Technical Directorate

Maintenance Integration Review Panel (MIRP) Workshop Guidelines

Document Number: CRL1-XRL-O8-GUI-CR001-50011

Document History:

Revision:	Date:	Prepared by:	Checked by:	Approved by:	Reason for Revision:
1.0	06-02-2015	D Rayner	R Consterdine	G Overall	First issue

Contents

1 Purpose

The Maintenance Integration Review Panel (MIRP) workshops exist to provide confidence of the following:

- that the design of the Central Section and its interfaces take cognisance of, and are properly integrated with Crossrail Maintenance Principles, and are maintainable within the Crossrail Project Functional Requirements (CPFR) permitted access;
- to identify to system Designers and Contractors any potential technical or functional issues to be resolved regarding the maintenance and interfacing of systems and sub-systems within the Central Section, and at interfaces with other infrastructure managers (IMs) systems and other interfacing stakeholders (e.g. Network Rail; London Underground; London Boroughs) ;
- to identify any maintenance issues to be resolved, and develop appropriate solutions, in conjunction with RfL, LU, NR and other interfacing stakeholders.

The purpose of this document is to provide guidance for the planning and execution of MIRP workshops.

2 Scope

The scope of the MIRP workshops is to consider the current Crossrail Maintenance Principles, CPFR requirements and the “as developed” designs for the Crossrail Central Section works, and their interfaces with the adjacent On Network Railway works. They provide CRL with:

- confidence that all assets are maintainable within the CPFR permitted access;
- interfaces have been properly designed and can be appropriately managed, i.e. that there is clear accountability for maintenance and these accountabilities can be delivered;
- a mechanism whereby proposed changes to designs can be reviewed for potential impact on maintenance; and
- evidence of outstanding issues that require addressing.

The workshops are complementary to the detailed HAZID reviews carried out by individual system Designers under their individual System Safety Plans, which are required to consider the design with regard to maintenance involving all relevant stakeholders.

Core attendance at the workshops will be limited primarily to those having responsibility for demonstrating systems integration within Crossrail, including representatives of the Infrastructure Managers.

The workshops are referred to in the CRL Technical Assurance Plan [1].

The initial MIRP workshops will be repeated, as required, (known as MIRP2 workshops) during later stages in the project lifecycle when the Systemwide designs are more clearly defined. This will enable the impact of all maintenance, including Systemwide, required at the station to be assessed to confirm that there are no clashes that prevent maintenance being undertaken e.g. track maintenance in the station area preventing the station platforms being maintained. RAM information will be used as a key source of data for maintenance interventions.

The MIRP2 workshops will address outstanding issued raised from the original MIRP workshops and test any generic issues identified – see Appendix 1. MIRP2 will also examine the interaction of maintenance activities and the processes and safety systems necessary to deliver these activities.

3 Definitions

BOH	Back of House
CRL	Crossrail Limited
IM	Infrastructure Manager
HAZID	Hazard Identification Study
HAZOP	Hazard and Operability Study
ESM	Engineering Safety Management
FDC	Framework Design Consultants
M&E	Mechanical and Electrical
MIRP	Maintenance Integration Review Panel
MSG	Maintenance steering Group
SIRP	System Integration Review Panel

4 Workshop Preparations

The workshops will be organised under the direction of the Maintenance Steering Group which meets 4 weekly to plan future meetings and review progress. The MSG will maintain a current MIRP programme to ensure the Crossrail Concept of Operations is adequately addressed against the design.

A briefing pack will be prepared and circulated to delegates for each workshop.

The workshops will be designed to test key normal and degraded maintenance scenarios arising from the Crossrail Concept of Operations against the relevant reference system designs (and 'detailed' civil designs) of the Central Operating Section and its adjacent infrastructure interfaces, and the supporting design assumptions. Where operations and maintenance are closely interlinked, a joint SIRP and MIRP workshop will be held

5 Workshop Attendees

Proposed attendees are listed below by job title/discipline:

- CRL Maintenance Planning Engineer (Chairperson)
- CRL Assurance Engineer;
- Appropriate Systemwide Lead Engineer(s)*;
- Rolling Stock Engineer*;
- CRL Station M&E Engineer*;
- CRL Control Centre Manager*,

- CRL Engineering Manager;
- CRL Operations Representative*.
- FDC and D&B Contractor representation for relevant Station or System
- IM Maintenance Representative(s)

(*) As required by subject matter. Consideration will be given to the further involvement of any IM representatives / observers when testing interface boundaries.

6 Workshop Methodology

The workshop(s) will focus on maintenance and fault repair arrangements required to maintain the assets and preserve the service.

The approach will be to identify critical assets and the known sub-system interfaces (e.g. stations, signalling, track in tunnels, power, cross overs, tunnel portals, open track), and explore how the maintenance work required for each asset interacts with other assets, systems or subsystems.

Each asset will be examined in the workshop against proposed maintenance requirements as detailed in the respective Access & Maintenance Strategies and RAM information (part 30 forms), as submitted through Gate 3 reviews. This information is tested against a series of typical maintenance scenarios to establish the integrated design is capable of being maintained.

Test scenarios will be defined in advance of the workshop and will focus on the interaction between assets and systems, and pay particular attention to the systems of an interfacing IM. For example, when considering a tunnel geographic location the following may be considered:

- What isolations are required?
- What other systems or assets are impacted by the isolation?
- What overlaps exist between systems (i.e. will isolating asset A also render asset B inoperable)?
- Will preparing to, or maintaining an asset or system have any impact on the systems or assets of another IM or stakeholder?
- What works are not feasible to undertake in parallel (e.g. to what extent will track maintenance prevent work on platforms or platform screen doors)?
- What impact using certain plant and equipment has on the maintainability of other assets or other IMs or stakeholders' assets?

For each test scenario the following will be considered:

- operational, maintenance and design assumptions supporting each step/activity (from consideration of the Crossrail Maintenance Principles);
- interfaces between systems and their competing demand for access;
- the fullest extent of systems isolations;
- hazards arising from the scenario - recording those not previously considered to be addressed by the Designer-led HAZIDs;
- new issues to be addressed in the revised/final designs.

7 Record Keeping

The input for the meeting will be provided in advance and will be drawn from all available sources. It will include the available maintenance information, issues identified in the pre-meeting analysis, and the suggested maintenance scenarios to test at the workshop.

Actions arising in the meeting will be recorded in the Minutes, and will be actively monitored through the MIRP tracker. The MIRP tracker will be reviewed regularly by MSG

Technical and functional issues affecting the design will be recorded as actions placed on the relevant Systemwide Lead Engineers, or others, as appropriate, to be addressed with the relevant Design Contractor. Formal changes will be instructed via a Chief Engineer's Communication. MIRP will not be responsible for generating any resultant formal change proposal.

New safety hazards arising from the workshops will be entered into the Project Wide Hazard Record.

8 Workshop Reporting

Records will be issued following each workshop, and will be circulated to attendees for comment in advance of formal issue.

9 References

1 CRL1-XRL-O7-STP-CR001-50003, Crossrail Technical Assurance Plan

2 CRL1-XRL-O8-GUI-CR001-50003, CRL Maintenance Steering Group Terms of Reference

10 Appendices

- Appendix A: Generic actions from MIRP to be tested in Station MIRP2 workshops
- Appendix B: Scope of analysis to be carried out in advance of MIRP2 workshops

Appendix A: Generic actions from MIRP to be tested in Station MIRP2 workshops

The table below highlights actions raised at MIRP workshops that must be reviewed at MIRP2.

ID	MIRP Tracker URN	Issue/Concern (MIRP Tracker)	Test to be undertaken at MIRP2	Relevance
1	MIRP-00001	Key aim is for all assets to be captured in sufficient detail and to align with CRL's AD4 structure. This will ease production of O&M manuals and asset registers.	Ensure all assets are covered i.e. • Maintenance plans detail the correct items of equipment • AD4 structure and RAM part 30 forms tie up	All stations
2	MIRP-00004	Limited attempts have been made to define all inspections, Maintenance & Repair activities for each asset type in the existing C1xxx documents. Asset lives, sizes and weights to be confirmed through spec provided by contractors. Gaps in current coverage of interventions are identified. Where possible, CMCM has been used for assumptions.	Ensure all assets and types of interventions covered i.e. • correct items of equipment • AD4 structure and RAM part 30 forms tie up • Review CMCM information	All Stations
3	MIRP-00008	Hatches, anchor points and beams built in to station will need listing and adding to mtce list. Gaps in current coverage in C138 (e.g. pump rails) where AD4s exist should be flagged in this file. Verify that hatches, beams and anchor points are contained in in AD4.	Ensure all assets covered i.e. • correct items of equipment • AD4 structure and RAM part 30 forms tie up	All Stations
4	MIRP-00011	During mtce lifts not accessible. May limit access routes.	Consider how move equipment when lifts OOU for maintenance, refurbishment or	All Stations

		Note potential conflict at MIRP 1 - particularly for parts access at Broadgate. Planned maintenance is infrequent. During overhaul or long term breakdown, may need to use other shaft and move equipment along at platform level. Already covered by LWICOP.	repair	
5	MIRP-00013	PSD and wheeled frame only just fit Fire lift (10mm spare). Cleaning/mtce of trackside elements will stop trains running and OHLE off. Requires alignment of Maintenance frequencies. Not considered a big risk as task will not be undertaken that often.	Confirm that can move PSDs in lift • If not confirm route via engineering train	All Stations with PSDs
6	MIRP-00031	Adjacent DLR station	Confirm that can maintain station, track, OHLE etc at Custom House and any constraints that adjacent DLR poses. Understand any noise issues experienced by DLR that may also impact CRL.	Custom House only
7	MIRP-00038	Lift will be used to transport assets and equipment within the station.	Confirm impact on other maintenance regimes of lift outages for repair and overhaul. Overhauls will be infrequent and can be planned. Biggest issue is likely to be breakdown – need to understand contingencies and response times. This is a more severe version of ID 4.	Custom House only
8	MIRP-00063	What is the impact of having multiple hatches open?	Look at access routes and open hatches required for moving items required for maintenance to see impact on other maintenance/operations in the station. Look at the more frequent tasks.	All Stations

			Noted that CEC which has confirmed able to use FF lift for moving materials will reduce hatch use.	
9	MIRP-00093	Access to maintenance Pod	Look at access to RfL maintenance pod during traffic hours and any implications to what tasks can do – noted that at least WHI and TCR pods are not accessed via BOH areas.	All Stations
10	MIRP-00096	Not clear which storage spaces are for which purposes.	Location of maintenance pod not yet decided – use MIRP 2 to help decide location if not previously decided.	Canary Wharf only
11	MIRP-00112	Chiller performance may affect the performance of other assets - noted no redundancy during peak summer ambient conditions	Confirm redundancy of chillers, and understand any equipment rooms that could be affected and any mitigations that could be required. Noted that these issues may be closed off during gate process.	All Stations
12	MIRP-00113	Tunnel vent equipment - How are these moved and how is general maintenance carried out?	To test how replace Tunnel Vent equipment as CWC Access & Maintenance (A&M) Strategy did not cover this. (C610 currently devising strategy for this.)	Canary Wharf only
13	MIRP-00116/00200	Truss replacement / Transportation of material	To test how long / large items are replaced i.e. escalator trusses, lift guide rails and lift cars. (Not all A&M strategies covered this) Understand use of lifts, engineers' trains and access via PSDs involved in this.	All Stations
14	MIRP-00117	Will equipment fit in lifts?	Confirm that equipment required will fit in lifts. (A&M Strategy CEC issued to ensure D&B contractors provide this data.)	All Stations
15	MIRP-00230	All work (Lifts) is undertaken behind barriers. Modules 2 & 3	Test how major refurbishment is	All Stations

		need differing sizes of hoarding depending on the site and the task.	undertaken, size of hoardings required and identify any pinch points in passageways that could impact passenger flows.	
16	MIRP-00296	Use of MEWPs is generally preferred to use of scaffolding…….. Need to test the number of tasks which need a MEWP for access versus the number of MEWPs available in the station……..	Confirm number of MEWPs and storage/charging facilities and review against maintenance requirements for station and System wide assets and confirm that provision is acceptable.	All Stations

Appendix B: Minimum analysis to be carried out in advance of MIRP2 workshop

These analysis will be undertaken as part of MIRP 2 as a minimum. In addition, any relevant items from Appendix A will be reviewed and analysed.

Maintenance area	Analysis required before MIRP 2 Workshop.	Output required for workshop
Track maintenance	• What track maintenance activity would prevent other works taking place? • What specific resources/access equipment will be required? • What other maintenance activities might be impacted or prevented • Why other activities may be prevented (noise, dust, access etc) • Which other IMs or stakeholders might be impacted? • What are the physical limitations or constraints that would enable other activities to continue (e.g. track works may prevent platform works, but how close can track works be before platform maintenance activities cannot be carried out) • What, if any, mitigations could be applied to enable parallel activities	• PowerPoint slide(s) summarising situation • Drawings/maps • Any corroborating evidence
Signalling maintenance	• What signalling maintenance activity would prevent other types of work taking place? • What specific resources/access equipment will be required? • What other maintenance activities might be impacted or prevented • Why other activities may be prevented (noise, dust, access etc) • Which other IMs or stakeholders might be impacted? • What are the physical limitations or constraints that would enable other activities to continue • What, if any, mitigations could be applied to enable parallel activities	• PowerPoint slide(s) summarising situation • Drawings/maps • Any corroborating evidence
Electrical maintenance	• What electrical maintenance activity would prevent other types of work taking place?	• PowerPoint slide(s) summarising situation

	• What specific resources/access equipment will be required? • What other maintenance activities might be impacted or prevented • Why other activities may be prevented (noise, dust, access etc) • What overlaps exist between electrical circuits which may cause disruption or impact outside of the immediate work area, and in particular to other IMs or stakeholders when taking isolations? • Which other IMs or stakeholders might be impacted? • What are the physical limitations or constraints that would enable other activities to continue • What, if any, mitigations could be applied to enable parallel activities	• Drawings/maps • Any corroborating evidence
Lift maintenance	• What lift maintenance activity would prevent other types of work taking place? • What specific resources/access equipment will be required? • What other maintenance activities might be impacted or prevented • Why other activities may be prevented (noise, dust, access etc) • Which other IMs or stakeholders might be impacted? • What are the physical limitations or constraints that would enable other activities to continue • What, if any, mitigations could be applied to enable parallel activities	• PowerPoint slide(s) summarising situation • Drawings/maps • Any corroborating evidence
Escalator maintenance	• What escalator maintenance activity would prevent other types of work taking place? • How will escalators physically and electrically closed off • What specific resources/access equipment will be required? • What other maintenance activities might be impacted or prevented • Why other activities may be prevented (noise, dust, access etc)	• PowerPoint slide(s) summarising situation • Drawings/maps • Any corroborating evidence

	• What overlaps exist between electrical circuits which may cause disruption outside of the immediate work area? • Which other IMs or stakeholders might be impacted? • What are the physical limitations or constraints that would enable other activities to continue • What, if any, mitigations could be applied to enable parallel activities • Impact of more than one escalator out of service e.g. failure or Preventative maintenance occurring while another escalator is undergoing a major overhaul	
Platforms, Platform Screen Doors (PSD) & Platform Edge Screen (PES)	• What platform and PSD maintenance activity would prevent other types of work taking place? • How will platforms and PSD be physically and electrically closed off • What specific resources/access equipment will be required? • What other maintenance activities might be impacted or prevented • Why other activities may be prevented (noise, dust, access etc) • What overlaps exist between electrical circuits which may cause disruption outside of the immediate work area? • Which other IMs or stakeholders might be impacted? • What are the physical limitations or constraints that would enable other activities to continue • What, if any, mitigations could be applied to enable parallel activities	• PowerPoint slide(s) summarising situation • Drawings/maps • Any corroborating evidence
All maintenance categories	• What resources and access equipment are required? • Access to site inc. maintenance parking • How will any resources and access equipment (e.g. MEWPS; scaffolding) access the work site?	• PowerPoint slide(s) summarising situation • Drawings/maps • Any corroborating evidence

	• Booking on – too many parties booking on? • Where will resources and access equipment be stored immediately before and after the work period if it needs to be brought on site in advance of the work period • How will difficult to access areas be reached (e.g. above escalators) • How will staff access the worksite? Will staff need to access through another IM or stakeholders' jurisdiction? What processes will be in place to facilitate this? • What safeguards will be in place to ensure only the authorised staff access the site? • Fault response by IMs and their contractors (any special response times from RAM analysis) • Will equipment get in the way if can't be moved out in one shift? • Use of hatches – any issue e.g. block of fire escapes • Impact of maintenance on Station cleaning	
Exceptions	• Document any areas excluded from the review	•