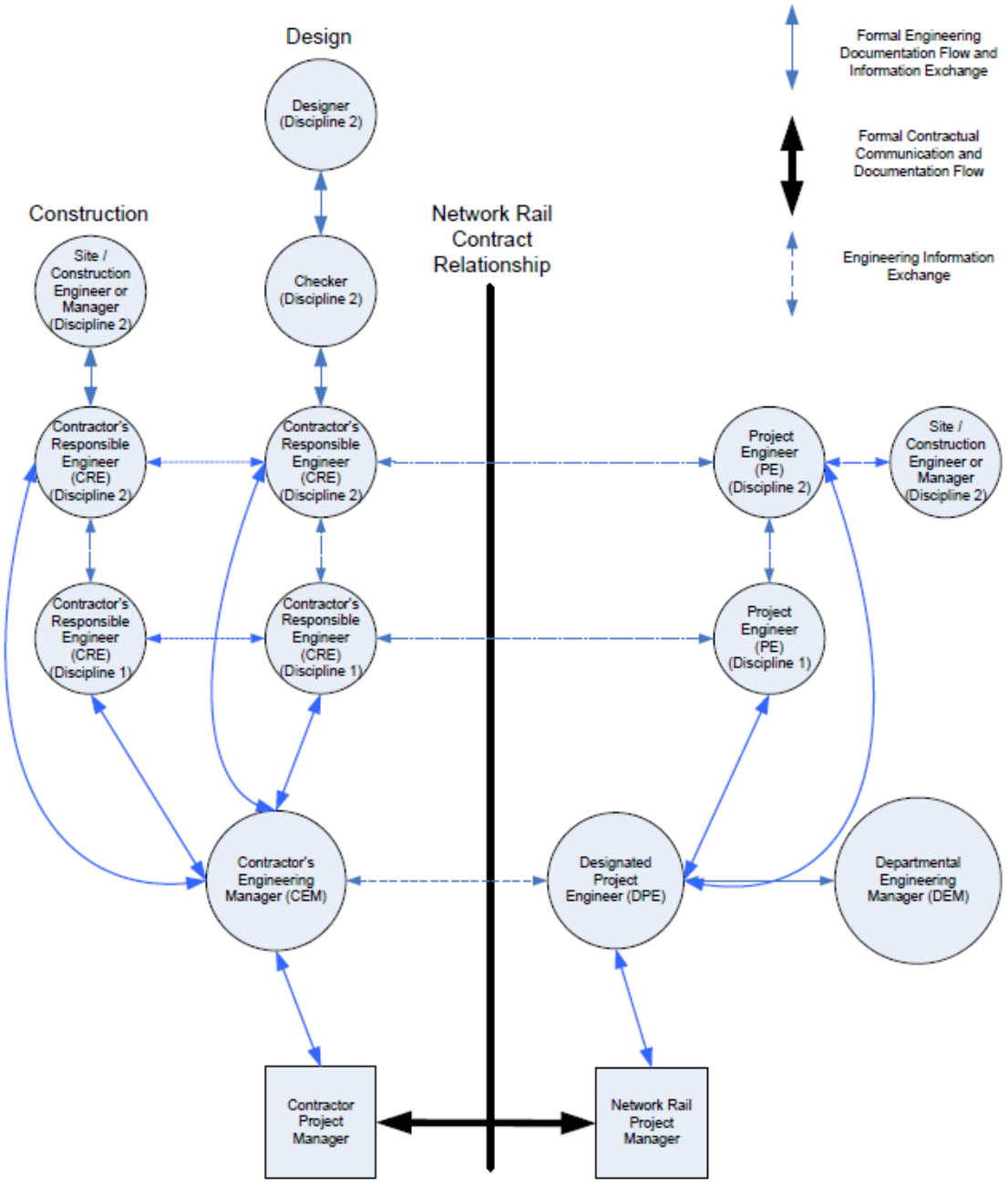
The Professional Heads shall qualify on the register suitability for large complex or small projects and design/ construction phase. They shall further define individuals who are deemed suitable to mentor new or less experienced CRE's, ideally on smaller / simpler projects. CREs under mentorship shall also be shown on the list.

d) Sufficiency of Resource

The Engineering Director/Business Managers shall overview the business commitments in accordance with projected business growth plans, tendering activity etc. and ensure that there are sufficient people of the correct calibre and experience in their business to enable robust coverage of these responsibilities in accordance with SAF 09 Safety Validation.

e) Engineering Interfaces

Network Rail DPE has a supporting group of Discipline specific Project engineers supporting him. NR/L2/INI/02009 lays down an 'Engineering Team Relationship' organogram allowing Engineering Information Exchange between the Clients PE and Volker Rail CRE similarly between the Clients DPE and Volker Rail CEM.



Engineering Team Relationships Client / Contractor

5.3.9 Key Engineering Responsibilities

The CEM shall ensure that:

- They are fully conversant with the requirements and responsibilities identified in NR/L2/INI/02009
- They have adequate time to undertake the role
- An Engineering Management Plan (EMP) is produced for the project
- The requirements of VolkerRail Standards are identified and briefed to the CREs and other members of the project team as required.
- A documented IDC process is initiated and managed with appropriate actions to ensure identified issues are effectively closed out.
- The interfaces are clearly identified and documented between all discipline CREs/PEs.
- Establish and implement technical change and query processes throughout the life of the project.
- Establish a process that identifies and briefs the project team on changes to engineering standards affecting the Project - see clause 8.2.2 for details of the Company briefing arrangements.
- Where a potential non-compliance with standards is identified, for site or contract specific standards, the CEM shall review the applicable information, and if considered justified submit an application in accordance with NR/L2/EBM/STP001 'Network Rail Standards Management – Process Requirements' to the DPE's for consideration. For a potential variation to NR standards or deviation to Railway Group Standards, the CEM shall review the applicable information, and if considered justified submit the details to the relevant Professional Head in accordance with VolkerRail procedures.
- The CEM is accountable for all design and / or construction as applicable to the specified works; specifically its ability to integrate with all other design, construction and existing infrastructure, and its compliance with all applicable standards, legislation, Contract requirements and specifications
- Any design issued to Network Rail for Acceptance shall be approved by the CEM confirming that such design:
  - has been produced by competent designers;
  - has been subject to a Design Check by competent checkers to verify that the information accords with the Contract and the applicable standards communicated in the Contract;
  - includes evidence that the designer has considered design risk as required by the Construction (Design and Management) Regulations and eliminated such risks, where reasonably practical to do so, or communicated the residual risk in the design documents;
  - accompanied by the IDC certificate with all actions closed out and the ECC.
- Approve all designs as 'Approved for Construction' following completion of the design acceptance process including satisfactory close out of all DRNs. Where AFC design is not available prior to installation, formal derogation from the Engineering Director shall be sought in advance.
- The CEM is accountable for assessing the competence of all Contractors Responsible Engineers (CRE) required to work for or on behalf of the design and/or construction organisation. The CEM shall ensure that all appointed CREs have the time to undertake their responsibilities in accordance with NR/L2/INI/02009. The relevant Professional Head shall be consulted on the proposed CRE, and the CEM shall authorise the appointment.
- The CEM shall not allow any products, materials, equipment, infrastructure and other systems to be utilised that are not approved for use in accordance with current Network Rail product acceptance standards.
- The CEM shall implement a risk management process that:
  - identifies and mitigates risk;
  - communicates details of unmitigated risk;
  - supports the NR project Risk Log.
- The CEM shall produce one or more Engineering Compliance Certificates as required by NR/L2/INI/02009. The VolkerRail process requires the CRE (Design) to sign the form before submission to the CEM.

The CRE shall ensure that:

- They are fully conversant with the requirements and responsibilities identified in NR/L2/INI/02009
- They have adequate time to undertake the role
- They comply with the requirements of VolkerRail Standards and that these requirements are briefed to other members of the project team as required.
- A process is implemented that confirms the competence and availability of resources to be employed on the project, by that organisation, in order to carry out all required engineering and technical responsibilities safely and in the agreed timescales e.g. designers, checkers, site managers, site engineers, construction / installation staff, construction managers etc.
- Where Network Rail standards specify the nomination and appointment of Checkers the CRE (Design) shall propose a suitable competent person for acceptance by the relevant Project Engineer.
- They take responsibility for confirming that that the discipline design and / or construction comply with all applicable standards, legislation, Contract requirements and specifications, this is to include ‘as built’ records.
- They shall operate a technical query process to ensure all engineering queries are resolved to the satisfaction of all parties in a timely manner.
- Where a single CRE has been appointed for an engineering discipline they are responsible for managing the interface between design, installation and testing activities.
- Where multiple CREs are proposed for a single engineering discipline each CRE shall have a clear understanding of their responsibilities. They shall pay particular attention to the management of interfaces between design, installation and testing activities.
- The CRE accountable for design shall co-operate with other designers i.e. Participate in IDCs, provide information on any significant risks associated with their design and avoid exposing those involved in constructing and maintaining the designed infrastructure (including demolition) to any foreseeable risks.
- The CRE accountable for design shall implement all design production and checking, including mentorship arrangements where applicable, processes applicable to their specific engineering discipline. The CRE shall approve and endorse all design to confirm this has been achieved.
- The CRE accountable for design shall participate in IDCs including those implemented by another organisation which encompass their engineering discipline, as appropriate to the work being undertaken. The IDC shall be considered complete when the CRE confirms that their design interfaces correctly with the design produced by other interfacing engineering disciplines.
- They participates in all applicable IDCs of other engineering disciplines to confirm that their design and construction interfaces correctly with the design produced by their own engineering discipline. CREs shall endorse all such design documentation to confirm their acceptance of the design documentation under consideration from the perspective of its acceptability to interface correctly with the design produced by their own engineering discipline. Alternatively where no interfaces exist the CRE may give a positive indication that there is no impact on the design produced by their own engineering discipline.
- The CRE responsible for design shall not, without the agreement of the DPE, include any products, materials, equipment, infrastructure or other system in their design that are not approved for use in accordance with current Network Rail product acceptance standards.
- Confirm suitability and approve all Work Package Plans.
- They accept and approve all task briefing Sheets or formally delegate.
- Inspection and Test Plans with suitable ‘Client Witness’ points are produced for all stages of the works

5.3.10 Interface Management

a) Interdisciplinary Check and Management

One of the principle roles of the ***CEM/CRE*** is to ensure integrity/ constructability of all interdisciplinary cross functional engineering matters from design through construction to project completion and handback. These requirements will be detailed in the project Engineering Management Plan produced in accordance with NR/L2/INI/02009.

5.3.11 Engineering Deliverables

The CEM shall identify from the Technical Workscope and other agreed project documentation, the list of engineering deliverables with appropriate milestones. The CEM shall ensure that these deliverables are identified to the Project Manager and that they are listed by the Project Manager through the AMP process.

5.3.12 Success Criteria

This can include some of the following:

- Successful meeting of GRIP requirements
- Successful EIS
- Meeting Programme milestones
- Successful close out of DRN's and DRN's to ALARP
- Successful close-out of IDC Actions
- Construction 'snagging' to ALARP
- Successful audit/end-product check regime in place and any NCR's closed out
- Identification of project/business Risk/Mitigation

5.3.13 Training & Competence

The CRE shall ensure that all project delivery personnel on the project have the appropriate competencies to undertake the tasks they are undertaking. This includes where the delivery personnel are from the approved supply chain. The Competence Systems Manager maintains a competency matrix for all disciplines.

Where the CRE identifies gaps in competency they shall discuss the issue with the CEM/Project Manager and recommend appropriate action to address the problem which may involve training/retraining or the use of alternative personnel.

5.3.14 Standards and Changes to Standards

The CEM shall confirm that all CREs have a process in place to identify and brief changes to engineering standards and processes to their engineering team and any other team members required to implement such standards. This includes the briefing of all relevant staff and sub-contract staff or contractors.

The CEM shall establish and implement an effective technical change control process throughout the life of the project.

The CEM shall establish a process that identifies and briefs the project team on changes to engineering standards affecting the Project. Any standards or changes to standards identified as part of the project which the Professional Head will not be aware of through the normal national procedures, the CEM shall pass to the relevant Professional Head for review of the implications for company procedures.

Where a potential non-compliance with standards is identified, the CEM shall review the applicable information, and if considered justified submit an application in accordance with NR/L2/EBM/STP001 'Network Rail Standards Management – Process Requirements' to the DPE for temporary non-compliance or derogation as applicable; advising their project team that such a step is necessary. No action to implement a non-compliance shall be taken until the relevant authority issues a temporary non-compliance or derogation, except with the documented authority from the standard's owner or nominated representative.

5.4 Supporting Modules

This handbook shall be augmented by subject specific Engineering Assurance modules which detail the specific arrangements to be applied to ensure projects are delivered to the right quality right first time, every time safely. A full list of modules is available through the Engineering Assurance Handbook Index.

5.5 Audit Requirements

The arrangements in this handbook shall be audited on an annual basis by the Engineering Director/Professional Heads

6. DOCUMENTATION (OUTPUTS)

- CEM/CRE Nomination Forms
- Project File
- Engineering Management Plan
- Engineering Assurance Handbook Index