



INTEGRATION ENGINEERING SAFETY MANAGEMENT

Crossrail Format and Process for Comparative Risk Assessments

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1 Purpose

The purpose of this document is to define the process for carrying out comparative risk assessments as part of optioneering of different design proposals considered on the Crossrail Project.

2 Scope

Scope is limited to hazard analyses carried for the central section of the Crossrail railway, which includes CRL, its Delivery Contractors and Suppliers.

This document does not apply to adjacent On Network Works where Network Rail is the Infrastructure Manager.

3 Definitions

ALARP	As Low As Reasonably Practicable
CDM Regs	Construction (Design and Management) Regulations 2015
CRA	Comparative Risk Assessment
CRL	Crossrail Limited
ESM	Engineering Safety Management
HAZID	<u>HAZ</u> id <u>I</u> dentification study
HAZOP	<u>HAZ</u> ard and <u>O</u> perability study

4 Background

When considering different design options it may be necessary to make decisions supported by a comparison of the engineering safety risks associated with each option. These preliminary decisions may be best facilitated by a simple comparison of the key safety risks measured by a semi-quantitative risk matrix.

Once the decision is made regarding the selected option, the engineering safety risks may then be analysed via the normal engineering safety management (ESM) processes and risk assessment, where appropriate.

For the purpose of the Comparative Risk Assessment the engineering safety management (ESM) analysis has adopted the same risk assessment template as used for Construction Design and Management (CDM) risk comparative risk analyses.

5 Comparative Risk Assessment Process

The Comparative Risk Assessment (CRA) shall be carried out as a Microsoft Excel Spreadsheet(s) having the format shown in the example given in Attachment 1. The Microsoft Excel template for the CRA Spreadsheet is available from the CRL Head of System Safety, or the CRL System Safety Manager.

The CRA Spreadsheet enables the comparison of up to three design options; it is recommended that no more than three options are considered simultaneously.

A meeting of the key stakeholders shall be convened to confirm the accuracy of the Comparative Risk Assessment. The Lead ESM Assessor may choose to use the meeting to generate the Comparative Risk Assessment, or alternatively may wish to generate a draft of the CRA Spreadsheet beforehand to aid discussion. The format of the meeting shall be consistent with:

- CRL Guidelines and Etiquette for Undertaking HAZID and HAZOP Workshops [Ref 1]

Each field in the CRA Spreadsheet is summarised below (see Attachment 1).

Haz Ref

- Unique identifier related to the particular hazard identified and assessed (1, 1.1, 2 etc.).

(Risk Description) Activity

- Description of the activity (related to construction, operational, maintenance or emergency) against which the particular hazard is identified.

(Risk Description) Estimated Frequency

- Estimated frequency of the activity against which the hazard is identified. For example, if associated with a maintenance operation this would be the periodicity of the maintenance activity, which is not necessarily the same as the frequency of the hazard.

(Risk Description) Safety Risks

- A description of the identified hazard and its consequences, with particular emphasis on safety implications.

Design Option 1, 2, 3 etc.

- The header of the column will indicate which option is being considered.

This field of the spreadsheet considers how the identified hazard relates to each of the options being assessed. It considers where and why the probability or consequences may be different, and what relative risk mitigation measures are afforded. It should contain sufficient information to derive the comparative risk assessment.

Probability

- Probability of the hazard occurring (VH, H, M, L, VL.) based on the classifications given in the Probability Rating Guidance (likelihood) table at the top of the CRA Spreadsheet.

Safety Impact/Severity

- Estimated consequences relating to the hazard (VH, H, M, L, VL.) based on the classifications given in the Impact Rating Guidance (Severity) table at the top of the CRA Spreadsheet.

Score

- The score is generated automatically from the Probability and Safety Impact/Severity ratings and is classified high (red), medium (yellow) and low (green) in accordance with the risk classification table at the top of the spreadsheet.

The risks are classified as follows:

- | | |
|----------------------------|---|
| Red ≥ 15 | Risk is Intolerable (must be eliminated) |
| <15 Yellow >4 | Risk is Tolerable (risk reduction measures should be considered to justify ALARP with Safety Factor of 3 for Costs Benefits Analysis) |
| Green ≤ 4 | Risk is Tolerable (risk is ALARP), or negligible |

Comments

- Any relevant comments considered relevant to the Comparative Risk Assessment.

6 Interpretation

The overall score for the Comparative Risk Assessment are generated automatically at the bottom of the CRA Spreadsheet as follows:

Total – the sum of the scores (risk classification) from each of the identified and assessed hazards

Relative Position and normalised % - the lowest total score is assigned a value of 100% and the other options are rated as an over-percentage against the lowest scoring option

7 Reference Documents

Ref:	Document Title	Document Number:
1.	CRL Guidelines and Etiquette for Undertaking HAZID and HAZOP Workshops	CRL1-XRL-O8-GPS-CR001-50010

8 Standard Forms / Templates

Ref:	Document Title	Document Number:
A.	Not used	

9 Attachment 1: Format of Comparative Risk Assessment (excel format)

<https://eb.crossrail.co.uk/eB/Search/QuickLink.aspx?n=CRL1-XRL-O8-GPS-CR001-50007&t=3&d=Main%5ceBProd&sc=Global&state=LatestApproved&i=view>