Thameslink Programme

London Bridge Station & Civils (LBS&C)
Engineering Management Plan

Compliance

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All references made within this document were considered correct at time of approval.

Supply

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Control

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Version History

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<tr>
<td>02</td>
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<td>03</td>
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<td>• Updated organisation and responsibilities&lt;br&gt;• Removed construction management aspects which are covered in the Construction Management Plan,&lt;br&gt;• Updated CSM process&lt;br&gt;• Updated to reflect changes with CDM 2015 Regulations</td>
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<td>04</td>
<td>Jan-2017</td>
<td>• Moved abbreviations to section 4&lt;br&gt;• Document restructured to make it easier to comprehend and review&lt;br&gt;• Added sub-contract design management process&lt;br&gt;• Updated Temporary Works, CSM and organisation sections&lt;br&gt;• Remove reference to Programme Readiness</td>
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<td>• Organisational updates and Assurance Verification&lt;br&gt;• Construction before AFC</td>
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1. Purpose

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The purpose of this document is to specify how the Infrastructure Projects, Thameslink Programme, London Bridge Station and Civils (LBS&C) Projects will comply with, NR/L2/INI/02009 Engineering Management for Projects and the Thameslink Programme Engineering Management Plan (N000-01000-NRT-STR-EG-000002) and how those duties under CDM Regulations 2015 which relate to Engineering Assurance will be discharged.

The document will define and provide guidance on:

- Clarification on the application of Engineering Management for Projects (NR/L2/INI/02009) on LBS&C Projects.
- The policy for provision of design, construction and engineering to LBS&C Projects.
- The management structure of the Engineering function within LBS&C Projects.
- The responsibilities for managing technical interfaces between the different projects making up the TLP.
- Engineering organisation integration between, TLP, LBS&C projects, LBS&T (Railway Systems) projects, High Capacity Infrastructure (HCI) and other Delivery Groups engaged on the Thameslink Programme.
- Clarity of engineering requirements for Entry into Service, As-built information and Handback deliverables

2. Scope

This document applies to all projects delivered by the LBS&C and sets out the management processes and procedures which are to be followed during the GRIP lifecycle of the LBS&C Projects. For clarity these are

- London Bridge Station Regeneration (LBSR) – GRIP 5-8
- London Dungeons Retail – GRIP 3-8
- Structure Strengthening Project (SSP) – GRIP 3-8
- Bermondsey Dive-under (BDU) – GRIP 5-8
- Borough Viaduct (BV) – GRIP 7-8 (whilst the works are now complete, the structure is still not handed over to Network Rail Asset Management).

[Note:
. GRIP 4 delivery of London Bridge Station and Bermondsey Dive-under was managed under the Thameslink KO2 Engineering Management Plan - N000-01000-NRT-PLN-EG-000009]
. Whilst the Borough Viaduct works are now largely complete, the new assets are still managed by the KO2 teams and it is therefore included as part of the scope covered by this document.

The scope of this EMP relates to the Engineering activities which support the works to be undertaken by LBS&C. All engineering related activities undertaken by LBS&C Project team, Lead Design Organisations (LDOs), Delivery Partners and Main Design Contractors (MDCs), Principal Designers, Principal Contractors, Main Contractors and sub-contractors shall comply with the requirements of this plan.
3. **Compliance Requirements**

This plan contains mandatory requirements applicable to LBS&C Projects and shall be complied with by Network Rail and its contractors where applicable from 1st February 2017.

3.1 **Application of Organisation Specific Process and Procedures**

Owing to the size, complexity and number of projects, it has been recognised that the Programme’s engineering activities cannot be managed solely through the application of Network Rail Corporate Standards and GRIP.

To impose a degree of consistency and control over engineering activities, TLP has developed and implemented a bespoke Integrated Management System (IMS).

The IMS manual N000-NRT-MAN-MD-000001 provides a high-level overview of the Integrated Management System. It covers the intent, scope, structure and organisation of the management system.

Where engineering processes and procedures rely on input from others these interfaces and activities are shown.

Compliance to the documents contained in the IMS is mandatory. As such, all employees, irrespective of their position, have a duty to take all reasonable measures to comply with those IMS requirements that are applicable to their activities.

The DPE shall document any deviation from the IMS, for agreement with the DEM and approval by the TLP Standard Owner (refer to N000-01000-NRT-PMP-EG-000022, ‘Non Compliance with Standards’).

4. **Review and Update of Document**

This document shall be reviewed as and when necessary but as a minimum annually by the DEM.

5. **Key Reference Documentation**

NR/L2/INI/02009 Engineering Management of Projects
NR/L2/CIV/003  Engineering Assurance of Building and Civil Engineering Works.

NR/L2/ELP/27311  Engineering Assurance Requirements for Design and Implementation of Electrical Power Engineering Infrastructure Projects

NR/L2/TEL/30022  Engineering Assurance Arrangements for Communications Engineering Schemes and services

NR/L3/CIV/151  Engineering Assurance of Standard Designs and Details for Building and Civil Engineering Works

N000-NRT-MAN-MD-000001  Integrated Management System Manual

N000-01000-NRT-STR-EG-000002  TLP Programme Engineering Management Plan

N000-01000-NRT-PRO-EG-000013  Management of Standards

N000-01000-NRT-PRO-EG-000026  Changes To Approved Designs

N000-01000-NRT-PLN-EG-000005  Technical Interface Management Plan

N000-01000-NRT-STR-EG-000011  Central Engineering Team Engineering Management Plan

N000-01000-NRT-PP-EA-2222844  TLP System Safety Strategy

N000-01000-NRT-PLN-EG-000004  Infrastructure RAM Management Plan

N000-01000-NRT-PLN-EG-000003  Infrastructure Requirements Management Plan

N000-01000-NRT-PRO-EG-00009  Survey and Mapping Grids

N000-01000-NRT-PRO-EG-00015  TReqS Procedure

N000-01000-NRT-PRO-EG-000023  Generic Survey Procedures

N000-01000-NRT-GDN-EG-000007  ProjectWise Guidance for Project Teams managing CAD Data

N000-01000-NRT-PRO-EG-000005  Engineering CAD Procedure

N000-01000-NRT-PRO-DM-000001  Thameslink Programme Document Control Procedure

N000-NRT-GDN-EG-000009  Guidance for 3D CAD Modelling

N000-NRT-PRO-EG-000031  The Management and Implementation of Project Advice Notes (PAN’s) in TLP

N420-NRT-PLN-EG-000011  Construction Management Plan Thameslink KO2 Station and Civils Works

N000-01000-NRT-PRO-SQ-000001  Application of CDM on Thameslink

PAN/B&C-E/GEN/ADV/0090  Construction Management Plan

PAN/PMSE-E-CD-INS-0064  Review of Engineering Deliverables

N420-COT-ERP-MD-000008  Costain Design Management Plan
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<td>N420-SKA-PLN-CS-000013</td>
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5.1 Document Hierarchy

The Programme Integrated Management System (IMS) Hierarchy (showing association of Engineering Management Plans) is shown below:

Other Key EMPs within the TLP Programme are:

- CET Engineering Management Plan - [N000-01000-NRT-STR-EG-000011](#)
- N423 HCI EMP – [N423-NRT-PLN-EG-000001](#)
# Abbreviations

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<td>AFC</td>
<td>Approved for Construction</td>
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<tr>
<td>AIR</td>
<td>Approvals for Issue Record</td>
</tr>
<tr>
<td>ASPRO</td>
<td>Asset Protection</td>
</tr>
<tr>
<td>ALARP</td>
<td>As Low As Reasonably Practicable</td>
</tr>
<tr>
<td>CDM</td>
<td>Construction Design and Management (Regulations) 2007</td>
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<tr>
<td>CEM</td>
<td>Contractor's Engineering Manager</td>
</tr>
<tr>
<td>CET</td>
<td>TLP Central Engineering Team</td>
</tr>
<tr>
<td>CIBSE</td>
<td>Chartered Institution of Building Services Engineers</td>
</tr>
<tr>
<td>CIP</td>
<td>Competent Independent Person</td>
</tr>
<tr>
<td>CIP</td>
<td>Construction Manager</td>
</tr>
<tr>
<td>CRE</td>
<td>Contractors Responsible Engineer (Discipline)</td>
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<td>DCP</td>
<td>Design Control Point</td>
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<td>DCVR</td>
<td>Design Compliance Verification Report</td>
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<td>DEM</td>
<td>Departmental Engineering Manager</td>
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<td>Design Integration Schedule</td>
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<td>Designated Project Engineer</td>
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<td>Enter into Service</td>
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<td>Engineering Management Plan</td>
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<td>Employers Representative</td>
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<td>Engineering Resource Manager</td>
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<td>EVR</td>
<td>Engineering Validation Review</td>
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<td>GRIP</td>
<td>Governance for Railway Investment Projects</td>
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<td>HoE</td>
<td>Head of Engineering</td>
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<td>HSEA</td>
<td>Health Safety Environment Assurance</td>
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<td>IDC</td>
<td>Inter-disciplinary Design Check (carried out by Supplier)</td>
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<td>IDR</td>
<td>Inter-disciplinary Design Review (carried out by NR)</td>
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<td>IET</td>
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<tr>
<td>IM</td>
<td>Integration Manager</td>
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<td>LBAP</td>
<td>London Bridge Area Partnership</td>
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<tr>
<td>LBS&amp;C</td>
<td>London Bridge Station and Civils</td>
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<td>LBSR</td>
<td>London Bridge Station Redevelopment</td>
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<tr>
<td>LBS&amp;T</td>
<td>London Bridge Signalling and Track</td>
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<tr>
<td>LDE</td>
<td>Lead Discipline Engineer (CET)</td>
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<td>LDO</td>
<td>Lead Design Organisation</td>
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<td>LU</td>
<td>London Underground</td>
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<tr>
<td>MDC</td>
<td>Main Design Contractor</td>
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<td>NR</td>
<td>Network Rail</td>
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<td>PC</td>
<td>Principal Contractor</td>
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<td>Principal Designer</td>
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<td>Principal Designer Representative</td>
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<td>Project Engineer (Discipline)</td>
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<td>PM</td>
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<td>Railways and Other Guided Transport Systems (Safety) Regulations 2006</td>
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<td>RS</td>
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<tr>
<td>SCE</td>
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<td>SCM</td>
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<td>SEMP</td>
<td>System Engineering Management Plan</td>
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<td>SLA</td>
<td>Service Level Agreement</td>
</tr>
<tr>
<td>SM</td>
<td>Site Manager</td>
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<td>SPE</td>
<td>Senior Project (or Programme) Engineer</td>
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<td>Senior Programme Engineering Manager</td>
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<tr>
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<td>Thameslink Programme</td>
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<td>TOC</td>
<td>Train Operating Company</td>
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7. Definitions

Definitions and responsibilities are as set out in Engineering Management for Projects (NR/L2/INI/02009). Some additions and clarifications are included in this document.

Unless otherwise stated for the purposes of this plan the term PEM refers to the LBS&C Programme Engineering Manager who will also be appointed to the DEM role under NR/L2/INI/02009. From herein, only the term DEM will be referred to for clarity.

7.1 London Bridge Area Partnership (LBAP)

The London Bridge Area Partnership consists of the principal delivery partners on KO2 Inner Area, being Costain, Balfour Beatty, Siemens, and Skanska. These organisations are working together with NR to deliver an integrated programme of works.

7.2 Lead Design Organisation (LDO)

The LDO is accountable for co-ordinating the output from and managing co-operation between all MDCs producing design for the project within the defined geographical boundary of responsibility.

The LDO is accountable for the implementation of the process that integrates all the design for a project within the defined geographical boundary of responsibility; this includes the management of the IDC process. The DPE shall support the process as appropriate and verify that co-ordination and integration takes place.

The LDO is accountable for defining and recording the responsibilities of each designer at the boundaries between geographical areas and within geographical areas where projects overlap.

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

7.3 London Bridge Station – Collaboration

In order to promote the efficient and effective management of interfaces between the station & infrastructure works packages and the operational railway system, a collaborative management approach has been set up between the contractor undertaking the station works and the contractors providing the track and signalling works within the London Bridge Area geography by forming the “London Bridge Area Partnership”.

<table>
<thead>
<tr>
<th>TPS</th>
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<tr>
<td>TReqS</td>
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</tr>
<tr>
<td>V&amp;V</td>
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</tr>
</tbody>
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This approach is designed to promote an open relationship between the Parties and the Employer whereby issues are jointly discussed and resolved in real time. There is alignment of all parties intent to deliver or assist in providing timely submissions and approvals, a reduction in man-marking, and issues are seen as challenges rather than problems.

For this arrangement to work, all parties will need to invest in their people. A revision in mind-set will be required to enable people to work to shared objectives alongside each other whilst supporting their own corporate goals.

A contractor / client integrated team has been established to deliver the London Bridge Station Redevelopment consisting of staff from both Network Rail and Costain (main contractor). The London Bridge organisation will principally be formed of two sub-teams namely:

- Programme Management Office (PMO) – Client
- Delivery Team – Main Contractor (Costain)

7.4 Programme Management Office

The PMO will effectively act as the client project management organisation responsible for administering the contractual arrangement between NR and Costain (main contractor and MDC) for London Bridge Station. For the purposes of NR’s standards/procedures, the NR PM shall be the NR Project Director or where delegated, the Programme Manager, both of whom are within the PMO.

The PMO will also act as the principal controlling interface between the Station Delivery Team and its full integration with the remainder of Thameslink KO2.

The NR Engineering Assurance team report to the NR Project Director and form part of the PMO.

The BDU and SSP projects are design and build projects being delivered by Skanska as both main contractor and MDC. The works are part of LBAP but are being delivered via more conventional Client/supplier relationship albeit with a strong focus on collaboration, linked directly to BS11000, between the NR project management team (Client) and Skanska team (main contractor and MDC).

The design responsibilities on the project are detailed in table 1 below.

<table>
<thead>
<tr>
<th>Project</th>
<th>Main Design Contractor</th>
<th>Lead Design Org</th>
<th>Principal Designer</th>
</tr>
</thead>
<tbody>
<tr>
<td>LBSR</td>
<td>Skanska</td>
<td>Skanska</td>
<td>Skanska</td>
</tr>
<tr>
<td>BDU</td>
<td>Skanska</td>
<td>Network Rail</td>
<td>Network Rail</td>
</tr>
</tbody>
</table>

**Table 1: BDU and SSP Tabulated Design Responsibilities**
8. TLP Stations and Civils Engineering Team Organisation

8.1 Central Engineering

The Central Engineering Team (reporting to the Head of Engineering) acts as Infrastructure Technical Authority for the Programme and generally comprises the Programme heads of discipline (referred as Lead Discipline Engineers in this document) as well as a number of small teams providing specialist analytical and support services to the Delivery Teams. In a small number of cases, the LDE role is combined with a delivery role in one of the Delivery Teams, and in this case the LDE acts both as a Project Engineer and, reporting via a dotted-line to the HoE, as a LDE.

The Central Engineering Team has produced the Thameslink Programme Engineering Management Plan - N000-01000-NRT-STR-EG-000002 which describes the activities carried out on behalf of the Delivery Teams, as well as those in support of the Delivery Team and for engineering assurance.

The Central Engineering Lead Discipline Engineer (LDE) is accountable for the competency of NR engineering staff on TLP for a specified discipline. Discharging this accountability shall include supporting the DEM in:

- Recruitment
- Technical induction
- Authority to Work procedure
- Competence review and development
- Graduate training

Cross reference should be made to section 13.2.

The LDE may, by prior agreement, delegate these duties where it is not possible for him or her to carry them out in person.

Where there is no appropriate LDE, the Departmental Engineering Manager shall agree alternative arrangements for assessing competence with the Senior Engineer and formally recording the arrangements.

8.1.1 Thameslink Head of Engineering (HoE)

Head of Engineering undertakes the role of Senior Engineer, and Technical Authority for the Programme.

The Thameslink Head of Engineering is the Senior Engineer referred to in NR/L2/INI/02009. Refer to Section 10.
8.2 LB S&C Engineering Team Objective

LBS&C engineering team objective is to provide infrastructure for an integrated railway system that delivers functional requirements cost effectively with due regard to Health and Safety, Environment, Quality, Operation and Maintenance, while achieving compliance with legislation, Railway Group Standards and Network Rail Company Standards, the requirements of the TLP IMS, and with minimal disruption to the existing operational railway. In addition, the objective is to achieve engineering solutions, products and outputs that:

- Are compliant with the Project remit and technical requirements
- Are produced and delivered efficiently
- Are of acceptable quality
- Represent value for money
- Are complete and co-ordinated between disciplines
- Follow due process in relation to approvals
- Can be constructed safely and efficiently
- Provide a safe, reliable and available system which can be operated, inspected and maintained within the bounds of a tolerable and ALARP risk argument
- Challenge in-efficient processes and procedures

8.2.1 Geographical Areas

The Geographical boundary between London Bridge Station and Inner Area is defined by the following diagrams (Refer to Project Wise file for current version of Boundary Diagrams):

- Street Level N000-NRT-PRO-MD-000001
- Terminating Level N420-NRT-DRG-PM-000002
- Through Level N420-NRT-DRG-PM-000003

The following organisations have LDO responsibilities:

- Costain – LDO London Bridge Station
- Skanska – LDO BDU
- Network Rail LBS&T – LDO London Bridge Inner Area (includes SSP)
- Network Rail HCI – LDO ATO/ETCS/TM

The LBS&C allocated projects are organised into two geographical areas, London Bridge Station Area and London Bridge Inner Area. Over the two geographical areas, the projects fall into LBS&C teams – London Bridge Station and Structures.

8.2.2 Organisation Structure

To facilitate collaboration, the NR Engineering Assurance team is embedded within the delivery team for day to day working but has an independent reporting line through the DEM to the LBS&C Project Director. The LBS&C organisation charts are located in the OrgPlus Enterprise tool on Connect.
The LBS&C Engineering Team organisation chart mapped against the above table is shown below:

![LBS&C Engineering Assurance team organisation chart](image)

**Figure 1: LBS&C Engineering Assurance team organisation chart**

The responsibilities division within the team is shown in the table 2. The responsibilities distribution within the team has been organised to reflect the project demands for fast and robust decision making. This is achieved by close integration with the delivery team and area ownership which corresponds to the arrangements within the Principal Contractor organisation.

The area diagrams are included in Appendix B.

Borough Viaduct structures and the Shard Concourse Roof are assets yet to be handed over to the Route Asset Managers and are currently under the control of TLP LBS&C DEM, who is currently the Asset Manager responsible for these structures and controls access to them. [Note – properties affected have all been handed back to third parties or NR Property.]
NR Project Engineering resource levels required to deliver the projects will be monitored by the DEM and discussed at Project level with the Project Director and Project Managers. Resource needs will be raised to the Project Director where conflicts arise.

The IP Discipline Engineering Resource Manager’s will work with the LBS&C projects to establish the overall resource needs for each discipline. This information will be used to prepare, maintain and deliver a resource plan for the discipline that meets the needs of the project.

The DEM shall be consulted prior to the commencement of the recruitment process for any Engineering post. The DEM will consult with the CET LDE to seek a review of competence prior to interviews.

The DEM should be further consulted at the following stages:

- Short list of applicants

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**Table 2: LB S&C Engineering Assurance Team – distribution of responsibilities**

8.3 Resources and Appointments

<table>
<thead>
<tr>
<th>Contractor</th>
<th>Costain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project</td>
<td>LBSR</td>
</tr>
<tr>
<td>Project Area</td>
<td></td>
</tr>
<tr>
<td>Western Structures</td>
<td>Urban Realm</td>
</tr>
<tr>
<td>Western Arcade &amp; Quad Arches</td>
<td>Piling, Demolition and Drainage</td>
</tr>
<tr>
<td>Main and East RC W orks</td>
<td>Heritage Façade Fixtures and fit out</td>
</tr>
<tr>
<td>Platforms and Canopies</td>
<td></td>
</tr>
<tr>
<td>DEM</td>
<td>Boris Lucic</td>
</tr>
<tr>
<td>DPE</td>
<td>Phil Carter</td>
</tr>
<tr>
<td>SPE Buildings &amp; Architecture</td>
<td>Phil Carter</td>
</tr>
<tr>
<td>PE Buildings and Architecture</td>
<td>Will Nurse</td>
</tr>
<tr>
<td>SPE Civil Engineering</td>
<td>Kevan Purcell (Deputy: Alex Sullivan)</td>
</tr>
<tr>
<td>PE Civils</td>
<td>科尔斯伍德</td>
</tr>
<tr>
<td>PE Statin Telecomms</td>
<td>Michael Frewin</td>
</tr>
<tr>
<td>PE MEP</td>
<td>Paul Gayler</td>
</tr>
<tr>
<td>PE Electrical</td>
<td>Derek Frost and Richard Burgess</td>
</tr>
<tr>
<td>Fire Engineer (support from HQ)</td>
<td>James Holland</td>
</tr>
<tr>
<td>Ergonomics (support from HQ)</td>
<td>Kate Moncrieff</td>
</tr>
<tr>
<td>Station Capacity Planning</td>
<td>Shravan Patel</td>
</tr>
<tr>
<td>Safety Case</td>
<td>Mark Lincoln</td>
</tr>
</tbody>
</table>
• Interviews
• Decision to offer

All recruitment shall be undertaken in line with Network Rail HR policy and Procedures

8.4 Appointments

The Senior Engineer shall appoint the DEM for their area of responsibility using form F0037 in NR/L2/INI/02009.

Appointments should be undertaken in accordance with Engineering Appointments procedure N000-NRT-PMP-EG-000093 in TLP IMS.
9. Safety Engineering

9.1 Safety Verification

The DPE shall assist the Project Manager and/or delivery team in determining the timing of and implementing the process by which the project will be taken into operational use.

Safety Verification shall be carried out in accordance with the Infrastructure System Safety Strategy (N000-01000-NRT-PP-EA-2222844).

A Written Scheme of Safety Verification for the Thameslink Programme, in accordance with standard NR/L2/RSE/100/02 has been prepared by Central Engineering and agreed with NRAP. It is the responsibility of the Project to produce and seek approval for individual, Project Safety Verification Plans. Note that during 2014, the Project Safety Verification Plan template and related procedure in the IMS has been updated to take further account of the Common Safety Method. As this is a changing area of legislation during the Programme, the latest Systems Safety Assurance procedures should be referred to in the TLP IMS.

9.2 Application of CDM Regulations


CDM2015 mandates attention on planning and management throughout construction projects, from design concept onwards, with the aim being that Health and Safety considerations are central to the decision making processes and information flows throughout the project lifecycle.

CDM plans have been produced for LBSR, BDU and SSP. The LBSR Engineering Team will contribute to the discharge of some of the Client Duties, on behalf of the NR Client Representative; and for SSP some of the Principal Designer duties, on behalf the NR Principal Designer Representative (PDR).

The specific Client duties, of the Project Engineering Team’s roles and the evidence required/delivered are contained within the CDM Plans. In high level terms the Project Engineering Team will actively support the processes which assure that:

- the suppliers and PDRs are carrying their roles effectively and in line with agreed process
- application of design risk management in relation to construction, maintenance and operation risk
- information on known residual risks is suitably developed and recorded in the correct documentation i.e. the preconstruction information pack (PCIP), Health and Safety File (HSF), contractors risk log
- the suppliers have competent and sufficient design and engineering resource
The specific duties will be discharged through the processes contained within this plan such as the IDR/IDC process and approval of suppliers CREs.

For reference the document numbers for the 3 CDM Plans are contained in section 5 of this document.

9.2.1 Client

NR are the Client for all the projects covered by this plan. The NR CDM Plans for LBSR, BDU and SSP all detail how the NR project teams/PMO will discharge the Client duties specific to the respective projects.

One the key new developments of CDM2015 from a Client duty holder perspective is the requirement to ‘take reasonable steps to ensure the Principal Designer complies’ with his duties under the CDM regulations.

As the technical lead on behalf of the Client Representative (Project Director) the PEM and the Project Engineering Team are a critical component in assuring the competence of key engineering staff within the supply chain, that suppliers’ designs comply with NR and Railway Group Standards as well as legislation and that significant CDM risk are managed through ARM. The responsibilities of PEM and the Project Engineering Team in relation to these work streams and how these directly relate to discharge of elements of the Client duties are detailed in the CDM plans.

9.2.2 The Principal Contractor (PC)

The Principal Contractor’s CEM, as the engineering representative of the PC’s engineering organisation, leads on all engineering issues associated with the execution of the PC role. Particular attention needs to be paid to the engineering coordination of the works of all construction organisations during the construction phase. All CEMs and CREs shall co-operate and support the PC CEM in undertaking these duties.

The PC CEM shall prepare a management ‘organisation’ chart identifying the CEM and all CRE’s along with the interfaces and responsibilities for each.

It is good practice to nominate deputies for key roles during periods of leave.

9.2.3 The Principal Designer (PD)

With the LBSR and BDU the PD is also the PC meaning the interface between the coordinators of the pre-construction phase and the construction phase is an internal one.
The Design Management Plan (for Costain) and BDU Design Execution Plan (for Skanska) detail the organisation and arrangements for delivering the PD role and interfacing with the engineering and construction elements i.e. the CEM of the PC organisation. The respective construction phase plans also detail those arrangements from the construction team’s perspective.
NR are the PD for the SSP. Skanska’s Design Execution Plan for the SSP works details how they as designer will interface with NR as the PD and with the roles within Skanska team delivering the construction and engineering elements of the PC. The NR CDM Plan for SSP details the arrangements for delivering the PD role and the evidence required for demonstrating this has been achieved. The Project Engineering Team provides critical support to the SSP Programme Manager in delivering the role of PD Representative (PDR) on behalf of NR.

9.2.4 Health and Safety Files – Technical Assurance Reviews

Health and Safety file content shall be agreed with National Records Group in advance of preparation in accordance with company standard.

The DPE shall review the technical content of the Health and Safety file to assure the completeness of the file. This will include O&M Manuals, as-built records, STQ’s & RFI’s, ITP’s and commissioning records and certificates along other technical documents required for a complete file. A DRN shall be used to review the file. The Project Manager shall not issue the file until DRN comments are closed out to the satisfaction of the DPE.

9.2.5 Application of the Common Safety Method

The Common Safety Method Risk Evaluation and Assessment (CSM REA) describes a mandatory European risk management process for the railway industry. Where there is a significant change, and this change can be technical, operational or organisational, compliance with the risk management process of the CSM REA is achieved by production of a suitable and sufficient risk assessment for the change.

If the change has an impact on safety it must be assessed to determine if the change is significant or not using the criteria defined in the CSM REA. If it is significant, the risk management process must be applied to it and if not a record of the decision and the rational for the decision must be kept.
Figure 2: Determining the significance of a change

- Each stage in the process is defined in Table 3: CSM REA Stages, below
- The scope of this process ends with step 6, assessment if the evidence is complete to address and close the hazard.
- If any hazards cannot be demonstrated to be controlled by any of the three Risk Acceptance Principles, further analysis will be required to identify relevant measures to control the risks.
- The results of the above process will be independently evaluated by the independent Assessment Body (AB) appointed by the TLP.
- The project CEM in conjunction with the DPE are responsible for putting in place a detailed process to implement CSM on their projects. The detailed arrangements are to be detailed
Table 3: CSM REA Stages

<table>
<thead>
<tr>
<th>Step</th>
<th>Stage</th>
<th>Activity</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Preliminary System Definition</td>
<td>Agree the station systems, agree what is being changed, the scope of the change. Agree the operational changes and if there are any organizational changes. Conduct a preliminary risk assessment to determine the systems that affect safety and record the decision making process.</td>
<td>To determine the significance of a change, you first have to define and agree the system(s), then assess if the system affects safety.</td>
</tr>
</tbody>
</table>
| 2    | Determine the significance of a change | Where a change has an impact of safety, the significance of the change is assessed and recorded against:  
  - The failure consequence  
  - Novelty  
  - Complexity  
  - Monitoring  
  - Reversibility  
  - Additionality | This allows prioritization of the most important systems to analyse.                                                                                                                                   |
| 3    | System Definition              | For the systems that affect safety and are significantly changed, define the purpose and functionality of the system, the system boundary and interacting systems, physical and functional interfaces and existing safety measures that apply to it. Note that interfaces also include interfaces with people. Assumptions should be made that determine the limits of the risk assessment. Identify any environmental considerations. Define how each system and interacting systems perform in normal, abnormal, degraded and emergency modes of operation. Repeat for each of the migration stages through to end state. | Provides key information on the systems that are being changed.                                                                                                                                       |
| 4    | Hazard Identification         | A structured group discussion with competent attendees will use a framework and template to systematically identify and record the hazards for each system.                                                | To identify all foreseeable hazards which are then analysed in the next steps.                                                                                                                        |
| 5    | Apply Risk Acceptance Principles | For all of all the hazards that have been identified, each shall be analysed and mitigated by either:  
  - Applying standards  
  - Comparison with similar systems in service  
  - Explicit Risk Estimation | To determine and record the decision of the level of analysis required for the systems.                                                                                                                |

in a written document which is to be accepted by the PEM and the Network Rail Safety Engineer.
10. Application of NR/L2/INI/02009 Engineering Roles and Responsibilities

Persons appointed to roles within NR will be subject to competence assessment and will be appointed in writing as required under NR/L2/INI/02009 and N000-NRT-PMP-EG-000093, ‘Engineering Appointments’

Where the accountabilities and responsibilities set out in NR/L2/INI/02009 require communication or correspondence with the contractor, then this communication or correspondence should be directed through the Network Rail Project Manager or other authorised representative for the contract.

The Project Engineering Team are collectively responsible for supporting the Project Managers and/or collaborative delivery teams in overseeing implementation of the engineering assurance processes across the project. The engineering team’s key responsibilities are:

- Production and coordination of the Engineering GRIP products
- Agreeing technical baselines, as a starting point for future design development
- Reviewing, commenting and accepting design deliverables on behalf of the Project
- Responding to technical queries and requests for information
- Evidence that the Contractor has suitable measures in place such that emerging designs are coordinated, integrated and complete
- Evidence that the Contractor has suitable measures in place such that completed designs meet the defined requirements.
- Evidence that the Contractor has suitable measures in place such that the completed designs are buildable, operable and maintainable.
- Evidence that the Contractor has suitable measures in place such that emerging designs are affordable and represent value for money
- Evidence that the Contractor has suitable measures in place such that the product built on site is constructed safely, in accordance with the design and to the appropriate quality.

The Engineering Team is required to manage a range of interfaces in order to undertake their responsibilities. The key interfaces are:

- LBSR Delivery Team
- LBS&C Structures Strengthening & Bermondsey Dive-under Delivery Team
- LBS&T Delivery Team
- High Capacity Infrastructure Delivery Team
- TLP Central Engineering Team
- TLP Sponsor Team
- Network Rail Routes (RAM Teams for Structures/Buildings/Track/E&P/Telecoms)
- Network Rail Managed Stations
- Transport for London (TfL)
- Other Network Rail Delivery Groups (including Maintenance Delivery Manager)
- London Underground
• Delivery Partners
• Contractors & Sub Contractors
• Discipline Management (Incl ERM)
• Train Operating Companies (TOCs)
• Freight Operating Companies (FOCs)
• Principal Contractors
• Design Supply Chain

Roles and responsibilities are generally as set out in NR/L2/INI/02009 with the following clarifications or additions.

10.1 Thameslink LBS&C Programme Engineering Manager – Departmental Engineering Manager

The LBS&C Programme Engineering Manager is appointed as LBS&C DEM.

There is no change to the role as set out in NR/L2/INI/02009. The LBS&C DEM is appointed to cover London Bridge Station (including Advanced, Enabling and Early Works), Western Approach Structures, Borough Viaduct, and Bermondsey Dive Under.

The DEM will lead on engineering management and input for the projects delivered in the project and will clarify the management arrangements for these.

The DEM is responsible for the top level integration within the project and shall provide the primary link to Central Engineering and other projects within the TLP.

The DEM shall develop and manage the LBS&C team structure and processes to deliver and review engineering outputs to support the project schedule, budget and quality requirements.

The DEM shall, in line with project requirements, identify and manage the introduction of new systems on the network, where applicable, including systems/safety approvals and monitoring so that processes and documentation exist for sustained network usage.

The DEM shall manage all engineering and project development activities so that they result in schemes that are affordable, and that meet project requirements in a safe and environmentally responsible manner for time, cost and quality.

The DEM shall provide professional functional leadership for engineering within the project, in accordance with policies set up by the Engineering function.

The DEM shall manage the appropriate validation and verification of engineering activity in accordance with TLP procedures.

For LBSR, the DEM shall be represented at the Early Warning Notice meeting to discuss design change during the design process.
The DEM is a standing invitee to both Station and SSP/BDU Project Change Panels.

### 10.2 Designated Project Engineer

The general responsibilities and limits of appointment are outlined in procedure Engineering Management for Projects - [NR/L2/INI/02009](#). The following sections provided additional definition:

Areas of DPE responsibility shall be segregated by geography or time.

TLP Delivery Teams with responsibility for works within the geographical footprint and timescales of the London Bridge Station Area responsibility include:

- High Capacity Infrastructure Delivery Team
- LBS&T Delivery Team

Other Delivery Teams with responsibility for works within the geographical footprint and timescales of the London Bridge Station Area responsibility include:

- London Bridge Infrastructure Maintenance Delivery Unit;
- Route Asset Management;
- Network Rail Infrastructure Projects Renewals and Enhancements.

GRIP 5-8 for LBS&C projects will require the following DPE appointments:

- N420 London Bridge Station Area including WAS;
- N420 Bermondsey Dive Under;
- N232 Borough Viaduct Defects Correction (now completed)

LBS&C has identified SPE’s to act as key interface for Main Station works and Western Approach Structures (WAS) works within the London Bridge Station Area and support the London Bridge Station Area DPE as detailed in section 11.

For Structure Strengthening requirements within the Inner Area LBS&C has identified a SPE from within the project to act as key interface and to support the N421 DPE. The SPE will also assist the Programme Manager for SSP in discharging the Principal Designer's Rep role for the SSP works.

For High Capacity Infrastructure (HCI) requirements within the London Bridge Station Area the HCI Team DPE is acting as key interface with the London Bridge Station DPE.

Upon completion of the structures works for Bermondsey Dive Under, LBS&C shall identify a SPE from within the project to act as key interface and to support the Inner Area DPE.
The responsibility for discharge of DPE duties for both BDU and BV shall transfer from N420 to N421 at the point N421 start to fit out railway systems on the respective structures.

DPE and SPE appointments will be held by a Network Rail employee or specifically appointed agent. In the case of an agent being appointed, this will not be a direct employee of an organisation which is delivering design and/or construction to the project. The DPE must have impartiality to demonstrate the Inter-discipline review process is conducted without bias.

The DPE shall be satisfied that suitable measures are put in place to assess the competence of the Engineering team including design consultants and contractors staff nominated to roles under NR/L2/INI/02009. Refer to Section 13.2 and 16.3

The DPE shall be satisfied that suitable measures are put in place to establish that due process has been followed in relation to design production, checking, coordination and integration and implementation.

The DPE shall be satisfied that suitable measures are put in place to establish that the resulting product is of an appropriate quality and is integrated across all disciplines.

The DPE shall arrange for suitable measures to be put in place to establish that engineering interfaces (both internal and external) are being identified, managed and closed out and that due process, in accordance with the Technical Interface Management Plan is followed in relation to design integration.

The DPE shall support the implementation of the CDM 2015 regulations throughout the project lifecycle.

The DPE, in conjunction with the HoE, is responsible for determining the requirements for Engineering GRIP products and Supplier deliverables. Refer to N000-01000-NRT-PRO-CL-000001 “GRIP Compliance Plan” and N000-NRT-TEM-DM-000108 “GRIP Compliance Matrix” on the TLP IMS.

The DPE is responsible for overseeing design and construction assurance so that it is delivered and signed off in time to meet the requirements of the project.

The DPE is responsible for managing the work of the Engineers and Suppliers such that engineering activities result in schemes that are affordable, safe, environmentally responsible, are of the quality required and are cost effective.

The DPE is responsible for managing the development of the engineering design and construction so that full consideration is given to safety, reliability, operational capacity modelling, maintainability, ease of construction, and environmental / whole life issues.

For BDU and SSP, the DPE is responsible for overseeing the Implementation of the Design Change Control Process – refer to N000-01000-NRT-PMP-EG-000072 “Changes to Approved Design” on the IMS.
The DPE will be consulted regarding the LDO / MDC schedule of Inter Disciplinary Checks (IDC’s).

The DPE is responsible for making sure Inter Discipline Design Reviews (IDR’s) are organised and managed adequately. Please refer to N000-01000-NRT-PMP-EG-000008 “Interdisciplinary Design Review” on the IMS.

The DPE is responsible for making sure DCVR/EVR reports are produced in accordance with TLP design verification and validation procedures on IMS.

The DPE shall, acting on behalf the Project Director, as appointed Client Rep support the Principal Designer and the Designers and where appointed the CDM Implementation Manager in identifying key CDM Risks from the project register which need to be duplicated into ARM. This review should happen regularly but as a minimum, 4 weekly.

The DPE or nominated representative shall be a signatory to the Entry into Service certificates.

10.3 Project Engineer (Discipline)

The general responsibilities and limits of appointment are outlined in procedure NR/L2/INI/02009. The following sections provided additional definition:

The PE is responsible for resolution of engineering issues within their discipline.

The PE is responsible for production of discipline technical briefs / work scopes for professional engineering services to be undertaken by Suppliers.

The PE shall work closely with Suppliers to assist, advise and interrogate the design / construction solutions proposed.

The PE shall work with suppliers CRE’s to determine and agree appropriate deliverables at each Design Control Point (DCP) in order to permit accurate and agreed progress reporting.

The PE shall review progress reports to agreed time scales to monitor works progress and expenditure.

The PE shall review technical reports, design calculations, drawings and all appropriate deliverables, for the assessment of existing or the introduction of new or modified assets into operational service.

The PE shall review the quality and suitability of professional services and works from suppliers for compliance with Network Rails group and company standards and procedures (and / or LU as appropriate), including site supervision where required.

The PE shall review contractor’s temporary works submissions.

The PE shall review contractors Inspection and Test Plans.
The PE shall conduct verification checks of contractors and design consultant’s works where required by the DEM and/or audit schedule.

The PE shall agree with the CRE and NR Authority the evidence required to obtain NR Technical Approval and LU Conceptual Design Statement and Design Compliance sign off and to take ownership of that process.

The PE shall agree with the appropriate asset engineer the deliverables and assurance evidence required to facilitate Handback to the asset owner and maintainer.

The PE shall liaise effectively with the DPE, Engineers from other disciplines, Project Managers, Construction Managers and Health Safety Quality Engineers to satisfy themselves that designs and works are co-ordinated.

The PE shall support the PM and/or delivery teams in liaising with Third Parties who may be affected by works on the operational railway, or whose works may affect the safety and operation of the railway.

The PE shall review tenders for technical content.

To aid achievement of the responsibilities, the PE should be active in liaison with the respective suppliers and should attend design development reviews where possible.

10.4  **Senior Project Engineer**

There is no change to the role as defined by the Job Description. The role is a template role and not an appointed role under NR/L2/INI/02009.

10.5  **Assistant Project Engineer**

This is a template role and not an appointed role under NR/L2/INI/02009. The Assistant Project Engineer (APE) shall assist the Project Engineer in:

- the supervision of design development and the checking of designs;
- the monitoring of construction work for compliance with design, standards, and legislation;
- the monitoring of project construction HSQE;
- the development and maintenance of quality systems throughout the lifecycle of projects.

The APE shall maintain a log demonstrating own development and achievements towards meeting the competency requirements to discharge the role of a Project Engineer and support their professional development.
10.6 Delegated Authority

The Project Engineers within the LBS&C team will hold delegated authority under the Authority to Work process. This delegation will be managed by the DEM with support from the LDE and will be subject to two yearly review. The project list detailing individual's delegation levels is held in eB.

The Project Engineers delegation will apply to design submissions (Form 003’s and where still appropriate, Form B’s) compliant with the Form 002’s (Form A’s). Where deviations are required, or the design is not compliant with Form 002’s (or Form A’s) and comments, then the escalation process to the DPE will be required. The DPE will then seek LDE and/or Asset Manager acceptance as necessary.

For the avoidance of doubt, Form 003’s which deviate from the agreed principles set out in the Form 001/002 shall not be signed without reference to the discipline LDE.

10.7 Contractors Engineering Manager

All organisations contracted to Network Rail shall appoint a CEM to be responsible for the technical adequacy of the design and construction works undertaken by their respective teams through the various CRE’s.

It is good practice for a nominated deputy CEM to be identified and appointed with clearly defined roles and responsibilities to be able to cover periods of sickness and leave.

The general responsibilities and limits of appointment are outlined in procedure Engineering Management for Projects - NR/L2/INI/02009. The following sections provided additional definition:

- The CEM shall have demonstrable competence, which may include a minimum of ten years relevant experience in the type of work being undertaken.

- The CEM shall normally have Chartered Engineer status with an appropriate professional institution.

- The CEM shall be able to demonstrate an appreciation of multi-discipline work, inter-discipline checks and the application of a system engineering approach, with evidence of at least one recent job with the mixture of disciplines.

- Suppliers should provide their CEM with sufficient authority within their own company to agree and carry out whatever the CEM deems is required to match Network Rail expectations.

- The CEM shall undertake competence checks and formally appoint all CRE’s

- The CEM will approve the accompanying IDC certificate for the design rather than signing each individual design.
• The CEM for the PC shall also be responsible for the coordination and integration of the design from all LDOs and MDCs within their specific geographical area.

• The CEM shall manage and administer the design and construction through to EIS, As-built information and Handover, including approvals and information flow.

• The CEM shall demonstrate that the designs carried out in their respective design offices meet the requirements of the project.

• The CEM shall manage, co-ordinate and integrate the works of the whole team including designers, specialist designers and sub-contractors.

• The CEM shall chair Interdisciplinary Design Checks (IDC’s).

• The CEM shall provide an organisation chart indicating the CRE’s appointed to the project and their key areas of responsibility and technical interfaces.

• The CEM shall oversee management and implementation of the testing and commissioning processes on the project.

10.8 Contractors Responsible Engineer (Discipline)

The general responsibilities and limits of appointment are outlined in procedure Engineering Management for Projects - NR/L2/INI/02009. The following sections provided additional definition:

Each contractor, through the CEM, shall appoint a CRE for each discipline, e.g Civil / Structural, Architectural, Telecommunications, Electrical, Signalling, Track, EMC, E&P, etc. to be responsible for the technical adequacy of the design and construction works undertaken by their respective teams. Specialist disciplines shall also have a CRE appointed from the specialist supplier.

Appointment as CRE is a privilege of standing in the organisation and those not exhibiting the quality of outputs and behaviours expected, will be removed from the position.

The CRE shall have demonstrable experience, which may include a minimum of five years relevant experience in the type of work being undertaken.

The CRE shall normally have Chartered Engineer status with the Engineering Council and be registered with the relevant professional institution. In particular situations the DPE may consider the candidates experience, training and behaviours in lieu of professional standing in making appointments.

The CRE shall work in close liaison with the Designers, Site Engineers and NR Assurance team to deliver outputs to time, quality and cost requirements.
The CRE shall provide assurance evidence as agreed with the DPE and PE sufficient to allow technical acceptance of the works.

The CRE shall establish and manage a design change control process.

The CRE shall carry out risk analysis of the design and construction work as it progresses.

The CRE shall co-ordinate the preparation of “as-built” drawings / information and have a robust system in place to collate design changes during construction to facilitate this.
11. Engineering Assurance

11.1 DEM Acceptance

The following require formal acceptance from the DEM:

- PDSs or proposed changes to PDSs
- Amendments to the Construction staging / sequencing
- Design Management Plan
- Design Quality Plan (or equivalent)
- Applications for Deviations
- Product Acceptance Applications
- Safety Verification
- DCVR
- EVRs (refer to N000-NRT-PMP-EG-000120 ‘Engineering Validation Review Panel’)
- EIS Short Forms or EIS Files content.

Where delegated under the contract, the DEM shall issue Clause 7 Employers Consent to Construct – refer to section 19.16.

11.2 Assurance Verification

The success of any project is dependent upon it being completed and handed over to the end user on time, defect free with all works being delivered in accordance with the AFC design and specification.

As a result of legacy DOWLS from previous construction stages, LBSR project have introduced an engineering assurance verification check to verify the adequacy of the works, commissioning paperwork and accuracy of the schedule of outstanding works and defects.

11.2.1 Verification Engineers

An independent multi discipline team of engineering verification engineers has been put together to carry out a number of vertical slices of the assurance verification process. Working closely with the NR Construction team and lead by Will Nurse the projects Quality Manager. Their principle role includes:

- A desk top review of Stage 3 AFC and sub-contract fabrication designs
- Review of supplier ITP’s and check sheets for adequacy, completeness and compliance with NR standards
- Undertake quality conversations with CRE’s and site engineers to gauge their understanding of the works, quality and the assurance process
• An inspection of the works to check that it is in accordance with the AFC design and ITP check sheets. The inspection includes a review of the DOWL list for completeness prior to Entry into Service of the asset
• Provision of regular verification reports detailing findings from the deep slice reviews, identifying areas of good practice and non-compliance and making recommendations for improvements in quality management and delivery of assurance evidence
12. Engineering Design Management

12.1 Design Control Points

The output from each design package shall be coordinated and measured through pre-defined Design Control Points (DCPs) with each DCP submission representing a snapshot of the developing design. Effective development of the DCPs provides a number of advantages including:

- Assures that the design delivery is thought through and complete
- Gives a detailed structure to the design programme to allow interrogation and validation by the engineering team
- Identifies a clear quantification of what is expected at each point so actual progress can be measured against predicted
- Provides a framework for management of interfaces, assumptions, risks and change control.

The Costain Design Management Plan for LBSR and Skanska’s Design Execution Plan will detail out the control points and deliverables expected at each.

12.2 Design Development Review

To encourage early constructive cooperation between designer, contractor, Network Rail and other stakeholders as well as meet the programme and time constraints, the following process shall be put in place:

- Designer produces design documentation for Design Development Review (DDR)
- Documentation is submitted on eB at ‘Issued for Information’ status
- DDR meeting set up and link to submission on eB sent to attendees (incl. Contractors, Network Rail Project Engineers and other stakeholders)
- DDR meeting shall be chaired by the CEM with attendance from all the relevant CRE’s and recorded on a Design Development Review record sheet
- Convene further DDRs, as necessary, repeating actions 1 to 4 above and closing out issues from previous DDRs
- When design is ready for final co-ordination, submit revised design documentation on eB and send link of submission to all attendees (incl. Contractors, Network Rail Project Engineers and other stakeholders) a minimum of 10 working days prior to the IDC
- IDC meeting shall be chaired by the CEM with attendance from all the CRE’s and recorded on NR/L2/INI/02009/F0046, ‘Certificate of Interdisciplinary Check’
- Design documents are revised and checked by CREs to confirm close out of issues raised in the IDC
- CEM signs off the submission and the design documents are submitted on eB at ‘Issued for Acceptance’ status
- Link of submission including a Design Review Notice (DRN) is sent to Network Rail Designated, Lead and Project Engineers for Design Acceptance Review.
The objective of the above process is to provide early coordination between MDCs and minimise rework by early resolution of issues and agreement on solutions. An up to date 3D model is key to this process.

Local variations on this process are documented in the Design Management/Execution Plans. The local variations must specifically address the CDM duty holder capacity in which Network Rail is operating; predominantly for station and civils works that is Client, however for the Structure Strengthening Programme Network Rail has also appointed itself as Principal Designer.

12.3 Design Acceptance Review

Design Acceptance reviews shall be carried out in accordance with Engineering Management for Projects - NR/L2/INI/02009 and the IMS procedures.

DRNs shall be managed in accordance with Design Review Notices (DRNs) - N000-NRT-PRO-EG-000043 and N000-NRT-PMP-EG-000116.

Design submissions shall be made as bundles of related design via eB with the DRN included in the virtual bundle.

Acceptance Reviews are not a check of Design and they are not normally a 100% review of the Design. They are a sample review of the Design based on the risk that the implemented design presents to Network Rail. Acceptance Reviews are implemented to provide assurance that, based on a sample review of the Design, it:

- ‘Complies with the specification; applicable standards, product acceptance requirements, agreed mentorship arrangements, legislation and has been produced and checked i.e. a Design Check has been completed by competent people’

In order to achieve the above, the Acceptance Review should be targeted to consider those elements of Design that offer the greatest risk exposure to the project and hence Network Rail and our stakeholders. For example a PE should review for the inclusion of the correct controls, compliance with the remit / contract, compliance with policy, compliance with critical standards, maintainability, constructability, safety, operation and integration.

In accordance with the TLP Programme Engineering Management Plan, the ‘Route to Gold’ process under PAN/PMSE/-E-CD-INS-0064 shall not reduce the review from a detailed review unless the DPE carries out a risk assessment under CSM to determine the risk as ‘non-significant’.

Project Engineers shall actively participate in the development of any Design as this will deliver efficiencies in the Acceptance Review process reducing Acceptance time. PE’s should seek regular contact with the designer and CRE’s to fully understand the design development, issues, assumptions and solutions.
Reference shall be made to PAN-B&C-E-GEN-INS-0065 – Project Engineer Reviews and PAN-B&C-E-GEN-INS-0066.

As part of the completion of a GRIP stage and/or Sponsor Review, the CEM and DPE, in conjunction with the DEM, shall review the deliverables for the next stage and assess the anticipated acceptance review level for each deliverable in accordance with the above policy. This review shall be recorded in a pre-contract deliverable acceptance register and include:

- Risk category expressed as High, Medium or Low
- Level of review expressed as a %
- Discipline Project Engineers required to review deliverable
- Role authorised to accept the deliverable
- Approval required external to LBS&C
- Approval required external to KO2
- Approval required external to TLP

The Design Review Acceptance Plan (DRAP) shall be reviewed 3 months post contract commencement to enable an initial assessment of the contractor’s performance to be incorporated within the risk and review level. The DRAP shall be updated and issued as the post contract deliverable acceptance register.

The post contract deliverables acceptance register shall be reviewed by the DPE at six monthly intervals or as required by the DPE or DEM based upon contractors performance and development of the scope.

12.4 Technical Interface Management
The DPE is accountable and responsible for assurance of all interfaces within the designated geographical area and boundaries following the ‘inside out’ principle.

The principle is that any interface crossing a boundary between two adjoining projects is managed by the inner most project. TLP can be modelled as a series of concentric circles starting with London Bridge Station at the centre and moving outwards through Inner Area to Outer Area.

The IM is responsible for assurance of all interfaces within the designated geographical area.

The LDO is responsible for the management, integration and coordination of all technical interfaces within the specific geographical area.

The LDO is responsible for the management of interfaces at the boundary of their geographical area following a principle of inside out, hence the London Bridge Station LDO is responsible for all interfaces with the Inner Area, and the Inner Area LDO is therefore responsible for the interfaces with the outer area.

All interface management will be carried out in accordance with the Technical Interface Management Plan (TIMP) (refer to: N000-01000-NRT-PLN-EG-000005 ‘Technical Interface Management Plan’).

The structure of Technical Interface Registers (TIR) for the final design is depicted below:

**THAMESLINK KO2 GRP 5 : TECHNICAL INTERFACE REGISTERS : GEOGRAPHIC ARRANGEMENT AND CO-ORDINATION OF CONTENT**
A Sub Set TIR shall be developed and maintained for each primary stage, this TIR shall also be used for the management of interfaces in all stages leading up to the primary stage.

12.5 Design Integration Management

The LBS&C Delivery Team supports the DPEs in discharging their responsibility for Design Integration across the LBS&C project.

The LBS&C Delivery Team shall:

- establish and maintain the Master Design Integration Schedule (DIS) for Final System Design and Primary Stages supported by input from the Delivery Partners, the Network Rail Project Engineering Team, SDG, other Delivery Teams, Contractors and Sub Contractors;
- facilitate the coordination between the DIS and the LBS&C master integrated programme;
- establish and maintain the Master Technical Interface Register (TIR) for the Geographical Area;
- manage the Interface Delivery Team (IDT) requirements defined in the TIMP - N000-01000-NRT-PLN-EG-000005 demonstrating that the responsibilities for discharging these requirements are understood, documented and agreed with the responsible person.

The LBS&C Delivery Team shall lead the identification of requirements for and co-ordination of:

- Agreed Interface Definition Document;
- Interface Requirements Specification;
- Interface Definition Documents;
- Interface Test Plan;
- Interface Test Data;
- Interface Acceptance Test Plan.

The Station delivery team have appointed an engineering integration manager to fulfil this role and manage the technical interfaces during the design development stages of the project.

12.5.1 Design and Programme Integration

The Design and Construction programmes shall be provided to the DPE on a regular basis to be agreed between the DPE and CEM.

These shall comprise a copy of the Clause 14 roll up programme and a detailed two-weekly look-ahead programme.

The design programme should include:
• Key deliverables
• DCP’s
• Design review meetings (DDR’s)
• IDC& IDR dates – combined review meetings
• Procurement for long lead items
• Start on site – where this is critical for the design package

The Construction programme should include:
• Procurement dates
• Start on site
• ITP intervention/hold/witness points
• Completion on site
• Entry Into Service (EIS)

12.5.2 Design and Construction Integration

TLP KO2 Inner Area has principally adopted two models from Engineering Management for Projects - NR/L2/INI/02009.

The LBSR geographical area utilises Design Integration Option 3 – A Lead Design Organisation (Costain) is appointed to Integrate Design (Pan Delivery Group Model).

LBS&T Inner Area utilises Design Integration Option 2 – DPE Integrates Design (Pan Delivery Group Model). For LBS&T works delivered within another geographical area the LBS&T DPE shall act as a Lead Project Engineer and support the accountable DPE in the integration of the design.

Within the boundary of the London Bridge Station area Costain shall undertake the role of the Lead Design Organisation and shall be responsible for the design integration within the London Bridge Station scope of works and the design integration throughout the defined geographical area with Railway Systems. Within the Inner area Costain shall act as the Designer for their scope of work and shall fully co-operate with the Railway Systems for the purposes of achieving robust design integration.

With the exception of Bermondsey Dive Under and Borough Viaduct, all other areas outside of the defined London Bridge Station geographical area (Inner Area) LBS&T shall undertake the role of Lead Design Organisation. Within the London Bridge Station geographical area LBS&T Delivery Team, Delivery Partners, Contractors and Sub Contractors shall act as the Railway Systems Designers and shall fully co-operate with the LBS&C PC for the purposes of achieving robust design integration.

The ‘inside out’ principle shall be applied to the interface management.
12.5.3 Construction Integration

London Bridge Station & KO2 Inner Area use Construction Integration Option 1 – External Contractor is appointed as PC – Pan Delivery Group Model.

For LBSR, Costain are appointed as PC, for the remainder of the Inner Area Balfour Beatty are appointed PC

12.5.4 Design Stakeholder Consultation

For London Bridge Station where the stakeholders and interfaces are complex, a specific consultation process and design acceptance recording process have been developed to identify those who need input and those who need to sign-off design documents. The process is detailed in the Design Consultation Matrix which is held on eB:

https://www.tSPEb.co.uk/TSPEB/Framework/Object.aspx?o=17359&t=3

This process is managed by the Costain Entry into Service team (EIS) to keep visibility that the design and construction process is leading to an asset which can be entered into service and handed back without issue from the stakeholders.

12.6 IDC - IDR Process Guidance

The LDO is responsible for a comprehensive IDC within the boundary of their geographic responsibility.

LBS&C is responsible for a comprehensive IDR within the boundary of their geographic responsibility with the DPEs/PE(D)s leading within their area and supporting the other Delivery Group outside of their geographic area of responsibility.

To assist the DPE in their responsibility the Delivery Team will facilitate and manage the Design Integration Process through design development and IDC.

To facilitate the program integration, design integration and IDC/IDR process a Master Design Integration Schedule shall be established for each substantive stage with input from the Delivery Partners, other Delivery Teams, Contractors and Sub Contractors.

For Design Development Reviews (DDR) and IDC process refer to the Costain Design Management Plan or Skanska Design Execution Plan.

DDR, IDC and IDR's form an essential part of the supplier delivering the Principal Designer role, whether that is the suppliers in the case of LBSR and BDU or NR in the case of SSP. These mechanisms also form part of the demonstrable evidence that NR is discharging the Client duty taking reasonable steps to ensure the Principal Designer is carrying out their role.
Where appropriate the Health and Safety Manager or, if appointed, the CDM Implementation Manager will be invited to the meetings and as a minimum will be made aware of the outputs so as to facilitate these being linked to the CDM filing structure on eB.

The following process shall be followed for the IDR:

- Following close out of issues raised in the IDC, CEM signs off the submission and the design documents are submitted on ProjectWise at ‘Issued for Acceptance’ status
- Link of submission including a Design Review Notice (DRN) is sent to Network Rail Designated, Lead and Project Engineers for Design Acceptance Review
- IDR meeting shall be chaired by the DPE with attendance from all the relevant PE’s and recorded on NR/L2/INI/02009/F0045, ‘Certificate of Interdisciplinary Review’. IDC action list confirmed as closed out at IDR
- From IDR action list, finalise and sign off Form F003 (or equivalent)
- DPE confirms acceptance by issue of IDR certificate, signed off by PEs and DPE
- Design documents are revised and checked by CREs to confirm close out of issues raised in the IDR
- CEM and appropriate CREs signs off the submission using an Approved for Issue Record (AIR sheet) or similar, and the design documents are submitted on eB at ‘Issued for Construction’ status
- PEs review AIR to confirm:
  - sign off by CEM and relevant CREs
  - design documents are at correct issue
  - DRN comments and IDR actions are closed out
- DPE closes out the DRN and advises DEM to issue Clause 7 Consent to Construct under the Contract

12.6.1 Interdisciplinary Reviews (IDR)

As part of engineering assurance, the design process for all projects requires inter alia:

- engineering compatibility checks across all engineering disciplines that form the project scope
- that all other interfaces e.g. with other adjacent projects have been identified and assessed
- the design interfaces with the existing infrastructure.
- Compatibility with phasing of the works

The project shall plan and undertake interdisciplinary reviews (IDR) in support of the design Programme at all stages of the project following the requirements of N000-01000-NRT-PMP-EG-000008 ‘Interdisciplinary Design Review’.

An IDR shall be required for all designs produced by Suppliers contracted to Network Rail or Suppliers contracted to another party under an agreement with Network Rail.
The IDR or joint IDC/IDR meetings shall consider the constructability, operability and maintainability of the project and suitable representation should be provided from the construction team, POIS and Maintenance organisation.

The master co-ordinated model shall be used to support the process – refer to N000-NRT-PMP-EG-000139 for management of the model.

The output of the IDR shall be recorded and held in an action log and the DPE shall prepare an IDR Certificate based on the template NR/L2/INI/02009/F0045.

12.6.2 Interdisciplinary Checks (IDC)

The CEM shall be responsible for making sure that interdisciplinary checks (IDC) have been carried out on each of their design packages within their contracted scope prior to their formal submission to Network Rail for review. The Master Co-ordinated model shall be used to support the IDC. Designs shall be completed to a stage to allow a robust IDC to be carried out.

The DPE shall be responsible for making sure that interdisciplinary checks (IDC) have been carried out for the design packages within their geographical area of responsibility and a robust check process can be demonstrated by the CEM.

The CEMs and CREs shall fully support the process and shall attend the LDO IDCs.

The IDCs shall be scheduled and results recorded throughout the design process and with sufficient time to allow any issues to be investigated and where appropriate incorporated into the design prior to formal submission to Network Rail for acceptance.

At the conclusion of the IDC process, all discipline CREs shall sign-off an IDC certificate, based on the template NR/L2/INI/02009/F0046, to confirm they have reviewed the design and resolved any relevant issues or recorded those accepted for transfer to a later GRIP stage. Where ‘no comments’, are made this shall be noted on the IDC certificate.

When appropriate the Network Rail project engineering team shall support CEM IDC activities without removing any of the Supplier responsibilities by providing input during design development and attending IDC meetings.

12.6.3 Combined IDC/IDR

It may be considered beneficial for the IDR to be undertaken as a joint regular IDC/IDR exercise throughout the design process subject to all appropriate Supplier and Network Rail staff being in attendance. In such circumstances records shall be kept by both the Supplier and Network Rail demonstrating compliance to both IDC and IDR requirements. The joint IDC/IDR process is at the DPE’s discretion.
12.6.4 Post IDC

The submission of all engineering designs shall be accompanied by a completed IDC certificate. The certificate must be endorsed by all relevant CRE’s interfacing with the work package.

Form 3’s must be complete packages incorporating all information required to progress to AFC and enable the works to be clearly set out, constructed and verified. Specific exceptions are reinforcement drawings and bending schedules which must be available if requested but not required for formal submission. These will be required for AFC issue.

Any document requiring modification after the IDC certificate has been signed off shall require a further IDC and preparation of another IDC certificate unless otherwise agreed by the DPE.

12.7 Technical Approval

Technical Approval shall be in accordance with NR/L2/CIV/003 for civil engineering, building, architectural and building services works, NR/L2/ELP/27311 for electrification and Plant (station HV supplies) and NR/L2/TEL/30022 for Telecommunications. Other asset technical approval standards shall be applied where appropriate.


Individual appointment to act as approver under these standards is subject to a competence based assessment by the Route Engineer. However, it is usual for the role of approver under these standards to be undertaken by the Senior Project Engineer within the delivery team.

The DEM will make sure that the engineering assurance team has completed the Competence assessments and have been given the appropriate level of Authority to Work.

The requirements for Technical approval shall be defined within the Design Review and Acceptance Plan (DRAP) defined within section 19.7.

12.7.1 Deviations to Standards

Formal applications for deviation may only be made with the permission from the TLP LDE.

Once progression of an application has been authorised, the LDE shall follow the TLP processes for the submission and monitoring of deviation applications and shall keep the DEM informed of progress and issues (refer to – N000-01000-NRT-PMP-EG-000022 ‘ Non Compliance with Standards’).
12.7.2 Product Acceptance Applications

The Product Acceptance process is identified on the TLP IMS (refer to – N000-NRT-PMP-EG-000087 'The Acceptance of Engineering Products').

It is the responsibility of the Design or Construction organisation that proposes to utilise materials, systems or equipment potentially requiring product acceptance or amendment to the scope of existing acceptance to advise the appropriate discipline PE as soon as is reasonably practical following identification.

It is the responsibility of the Design or Construction organisation that proposes to utilise materials, systems or equipment potentially requiring product acceptance or amendment to the scope of existing acceptance to complete the application form and undertake any required risk assessment and Engineering Safety Management activities required to support the application, these shall be submitted to the relevant discipline project engineer for entry into the TLP non-compliance management process.

It is the responsibility of the discipline PE to advise the appropriate DPE and LDE as soon as is reasonably practical following identification.

The DEM shall maintain a central tracker of product acceptance requirements; each discipline PE shall manage a local tracker to monitor progress of applications against project programme.

It is the responsibility of the Project Manager/Delivery team to incorporate the product acceptance requirements into the programme to enable these activities to be adequately monitored.

Upon identification of the proposal to utilise materials, systems or equipment potentially requiring Product acceptance or amendment to the scope of existing acceptance the PE/DPE shall advise the DEM.

Formal applications for product acceptance shall not be submitted without permission from the DEM.

Once progression of an application has been authorised, LBS&C shall follow TLP processes for the submission and monitoring of product acceptance applications and shall keep the DEM informed of progress and issues.

The appropriate LDE shall be responsible for managing the product acceptance process and interfacing with Network Rail HQ acceptance services following notification of the requirements from the Project.

12.8 AFC Issue
Design information may only progress to AFC status once all IDC and IDR comments have been fully closed and accepted by the DPE. All relevant information must be present to progress to AFC. Post AFC supplementary information issue must be avoided. AFC issue must encompass sufficient clear information presented in a manner to allow accurate setting out, construction of all works, and verification of completed works to be undertaken.

12.9 Permission to Commence Construction Process and Clause 7 consent

Under the Contracts for N420 (Costain and Skanska) Boris Lucic (DEM) has delegated authority from the Employers Representative for Clause 7 – Employers Consent to Construct. The DPE will advise the DEM on the suitability to issue consent against design packages.

The DEM will issue a letter to the contractor granting consent to construct in accordance with the submitted engineering documentation.

Within the Station Area Costain operate the Permission to Commence Construction process (PCC) on eB which the DEM can endorse to grant Clause 7 consent. A similar process shall be implemented by Skanska for their site activities.

12.10 Construction Before AFC

In exceptional circumstance the Project Manager and DPE may wish to grant authority to commence construction before the associated design has achieved AFC or issue AFC design prior to all associated variations (to standards) being certified. In such instances, the DPE shall undertake an assessment in accordance with the IMS procedure Management of Construction prior to AFC (N000-NRT-PRO-100049) and if appropriate seek authorisation from the DEM.

CEMs shall not issue construction details or permit construction to commence unless the appropriate authority has been granted. The Project Manager supported by the Construction Manager shall monitor site activity for compliance.

As regards the scope of works covered by the PEMP, this process is administered through the application of the Permission to Commence Construction process. The requirement that the PCC is signed by the PEM, adds a further level of rigour to the procedure.

12.11 Site Technical Queries (STQ) & Request For Information (RFI) Process
All STQ’s and RFI’s will be managed through eB in accordance with the TLP procedure (refer to – **N000-01000-NRT-PMP-EG-000021** ‘Technical Queries’ and **N000-NRT-PMP-PC-000040** ‘Request for Information’).

Site Technical Queries raised by the construction teams will be managed in accordance with the respective contractor management processes.

**12.12 Change Management**

As soon as it becomes apparent that there is potentially a change to the scope, cost, programme or the technical provisions of the scope of any of the suppliers to NR they shall raise an Early Warning in accordance with **N000-NRT-TEM-DM-000106** ‘Early Warning Notice Template’.

It is the responsibility of the NR Engineering team to raise an Early Warning if any potential changes to scope, cost, and programme are identified. It is at the discretion of the PM whether to issue these to the supplier.

The Early Warning Register is maintained by the Project Commercial Manager. This register holds details of all potential Budget, Contract and Design Changes.

**12.13 Post AFC Design Change Control**

Post AFC design change is managed in accordance with **N000-01000-NRT-PMP-EG-000072** – Changes to Approved for Construction (AFC) Design.

Design change within is managed through the EWN and shall be documented within the Costain Design Management Plan and Skanska Design Execution Plan.

A design change will trigger the re-issue of all relevant documentation, design and checking forms, DRN’s, AFC packs and AIR Forms, etc, unless specifically agreed otherwise with the DPE.
13. Requirements Management

Requirements management shall be managed in accordance with N000-01000-NRT-PLN-EG-000003, using TReqS.

13.1 DCVR

The DCVR and DAF process shall be managed in accordance with N000-01000-NRT-PMP-EG-000073.

13.2 Engineering Verification Review process

The EVR and EAF process shall be managed in accordance with N000-NRT-PMP-EG-000120.

Close out of As-Built records will be undertaken at the subsequent EVR to the stage EVR. i.e. Stage 1 as-built records will be closed out at Stage 1A EVR.

13.3 Project Engineering Verification Checks

Engineering Verification shall be managed in accordance with the requirements of N000-NRT-STR-EG-000018 – Engineering Verification Strategy
14. **Subcontractor Management**

Post AFC, key subcontractors meet regularly at formal design co-ordination meetings known Subcontractor Interface Reviews (STIRs) to resolve and agree installation interface issues. The frequency of the meetings can be adjusted to suit the size complexity of subcontractor design packages.

The formal design co-ordination meetings are attended by representatives from the different parts of the design, supplier and construction teams and provide the functions identified below. Collectively they deliver a “Controlling Mind” function for the development of the design Post AFC.

Issues discussed, include *inter alia*:

- Scope review of subcontract deliverables and responsibilities including CAD requirements;
- Definition of interface requirements considering subcontractor design responsibility, fixings, loads and temporary works;
- Engineering and technical review - LDO GRIP 6 team perform this function to review the Post AFC development of the detailed design considering the AFC design intent;
- Model Management - this function is performed jointly by MDC and LDO and will ensure that the latest models are reviewed for quality, included in coordination meetings, circulated, and stored in ProjectWise.

The most recent models from all parties are merged and clashes identified in the Clash Log. The models are reviewed in each coordination meeting and the log updated showing the actions necessary to close the clash. Log to be issued with minutes.

Management of process is performed by MDC with support from LDO. This function includes the production of minutes to the regular coordination meetings and ensuring issues are actioned and resolved.

14.1 **Sub-Contractor Design Review (SDR)**

The SDR process is a separate procedure but forms an integral part of the Post AFC process. The Status of the SDR’s are reviewed in each meeting. This is led by MDC with support from the LDO Grip 6 team and associated subcontractors.

- Programme. The delivery of information in a timely manner is key to the successful delivery of this project. MDC construction team representation in the meeting will provide the key dates for expected delivery on site. The construction team will also provide advice regarding sequence and buildability.
- Subcontractor Form 03 production and acceptance shall be in accordance with the NR assurance process and it is essential that Form 03s are completed,
delivered, checked and signed to suit the programme dates. MDC are responsible to manage this process post AFC with support and input from LDO and the subcontractors’ designers.

- Design Change: All parties within the “controlling mind” are required to review and manage change. MDC need to notify subcontractors of instructions from NR. All parties have a responsibility to bring into the “controlling mind” forum changes that are likely to impact on others. All parties have a responsibility to raise EWN’s on potential changes and their impact. No changes shall be implemented without a formal instruction. All Subcontractors (especially those who have design responsibility) are responsible for notifying proposed design changes. These proposals shall be identified on revised Documents/Drawing/Model/Transmittal sheets, and will include the proposed changes in the update. All changes must be raised using the STQ process.

- PCC: At the end of the Post AFC process the construction team need to issue a PCC – Permission to Commence Construction to the relevant subcontractor. The “controlling mind” will produce a list of drawings and documents that need to be included in the PCC. The model management team to make available model references to be included and LDO to provide the drawings and document numbers. MDC document controller to provide the Form 03 document number. All this information should be generated by eB when used for the production of a PCC. The “Controlling Minds” will agree on the status of any outstanding DDNs prior to issuing a PCC.

The process/work flow is detailed in the figure below:

Figure 3: Post AFC Workflow
14.2 Responsibilities for the SDR process

- Engineering and technical review: LDO discipline CRE.
- Model Management: MDC BIM Manager plus support.
- Clash detection: LDO GRIP 6 BIM Coordinator “controlling mind” team support.
- Management of Post AFC process: MDC Design Management.
- SDR Process: MDC Grip 6 Design Management.
- Programme: MDC construction and design management team.
- Subcontractor Form 03: Subcontractor to produce, LDO to sign for coordination with design, MDC sign for buildability prior to submission to NR as required. Process managed by MDC Design Management.
- Change: All parties.
- STQ’s: MDC GRIP 6 Design Manager.
- PCC: MDC Construction supported by LDO Engineering, MDC Design Management and MDC Model Management.

14.3 Implementing the Post LDO Interdisciplinary Process

Assurance standards support the process up to Construction and interface management is an essential part of assurance. The early construction stages have identified interface issues that arise between subcontractor’s packages.

The ideal for technical assurance would be to engage all sub-contractors at or before the IDC/IDR. This has however in the main been extended to “Early Contractor Involvement” or ECI for the platforms and canopies, columns, bridge beams, piling and key mechanical and electrical works.

The expectation from the commercial and procurement team has been to wait for a finalised accepted design to tender the works. The outcome of this staged approach is that packages let separately could allow for issues to arise between subcontractors. In order to address this, the subcontractors design management team have developed the “Subcontractor Technical Interface Review” process, STIR for short. The plan for stage 3 subcontractor design review is for MDC to review the majority of subcontractor design including coordination.

14.4 Subcontractor Technical Interface Review Process (STIR)

The lead CRE for Subcontractor Design management leads the STIR process. The Subcontractor Design matrix provides support for this process, identifying contractors against deliverables and if there is a design submission required. The remaining (post Stage 2A) works has been broken down into circa 30 STIRs.
These reviews are led by the Subcontractor Design Manager, or Design Manager as appropriate. Issues are recorded in the STIR register.

All subcontractors affected are expected to attend, and where design is required, to be represented by their CRE and PM. LDO will be required to review any elements of new scope not repeated from previous stages. Form 3s will be required from subcontractors where there is an element of design in their submission.

Should changes be required to AFC documentation as a result of the STIR process then the existing systems in place to manage post AFC change are applicable (STQ, NCR, etc). Each STIR has three elements to the process: STIR 1, STIR 2 and STIR 3.

First stage - STIR I:

STIR I should take place at the start of the design process for the particular subcontractor package element of works (based upon which subcontractor commences design works first).

Purpose of meeting:
- Capture lessons learnt from previous stages
- Clarify scope of works under review
- Interface definition between elements of design and install
- Quality and assurance
- Review timing/sequence/priorities for the installations

Pre-requisites to be presented at STIR:
Principal Sub-contractors (P S/C’s), Design Managers, CREs / Engineers, Quality Delivery Managers to review following elements for similar areas of work that show repeated and/or high impact issues:
- Design related site issues (All)
- Non-conformances (P S/C’s, QDMs, CREs, ENGs)
- STQs (P S/C’s, DM, CRE, ENGs, QDMs)
- Identify scope gaps (P S/C’s, CRE, ENGs)
- DOWLs (P S/C’s, QDMs)
- EWNs (P S/C’s, QS)
- Cross check the relevant risk registers for outstanding design issues

Outputs:
Capture and confirm lessons learnt
Record and agree accountability for any scope gaps identified. Recording kept on STIR action register
- Decision making where required (including instructions)
- CREs, Site engineers first draft of PCCs and ITPs
- Identify sub-contractor model requirements
- Which elements of design are to be reviewed by MDC and/or LDO
• Draft assurance pack requirements (MARs, samples, control samples)

Second stage - STIR II:
STIR II occurs approximately 6 weeks following the start of the subcontractor design, prior to design review and acceptance.

Purpose of meeting:
• To confirm incorporation of STIR I outputs
• To demonstrate coordination between interfacing subcontractors
• The DM can decide that issues raised requires a formal DDR

Outputs:
• Completed / closed out SDR review comments
• Completed quality readiness reviews (QRR)s
• Signed subcontractor Form 3s ready for submittal (where applicable)

Third stage - STIR III:
STIR III occurs after acceptance of subcontractor design – approximately 16 weeks following start of design, and shortly prior to commencement of manufacture (where applicable).

Purpose of meeting:
• To review buildability and sequencing

Outputs:
• PCCs – to be ready just before works due to commence
• ITPs – these should be prepared and accepted by “T-6”
• Understand where handovers are required between MDC and subcontractors
• Clear sequenced plan of works
• List of redlines / as-builts required
• List of s/c design STQs for package of works

14.5 Required attendees from each team for STIRs

The following table sets out the expectations

<table>
<thead>
<tr>
<th>Who?</th>
<th>STIR I</th>
<th>STIR II</th>
<th>STIR III</th>
</tr>
</thead>
<tbody>
<tr>
<td>NR Assurance</td>
<td>Required</td>
<td>Required</td>
<td>Optional</td>
</tr>
<tr>
<td>NR Build</td>
<td>Optional</td>
<td>Optional</td>
<td>Required</td>
</tr>
<tr>
<td>LDO</td>
<td>Required</td>
<td>Not required</td>
<td>Not required</td>
</tr>
<tr>
<td>NGB</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
</tr>
<tr>
<td>MDC DM</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
</tr>
<tr>
<td>MDC CRE</td>
<td>Required</td>
<td>Required</td>
<td>Required</td>
</tr>
</tbody>
</table>
Note: Subcontractor’s attendance to reflect design and build expectations
The above attendees will be split into two categories: principals and supports.
Principal subcontractors are identified on STIR register as well as other principal roles. Principal attendees are required to bring the relevant information to the meeting for discussion.

14.6 Subcontractor Fabrication detail and design

The Subcontractors Deliverables Review (SDR) process, has been set up to ensure that all sub-contractors fabrication drawings are reviewed and coordinated by both the lead designers against the main design intent and specification and MDC for buildability and cost. The SDR process will be developed in detail by the CEM for each of the projects and documented. An outcome of the SDR process can be the requirement to submit it as a Form03. Where that is required it is undertaken in accordance with the NR process in a same way as for any other design.
15. **Temporary Works Design and Management**

Temporary Works, as described in BS5975:2008, shall be delivered in accordance with NR/L2/CIV/003, ‘Engineering Assurance of Building and Civil Engineering Works’ or other appropriate discipline technical approval standard. Appointment of a temporary works CRE shall be made in accordance with NR/L2/INI/02009.

Temporary Works should not ordinarily be in place for a period longer than six months. If this period is to be extended the assurance requirements should be reviewed jointly by the DPE and the CRE, and the design resubmitted for assurance review if deemed necessary. Works that are planned from the outset to be in place for more than six months shall be treated as a permanent, or an interim design deliverable and assured as such. A Form 001 is not usually required unless the DPE deems specifically necessary.

Temporary works shall be managed by the Principal Contractor in accordance with the principals of BS 5975:2008 +A1:20011, with a register of all temporary works on site maintained by the temporary works coordinator (TWC). This must include both temporary works delivered directly, and that of the sub-contracting teams. E&P, Telecoms and Building Services temporary works will be managed using the same principles, with a TWC in place for these works, with these temporary works also held on a register.

The temporary works register shall be reviewed jointly by the DPE and CRE to identify which require temporary works present an operational risk to NR and should be formally submitted for Acceptance under NR/L2/CIV/003 process. This review is done on a risk basis with due regard to transfer of risk to public, staff, permanent works and operational infrastructure. The risk profile is recorded as part of the design brief process and will also help to inform the level of independence of design check (cat 1, 2 or 3). High risk temporary works, and other designs where there is a high interdisciplinary element, will also require an IDC/IDR to be carried out in accordance with NR/L2/CIV/003.

Temporary works is a key element of delivery of a project and should be treated as such, with significant temporary works highlighted in any consequent Work Package Planning exercise.

There is a Buildings and Civils Temporary works guidance note on Safety Central: held here: Safe by Design Guidance note – Temporary Works and Buildability 16.4.16
16. Construction Engineering Quality Management

16.1 Monitoring of Construction

Construction monitoring will be undertaken in accordance with the Construction Management Plan.

The DEM shall liaise with the PCM to arrange for the construction work to be suitably and adequately monitored on site for compliance with the design (permanent and temporary works) and other specified technical requirements. The DPE will advise the DEM on the level of monitoring required and specific technical skills required. Monitoring shall be carried out by competent persons who are independent of the construction organisation.

Close liaison with the Construction Manager (CM) is required by the PE’s, Site Engineer’s and DPE. Regular site visits will be undertaken by the CM and copies of reports issued to the PE. The PE, SE and DPE shall attend site to support the CM’s and discuss technical issues, design changes, test and commissioning and snagging inspections.

The DPE shall regularly review the requirements for monitoring and advise the DEM if any change in the regime is necessary.

For LBSR, construction monitoring and site engineering shall be led by the PE Temporary Works and Construction Interface (TW&CI). Site Engineers and Construction Managers will report with dotted line to the PE (TW&CI).

Quality Surveillance Reports (QSR) will be completed and logged in MDC’s quality system, copied to the PE (TW&CI).

A weekly Quality meeting will take place within LBSR to review the look-a-head programme and determine the level of NR witnessing required to support the ITP process.

16.2 Test and Commissioning and Inspection and Testing

For clarification, NR/L2/INI/02009, Section 5.8.8 – Testing and Commissioning Phase applies to the LBS&C Project for Civil, Structural and Building Services. This requirement is met by the Inspection and Test Plan process.

Telecoms, Security, Fire and operational services will follow the discipline specific Test and Commissioning Plans provided under the relevant NR Standards.

Test and Commissioning will be in accordance with N000-NRT-STR-EG-000020.
16.3 Factory Acceptance Testing (FAT) and Site Acceptance Testing (SAT)

The DPE in conjunction with the PE will review the requirements for FAT and SAT and determine a programme of witnessing.

16.4 Structural Fabrication Inspection

The size and nature of the fabrication should be assessed by the DPE to determine the need for inspection. It is advisable that a fabrication inspector is appointed where the DPE or PE do not have relevant experience to undertake the role.

The requirement for a trial erection should also be assessed, based on site constraints and the risks to the construction programme from poor fit. All prefabricated and pre-cast works to be assembled during possession time, or on programme critical path, shall be trial erected to verify fit, and enable any corrective action, before despatch to site.

The number of visits and interval shall be agreed between the DPE and the Fabrication Inspector, aiming for the minimum number to give the required degree of confidence in the final product.

16.5 Entry into service and Fitness to be taken into use

Entry into Service (EIS) shall be managed in accordance with the requirements of NR/L2/INI/CP0075.

The Project Manager is accountable for the demonstration of readiness for EIS and responsible for:

a) including the requirements of NR/L2/INI/CP/0075 within the Project Management Plan or similar
b) provision of relevant deliverables for the EIS file
c) the final decision to authorise EIS
d) making sure that any deferred items are progressed and closed within the agreed time limits.

The organisation and processes established on LBSR by the Project Manager, to implement the TLP Operational Readiness procedure will be detailed in the Project Execution Plan.

The EIS requirements shall be considered in the development stages of a project and an EIS Strategy shall be produced and updated as necessary as the project progresses.
For the LBS&C project of works the Delivery Team shall produce the EIS strategy in accordance with NR/L2/INI/CP0075 taking into account the processes established within TLP N000-01000-NRT-PMP-EG-000060 ‘LUL Interface Assurance (System Test, Integration & Entry into Service’).

The strategy shall:

a) explain any staging of works
b) describe how competent people are allocated to all relevant activities
c) describe when the EIS file(s) needs to be produced
d) include a draft checklist of deliverables
e) allocate responsibilities for deliverable production and acceptance by suitably competent people
f) describe the process for managing any deferred items
g) describe how the EIS file is managed.

The Designated Project Engineer is responsible for:

a) supporting the Project Manager in accordance with NR/L2/INI/02009
b) accepting Engineering Deliverables
c) where applicable, appointing a suitably competent person to accept deliverables immediately prior to and at the point of EIS
d) supporting the Project Manager with the preparation of the EIS strategy and the EIS file.

NR/L2/CIV/003 contains a requirement for a NR/L2/CIV/003/F005 (F005) ‘Certificate of Fitness to be Taken into Use’ to be produced. The F005 is to be signed by the Contractor’s Responsible Engineer (CRE) to confirm that the works have been constructed in accordance with the design (permanent or temporary works) documents. The CRE may delegate this role to an appointed person who will be subject to NR competency assessment focussing on the nature of the works to be signed for. This will follow the process for CRE assessment.

The F005 shall be signed by the construction organisation and is to be produced for all works within the scope of this EMP, including building services and works to other assets infrastructure, as follows:

i. Permanent Works – At the end of a possession when new construction work or strengthening work is undertaken to structures in the vicinity of the railway (trains running over, under, through or adjacent) whether the works are completed or not e.g. bridge works, footbridges, platform work, depot building or plant, train shed roof, etc.

ii. Permanent works – On completion of the permanent works i.e. a minimum of one F005 for each scheme.

iii. Temporary Works – At the end of a possession when temporary works are erected in the vicinity of the railway whether or not the temporary works are completed e.g. scaffolding, propping, hoardings, etc.

iv. General – Any other situation when requested by the Designated Project Engineer.
By producing the F005, the contractor is confirming that the construction works have been constructed in accordance with the design documentation (Drawings and Specification) and that the inspection and test regime identified has been complied with. Particular attention must be paid to gauge clearance and the effects of the works on the operational railway and travelling public.

The Designated Project Engineer shall make sure that the F005s are duly completed and put on the H&S File.

17. **As-built Records**

The production of As-built records shall be in accordance with the relevant technical workscope and shall comprise the following:

- **The 3D design model is for TLP use in clash detection during design and construction purposes only and does not need to be provided as a final As-Built deliverable in the H&S File. However, updates to the model will be required during the design/construction where design/site change is sufficient to impact ongoing stage design and/or other TLP projects, i.e. High Capacity Infrastructure. The model may be used by other suppliers to TLP.**

- **All GRIP 5 AFC (C01) issued design drawings need to be updated to As-Built (Z01) records in Microstation in accordance with TLP procedures.**

- **Suppliers fabrication and part/equipment drawings do not need to be imported into the 3D model unless they have significant impact on future design stages and/or other TLP Projects.**

- **Suppliers fabrication and part/equipment drawings can be submitted in electronic PDF format as red-lines within the H&S File and do not need to be provided in native CAD format – provided that the changes on the red-line mark-up are clear. If ambiguity exists then the original drawing should be updated and a clean PDF issued at Z01 status. All PDF red-lines should be stamped, signed by the CRE and indicated as Z01 status.**

- **Suppliers GRIP 5/6 design drawings (where design liability is held, i.e. not simply fabrication or part drawings but where design detail has been developed by the supplier) will be required to be updated to Z01 status in Microstation.**

- **In addition to the engineering As-Built records discussed above, As-Built Survey information shall be provided in accordance with section 5.25 of the TLP Survey Procedure N000-01000-NRT-PRO-EG-000023**

- **Specifications will not be updated to As-Built status**
18. Recruitment, Competence Management, Training and Development

18.1 Recruitment

The DEM shall review the competence of engineers prior to their appointment. This may be achieved by supporting the recruitment manager in the interview or selection process, or by CV review if deemed appropriate.

Support from the appropriate Lead Discipline Engineer must be sought where engineering disciplines are being appointed and Project team members are not qualified to assess the competence of the applicant. Refer to section 13 and 16.3

18.2 Engineering Staff Induction

Newly appointed engineering staff shall receive technical induction arranged by the Line Manager in accordance with the requirements N000-NRT-PMP-HR-000004, ‘Human Resources - Induction’ and LBSR – Record of Engineering Staff Technical Induction, Appendix A. This induction will include briefing on the requirements of this Engineering Management Plan as well as other Thameslink processes relevant to the role.

Core documents to be incorporated within the briefing include:

- N000-01000-NRT-STR-EG-000002, TLP Engineering Management Plan
- N000-01000-NRT-STR-EG-000011, TLP Central Engineering EMP
- N000-01000-NRT-PLN-EG-000002, TLP Railway Systems Directorate EMP
- Thameslink IMS
- N000-NRT-GDN-DM-000008 – eB The Instructions

Line Managers are responsible for providing and recording the induction.

Records of inductions shall be provided to the DEM and held on eB.

The DEM should consider the need for the appointment of a mentor for newly appointed members of the team. The mentor will normally be an experienced member of the Project team. Where specific engineering competence requirements are not available within the direct project team the appointed mentor may be supported by a discipline engineer from the TLP team or from another Infrastructure Projects Programme. The mentor will provide guidance and support though a documented plan for an appropriate period, typically a minimum of 3 months.

The above shall be conducted in addition to Network Rail HR and TLP induction requirements.
18.3 Competence Review and Development

Competence and development requirements shall be reviewed concurrently with twice-yearly staff appraisals and included in Action Plans so that the assessor may support the appraisal in personal development and in developing competency for both current and future roles.

Network Rail will support and work with the contractor to develop CRE’s and CEM’s competence. Contractors proposals for mentoring and training schemes will be considered on merit for each project or programme.

Competence assessments shall be undertaken for all Network Rail Project Engineering staff in accordance with each disciplines requirements under the Network Rail Discipline Management structure. Refer to section 16.2.

18.4 Standards Briefing

Lead Discipline Engineers in CET will attend their respective discipline briefing and will cascade brief the TLP discipline staff.

TLP Standards Impact Assessment (SIA) meeting will determine the standards to be briefed and instructed into contracts on the programme.

Refer to N000-01000-NRT-PMP-EG-000079 and N000-01000-NRT-PMP-EG-000080 for the TLP Standards Management processes.

18.5 Graduate Training

Graduate training will typically be provided in accordance with the company’s Graduate Training Scheme. Experience and achievement of the scheme’s objectives will be managed and monitored by the company’s Supervising Civil Engineers (SCEs), or equivalent role for IET, IMechE, CIBSE etc., who are appointed by the Institution, and Delegated Engineers who are accepted by the SCEs as having sufficient experience to manage and agree the graduate’s level of objective attainment.
19. Value Engineering

19.1 Value Engineering and Improvement

Value Engineering shall be managed in accordance with the requirements of N000-01000-NRT-PLN-PC-000002 ‘Risk and Value Management Plan’.

The early involvement of the PE in the development of a remit is essential. It is between the remit stage and finalisation of outline design that most value improvements can be realised. The option to progress with a standard design should be identified if possible. The input of the Project Engineer at this stage can greatly assist the Development Team in identifying an optimum value-engineered solution before extensive design work is undertaken.

It may be possible to omit the Feasibility stage of a project, depending on the remit and the proposed design solution. Where standard designs are implemented, then the option to omit this phase of the project should be taken provided that the engineering risks are understood.

The objective of the project team should be to identify and evaluate all options prior to completion of GRIP 3, achieving a solution which economically meets Engineering Policy with a minimum of design input. The parties engaged in the process prior to producing the Approval in Principle (AIP) submission should include the Sponsor, Project Manager, Designer, PEs, the DPE and the DEM.

An option presentation review should be held at the earliest opportunity for larger and technically complex projects, to look at the feasible options and to agree the preferred solution to be developed to AIP. The preferred option should be agreed with an appropriate range of experience at the review, and the Asset Manager should be able to formalise his agreement through the AIP submission based on the conclusions of the review.

Value Management is a process that enhances the value of an output. It takes a structured, team orientated, approach to defining what value means to a client in meeting a perceived need. This is achieved by establishing a clear consensus about the project objectives and how they can be achieved.

There are a number of key points at which Network Rail must make option decisions. Value Management helps to ensure that these decisions are taken in a way that is rational, explicit, accountable and auditable.

The core Value Management process follows the principles:

- Involvement of key stakeholders
- A structured Value Management Job Plan.
- Thorough Function Analysis
- An agreed, and endorsed, Value Management Report
- An implemented Action Plan
Value Management places emphasis on obtaining the optimum value for money solution for the functional requirements required by the Stakeholders.

19.2 Standard Designs

A suite of standard designs and details has been developed by IP B&C. The designs have been produced to meet many of the commonly occurring solutions required in the B&C portfolio and shall be used wherever possible to avoid the need for re-working of routine designs. A complete set of the current standard designs may be found on ProjectWise via the Standard Design Catalogue.

http://oc.hiav.networkrail.co.uk/programmes/IIIP/IPPM/standarddesign/default.aspx
20. Communications

20.1 Management Communications

Management communications take the form of the management cascade, programme team meetings, project team meetings, standards briefings and discipline management briefing notes. These give general guidance and information regarding corporate policy and company requirements along with performance information.

20.2 Project Engineering Communications

The successful delivery of a project depends on good planning and communication so that the correct information is available when required. The technical approval process must be followed correctly in a planned manner to ensure that the final output of design documents including drawings and specifications are produced correctly, properly checked and acceptable to Network Rail. Achievement of this may be facilitated by good communication throughout the whole process.

To support this the PEs, DPE, CREs, CEMs and the PM shall attend regular design review meetings so that the engineering requirements are understood and well communicated through the project team and particularly to the respective designers and contractors. The DPE shall initiate these meetings.

Other meetings shall be held during the development of the project to discuss the engineering solution. These may comprise the remit reviews, options, design review, reviews for IDC/IDR and other ad hoc meetings to resolve specific issues as required.

The PM shall consult the DPE to determine the need for such meetings and the appropriate frequency.

Liaison between the PEs, DPE, CREs and the CEM should be regular and address project and general engineering process.

On a wider basis, liaison between the DPE, DEM, PM and the CEM should be regular and address more strategic issues relating to the engineering programme.

20.3 Programme Engineering Meetings

The table below identifies LBS&C Engineering representation at the Programme Engineering Meetings:

<table>
<thead>
<tr>
<th>Meeting</th>
<th>Frequency</th>
<th>LBS&amp;C Engineering Representative</th>
</tr>
</thead>
<tbody>
<tr>
<td>TLP DEM Meeting</td>
<td>Four Weekly</td>
<td>DEM</td>
</tr>
<tr>
<td>LBS&amp;C &amp; RS DPE Meeting</td>
<td>Two Weekly</td>
<td>DPE's</td>
</tr>
<tr>
<td>TLP DPE Forum</td>
<td>Two Monthly</td>
<td>DPE's</td>
</tr>
<tr>
<td>TLP B&amp;C Standards Briefing</td>
<td>Quarterly</td>
<td>All Staff</td>
</tr>
<tr>
<td>PEM/DEM Team Meeting</td>
<td>Weekly</td>
<td>Direct Reports</td>
</tr>
</tbody>
</table>
### 21. Appendix A – Record of Engineering Staff Technical Induction

<table>
<thead>
<tr>
<th>SUBJECT</th>
<th>DATE BRIEVED (OR N/A)</th>
<th>SIGNATURE (denotes item briefed and understood)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The structure/hierarchy of Railway Group/Network Rail Company Standards/British Standards etc.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Network Rail Approval processes (Form A, Form EA, Scheme Plans etc.)</td>
<td></td>
<td></td>
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<tr>
<td>Safety Verification and Interoperability</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organisational interfaces (II / Engineering / Operations &amp; Customer Services)</td>
<td></td>
<td></td>
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<tr>
<td>Network Rail Safety Management System</td>
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<td></td>
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<tr>
<td>Engineering Process NR/L2/INI/02009</td>
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<tr>
<td>CDM Regulations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engineering documentation location and how to access</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Team Organisation / Structure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Network Rail product acceptance and change process</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The format and contents of Network Rail documentation (e.g. Contract Forms, Scopes of Services, Contract Requirements – Technical, Reports)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Core Thameslink documents to be incorporated within the briefing include: Thameslink EMP, Thameslink CET EMP, LBS&amp;C EMP, RS EMP, Thameslink IMS, eB, ProjectWise</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Mentor (name) if applicable:**

Induction by (name):

Signature:

Induction for (name):

Signature:

This record can be completed over a period of time.
Appendix B: Station Area Diagrams