INTEGRATION
ENGINEERING SAFETY MANAGEMENT

Crossrail Process and Format for Product Breakdown Structures for Systems

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2.0	2 Year Review; Reference documents updated

Contents

1 Purpose

The purpose of this document is to define the process for assuring the pedigree of previous railway proven use, formal safety acceptance of reference systems proposed and the requirements for components and / or systems that may not have been in proven use (and therefore require an appropriate Safety Case as per BS EN 50129) to be procured for installation on the Crossrail Project.

2 Scope

The scope applies to all components, equipment and systems installed in the central section of the Crossrail railway.

3 Definitions

CRL	Crossrail Limited
CSM	Common Safety Method
ESM	Engineering Safety Management
LUL	London Underground Limited
NRIL	Network Rail Infrastructure Limited
PADS	Parts and Drawings System (NRIL)
PBS	Product Breakdown Structure

4 Background

The Crossrail Project has adopted the EU Commission Regulations – Common Safety Method for Risk Evaluation and Assessment (CSM) **[Ref 1]** for the safety assurance of the installed railway systems. How this is applied is explained in:

- Crossrail Common Safety Method Hazard Assessment Process **[Ref 2]**

This explains that hazards can be analysed and evaluated on the Crossrail Project by a combination of one or more basic principles:

- the application of Codes of Practice;
- comparison with similar systems (i.e. reference system);
- explicit risk estimation (using a combination of qualitative and / or qualitative methods).

Where reasonably practicable, the preference is to use railway proven, tried and tested components, equipment and systems (i.e. reference systems) on the Crossrail Project. For each system the pedigree of proven use and safety performance shall be evaluated in respect of previous relevant NRIL or LUL product approvals, or via cross-acceptance from another recognised railway authority. The safety implications of differences in application and environment of the Crossrail railway shall be analysed.

In the event of components, equipment, systems or applications being proposed by Delivery Contracts with no obvious justification of proven use (i.e. not a reference system) and including new and / or novel application, then this is to be highlighted, and the necessary evidence provided in the form of an appropriate Safety Case to secure approval for use from CRL in advance of finalising the design. This will require the preparation of a Generic Product Safety Case (GPSC), Generic Application Safety Case (GASC) and / or a Specific Application Safety Case (SASC) by the Delivery Contractor (also see section 6 for more details). The definition of SASC includes the production of the Product Safety Case as specifically identified within the CSM as identified in Attachment 1: Format of Product Breakdown Structure.

All Safety Cases require to be submitted to and be accepted by the Rail Approval Board (Crossrail) – RAB (C) **[Ref 3]**.

On the Crossrail Project Product Breakdown Structures (PBS) are to be prepared by the Delivery Contractors to list the reference systems(s), the related evidence of previous proven use and product approvals evidence for the installed railway systems, equipment or components.

5 Product Breakdown Structure Format

The Product Breakdown Structure(s) (PBS) shall be prepared as a Microsoft Excel Spreadsheet(s) having the format shown in Attachment 1. The Microsoft Excel template for the PBS Spreadsheet is available from the CRL Head of System Safety, or the CRL System Safety Manager.

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

System/Equipment Description

- Description (list) of the significant systems, equipment and/or components against which the pre-approval is claimed.

  This shall be limited to significant items that have a direct implication on safety and including those which are being claimed as a “reference system”.

Proposed Supplier

- The Company Name of the Manufacturer, and the address of the Division of the Company supplying the systems, equipment or components and which are being claimed as “reference systems”.

Supplier QMS

- Information regarding the accreditation of the Manufacturer’s / Supplier’s Quality Management System (QMS). Preferably this should be by reference to appropriate ISO9001 certification relevant to the scope of the Manufacturer’s activities. Where no ISO9001 accreditation exists, it is essential to highlight this to CRL for agreement in advance and provide other evidence as to the adequacy of the proposed Supplier’s QMS.

Statement of Previous Use

- Example(s) of where the systems, equipment or components provided by the Supplier have been previously in use in a similar railway environment.

Description of Reference System

- Brief description of the "reference system(s)" which are claimed relevant to the Crossrail Project and against which the original product approvals / safety acceptance was granted. Where practicable, the previous approval shall be aimed at an appropriate equipment level and not at individual components.

Product Approvals Certification

- Reference to the documentation which proves previous acceptance by a recognised railway authority. This could be a NRIL PADS certificate number, LU standard equipment drawing, or approval letter from another recognised railway authority.

In the case where new / novel or bespoke equipment is proposed or as otherwise detailed in Section 4 above, this is to be by reference to the appropriate Product / Application Safety Case which has been prepared by the Delivery Contractor and approved by CRL

Comments and Application and Environment

- Identification and analysis of any safety significant differences in application or environment relating to the use on the Crossrail Project.

  In the event the previous application and environment of the reference system(s) are obviously the same or very similar to the Crossrail Project then this may be explained in this field of the PBS.

  However where there are apparent differences, especially those which are safety significant, these must be analysed and justified by the Delivery Contractor. This may be formally reported in Design Engineering Safety Justification(s) for the relevant Elementary Systems or in a separate risk assessment, whichever is appropriate

Fire Performance

- For systems(s), equipment and components installed in tunnels particular emphasis is to be placed on the fire performance requirements for the Crossrail Project. Confirmation that for systems to be installed in tunnels or sub-surface stations conform to CRL fire performance requirements of LU Standard 1-085. Any concessions applied for by the Delivery Contractor should be referenced.

6 Production of a Product / Application Safety Case

As referenced in Section 4, one or more of the following safety cases will be required to provide the necessary evidence.

Generic Product Safety Case (GPSC)

To be created when it is intended to use a certain "specific" product in a particular "generic" application. This defines the safety related application conditions that have to be met for the product to be used.

Generic Application Safety Case (GASC)

To be created where the application of an unspecified or generic product is to be used in a generic application.

Specific Application Safety Case (SASC)

To be created where it is intended to utilise a specific product within a specific application.

In all of the above cases, the demonstration of safety ("The Safety Case") will take a consistent format (as per BS EN 50129), as follows:

Part 1: Definition of System / Sub-system / Equipment.

Part 2: Quality Management Report (evidence of Quality Management).

Part 3: Safety Management Report (evidence of Safety Management).

Part 4: Technical Safety Report (evidence of Functional / Technical Safety).

Part 5: Related Safety Cases (if applicable – otherwise n/a).

Part 6: Conclusion.

7 Delivery and Timescale

The PBS is to be prepared as a formal contract deliverable for each of the CRL Delivery Contracts, and for each Elementary System.

These are to be made available to CRL prior to the equipment procurement phase for each of the Delivery Contracts to manage the risk of procuring equipment which is subsequently not approved for use on the Crossrail Project.

The evidence referred to in the Product Breakdown Structure(s) (PBS) shall be held by the Delivery Contractor and made available for audit by CRL, or provided on request. The PBS and the supporting evidence shall be provided to CRL at Contract Completion.

8 References

Ref:	Document Title	Document Number:
1.	2015/1136/EU & 402/2013/EU - EU Commission Regulation – Common Safety Method for Risk Evaluation and Assessment	N/A
2.	Crossrail Common Safety Methods Hazard Assessment Process	CRL1-XRL-O8-GPS-CR001-50003
3.	Rail Approval Board (Crossrail) RAB(C) Terms of Reference	CRL1-RFL-O-GPD-CR001-50001

9 Standard Forms / Templates

Ref:	Document Title	Document Number:
A.	None	

10 Appendices

Attachment 1: Format of Product Breakdown Structure (PBS)

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System /Equipment Description	Proposed Supplier	Supplier QMS	Statement of Previous Use	Description of Reference System	Product Approvals Certification				Comments on Application & Environment	Fire Performance
					NRIL	LU	Others	Document Reference Number		
Brief description of the significant system(s), equipment or components against which the pre-approval is claimed. Should be limited to significant items that have a direct implication on safety.	Name and location of proposed Manufacturer/Supplier	Confirmation of the Quality Assurance accreditation of the Supplier. Reference given to ISO9001 certification, or equivalent.	Example of where the system, equipment or component has been previously in use in similar environment.	Brief description of the reference system which is claimed relevant to Crossrail and against which original approval was granted. The approval should be aimed at an appropriate equipment level and not necessarily at individual components (e.g. nuts & bolts)	Yes or No	Yes or No	Yes or No If yes, name of other railway authority which granted approval.	Reference to the document which proves acceptance. This could be a NRIL PADS certificate number, LUL standard equipment drawing, or approval letter from other recognised railway safety authority. In the case where new/novel or bespoke equipment is proposed this would be reference to the appropriate Product / Application Safety Case and proof of approval by CRL acceptance body.	Identification of any safety significant differences in application or environment for use on Crossrail. Safety Significant differences are expected to be justified by separate risk assessment, or in the Design Engineering Safety Justification(s) for systems within scope of supply of the Delivery Contract and which are safety deliverables to CRL. For systems(s), equipment and components installed in tunnels or sub-surface stations particular emphasis is to be placed on the fire performance requirements for Crossrail.	Confirmation that for systems to be installed in tunnels or sub-surface stations conform to CRL fire performance requirements of LU Standard 1-085. Any concessions applied for should be referenced.
System A										
Equipment 1										
Component (i)										
Equipment 2										
etc										
System B										
etc										