TECHNICAL ASSURANCE

Engineering Design Assurance Gates Procedure

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1.0	12-03-14	[redacted]	[redacted]	[redacted]	Updated for Mini-gate procedure and general revisions
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Revision Changes:

Revision	Status / Description of Changes
3.0	**Updated to include requirement for Gate Strategy, and clarify requirement for Gate Readiness Review**
Reference	**Amendment**
6.2.2	Additional guidance added on the process for determining applicability of criteria to be covered under a mini gate and the potential reduction of attendees at mini gates.
6.2.5	Statement added regarding the preparation of a Gate Risk Assessment for Mini-Gate Submissions.
6.3	Section added regarding Gate Readiness Reviews prior to Gates.
7.2	Minor amendments to 'Gate Comparison' table.
8.4.8	Removed
8.4.9	Removed
8.5	Provides Guidance on the provision of a clear Gate Strategy where a Station, Portal or Shaft Contractor's Gates submission is broken down into multiple packages. This will be contained within the Contractor's Design Management Plan.
8.5.2	Provides guidance on how the Gate Strategy should consider the Gates' supporting documentation
8.5.3	Provides specific guidance on the consideration that needs to be given to FDS(b) documents when considering multiple Gates/Mini Gates
8.5.4	Guidance added on the provision of a Gate Risk Assessment form.
8.5.6	Information added on the need to demonstrate the closure of mitigating actions from the Gate Risk Assessment at the Final Main Gate 3.
Figure 2	Example of Gate/Mini Gate breakdown provided.
9.3.6	Statement added to provide guidance on the acceptance procedures for architectural designs (samples, mock-ups, prototypes etc).
12	Ref added for Acceptance of the Contractor's Architectural Samples, Mock-ups, Prototypes and Key Benchmarks document.
Appendix A No. 4	Added 'AsBo' letter of comfort.
Appendix A No. 9	Added guidance on Gate 3 requirements to demonstrate acceptance of architectural designs.
Appendix C	Human Factor's Assessment Report.
General	Roles and Gates attendees updated to reflect current organisation.
4.0	This document has been reviewed and is fit for continued use. The content has not been changed.

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5.0	Section 11.1.3 & 11.1.4 - IM endorsement on GIR form for changes impacting handed over assets. 11.1.6 added to confirm review of GIR against existing TSI compliance. Section 12 - reference to Signal Sighting and updates to Gate criteria in Appendix A - change impacts on assets handed over.

Contents

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1 Introduction

1.1 General

1.1.1 Crossrail is being developed and implemented in a way that satisfies the employer's requirements to operate and maintain the new railway safely, reliably, efficiently and cost effectively. These are being realised through an establishing assurance process that progressively provides this confidence throughout Crossrail's lifecycle. This procedure sets out the process for the Central Section Project (Westbourne Park to Pudding Mill Lane and Plumstead portals) and supersedes the **'Engineering Assurance Gates Procedure' number CR-DV-MGT-X-PD-00010** for Crossrail Central Section activities.

1.1.2 Crossrail impacts the infrastructure of railway Industry Partners, including Network Rail (NR), London Underground (LU), London Overground (LO), Docklands Light Railway (DLR), Rail for London (RfL) and Heathrow Express (HEX). Once completed, significant parts of Crossrail will become part of the infrastructure controlled by NR & RfL and key elements such as stations will become part of the infrastructure controlled by LU, DLR and RfL.

1.1.3 The assurance process that CRL employs fulfils both its own project specific requirements and the assurance requirements of the other key stakeholders and industry partners, principally NR, LU, DLR and RfL.

2 Purpose

2.1.1 The purpose of the Engineering Design Assurance Gates procedure is as follows:

2.1.2 To provide progressive assurance during the design stage that the objectives of the project will be achieved and that the project can prog ess successfully to the next stage;

2.1.3 To establish a regime where agreed products and deliverables are submitted, reviewed and accepted first time. In the event that submissions are rejected the Assurance Gates provide a control mechanism for re-submission; and

2.1.4 To provide clear visibility at progress checkpoints to ensure compliance to Crossrail broader governance and authority processes.

2.1.5 Clarify where key stakeholde s, principally RfL, will be required to acknowledge and endorse change during the transition to full Handover of the Railway.

3 Scope

3.1.1 This procedure applies to all work packages within the Crossrail Central Section of the Crossrail Project. It does not cover those projects undertaken by other bodies (LU, DLR, RfL and NR) under their own project management systems as part of the Crossrail programme.

3.1.2 This procedure complies with the ***Design Management Process (Ref 1)*** and sets out the Assurance Gates for the design phase up to final detailed design for construction, manufacture and installation.

3.1.3 Civils design contracts will progress through gates 1, 2 and 3. M&E systems design/Architectural contracts will also progress through Gate reviews during detailed design phase with additional Gate 3 requirements as mentioned in the following: ***Guidance on level of evidence expected for designs submitted to the Crossrail panel for Gates 1, 2 and 3 (Appendix A).*** Systemwide contracts have been through Gate 1 with the FDC's, further Systemwide Gate 1, 2, and 3 reviews

will be carried out with Contractors in accordance with the Works Information Volume 2B / Part 29.

3.1.4 Post Gate 3 reviews may be required when the Engineering Manager has identified significant design change post IFC that requires revalidation of the design. The Engineering Manager in conjunction with the Designer is responsible for evaluating the risks and impact of design changes against the Gates criteria in accordance with the ***Post IFC (Issued for Construction) Changes Guidance Note (Ref 21 for SSPT & Ref 16 for Systemwide),*** this is further explained in Section 11. The ***Gate Impact Report Template*** is included in ***Section 13 for SSPT.***

3.1.5 The ***Assurance Gates Implementation Procedure (Ref 14)*** provides detailed guidance for the implementation of the following gates documents:

- Engineering Design Assurance Gates Procedure – (this procedure);
- Systemwide Design Gate Review Procedure (Ref 12);
- Post Issued For Construction (IFC) Changes Guidance Note SSPT (Ref 21)
- Post Issued For Construction (IFC) Changes Guidance Note – Systemwide (Ref 16)

4 Glossary

Subject	Definition
ALARP	As low as reasonably practicable
CDM	Construction (Design and Management) Regulations 2007
CDT	CRL Commitments Delivery Tracker
CDO	Conceptual Design Overview
CPFR	Crossrail Programme Functional Requirements
CRAs	Comparative Safety Risk Assessments
CRL	Crossrail Limited
CSW	Central Section Works
Designer	FDC (see below) or D&B Contractor
D&B	Design & Build
DOORS	Dynamic Object Oriented Requirement System
DfT	Department for Transport
DLR	Docklands Light Railway
eB	Crossrail document Management System also referred to as EDMS
EMR	Environmental Minimum Requirements
ESM	Engineering Safety Management
FCD	Field Change Document
FDC	Framework Design Consultant (Designer)
GRIP	Guide to Railway Investment Projects
H&S	Health & Safety
HEX	Heathrow Express
ICD	Interface Control Document
IDC	Inter Design Consultant Check
IDR	Inter Design-consultant Review
IM	Infrastructure Manager
LO	London Overground
LOD	Limit of Deviation
LU	London Underground
MDL	Master Documents List
NCR	Non-Conformity Report
NR	Network Rail
PCI	Pre-construction Information
PDA	Project Development Agreement
PEP	Project Execution Plan
PPP	Public Private Partnership
PFIs	Private Finance Initiatives
QDR	Qualitative Design Review
RIR	Register & Issue Record
RFI	Request for Information
RfL	Rail for London
RIBA	Royal Institute of British Architects
ROGS	The Railways and Other Guided Transport Systems (Safety) Regulations 2006
SDR	Single Design-consultant Review
TIC	Total Installed Cost
TfL	Transport for London

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5 Procedure

5.1 Programme and Project Lifecycle

5.1.1 In accordance with the Technical Assurance Plan (TAP) (Ref 2), Technical Assurance requires a lifecycle to be defined which represents a sequence of standard phases that each project or work package will undertake i.e. lifecycle phases. CRL will use a lifecycle model based on the 'V' Cycle set out in CENELEC RAMS Standard EN 50126. IMs, notably London Underground have adopted the model in their Assurance Standard S1-538 (Ref 3);

5.1.2 These lifecycles provide a reference framework to define:

5.1.3 The scope and boundaries of assurance plans and responsibilities;

5.1.4 The location of assurance "Gates" and "Checkpoints"; and

5.1.5 "A standard project lifecycle representation", in support of compliance with the **LUL Assurance Standard S1-538**. The ***Technical Assurance Plan (TAP) (Ref 2)*** identifies the lifecycle being used by CRL. Where CRL is responsible for delivering work against multiple lifecycles, the TAP will show how lifecycles are integrated.

5.2 Systems Integration

5.2.1 Systems Integration is described in the ***Systems Integration Plan (Ref 9). Figure 1*** (overleaf) shows the "V lifecycle" and shows how the various processes are applied during the lifecycle. The left-hand side of the V is the "design phase" and the right-hand side is the "implementation phase". Note that this cycle is repeated for each individual package and for the complete railway system. The systems Integration processes shall ensure that the Central Section Works when integrated with the trains, Canary Wharf station, Woolwich station and other interfaces (including LU and NR) deliver a safe operable, maintainable railway. A separate procedure will be developed to include the implementation phase gates, readiness reviews, testing and commissioning activities as the project progresses. The ***Certification Process Roadmap (Ref 10)*** further illustrates the various stages through the design process and includes reference to the respective IMs and their requirements.

5.3 Design

5.3.1 Certification: At the end of the design phase at Gate 3 the designer shall produce a ***Design Completion Certificate (Ref 23)*** to confirm that the prepared design conforms to the approved Conceptual Design Statement (CDS). This is further explained in the ***Technical Assurance Plan (TAP) (Ref 2)***. In order to gain the IM approval to support the discrete letting of construction contract packages, design compliance certificates shall be produced for the design elements associated with the construction packages as described in the ***Design Review Procedure (Ref 4).***

5.4 The Assurance Gates Process for Design

5.4.1 CRL is responsible for delivery of all works in the Central Section and will implement a structured process based on three 'Assurance Gates' during the design phase of the works. Supplementary gate reviews may be held as required by the Gates Chair Person. As can be seen from ***figure 1*** (below) the gates are strategically placed to provide check points as significant points on the 'V' lifecycle for the project. These gates will be held at the following points:

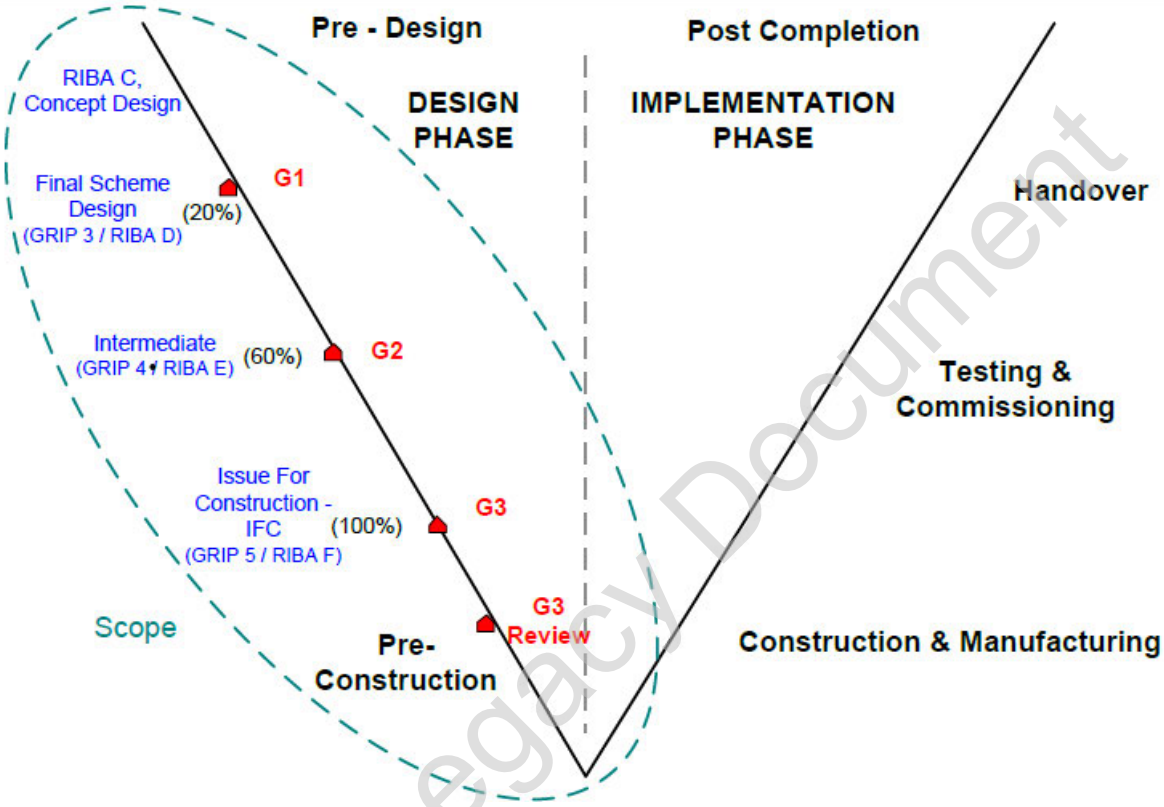

Figure 1: Gate 'RIBA' review points

Gate 1: Final Scheme design (i.e. scope freeze at concept design)

Gate 2: Intermediate (i e. a progress check at 60% complete design)

Gate 3: Design completed (i.e. issue for construction - IFC)

5.4.2 The ***Design Review and Gate Review Programme (Ref 6)*** is used to plan the gate reviews. This programme provides a three month look ahead for forthcomingfor the Crossrail programme.It is the responsibility of the Project Engineers for the respective FDC contracts and EM s for D&B contracts to provide up to date information regarding the planned review dates and IFC dates. These dates are to be reflected in the CRL programme which is updated on a periodic basis. Dates are to be provided for the following activities: SDR, IDR, CDO, Gate 1, Gate 2 and Gate 3. Note: The Conceptual Design Overview (CDO) is a presentation of the design to Infrastructure Managers for the stations and the date shall always be ahead of the Gate 1 review. It is not necessary to have a CDO for all design packages.

5.4.3 The Project Engineer is responsible for managing design production from one FDC whereas the Engineering Manager is responsible for the implementation of the design using multiple Designers within a single construction contract.

5.4.4 This Engineering Design Assurance Gates Procedure incorporates project requirements to support the corporate level review of the project programme, cost and risk deliverables.

5.4.5 For each contract a Master Documents List (MDL) shall be produced by the Designer. This must be based on the agreed list of Design deliverables that has been previously provided by the Project Engineer / Engineering Manager. The MDL is not the technical assurance evidence, it is the definitive list of technical assurance evidence documents and facilitates navigation to and retrieval of documents from eB. Only documentary evidence that is stated in the MDL can be used to assure the design. This process will be in accordance with ***Technical Assurance Master Documents List Procedure (Ref 5).***

5.4.6 The primary objective of the Assurance Gates Process is to ensure that the engineering output aligns with CRL requirements and obligations. By doing this the gate provides a mechanism to control progression to the next stage. A check list will be used, consisting of minimum requirements for each gate, to assist with the assessment.

5.4.7 This procedure defines the roles and responsibilities of the Gate review panel attendees.

6 Assurance Gates

6.1 Overview

6.1.1 The Assurance Gates 1 to 3 are a control mechanism that provides progressive assurance when evidence is reviewed at defined stages to confirm that the design infrastructure and systems produced meet the project objectives, requirements, obligations and that the risks associated with the engineering are identified and fully understood. The next stage of the project can only proceed when the Gate is successfully passed. Where a Conditional Pass is granted the project must demonstrate it is complying with the stated conditions.

6.1.2 The minimum approval criteria used for determining whether or not the design meets the project objectives are set out in Section 8.3. I addition to these minimum requirements, the Project Manager, Engineering Manager and Project Engineer may specify further criteria at the outset of each design stage. This will set the benchmark at the Gate Review. These additional criteria are to be specified in the Design Management Plan as required by ***Design Management Process (Ref 1).***

6.2 Mini-Gate

6.2.1 A Mini-Gate Submission may be held, at the discretion of the Gate Chair, when the designer (FDC or contractor) considers that a part of the works is of less complex design than the other parts of the main works or is required earlier than other parts of the main works and can therefore be justified to warrant a separate Gate review. It will normally take place at the Gate 3 stage.

6.2.2 There may be justification for reviewing the design against a reduced number of approval criteria and for involving a reduced number of panel members in the Mini-Gate review, depending upon the complexity and the scope of the mini gate. The applicable criteria for the mini gate will be identified by the Contractor and Engineering Manager within the submission form and the Gate Chair shall agree any proposed reduction in approval criteria. The Gate Chair shall decide the appropriate attendance at the review considering the above.

6.2.3 A proposal for a Mini-Gate review shall be made in the same way as for a normal Gate review and shall be accompanied by the appropriate evidence to convince the Gates Panel members of its compliance with approval criteria. Whenever possible Mini-Gate reviews shall be included in the programme for Gate Reviews, in advance of the review actually taking place. If not possible then they shall be shown in the programme as a record of the review.

6.2.4 A template for the ***Mini-Gate Submission*** is shown in ***Section 13.***

6.2.5 A Gate Risk Assessment shall be prepared for each Mini-Gate Submission (See Ref 22)

6.2.6 A Gate Review Report and Gates Pass Certificate shall be prepared for each Mini-Gate submission as described in this Procedure and issued to the Designer.

6.3 Gate Readiness Review

6.3.1 The Crossrail Engineering Manager will undertake a Gate Readiness Review in advance of the Gate 3 Review, seeking assistance from other specialists (including the IM) to review documents and receive their comments as required.

6.3.2 The Gate Readiness Review is a multi functional review of the design scope to be gated, and will evaluate readiness against the approval criteria defined in Section 8.3. This will be assessed through review of the Contractor's draft RIR and the acceptance status of the documents that support the forthcoming Gate (see also Appendix A).

6.3.3 The Gate Risk Assessment produced to identify the risks associated with progression of the design via multiple Gate reviews (See **Guidance on the FDS Submission and Approval Process Ref 22**) will be reviewed during the Gate Readiness Review and will be supplemented with additional risks that are identified during the review.

6.3.4 The Gate Readiness Review will identify, as far as possible, that all relevant evidence is already available, or can be provided, at the due time for consideration by the Panel in advance of the planned Gate 3 Review. If the evidence will not be available this will be considered as part of the Gate Readiness Review.

6.3.5 The completed Gate Risk Assessment shall be used to identify gaps, unresolved technical issues, and a lack of integration with systems designed and installed by others. The risk assessment will quantify the associated risks and define a course of action to be taken. This may prompt the requirement to add items to ARM particularly, for example, where there is a risk of post Gate 3 design change.

6.3.6 The EM shall issue completed Gate Risk Assessments to the relevant IM for information.

6.3.7 The dates of all Gate Readiness Reviews shall be advised to the Gates Coordinator.

6.3.8 To conclude the Gate Readiness Review the Engineering Manager will make a recommendation to the Contractor and the Gates Chair as to the readiness of the design for the forthcoming Gate.

7 Definition of the Assurance Gates for Design.

7.1 Gate Stages

7.1.1 **Gate 1** (GRIP 3 / RIBA D) - At this stage the design is a ***final scheme design*** where a single option has been selected for development. The details will be outline only but will define the character, limit and form of construction.

7.1.2 **Gate 2** (GRIP 4 / RIBA E) - At this stage the design has progressed to an ***intermediate*** position (progress check at 60% complete) This Gate is a check point at about the mid point between Gate 1 and the final design. At the outset of a project the target deliverables at Gate 2 shall be clearly defined so that it will provide an interim way point to confirm progress.

7.1.3 **Gate 3** (GRIP 5 / RIBA F) - At this stage the design is complete and ready to be ***issued for construction***. Design details will be finalised and fully integrated with other interfacing works.

7.2 Gate comparison

Table 1 provides a comparison between the gates described above and the equivalent RIBA and GRIP stages:

Crossrail Gate	RIBA Stage	GRIP Stage	LU Stage	% completion	Description
Gate 1	C or D	3	2 Conceptual Design Statement Ref Clause 3.15 – S1538	20% Design	Final Scheme design
Gate 2	E	4		60% Design	Development of single option
Gate 3	F	5	Compliance Submission Ref Clause 3.17 - S1 - 538	100% Design	Detailed design; tender documents and production information

Table 1: Gate comparison

8 Format of the Assurance Gate Reviews

8.1 General

Each Assurance Gate Review focuses on assessing whether the design deliverables meet all the objectives and criteria appropriate to the Gate. Evidence will be presented to the Gate Review Panel who will assess whether or not the evidence is adequate and complete. The Gate Review Panel will examine the evidence and may ask the presenters questions in order to validate the adequacy and completeness of the evidence through identification of gaps in the submissions. If the evidence demonstrates that the design meets all the objectives and criteria, the design will pass the Gate and can proceed to the next stage.

The Assurance Gate Review will not be a check or detailed review of design deliverables, but will validate the evidence that adequate checks and reviews have been conducted. The Gate Review will record the evidence including any clarifications made during the Gate Review as part of the Assurance Process

8.2 Approvals

8.2.1 If the evidence submitted at the Gate Review demonstrates that the design meets the objectives, it will be approved by the Gate Panel (refer to 9.2) and given a pass. If missing deliverables or evidence that does not impact on the ability of the project to proceed, the Gate Panel are authorised to give a conditional pass, subject to the remaining deliverables being comp eted within a specified time. This is generally within 4 weeks or as agreed by the Head of Technical Assurance /Gates Chair Person. The Gates Co-ordinator will track and manage the status of conditions raised during the Gate Reviews. Evidence supplied to address outstanding conditions will be reviewed and accepted by the Head of Technical Assurance /Gates Chair Person prior to a Gate Pass being awarded.

8.2.2 If the Gate Panel decides that the submitted deliverables fall short of the requirements, the design will not pass through the Gate Review and is therefore prevented from proceeding to the next stage. In such cases a resubmission of the gate evidence is required. When a resubmission is necessary, if specific criteria of the submission are acceptable, the failed criteria only may be submitted at the discretion of the Head of Technical Assurance/Gates Chair Person.

8.2.3 If there are changes to the requirements for a work package following Gate Review 3 the Designer's package manager will re-submit the deliverables to capture the changes to the required standards. The Designer will also make sure the changes meet the overall project objectives, obligations and any engineering risks associated are identified, captured and fully integrated to the programme. However, for any non-compliance they will be captured and recorded as per CRL procedures. The timescales for resubmission of deliverables will be within 14 days or as instructed through the respective Head of Technical Assurance /Gates Chair Person/Project Engineer for that work package. The minimum approval criteria for revised deliverables will be same and are set out in Section 8.3.

8.2.4 The outcome of the review, e.g. pass, conditional pass or resubmission, is noted on the Gate Review report (see Sections 10 and 11 for details of how conditions are monitored and closed out).

8.3 Approval Criteria

8.3.1 Each Gate will assess evidence against the following approval criteria:

- Meeting Employer's requirements and other project specific requirements as appropriate;
- Compliance with the Crossrail Act 2008, consents and any other applicable legal requirements and the PDA;
- Compliance with the appropriate standards;
- Ensuring safe construction, maintenance and operations including;
    1. consultation and coordination of construction/constructability health and safety risk with others affected by the design.
    2. collection, collation and sharing with those that need the information necessary for others (designers and contractors) to avoid health and safety risk.
    3. Application of the principles of prevention.
- The predicted Total Installed Cost (TIC) remains within budget and the design is affordable;
- The design assumptions and risks have been identified, documented and evaluated. Evidence is required to demonstrate that they have been closed out or accepted by CRL and carried forward to the next stage;
- The design is fully co ordinated in itself and integrated with other sections of design or adjoining works. SDRs / IDRs carried out and comments addressed.
- 3D Model eviews carried out and issues addressed and recorded in the Model Issues Report, as per **3D Model Review Procedure (Ref 18)**;
- The design complies with the Environmental Minimum Requirements (including Undertakings and Assurances) and is suitable for construction or manufacture and installation;
- The appropriate level of quality control and assurance has been applied and the design meets the required level of detail for the Gate to allow endorsement of the design by Crossrail. This will be in line with the **Technical Assurance Plan (TAP) – (Ref 2)** and **Design Management Process (Ref 1)**; and
- The design will enable the project to meet the delivery schedule.
- Where the works are adjacent to the operational railways a **Gauge Acceptance Criteria [Ref H]** form shall be completed and submitted prior to Gate 3.
- The LUCT Acceptance Record shall be completed prior to Gate 3. Refer to Appendix 3 of **Guidance on the Final Design Submission (FDS) and Approval Process [Ref 22]**.

8.3.2 Each Gate requires different levels of evidence against each of the criteria, progressively increasing the level of assurance from Gate 1 to Gate 3. Guidelines of the evidence expected against the approval criteria at each Gate are set out in **Appendix A.** These guidelines set out typical forms and level of evidence but have been kept flexible to allow for the different size and nature of packages that may be presented for Gate review.

8.4 Gate Review Structure

8.4.1 At the commencement of a Design Activity all Designers are required to prepare a Design Management Plan (DMP) that is submitted to the Crossrail team for acceptance. The template for the DMP is contained as Appendix A in the ***Design Management Process (Ref 1).*** This will include how activities will be planned and integrated to ensure the design will pass through the Gate Review Process including planned SDR, IDR and Gate dates with the scope of each Gate release. Depending on the size and complexity of the Package, and the needs of the construction and manufacturing schedule, the Designer may be required to submit sections or smaller packages of designs for Gate Review before the final submission is made for the overall Package. In this way the Package is assured in stages building towards final acceptance.

8.4.2 The ***Design Management Process (Ref 1)*** and ***Certification Process Roadmap (Ref 10)*** details how the Gates Procedure fits within the Certification Process.

8.4.3 The scope of the Gate submissions is therefore flexible to suit the needs of the project and the type of procurement arrangements. If there is no requirement for submissions in parts, the default is for the complete Work Package to be submitted at each of the three Gates as applicable.

8.4.4 In all cases the scope, including the geographical and functional extents, of the submission for Gate Review must be clearly defined.

8.4.5 The Gates Co-ordinator will manage the Gate Review meetings schedule.

8.4.6 Submission documents through the Designer s Package Manager must be provided at least 5 working days prior to the scheduled review da e.

8.4.7 The Project Engineer / Engineering Man ger shall review the Gate presentation materials to ensure their suitability to demonstrate the requirements of that Gate before the scheduled Gate review meeting. If the presentation materials are not suitable actions shall be taken by the Project Engineer to ensure that the consultant revises the materials to the required standard before the Gate Review meeting. If that cannot be achieved the Head of Technical Assurance/ Gates Chair Person or he Gates Co-ordinator shall be advised and the review postponed if necessary.

8.5 SSP(Station, Shaft & Portals) Multiple Gates Submission Strategy

8.5.1 Multiple Gate Submissions – Where a Station, Portal or Shaft Contractor Gates submission is broken down into multiple packages (including agreed mini Gate packages), the Contractor will be required o provide a Gates Strategy within his Design Management Plan. This document will describe the scope and sequence of all the proposed gates/mini gates for the particular Element (refer to figure 2 below), and the Design Management Plan shall be updated accordingly.

8.5.2 This Gate Strategy will also state the plan for updating the documents that support individual Gates and individual FDS(b) submissions including the Fire Strategy, A&M Strategy, RAM Assessments, Testing & Commissioning Strategy, Human Factors Report, Design Engineering Safety Justification and Way Finding & Signage report, and will describe how the documents will be submitted for each successive proposed Gate and FDS(b) submission to demonstrate a fully integrated assured design for that part of the Element. It should be noted that these documents must achieve a Code 1 for the last proposed Gate as reflected in the contractor Gates Strategy, and will be a pre-requisite for acceptance of the Certificate of Integration.

8.5.3 Where IM acceptance is to be sought for the scope of design covered by a particular Gate 3, via the submission of an FDS(b), it will be necessary to identify within the Gates Strategy that an FDS(b) is to be produced. The Gates Strategy shall demonstrate that the scope of design covered by the total planned FDS(b)s covers the complete scope of the Contractor's design responsibilities (refer to ***Ref 21 'Guidance on the Final Design Submission (FDS) and Approval Process***').

8.5.4 In order to support the Contractor's demonstration that a suitable level of risk mitigation has been achieved, a risk assessment format has been provided (see Ref 22, Appendix 7). This will identify risks associated with the progression of the designs via multiple Gate reviews. It will be covered as part of the Gate Review process and the Contractor's final presentation to support the Certificate of Integration (see 8.5.5). Significant risks should be entered into the contractors Crossrail ARM risk Register.

8.5.5 The Contractor is responsible to provide a signed declaration on the CRL ***Certificate of Integration*** upon successful completion of all the Gates packages. This declaration will confirm that the connection of the services between multiple Gates submissions has met the overall design integrity requirement on safety, performance, co-ordination and interfaces. This template is in ***Section 13 Standard Forms / Templates.***

8.5.6 When the final Main Gate has been completed the Contractor is required to support each Elemental SSP (Station, Shaft & Portals) Multiple Gates Submission Integration Certificate through a presentation ('wrap up' Gate) demonstrating how this has been achieved. Acceptance of the Certificate of Integration by CRL will require closure of all Gate Conditions. The presentation will demonstrate that the mitigations proposed in all the preceding Gates and Mini-Gate Risk assessments have been closed out.

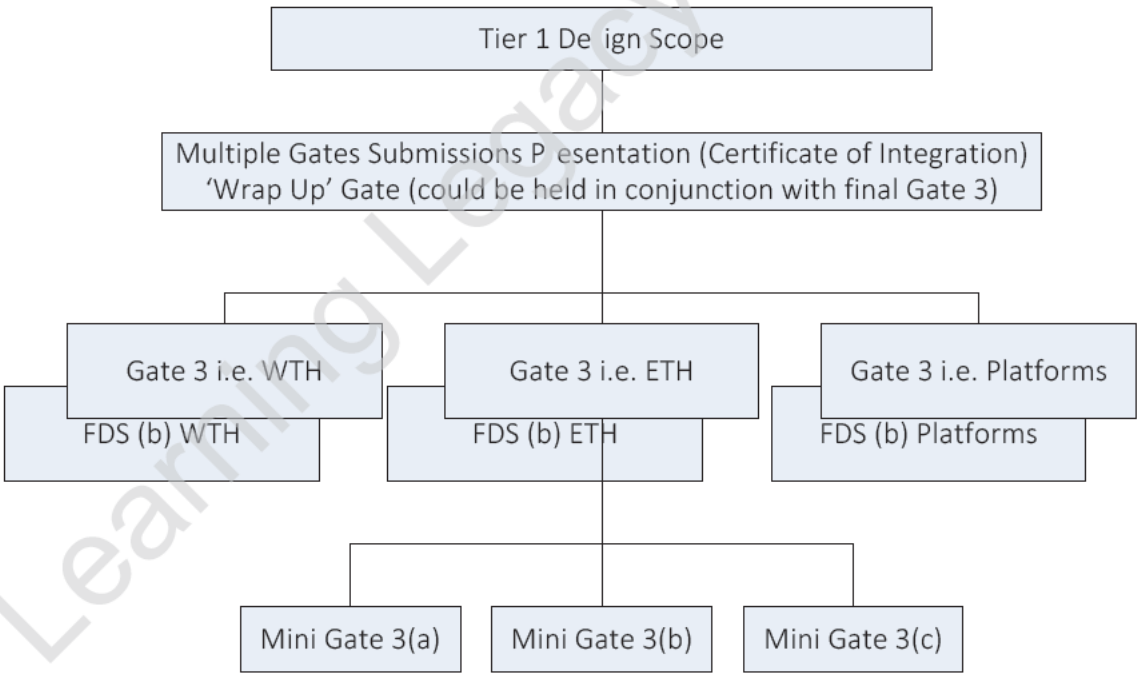

Figure 2: Example of Potential Gate and FDS(b) Structure

9 The Gate Review Panel

9.1 Make up of Gate Review Panel.

9.1.1 The Gate Review Panel, appropriate to the particular workscope submitted to CRL for review, is made up from the following CRL personnel or delegates:

- Head of Technical Assurance / Gates Chair Person (Chair)
- Chief Engineer (as required)
- Head of Civil Structures
- Lead MEP Engineer
- Interface Manager
- Lead Requirements Engineer

Plus, in attendance at all Gates:

- Assurance Gatekeeper
- Assurance Gates Co-ordinator

Other specialists are available within the Crossrail Technical Directorate to support the Chief Engineers Group. In particular the following staff will be made available to provide further assurance sign off where necessary.

Chief Engineer's Group

- CAD Team
- Risk Manager
- Managers of Engineering
- SCL Manager
- Head of Underground
- Head of Architecture or Lead Architect
- Head of Stations Engineering
- Head of MEP

Integration

- Head of System Safety & Interoperability

Systems & Commissioning

- RAM Manager
- Maintenance Planning Engineer

Sustainability

- Head of Sustainability and Consents

Technical Information

- Head of Technical Information

Systemwide

- Systemwide Director
- Systemwide Project Manager

Health & Safety Directorate

- Health and Safety Director

9.1.2 In addition to the Gate Review Panel attending at a review an Assurance Gatekeeper shall be present, particularly at Gate 3 Reviews. The Assurance Gatekeeper is independent of the Designer and the Gate Review Panel.

9.1.3 If the Gates Chair Person is not available he/she can appoint one of the Panel Members as the acting chair. On an exceptional basis other Managers may also appoint suitable delegates in their place. The Head of Technical Assurance/ Gates Chair Person, Gates Co-ordinator shall be notified of this at least one day before the meeting.

9.1.4 The meetings will be recorded in a report by the Gates Co-ordinator (see Section 10)

9.1.5 The number of attendees to form the Review Panel is the Chair plus a minimum of 3 Crossrail personnel depending upon the requirement (as noted in section 9.1.1 of this document) and the Gates Co-ordinator. The Gate Panel have all been deemed competent by the Head of Technical Assurance/ Gates Chair Person to attend the gate reviews. Records of competency are retained by the Crossrail team.

9.1.6 If members of the key disciplines are not able to attend the Gate Review, then they shall notify the Gates Co-ordinator and Head of Technical Assurance/ Gates Chair Person for their decision on the acceptability of the submission to reach the required gate standard. This will be by email stating "Satisfactory for that gate" or "Confirmation of no objection" listing any comments or conditional items necessary to achieve the minimum acceptable requirement. All attending Panel members will sign the attendance sheet as evidence of review/attendance and this will form part of the Gate Report.

9.1.7 The Gate Review Panel can be supplemented wi h individuals who have specific interface responsibilities and or skills appropriate to the submission. These additional panel members will be selected by the Gate Chair as necessary.

9.1.8 The Designer will be responsible for the preparation of information for the Gate Review Panel. This shall be made available to the Gate Review panel at least 5 working days prior to the scheduled date for the review. The Project Engineer shall manage the presentation to the Panel.

9.1.9 Briefings will be provided for consultants / contractors in the gates process.

9.1.10 ***Appendix B*** details the roles and responsibilities of all stakeholders in the Assurance Gates process.

9.2 Roles & Responsibilities of the Gate Review Panel and Assurance Gatekeeper

9.2.1 The Gate Review Panel is responsible for managing the Gates Process thereby ensuring that:

- The engineering progress and the design status has successfully reached a stage of development appropriate to the Gate being assessed.
- The engineering details have been fully integrated, will deliver the required outputs and meet the Crossrail requirements and other project specific requirements.
- Cost and programme issues have been agreed with the Project Manager and align with budget constraints.
- The assurance evidence presented to the panel is sufficient to support the Gate requirements.
- The risks are either designed out, have appropriate mitigation or have been clearly identified and agreed that they can proceed to the next stage.

- All the necessary consents and deliverables required under the Crossrail Act (2008) and other legal requirements and the Environmental Minimum Requirements have been identified, complied with and that the design is compliant with the Crossrail Act (2008) and the EMR (including undertakings and assurances).
- The Assurance Gatekeeper shall monitor the conduct of the Gate Review to ensure compliance with this procedure. In the event that a quorum of Gate Panel members is not present at the Gate Review then the Assurance Gatekeeper may make up the deficiency.
- At the conclusion of the Gate Review the Gates Chair Person and the Assurance Gatekeeper shall confer, taking full account of the views of the other Panel Members, and decide whether or not the Designer's submission and presentation meets the Gate Review objectives and consequently can be given a pass or is prevented from passing the Gate. If the Gates Chair Person and the Assurance Gatekeeper decide that missing deliverables or evidence do not impact on the ability of the project to proceed, then a conditional pass may be given, subject to the remaining deliverables being completed within a specified time. The conditions and timescales are conveyed to the Designer at the Review.
- Where conditions are raised that are potentially of a significant risk consideration shall be given to inclusion of the conditions in an Early Warning Notice (EWN) raised by the Project Manager.

9.2.2 The Review Panel findings are recorded, together with any supporting data.

9.3 Gate Review – Provision of Evidence

9.3.1 It is the Designer's responsibility to assemble and present to the Gate Review Panel sufficient evidence to enable the Panel to discharge their duties (as defined in this procedure). Contractor's design responsibilities are described in the Works Information Volume 2B / Parts 7 and 22.

9.3.2 The following must be available for the review:

- The key design products that are associated with a Gate Review for the Panel to refer to, at least 5 working days prior to the scheduled date for the review. The products can be made available in hard copy or digitally. In either case there must be a full list of all the documents, drawings and any other design products (including revision) that form the subject of the Gate Review. Please note that, for the purposes of permanent storage and retrieval, the evidence provided will have full CRL document numbering including revision to allow for future retrieval. This may be listed within a PowerPoint presentation. Note: It is not acceptable to provide only electronic links (without document numbers) to the relevant documents within the Gate submission.
- Evidence of compliance against the approval criteria (Guidance is set out in ***Appendix A*** for each of the Gates). This will include evidence of the review of the 3D model as described in the ***3D Model Review Procedure (Ref 18)***. Provision of a clash detection report demonstrating the model is clash free as provided by the closed-out Model Issues Report.
- Draft Final Design Submissions are a requirement for Gate 3. The process for submitting and gaining acceptance of Final Design Submissions, and the associated supporting documents to CRL and the Infrastructure Managers (IMs) is described in ***the Guidance on the Final Design Submission (FDS) and Approval Process (Ref 22)***.

9.3.3 The Designer will be required to make a presentation to the Gate Review Panel. The presentation must include:

- The scope of the package or sub-package for review including geographic and/or functional boundaries.
- The evidence to show how the design meets each criteria for approval in turn (as listed in Section 8.3).

9.3.4 The evidence shall demonstrate that the design product meets the criteria and shall also provide evidence that appropriate people and processes were used to produce the design.

9.3.5 A list of typical critical MEP and Fire Equipment items for which Material Compliance Records (MCRs) are required before Gate 3, is included in the following document - ***Demonstration of Materials Compliance Procedure (Ref 20).*** For completeness the list also includes MEP and Fire equipment MCRs required after the Gate 3 Review as Priority 2 items.

9.3.6 Where acceptance of architectural designs is required post Gate 3 i.e. for prototypes, samples etc, it will follow the requirements set out in the ***Demonstration of Materials Compliance Procedure (Ref 20)*** and ***Acceptance of the Contractor's Architectural Samples, Mock-ups, Prototypes and Key Benchmarks (Ref 24)*** where Materials Compliance Records and Contractor's Inspection Records will be accepted by CRL accordingly.

9.3.7 The Designer Confirmation for Architectural (Common Components) & Structural Architectural Detail Design Certificate shall be completed as required. This template is in Section 13 Standard Forms / Templates.

10 The Gate Review Report

10.1 General

10.1.1 A 'Draft' report with the results of the Gate Review will be published by the Gates Co-ordinator no later than ten working days after the review allowing the respective design team to progress any actions without delay. The completed signed report with conditional evidence as necessary shall be saved to eB and issued within 28 days unless agreed otherwise with the Head of Technical Assurance / Gates Chair Person. The ***Gate Review Report template*** is to be used for this purpose this is in ***Section 13 Standard Forms / Templates.***

10.1.2 The Gates Co-ordinator will keep a record of the status of any conditions raised in the gate reviews. It is the responsibility of the Designer to provide evidence to address any conditions noted. This may be supplied to the Gates Co-ordinator or the Head of Technical Assurance/ Gates Chair Person as a hard copy or by email. Where agreed with the Head of Technical Assurance/ Gates Chair Person a further review of conditional evidence may be carried out with specific panel members. After verification, conditional evidence shall be referenced or attached to the finalised Gate Certificate for issue as a record of the Gate outcome (See 9.2.1).

10.1.3 Following the Gate Review the Project Engineer shall ensure that a revised MDL is prepared and submitted to the Crossrail Technical Assurance team to enable formal approval. This process will be in accordance with ***Technical Assurance Master Documents List Procedure (Ref 5).***

10.1.4 If the package contains sub-packages, the MDL shall be filtered accordingly to show those documents relevant to the sub-package that has gone through the Gate Review.

10.2 Purpose of the Gate Review Report

10.2.1 The report will capture the results of the Panel's review. It serves as a record of the review and summarises the findings. The key aspects of the report are recording the evidence presented to satisfy the approval criteria and using this to support the decision regarding pass or resubmission.

10.2.2 The Gate Review report shall be signed by the Gates Co-ordinator and reviewed and signed by one other panel member as a minimum. Final approval is by the Head of Technical Assurance / Gates Chair Person, or delegate as appropriate. The final completed report shall have signatures to verify the review and approval process and be numbered and scanned into the eB as a formal record of the gate review.

10.2.3 When a complete gate pass has been achieved and all gate conditions have been addressed, a ***Gates Pass Certificate*** signed by the Head of Technical Assurance/ Gates Chair Person will be awarded to the Designer for the respective design package. This certificate will be saved to eB with any evidence to close out conditions and issued to the Designer and Crossrail. This form is in ***Section 13 Standard Forms / Templates.***

11 Post Issued For Construction (IFC)

11.1 Design Changes

11.1.1 Where there is a change to the gated design post IFC and the Engineering Manager determines that a Gate Impact Report is required, then this report will be produced by the Designer. This template is in ***Section 13*** Standard Forms / Templates. The report will be submitted to the Gates Coordinator(CRL_Gates&AssuranceTeamInbox) / Head of Technical Assurance to review the impact of the design change against the currently assured design.

11.1.2 The Head of Technical Assurance will seek guidance as necessary from Panel Members who will be asked to review the report for compliance and / or attend the Gate Impact review meeting. If acceptable a Gates Pass Certificate will be issued to cover the design change/s. The Head of Technical Assurance may request that a full Gate review is carried out if necessary.

11.1.3 Where a design change is identified as impacting directly on an asset that has been Handed Over this will require IM review and sign off as well as being copied to the Engineering Manager and Principal Delivery Engineer for any WPP required

11.1.4 On completion, the Gate Impact Report, together with the Gate Pass Certificate shall be sent to the relevant IM for information and copied to the Engineering Manager and Principal Delivery Engineer for any WPP required.

11.1.5 A guidance note to Engineering Managers (EMs) / Project Engineers (PEs) / Principal Delivery Engineers (PDE) for managing changes post IFC design has been produced: ***Post IFC (Issued for Construction) Changes Guidance Note (Ref 22).***

11.1.6 GIRs will be reviewed by the Interoperability Manager and should the change potentially impact existing compliance with TSI requirements then the CRL Interoperability Manager shall notify the NoBo of the change by letter/email.

11.2 Construction and Post Construction

11.2.1 The Issue of ***Design Documentation for Construction procedure (Ref 11)*** describes the process for the handover of IFC Packages from Engineering to Construction (including RIRs).

11.2.2 The Designer is responsible for all changes initiated through the RFI/NCR/FCD Process as governed by the ***Project Technical Request (RFI-NCR-FCD) Procedure (Ref 13).***

11.2.3 Post construction the Designer shall sign a ***Confirmation of Red Line Drawings Certificate.*** This is a declaration that the Designer has reviewed all the RFIs, NCRs, FCDs listed on the Certificate and that the intent of the design has been met. The ***Confirmation of Red Line Drawings Certificate*** is in ***Section 13 Standard Forms / Templates***

11.2.4 Where the final MEP design is produced by the Contractor, the CEG shall certify that any changes shown on the As-Built drawings have no impact on the original design intent. This is by completing the ***Designer Confirmation for Architectural (Common Components) & Structural Architectural Detail Design Certificate.*** See ***Section 13 Standard Forms / Templates.***

12 Reference Documents

Ref.	Document Name	Document Number
1	Design Management Plan Template	CRL1-XRL-O7-ZTM-CR001-50011
2	Technical Assurance Plan (TAP)	CRL1-XRL-O7-STP-CR001-50003
3	LU – Assurance Standard	S1-538
4	Design Review Procedure	CRL1-XRL-O4-GPD-CR001-50003
5	Technical Assurance Master Documents List Procedure	CRL1-XRL-O4-GPD-CR001-50004
6	Design Review and Gate Review Programme	CRL1-XRL-O-TSC-CR001-50001
7	Not Used	
8	Not Used	
9	System Integration Management Plan	CRL1-XRL-O8-STP-CR001-50010
10	Certification Process Roadmap	CRL1-XRL-O4-GPS-CR001-50001
11	Issue of Design Documentation for Construction	CRL1-XRL-O4-GPD-CR001-50007
12	Systemwide Design Gate Review Procedure	CRL1-XRL-O7-GPD-CR001-50012
13	Project Technical Request (RFI-NCR-FCD) Procedure	CRL1-XRL-Z-GPD-CR001-50006
14	Assurance Gates Implementation Procedure	CRL1-XRL-O7-GPD-CR001-50017
15	Signal Sighting Assessment Plan	C620-SIC-R2-RGN-CR001-50570
16	Post IFC (Issued for Construction) Changes Guidance Note (GIR) - Systemwide	CRL1-XRL-O7-GUI-CR001-50008
17	Not Used	
18	3D Model Review Procedure	CRL1-XRL-O7-GPD-CR001-50004
19	Not Used	
20	Demonstration of Materials Compliance Procedure	CRL1-XRL-N2-GPD-CR001-50007
21	Post IFC (Issued for Construction) Changes Guidance Note (GIR) SSPT	CRL1-XRL-O7-GUI-CR001-50001
22	Guidance on the FDS Submission and Approval Process	CRL1-XRL-O7-GPS-CR001-50001
23	Design Completion Certificate (DCC)	CRL1-XRL-O4-ZTM-CR001-50003
24	Acceptance of the Contractor's Architectural Samples, Mock-ups, Prototypes and Key Benchmarks	CRL1-XRL-O7-GPD-CR001-50008

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13 Standard Forms / Templates

Ref:	Document Title	Document Number:
A.	Gate Review Report Template	CRL1-XRL-O7-ZTM-CR001-50007
B.	Gates Pass Certificate (GPC)	CRL1-XRL-O7-ZTM-CR001-50008
C.	Gate Impact Report Template	CRL1-XRL-O7-ZTM-CR001-50009
D.	Mini Gate Submission Template	CRL1-XRL-O7-ZTM-CR001-50010
E.	Confirmation of Red line drawing certificate template (Applicable only for Civils & Structural)	CRL1-XRL-Z-ZFM-CR001-50009
F.	Designer Confirmation for Architectural (Common Components) & Structural Architectural Detail Design	CRL1-XRL-O-CER-CR001-50025
G.	Contract Design Integration Certificate	CRL1-XRL-O-CER CR001-50028
H.	Gauge Acceptance Criteria	CRL1-XRL-O7-ZFM-CR001-50001

14 APPENDIX A

Guidance on level of evidence expected for designs submitted to the Crossrail panel for Gates and post Gate 3/IFC Design Changes (GIRs).

No.	Criteria	Gate 1 (20%)	Gate 2 (60%)	Gate 3 (100%)	Gate Revised Post IFC
1	**Meeting Requirements**	(a) List of applicable requirements in DOORS from CPFR and other applicable CRL Requirements or agreed requirements for non Crossrail assets e.g. LU. (b) Any non or partial compliance identified at this stage of gate review. (c) list of validated assumptions in DOORS.	a) Systematic evidence and rationale to confirm that the design meets the applicable requirements with compliance evidence being added to the requirements, highlight any non-compliance or partial compliance at this stage of gate review. b) Any non or partial compliance agreed or agreement is being sought with CRL or 3rd party, i.e. LU, (as appropriate). c) Evidence of the management of validated assumptions showing alignment with RFIs, risk and any Interfaces	a) All applicable requirements with compliance evidence and rationale, (linked t a drawing or document) demonstrating either: (i) full compliance; (ii) partial compliance – where other designers contribute to full compliance b) Any non compliance agreed with CRL or 3rd party, i.e. LU, (as appropriate). c) All assumptions resolved or agreed, risk register entries for any non-resolved assumptions stating the level of risk associated with continuing to the next RIBA, LU or GRIP stage. d) Written confirmation, (email) of no objection by CRL Requirements Engineer.	As per Gate 3
2	**Compliance with PDA and Crossrail Act including EMR**	Confirmation that design is within LODs or justification for any design outside of LODs. All relevant EMR identified and taken into account. All necessary consents identified. All necessary Undertakings & Assurances (U&As) identified.	Confirmation with evidence that design is fully compliant with PDA, Crossrai Act, EMR and Undertakings & Assurances. Obtain or have formaly submitted all necessary consent . Prepare information for further consents applications.	Demonstrate all relevant necessary consents have been obtained. Update CRL Consents Register and monitor to ensure conditions are being addressed and existing consents being complied with. Demonstrate that all relevant U&As have been fully complied with. Provide compliance evidence and compliance strategy on CDT. ***NOTE:*** *for assets affected by a GIR (included those assets Handed Over) the evidence from relevant CRL L&P/Consents & Undertakings Leads must be acquired to evidence assurance.*	As per Gate 3
3	**Conform to Standards**	All applicable standards identified. For Crossrail Assets this will be taken form Crossrail New Works Standards Baseline. Any required concessions identifi d.	Standards and concessions agreed with IMs and compliance demonstrated.	Agreement from NR / LU / RfL to proceed. Materials compliance with LU standards 1-135 and 1-085; Materials Statement of Compliance with Building regulations. For MEP and Architectural D&B submissions, only critical items of MEP equipment are required to have passed through the MCR process and have demonstrated material compliance. Evidence of compliance with TSIs **Continued…** Design Contractor is responsible to provide assurance evidence to support how they have met the conditions of the concession during their designs. This includes those concessions which were granted to FDC's, the conditions of which are now the responsibility of the Design Contractor to meet within their	As per Gate 3

No.	Criteria	Gate 1 (20%)	Gate 2 (60%)	Gate 3 (100%)	Gate Revised Post IFC
				detailed design submission. All assurance evidence e.g. drawings, specifications or technical reports must be presented during the CRL Gates reviews.	
4	**Design for Safety**	CDM risk registers. Preliminary H&S File. Engineering Safety Management (ESM) Hazard Log. Comparative Safety Risk Assessments (CRAs). Design of workplace to Workplace Regs 1992. Qualitative Design Review (QDR - Fire) completed where appropriate. System Safety Plan.	Further update of CDM risk registers, preliminary H&S File and ESM Hazard Log. CRAs. Design of workplace to Workplace Regs 1992. Draft Pre-construction Information (PCI). QDR signed off for compliance with QDR success criteria by Fire Engineering Specialist.	Completed CDM risk registers. Further update of preliminary H&S File. Comple ed ESM Hazard Log. CRAs. Design of workplace to Workplace Regs 1992. Completed PCI. Design Engineering Safety Justification. AsBo Letter of Comfort.	As per Gate 3
5	**Affordability**	Major quantities calculated; cost estimate within allocated budget; Value Engineering opportunities identified.	Value Engineering and revised Bills of Quantities issued to CRL Project Controls; Evidence that changes have been trended.	F nal Bills of Quantities completed and confirmation of no objection by CRL cost manager. Note: Not required for D&B Contractors submissions.	As per Gate 3
6	**Management of Risk**	Completion of qualitative risk assessment and identification of mitigation measures.	Incorporation of risk mitigation into design; completion of quantified risk assessment; actions identif ed to resolve assumptions.	Evidence that output risks are ALARP; Remaining assumptions agreed with CRL / stakeholders.	As per Gate 3
7	**Coordination & Asset Management Update**	All interfaces defined; Interface Management Plans agreed; ICDs prepared and signed for key interfaces; IDR completed; IDC signed. Up to date 3D Master Model.	ICDs signed off by nter cing parties. Interdisciplinary reviews w th stakeholder involvement; IDR/IDC evidenced and tracking of issues demonstrated. Up to date 3D Master Model.	Resolution of all interface issues. Sign-off of ICDs by all parties including decal by Project Engineers. IDR/IDC evidenced and closure of issues demonstrated. Evidence of coordination and closure of issues relating to interfaces, including internal ones, brought about by scope packaging. Provision of a 3D Master Model and corresponding Clash detection report. Confirmation access to implement the change has been considered along with impacts on other CRL/IM activities e.g. Trial Running.	As per Gate 3
8	**Constructability**	Constructability issues considered	Evidence that a practical method of construction has been developed Evidence of Constructability Review.	Evidence of Constructability Review. Confirmation of no objection by construction manager.	As per Gate 3
9	**Overall Quality**	Design meets RIBA Stage C or D/LU Stage 2/GRIP Stage 3 requirements (as appropriate). Complies wi h quality processes and procedures Up to date MDL - signed as 'Approved' by the consultant and 'Accepted' by CRL.	Design meets RIBA Stage E/LU Stage 2/GRIP Stage 4 requirements; Incorporation of actions from Peer Reviews; Evidence of applying best practice Up to date MDL - signed as 'Approved' by the consultant and 'Accepted' by CRL. Up to date RIR.	Design meets RIBA Stage F/LU Stage 3/GRIP Stage 5 requirements; Cat III check certificates; Up to date MDL (includes deliverables as per Works Information) - signed as 'Approved' by consultant and 'Accepted' by CRL. Up to date RIR. Up to date Contract drawing register - signed as 'Approved' by the designer / consultant and 'Accepted' by CRL.	As per Gate 3

No.	Criteria	Gate 1 (20%)	Gate 2 (60%)	Gate 3 (100%)	Gate Revised Post IFC
		Up to date RIR. Sustainability Requirements please refer to Design Review Procedure (Ref 4) Agreement of IMs to CDO.	Sustainability Requirements please refer to Design Review Procedure (Ref 4) Agreement of IMs to CDS.	Sustainability Requirements please refer to Design Review Procedure (Ref 4) Draft FDS. Confirmation of MEP and Architectural Detailed Design certificate CRL1-XRL-O-CER-CR001-50025 Evidence of a satisfactory 3D model review and a closed out Model Issues Report in accordance with the 3D Model Review Procedure. Where Applicable for Design & Build Contractor for Station MEP/ Architectural: Outpu evidence to be provided for - 1) T sting & Commissioning Management Plan Commissioning Logic; Method Statements 2) Test Plans/ Inspection Test Plans; 3 Compliance of material against relevant IM Standards when this is on the critical list of critical MEP items. List of MCRs for critical MEP items to be agreed with CRL. Agreed Materials Proposal Schedule for Architectural components and approved Materials Compliance Records where agreed to be provided prior to Gate 3 (including, where appropriate MCRs for Samples and Prototypes). Where applicable for Mock-Ups, Benchmarks and Key Benchmarks the appropriate Contractor's inspection record accepted by CRL. Assurance documentation as per Works Information Volume 2A deliverables List and Vol 2B – Part 7 Design Requirements. New Contractor Design Teams should demonstrate technical qualifications and competences capabilities if not already provided. Interim Certificate of Verification from NoBo. Draft Final Design Submission (FDS) & Design Completion Certificate (DCC) Final Design Submission (FDS) & Design Completion Certificate (DCC) issued upon reciveing CRL Gate Pass Certificate Check list of deliverables at Stage F for MEP, Lifts and Fire Services (CRL1-XRL-M-RGN-CRG03-50012)	
10	**Supports Project Schedlue**	Construction / manufac uring durations and dependencies identified.	Evidence that the schedule for construction / manufacture is integrated with overall schedule for CSW. Agreed strategy on access, possessions and logistics.	Confirmation of impact on schedule.	As per Gate 3

No.	Criteria	Gate 1 (20%)	Gate 2 (60%)	Gate 3 (100%)	Gate Revised Post IFC
11	**Gauge Certification / Signal Sighting Acceptance**	N/A	N/A	Where the works are adjacent to the operational railway a Gauging Assessment Criteria form shall be completed and submitted prior to Gate 3, this template is in Section 13 Standard Forms/ Templates. The ass ciated Confirmation of No Objection from CRL Gauging Engineer & Functional Manager is required. Signal Sighting is also required for Routeway where System Wide design af ects the routeway or wayside assets due to signage/signalling. A similar process for completing SSFs (Signal Sighting Forms) associated with the relevant standards must be provided as per Signal Sighting Assessment Plan (ref 15)	As per Gate 3
12	**Risk Assessment Form**	N/A	N/A	The R sk Assessment form shall be completed prior to Gate 3. Refer to FDS(b) Guidance Document Ref: [22] Appendix 7.	As per Gate 3

Note 1. General: Further details of Gate 1, 2 and 3 Design Deliverables are provided in Appendix C.

Note 2. General: When members of the panel are not able to attend a gate review then an email stating "Satisfactory for that gate" or "Confirmation of no objection" listing any conditional items (Ref: Section 9.1.6).

Note 3. General: For MEP Designs refer to the BSRIA Guide 'A Design Framework for Building Services- 2nd Edition (BG 6/2009)' for the definition / deliverables for each RIBA Stage.

Note 4. It is important that all the evidence is issued to the Gates Panel at least 5 working days prior to the gate review so that a decision can be made about the completeness of the evidence and whether or not the planned Gate Review can go ahead. This may necessitate a quick page turn to confirm the evidence is adequate.

Note 5. General: For post IFC GIR changes affecting Handed Over assets it will be necessary to acquire an IM signature to evidence interfacing approval prior to CRL Gates Chair signature.

15 APPENDIX B

Gate Review Stakeholders Roles & Responsibilities

Organisation	Key project roles	Gate Responsibilities
DfT/TfL	▪ Project Sponsor ▪ Specify and own the Sponsors' Requirements ▪ Receive assurance that the Sponsors' Requirements will be fulfilled	▪ No specific responsibilities
Crossrail	▪ Interprets the project requirements to develop engineering: o Policies, strategies and design Standards o safety management system for the Crossrail Programme ▪ Develops standards, guidance and templates to ensure consistency of approach to consents and environmental management ▪ Sponsors' agent/informed client ▪ Interprets the Sponsors' requirements and specifies the Programme requirements; o functional and operational requirements (CPFR) ▪ Owns the Crossrail Programme railway safety case ▪ Develops and owns Operational plans, timetables etc. ▪ Receives assurance that operational requirements will be achieved ▪ Acts on behalf of the future operator ▪ Responsible for delivering the CSW project for CRL ▪ Employer and CDM Co-ordinator unde CDM Regulations ▪ Checks compliance with the Environmental Minimum Requirements ▪ Obtains approvals for the CSW ▪ Executes CRL's enginee ing assurance regime for the CSW ▪ Advise complianc with CRL s consents strategies ▪ Control and reduction of the safety risks of the CSW and its interface in line with BS EN 51026 and the Yellow Book ▪ Design Management and certification ▪ Advise on compliance with Undertakings & Assuranc s throughout the gates and sample check FDCs or Contractor's designer evidence in CDT.	▪ Responds to stakeholder queries ▪ Overviews gate process ▪ Manages the Gate Proc ss ▪ Reviews and approv s the design ▪ Records and makes available the assurance evidence ▪ Reviews that the CDM has been implemented by the contractor. ▪ Review evidence of the designers ESM activities
FDCs or Contractor's Designer	▪ Production of design with supporting evidence Compliance with Crossrail's Design Process and Technical Assurance regime ▪ Compliance to CRL design Standards and requirements ▪ Compliance with EMR (including Undertakings and Assurances) and Crossrail Act and consents ▪ Compliance to Systems Engineering Management Plans.	▪ Presentation to Gate Review Panels ▪ Preparation of assurance evidence to support Gate submission. ▪ Document control and configuration management of design assurance and supporting evidence
Network Rail	▪ Procure and manage the works on the national rail network (on behalf of CRL)	▪ No specific responsibilities but supports as requested by the Gate Review Panel
RfL	▪ Infrastructure owner and operator (part IM). ▪ Review assurance evidence ▪ Acceptance of CRL design Standards	▪ No specific responsibilities but supports as requested by the Gate Review Panel

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Organisation	Key project roles	Gate Responsibilities
London Underground	▪ Review assurance evidence where work impacts LU assets. ▪ Input to project requirements ▪ Acceptance of CRL design Standards ▪ Owns the subsurface stations' safety cases ▪ Mobilises involvement of PPPs and PFIs ▪ Provides assurance to CRL on works on LU side of the interface	▪ No specific responsibilities but supports as requested by the Gate Review Panel
Other 3rd party 'infrastructure controllers' and asset owners - HEX, DLR and Utility Companies	▪ Reviews assurance evidence where work impacts owners assets ▪ Input to project requirements ▪ Acceptance of CRL design Standards ▪ Owns the 3rd party safety cases	▪ No specific responsibilities but supports as requested by the Gate Review Panel

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16 APPENDIX C

Design Deliverables List – Gates 1, 2 and 3 (FDCs Only)

Deliverable	Gate 1	Gate 2	Gate 3	Gate Revised Post IFC
Requirements Allocation verified in DOORS	✓	✓	✓	✓
Compliance Statements in DOORS		✓	✓	✓
Compliance with Requirements verified in DOORS			✓	✓
Design assumptions in DOORS	✓	✓	✓	✓
All design assumptions closed in DOORS			✓	✓
Limit of Deviation Drawings	✓	✓	✓	✓
Environmental Design Statement Checklist (and supporting assessments)	✓	✓	✓	✓
Environmental Impact Assessments (where required)		✓	✓	✓
Consents Register	✓	✓	✓	✓
Applications for Planning Consents (including Listed building application or Heritage method statement)		✓	✓	✓
Applications for Environmental Consents		✓	✓	✓
Applications for Traffic Consents		✓	✓	✓
PET Consents Report		✓	✓	✓
Environmental Consents		✓	✓	✓
Detailed Planning Consent		✓	✓	✓
Traffic Consents			✓	✓
Listed Building Consents			✓	✓
Schedule of Undertakings and Assurances	✓	✓	✓	✓
Verification of Compliance with U & As			✓	✓
CEEQUAL/BREEAM Report			✓	✓
Carbon/Energy Report (where appropriate)			✓	✓
Site Waste Management Plan			✓	✓
Archaeological Written Scheme of Investigation		✓	✓	✓
CDM Risk Register	✓	✓	✓	✓
Pre-construction Information Pack		✓	✓	✓
HAZID and HAZOP logs		✓	✓	✓
QDR action tracker		✓	✓	✓
Risk Register	✓	✓	✓	✓
Constructability Report	✓	✓	✓	✓
Constructability Review Log	✓	✓	✓	✓
Conceptual Design Overview (CDO)		✓	✓	✓
Concept Design Statement (CDS)		✓	✓	✓
Staged Design Compliance Certificate (SDCC)		✓	✓	✓
Design Completion Certificate (DCC)			✓	✓

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Deliverable	Gate 1	Gate 2	Gate 3	Gate Revised Post IFC
Final Design Overview			✓	✓
Cat III check certificate			✓	✓
Maintenance Report		✓	✓	✓
Reliability, Availability, Maintainability (and Safety) RAM(S) assessment		✓	✓	✓
RAM(S) compliance statement			✓	✓
Bills of Quantities	✓	✓	✓	✓
Value Engineering Report	✓	✓	✓	✓
Legion Passenger Modelling Report		✓	✓	✓
Material & Workmanship Specifications		✓	✓	✓
Materials Schedule – Statement of Compliance			✓	✓
Combined Services Drawings		✓	✓	✓
Issue for Construction Drawings (Ready for acceptance)			✓	✓
3D Master Model (up to date to relevant stage)	✓	✓	✓	✓
Interface Control Documents	✓	✓	✓	✓
Integration Plan		✓	✓	✓
Single Design-consultant Review (SDR)	✓	✓	✓	
SDR action tracker	✓	✓	✓	✓
Inter Design-consultant Review (IDR) + IDC	✓	✓	✓	✓
Inter Design-consultant Check certificate (IDC)	✓	✓	✓	✓
IDR action tracker	✓	✓	✓	✓
3D Model Issues Report	✓	✓	✓	✓
Readiness Review Minutes		✓	✓	✓
Records of Security Review		✓	✓	✓
Master Documents List		✓	✓	✓
Internal Audit Reports	✓	✓	✓	✓
Engineering Safety Justification (ESJ)			✓	✓
System Safety Plan (SSP)	✓			
Safety Risk Assessments		✓	✓	✓
ESM Hazard Log (Project Wide Hazard Record in DOORS)	✓	✓	✓	✓

APPENDIX C – continued

Design Deliverables List – Gates 2 and 3 (Tier 1 Contractors Only)

Individual Contractor's deliverables are set out in:

- Works Information Volume 2A – Particular Works Information
- Part 7 – Contractors Design of Permanent Work
- Appendix 7B – Deliverables List for Contractor's Design

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