

# INTEGRATION

## ENGINEERING SAFETY MANAGEMENT

### Design & Build Contract Assurance Design Gate Engineering Safety Management Review Process

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## **1 Purpose**

The purpose of this document is to define the process for assuring a suitable and sufficient depth of Engineering Safety Management has been applied by Design and Build Contractors (D&BC) to secure design acceptance at Design Gate Reviews.

## **2 Scope**

The scope is limited to the D&BC Contracts and the associated Design Gates for:

- Stations, Shafts and Portal Contracts gates 1, 2 and 3
- Systemwide Contracts 30%, 60% and 90% gates.

## **3 Definitions**

CRL	Crossrail Limited
ESM	Engineering Safety Management
D&BC	Design and Build Contractor
GRIP	Guide to Railway Investment Projects (Network Rail document)
NoBo	Notified Body
PWHR	Project Wide Hazard Record
RIBA	Royal Institute of British Architects
SIF	Safety Issues File
SIL	Safety Integrity Level

## **4 Background**

Engineering Safety Management requirements placed on D&BC Contacts are defined in the following documents:

- Crossrail ESM System Safety Plan **[Ref 1]**
- Crossrail ESM Hazard Management Procedure **[Ref 2]**
- Crossrail Project Wide Hazard Record Process **[Ref 3]**

### **4.1 D&BC for Stations, Shafts and Portals**

For the stations, shafts and portal D&BC the Crossrail Design Gate procedure is defined in the document:

Crossrail Engineering Design Assurance Gates Procedure **[Ref 4]**

### **4.2 D&BC for Systemwide**

For the systemwide D&BC the Crossrail Design Gate the outline procedure is defined in Part 29 of the Works Information Volume 2B **[Ref A]**

## **5 Review Process**

### **5.1 D&BC for Stations, Shafts and Portals**

Contractors are expected to provide the ESM deliverables listed in Section 6.1 for review by the Crossrail System Safety Team at least two weeks prior to the date of the design gate review meeting, in accordance with the Works Information, Volume 2B Part 32 (Stations, Shafts and Portals) **[Ref B]**

The ESM Manager for the D&BC Contract shall submit to the Crossrail System Safety Manager an eB (Crossrail document database) link to the relevant documents to be reviewed, in accordance with the contract deliverables.

Appropriate review will be arranged by the Crossrail System Safety Manager, which shall be recorded on eB in accordance with CRL Review and Approval of Contract Engineering Safety Management Deliverables **[Ref C]**.

The outcome of the review shall be emailed to the Chairman of the Assurance Review gate no later than one week in advance of the meeting. The Reviewer will usually attend the meeting unless there are no areas of concern to be addressed.

### **5.2 D&BC for Systemwide**

Contractors are expected to provide the ESM deliverables listed in Section 6.2 for review by the Crossrail System Safety Team at least 30 days prior to the date of the design gate review meeting, in accordance with Part 32 of the Works Information, Volume 2B (Systemwide) **[Ref A and Ref D]**.

The ESM Manager for the D&BC Contract shall submit to the Crossrail System Safety Manager an eB link to the relevant documents to be reviewed, in accordance with the contract deliverables.

Appropriate review will be arranged by the Crossrail System Safety Manager, which shall be recorded on eB in accordance with Approval of Contract Engineering Safety Management Deliverables **[Ref C]**.

The Design Gate Review Report is to be issued five working days following the design gate review. The System Safety Team will provide their review comment and recommendation for acceptance to the CRL Project Manager.

## **6 ESM Deliverables at Design Gates**

For each design gate the D&BC will prepare a design gate report which details:

- Current version of the Engineering Safety Management Plan/ System Safety Plan
- Summary of the hazards in the Project Wide Hazard Record (e.g. number of hazards, the percentage open/ resolved/closed etc.)
- Details of safety analyses and assessments undertaken
- List of safety documentation prepared and issued
- Details of particular safety issues
- Details of planned safety related workshops
- Work in Hand ( what is left to do)
- Conclusions

The following sections lists the ESM deliverables required to be completed and recommended for acceptance by CRL System Safety Team prior to each design gate.

**6.1 D&BC for Stations, Shafts and Portals**

Design Gate	ESM Deliverables from D&BC
Gate 1 (RIBA D / GRIP 3)	<b>Engineering Safety Management Plan*</b> <b>RIBA D Hazard Log in the PWHR*</b>
Gate 2 (RIBA E / GRIP 4)	<b>RIBA E Stage Gate ESM Report*</b> <b>RIBA E Hazard Log in the PWHR*</b>
Gate 3 (RIBA F / GRIP 5)	<b>RIBA F Stage Gate ESM Report*</b> <b>RIBA F Hazard Log in the PWHR (all hazards to be transferred or resolved)*</b> Engineering Safety Justifications (for design and interfaces as required) SIL Justification (where appropriate) Product Breakdown Structure Product Safety Case (if required) Safety Requirements Statement Engineering Safety Management Plan (for the next phase)

\* Document identified in bold must be presented at the design gate reviews. The other documents identified are ESM deliverables which must be recommended for acceptance by the CRL System Safety Team prior to the gate review.

## 6.2 D&BC for Systemwide

Design Gate	ESM Deliverables from D&BC
30% Design Review	<p><b>30% Stage Gate ESM Report*</b></p> <p><b>Hazard Log in the PWHR*</b></p> <p>System Safety Plan</p> <p>System Software Safety Plan (if required)</p> <p>System SIL Requirements Report</p> <p>Safety Requirements Specification</p>
60% Design Review	<p><b>60% Stage Gate ESM Report*</b></p> <p><b>Hazard Log in the PWHR*</b></p> <p>System Safety Plan</p> <p>System Software Safety Plan (if required)</p> <p>System SIL Requirements Report</p> <p>Safety Requirements Specification</p> <p>Product Breakdown Structure (as appropriate prior to procurement)</p> <p>Product Safety Case (if required, as a appropriate prior to procurement)</p>
90% Design Review	<p><b>90% Stage Gate ESM Report*</b></p> <p><b>Hazard Log in the PWHR (all hazards to be transferred or resolved)*</b></p> <p>Engineering Safety Justifications (for design and interfaces as required)</p> <p>System SIL Justification</p> <p>Safety Requirements Statement</p> <p>Product Breakdown Structure (as appropriate prior to procurement)</p> <p>Product Safety Case (if required, as a appropriate prior to procurement)</p> <p>Interim Statement of Verification (provided by NoBo as appropriate)</p> <p>System Safety Plan (for the next phase)</p> <p>System Software Safety Plan (for the next phase if required)</p>

\* Document identified in bold must be presented at the design gate reviews. The other documents identified are ESM deliverables which must be accepted by the CRL System Safety Team prior to the gate review.

## 7 Reference Documents

Ref:	Document Title	Document Number:
1.	Crossrail ESM System Safety Plan	CRL1-XRL-O7-GST-CR001-00001
2.	Crossrail ESM Hazard Management Procedure	CRL1-XRL-O8-GPD-CR001-50002
3.	Crossrail Project Wide Hazard Record Process	CRL1-XRL-O8-GPS-CR001-50013
4.	Crossrail Engineering Design Assurance Gates Procedure.	CRL1-XRL-O7-GPD-CR001-50015

## 8 Other References

Ref:	Document Title	Document Number:
A.	Works Information, Volume 2B – General Requirements (Systems)	CRL1-XRL-V3-XWI-CR001-50131
B.	Volume 2B – General Requirements, Part 32 - Contractor's Engineering Safety Management Requirements (Stations, Shafts and Portals)	CRL1-XRL-O8-XWI-CRG03-50005
C.	CRL Review and Approval of Contract Engineering Safety Management Deliverables	CRL1-XRL-O8-GPS-CR001-50015
D.	Volume 2B – General Requirements, Part 32 - Contractor's Engineering Safety Management Requirements (Systemwide)	CRL1-XRL-O8-XWI-CRG03-50002

## 9 Standard Forms / Templates

Ref:	Document Title	Document Number:
A.	Not used	
B.		