

CENTRAL SECTION DELIVERY

MEP & Systemwide Certification Process

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1.0	First Issue
2.0	Updated with amended process and general clean-up
3.0	Minor amendment to Acceptance Certificates Phase 3 (Section 6.6) - Phase 3 testing on an interim basis – requirement for Risk Assessment. Update to the MOSH which is now DCS (Delivery Control Schedule)

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Learning Legacy Document

1. Introduction

This document clarifies the expectations of the requirements in parts 20, 28 and 29* of the Works Information volume 2B for the delivery of self-certification for Mechanical, Electrical, Public Health (MEP) and System works.

This document follows the main principles set-out in the Crossrail Construction Certification for Civil Engineering and Station Works procedure and the Certification Package Compilation and Monitoring Guidance Note.

This document also supports the implementation of Gate 3 assured design which is compliant with the requirements of S1-538 and accepted through the IM(s).

*Note: W.I. Vol 2B Part 29 only applies to Systemwide Contractors.

2. Purpose

In accordance with W.I. 28.2.1 throughout the phases of the testing and commissioning process the *Contractor* is required to 'ensure the integrity of all Plant and Materials, infrastructures, Sub-systems and Elementary Systems tested by the *Contractor* are verified by the *Contractor* before it proceeds with subsequent or sub-phases or testing and commissioning'. In order to satisfy this requirement, the existing process for construction certification has been adopted for MEP & Systemwide works. Assistance on achieving this is given herewith.

To define the method for producing the documentary evidence required by the Crossrail Delivery Team to demonstrate to Crossrail, the Infrastructure Managers and Sponsors that Crossrail Central Section Mechanical, Electrical & Public Health (MEP) and Systemwide works have been constructed, installed and tested in accordance with the Works Information Volume 2B Parts 20, 28 and 29.

This document is to be read in conjunction with the CRL Installation Release Notice (IRN) procedure which is in the Works Information Volume 2B Part 28.6.

3. Scope

This document covers the self-certification process for MEP and Systemwide works. It is applicable to all Crossrail Stations, Shafts, Portals, Depots and Systems Contracts. It does not give guidance on how to determine the Testing and Commissioning Logic or Commissioning Lot Structure as both documents are a precursor to the certification process.

It is intended to provide assistance for the Crossrail (CRL) Delivery, Certification, Testing & Commissioning and Handover Teams and for the Tier 1 Contractors and their supply chain.

This document supports the implementation of assured Gate 3 design compliant with the requirements of LU Assurance Standard S1-538 for the Crossrail Central Section project. The procedure and process described in this document will maintain the integrity of the assured design through to its implementation

4. Terms & Definitions

Installation Release Notice (IRN)	The document issued by the <i>Contractor</i> certifying its installation and the end of Phase 2.1. Formalising the transfer of responsibility for part of a system (Commissioning Lots) from installation to commissioning.
Acceptance Certificate (AC)	A certificate issued by the <i>Contractor</i> that formalises the end of Phase 3 when an Elementary System is completely tested along with its interfaces. For some systems the AC can be received at the end of phase 2.3 (if there is no integration testing required with 3 rd parties)
CEG & CEG Site Representative	Crossrail's Chief Engineer's Group Representative of CEG on site to support the technical assurance process. Usually a Lead Field Assurance Engineer.
Commissioning Logic (Com Logic)	Where the commissioning test activities have been linked together in a logical manner ensuring that the sequences and interdependencies of activities are recognised.
Commissioning Lot (Com Lot)	An assembly as part of a Sub-system that can be tested independently of other assemblies as a functioning unit
Commissioning Schedule	Where the Commissioning Logic is established, each test activity is given an estimated duration and is reviewed from the resource viewpoint. By analysing the results and carrying out a number of reconciliations to decide on the optimum numbers of, inter alia, personnel, test sites, items of Plant and Materials, the Commissioning Logic is converted into the Commissioning Schedule.
Deliverable Record Package or Site Assurance File (SAF)	A set of assurance records for an element of works; Fabrication, Installation or Testing & Commissioning.
Delivery Team	Depending on resources on the project, this could be the Field Assurance Engineers or Site Engineers and the <i>Supervisor's Rep.</i>
DRACAS	Data Reporting Analysis and Corrective Action System – an electronic repository for test logs (failures & retests) used during the testing stages (Post IRN) for providing evidence of reliability growth necessary to support RAM evidence at Completion.
Dynamic Tests	Test requiring the use of the Test Trains and are carried out during Phase 4 and Phase 5 of testing and commissioning.
eB	Crossrail's Electronic Document Management system
Elementary System	The top level of sub-division of the various systems that make up the Crossrail railway system, e.g. track, signalling, fire main system, etc.
FAC & FAT	Factory Acceptance Certificates / Tests
MEP	Mechanical, Electrical & Public Health
Outstanding Works List (OWL)	A document to record work that has not been completed at an inspection or acceptance stage.
Package Breakdown Structure & Schedule	A hierarchical outline of all planned certificates for the contract which follows the Commissioning Lot breakdown and a programme of forecast and actual submission and acceptance dates.
Partial Acceptance Certificate (PAC)	A certificate issued by the <i>Contractor</i> that formalises the end of Phase 2.3 when a sub-system is completely tested as a stand-alone system with its interface simulated.

Pre-Commissioning Certificate (PCC)	A certificate issued by the <i>Contractor</i> that formalises the end of Phase 2.2 when a Commissioning Lot is completely energised and tested.
<i>Project Manager (PM)</i>	Crossrail Project representative described in the NEC3 ECC Contract for the role of <i>Project Manager</i>
RPL (or PL)	Records Package Listing. An index of all related deliverable design, fabrication, installation, testing, as-built, operational and maintenance records for the element of works
SSPs	Stations, Shafts & Portals
Static Tests	Tests carried out without Test Trains, other than what would qualify as recording cars, on isolated systems.
Sub System	Parts of a System (or Elementary System) that can be tested as sets of components or assemblies without interfering with other parts of the System
<i>Supervisor's Rep (PFE)</i>	Crossrail Project representative described in the NEC3 ECC Contract for the role of <i>Supervisor</i>
T&C	Testing & Commissioning
VAP	Verification Activity Plan; site specific risk based provision of additional assurance for the IMs
Whole Contract Construction Certificate (WCCC)	A document issued by the <i>Contractor</i> to certify that all <i>Works</i> as stated in the Works Information, subject to the completion of the Defects in the Consolidated Outstanding Works List (COWL) have been completed. This Certificate shall not be accepted by the <i>Supervisor</i> or <i>Project Manager</i> until the Crossrail Employer's Completion Process is completed.
Works Authorisation Document (WAD)	The document to be produced by the <i>Contractor</i> in accordance with the WAD process to ensure that there is controlled access to areas of live, or potentially live Plant or systems which may be under test or activated from remote locations.

5. Responsibilities

5.1 Works Contractor

The appointed Works *Contractor* is responsible for;

- Determining the System Certification package breakdown structure in line with the approved T&C Strategy and Logic
- Producing and maintaining the certification breakdown schedule in line with the Commissioning Schedule and providing regular progress updates to CRL
- Progressively collating and populating the assurance documents for the Installation and the Testing & Commissioning (depending on the scope of works).
- Meeting with CRL Certification & Delivery Team each week to go through the progress of the certification.
- Regular interface with other contractors and/or stakeholders to ensure timely sharing of information and requirements.

5.2 CRL Certification Manager

The Certification Manager is responsible for;

- Providing guidance and training to the Delivery and Certification Teams and the *Contractor*
- Reporting progress and look-ahead to the CRL Directorate, Project Teams and Quality Teams
- Ensuring consistency across the projects
- Sharing improvements, best practices and lessons learnt

5.3 CRL Certification Engineer

The Certification Engineer is responsible for;

- Meeting with the CRL Delivery Team and *Contractor* each week to go through the progress of the certification process
- Providing feedback on best practices and lessons learnt
- Maintaining the CRL certification trackers
- Reviewing and reporting progress to the Certification Manager and *Supervisor's Rep.* This is essential for readiness of certification acceptance.
- Support the Delivery Team by conducting surveillances on the documentation required for acceptance of certification packages.
- Support the Delivery Team in the quality assurance review of Package Listings

5.4 Supervisor's Rep (PFE) & Delivery Team

The *Supervisor's Rep* and Delivery Team are responsible for;

- Reviewing the System Certification Package Breakdown Structure and Schedule
- Ensuring the *Contractor* meets the requirements of the Works Information and guidance given by CRL
- Interface with other contractors to ensure information from one contractor to another can be delivered
- Interface with Stakeholders and Infrastructure Managers to ensure information can be delivered
- Conducting surveillances on the deliverable documentation required for acceptance of the certification packages
- Reviewing and accepting Package Listings, ITP deliverable documents and Red Line Drawings
- Accepting the certification deliverables and certificates for phases 2.1, 2.2, 2.3 and 3 (where applicable).
- Ensuring the assurance requirements of Parts 20, 13, 28 and/or 29 are met which will impact the completion of the MEP or Systemwide certification requirements

Note: the SRs are supported by Field Assurance Engineers (FAEs) on station, portal and shaft contracts, and by Site Engineers (SEs) on systemwide contracts.

5.5 Project Manager

The *Project Manager* is responsible for;

- Ensuring the requirements of the Works Information have been achieved by the *Contractor*
- Accepting the Phase 3 Certificate
- Delegating a competent representative to accept phases 2.1, 2.2 and 2.3 where required

5.6 CEG Head of Discipline (HOD) or CEG Site Representative

The *HOD or CEG Site Representative* is responsible for;

- Signing the Phase 3 Acceptance Certificate to confirm the CRL Verification of Technical Assurance or Verification Assurance Plan (VAP) has been completed for the relevant System
- Support the review of documentation where required by the *Supervisor's Rep* PFE.

6. Procedure

6.1 Com-Lot / System Breakdown Structure

6.1.1 Certification Hierarchy

All certification packages shall come under the Whole Contract Construction Certificate (WCCC). This certificate is issued by the *Contractor* and signed by the *Supervisor's Rep, Supervisor* and *Project Manager* when all agreed contracted *Works* (Construction, Installation and Testing & Commissioning) are complete and the Crossrail Employer's Completion Process is complete.

All Stations, Portals, Shafts and Depot contracts with MEP scope are expected to have a hierarchy in a similar format to figure 1 below. Unless there are civil works in the scope, Systems contracts are expected to have a similar graphical hierarchy, excluding construction certificates.

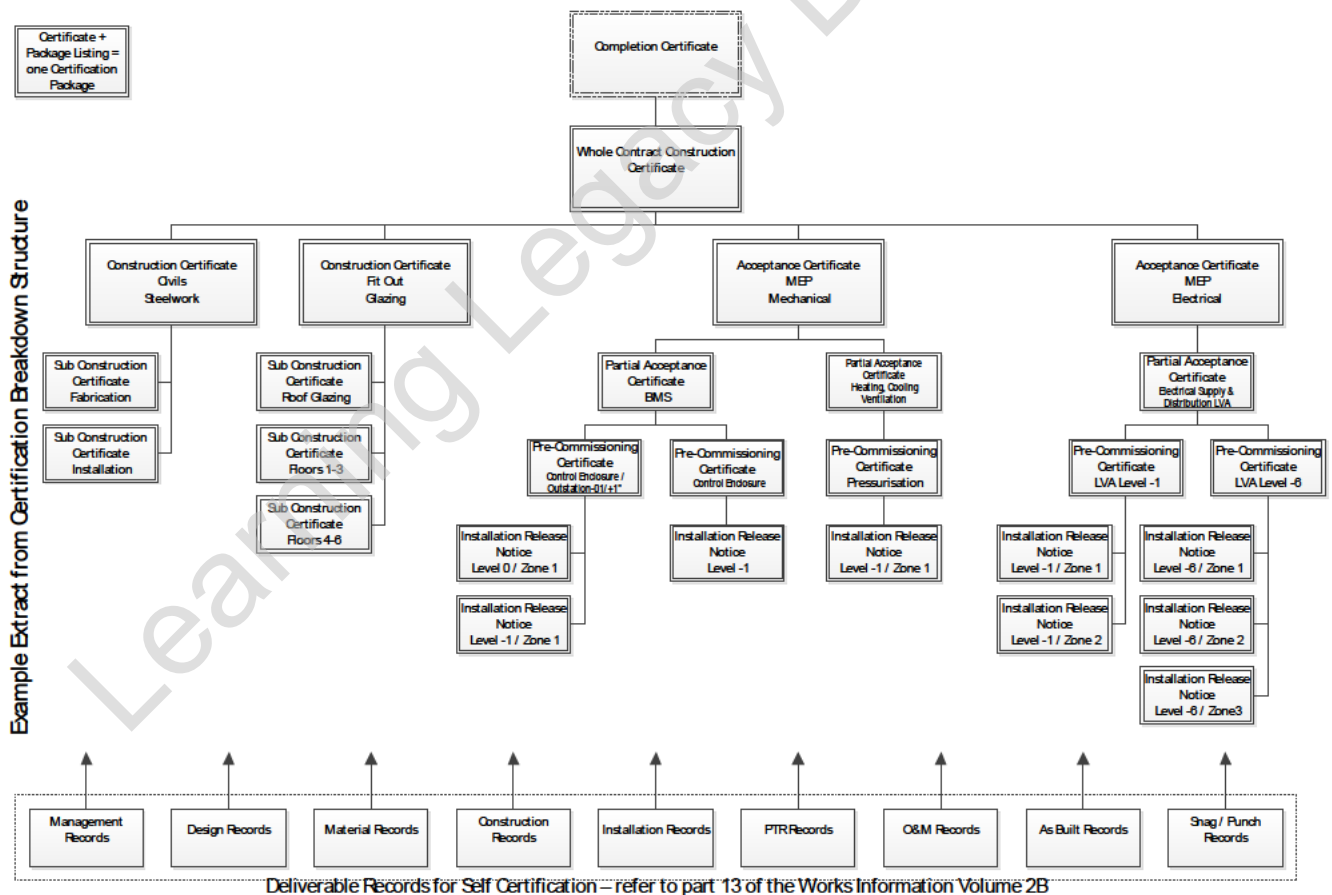


Fig. 1

6.1.2 System Certification Breakdown (Com-Lot Structure)

W.I. Vol 2B Part 28.1.6; The *Contractor* is required to break down systems into Commissioning Lots, commission each one and gradually commission between the units to enable the *Works* to be commissioned. Refer to the contract specific T&C Plans.

Once the Commissioning Logic and Commissioning Lot Structure have been determined the System Certification Breakdown Structure can be generated. This is a “live” document which is to be maintained by the *Contractor* and monitored in accordance with the Construction, Testing and/or Commissioning programme. If changes are made to the Logic or Com Lot Structure then the same changes must be reflected in the Certification Structure.

6.1.3 Com-Lot Schedule

W.I. Vol 2B Part 28.1.7; Utilising the Commissioning Schedule the *Contractor* shall indicate the planned and actual dates at which the individual packages and certificates for each phase are to be presented to Crossrail for acceptance, accepted by the receiving party and the current review status of each one. This schedule is to be issued on a 4 weekly basis.

The requirement in W.I. Vol 2B Part 14.3.8.5 is for the dates of planned certification submission to be included in their accepted P6 Programme. Due to the long process for the P6 approval, the Delivery Team and the *Contractor* may come to a local agreement how to deal with this, such as using the Construction Programme. The dates must also align to the key dates on the DCS (Delivery Control Schedule).

When planning the sign-off of the IRNs the *Contractor* needs to ensure that all documents are complete (unless agreed otherwise) and the site inspection / walk-down has been factored in to the programme.

6.1.4 Testing & Commissioning Phases (W.I. 28.2.2)

The *Contractor's* certification information will be captured for each phase as follows;

- Phase 1: Factory Acceptance Tests;
 - FATs/FACs required before shipment to site and installation into the works. Details of the accepted documents are captured on the package listing for each IRN.
- Phase 2.1: On Site Intermediate Static Tests per Commissioning Lot;
 - Verification that the Plant and Materials have been constructed and installed in accordance to the contract requirements and the next phase can start. The associated documented evidence is to be captured on the package listing for each IRN.
- Phase 2.2: On Site Power-on Tests Per Sub-System
 - Verification that the elementary components or sub-systems work on an independent basis. The associated documented evidence for the testing activities is to be captured for each PCC. See 6.2.2 note.
- Phase 2.3; On Site Commissioning per System
 - Verification that the sub-systems which form part of a system work on an integrated basis (simulation only) and the installed system or systems function correctly as designed. Documented evidence is to be captured on the package listing for each PAC.
- Phase 3: On Site Static Integration Tests per Elementary System
 - Verification that the interfaces between Elementary Systems, including interfaces with systems provided by others, are fully connected and demonstrate that it performs the function(s) for which it was designed. Documented evidence is to be captured on the package listing for each AC.
- Phases 4 & 5: Dynamic Tests and Trial Runs
 - Dynamic Integration Tests are performed on an entire System once it has been physically connected with another complete System to demonstrate that the System operates as an integrated System and demonstrates performance. Trial Running verifies that the design and installation of the plant, equipment, systems and works comply with the project

requirements and that all Systems are integrated so that the Overall Rail System operates properly and safely. Phase 4 and 5 tests are not entirely relevant to Stations, Shafts, Portals or Tunnels; these will be Systemwide T&C phases, which will be supported by SSPT.

- Certification requirements for these tests are not covered in this document.

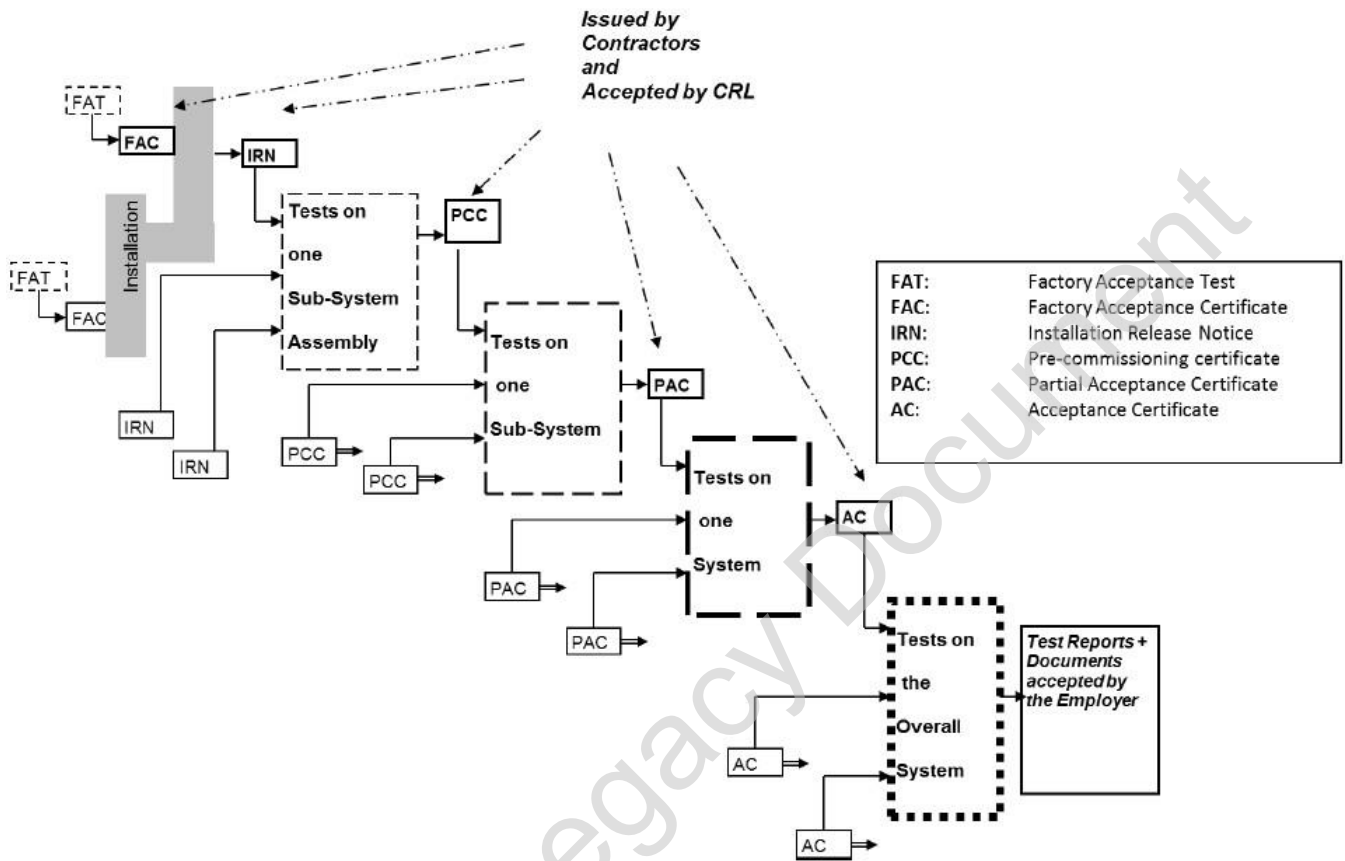


Fig. 2 Phases 1 to 3

6.2 Deliverable Records and Package Listing

6.2.1 Deliverable Records

Verification and Assurance records for construction, installation and/or testing are to be collated into packages for each phase of the works; per IRN, per PAC, etc. These may be known as ITP deliverable record packages, ITP packages, deliverable record packages or site assurance files (SAF).

The compilation of these records must be contemporaneous, in accordance with the requirement for progressive assurance in W.I. 29.2.1 and 13.1.

It is not necessary to include the records that have been submitted and accepted pre-construction, or PTR documents (e.g. NCRs, RFIs, etc.) as these will already be on eB. Best practice has shown that a signed copy of the Decal sheet for these documents may be added to the packages to assist the owner and reviewer of the files when ensuring all documentation has been accepted at Code 1 or 4.

Upon completion of each activity phase, these deliverable record packages shall be submitted to Crossrail for acceptance. The CRL FAE/SE may select which records to review in accordance with the Compilation of Certification Packages Process. If records have not been reviewed by CRL, then they shall be accepted Code 4. The associated certificate must not be signed until these records have been completed and provided to CRL.

6.2.2 Package Listing

A Package Listing, or Records Package Listing, is a standard template provided by CRL for every *Contractor* to use. It is an index of all deliverable records, and their individual eB numbers, that are generated during design through to testing and commissioning for each activity of works.

They shall be populated and submitted with each IRN and issued under one eB document number using the taxonomy code 'NOX' and CMDL filing number C21.0xx. (SSPs & Depots) or SMDL code S14.011. (Systemwide).

A package listing shall be submitted with each Certificate (PCC*, PAC & AC) and issued under one eB document number using the taxonomy code 'CER' and CMDL filing number C21.018, C21.019 or C21.020 (SSPs & Depots) or SMDL S14.015, S14.014 & S14.001 (Systemwide).

Package Listings that are populated progressively along side the works activities are found to be best practice for being completed accurately and on time. Continuous population of information reduces the impact of one or more parties leaving before the activity is complete. This also applies to the progressive compilation of records in 6.2.1 above. They also provide a tool for surveillance of ongoing works.

The *Contractor*, including the *Contractor's* Quality Manager, is required to sign the Package Listing Statement and the Delivery Team and *Supervisor's Rep (PFE)* shall sign on behalf of Crossrail.

***Note:** if the Contractor has defined the need for a PCC and a PAC, then the Package Listing requirement may be removed and the details included under the related PAC Package Listing. The requirement to have a Pre-Commissioning Certificate and the test results of Phase 2.2 remains. Eliminating the need to have a Package Listing will enable expedience of the T&C assurance process.

6.2.2.1 Required information

There are 7 sections of a Package Listing, each one including information such as;

1. Associated Certificates
 - a. WCCC, PACs, PCCs, IRNs. All lower level supporting certificates are to be identified. Higher level certificates may be added where appropriate.
2. Assurance Records
 - a. Audits and Surveillances that have been carried out on that particular activity. Generic audits or surveillances on activities such as Document Control are not required
3. Design Records
 - a. Design information such as the Register of Issued Records (RIR), specifications, IFC drawings used for the activity, calculations, etc. This section may not be applicable for PCC, PAC and AC.
4. Installation Records – split into 2 sections;
 - a. 4A. Manufacturing Records: Material records, ITPs, inspection records, working drawings used for manufacturing and fabrication. These records are to be provided prior to the material, equipment or plant being installed on site.
 - b. 4B. Installation Records: ITPs, Method Statements, inspection records, test records and red-line drawings, agreed punch list (or OWL).
 - c. Both sections must include any change information that is held in eB PTR e.g. NCRs, RFIs, FCDs and any PMIs that have been issued to make changes that affect the activity.
5. Testing & Commissioning Records
 - a. This section is for the PCCs, PACs and ACs only. Includes Testing & Commissioning Plans and Procedures, test records, results and certificates. PTR documents, DRACAS reports and agreed punch list or OWL.
6. Asset, Operation & Maintenance Records
 - a. O&M Manuals, training information, maintenance records generated prior to transfer (handback or handover). Asset Management & Traceability Records.

7. Outstanding Documentation

- a. An agreed list of documents from sections 1-6 that have not been submitted and or accepted at Code 1 or 4 but do not prevent the signing of the certificate. These items are to be transferred onto the *Contractor's* OWL to ensure they are tracked to closure.

6.2.2.2 Required sections for each certificate

Certificate	Section 1	Section 2	Section 3	Section 4	Section 5	Section 6	Section 7
IRN	If related Certs are known then add, else N/A	If applicable to that activity	Yes	Yes	N/A	References and progression to be confirmed	Yes
PCC See 6.2.2 note	All IRNs If other certs known add, else N/A	If applicable to that activity	If any changes since IRN signed, else N/A	If any changes since IRN signed, else N/A	Yes	Updated info from IRN, else N/A Add DRACAS info	Yes
PAC	All IRNs & PCCs If other certs known add, else N/A	If applicable to that activity	If any changes since IRN/PCC signed, else N/A	If any changes since IRN/PCC signed, else N/A	Yes	Updated info from IRN Add DRACAS info	Yes
AC	Yes	If applicable to that activity	If any changes, else N/A	If any changes, else N/A	Yes	Updated info from IRN (all code 1) Add DRACAS info	Yes

6.3 Installation Release Notice (IRN) Phase 2.1

6.3.1 General

To verify that plant and materials have been properly constructed and installed, and that they do not adversely affect or impede the proper functioning of all other systems, the *Contractor* shall issue an Installation Release Notice (IRN).

The requirement of W.I. 28.2.2.1 states One IRN shall be issued for every Commissioning Lot and defined in accordance with the definition of Commissioning Lots document prepared by the *Contractor*. However, this requirement is not always the most efficient in practice. Upon agreement with CRL, the *Contractor* may choose to combine multiple Com Lots under one IRN. This can only apply to Com Lots within the same system and not a combination of different systems. In the event of this, the Package Listing needs to define the Com Lots and identify documents that are applicable to specific Lots (e.g. MCRs).

The IRN also provides documentation for the certification of the *works* to ensure work is of a condition that allows pre-commissioning phase 2.2 tests to start. Therefore the change of responsibility is clearly documented and advertised so that all involved personnel will be kept aware of the current safety requirements providing a safe and smooth transition from the installation phase to the commissioning phase.

6.3.2 Site Inspection and outstanding items

As defined in the IRN Procedure, the IRN cannot be issued until a joint inspection by the respective installation and commissioning teams has taken place, and any outstanding items agreed and documented by way of an outstanding works/snagging list. The list will state clearly all outstanding items and a time scale for their completion. This will be attached to the IRN and package listing.

Best practice is for the snag list (or punch list) to be initialled or signed by the same parties signing the IRN as evidence the list has been agreed.

6.3.3 Asset Management & Traceability

As per W.I. Part 28 Appendix A cl.3.3 (Stations, Shafts & Portals) and W.I. Part 28 cl 28.6.3.3 (Systemwide), pre-requisites for the *Contractor* to issue an IRN include a Commissioning Lot Asset Sheet which provides the list of assets to the Commissioning Lot it relates to. As all relevant asset inventory information passed from the *Contractor* is imported in to the Crossrail Asset Information Management (AIMS), Contractors shall use the AIMS Contract Based Asset Listing Template (CRL1-XRL-Z3-ZTM-CR001-50007) and related generic cover and listing sheet whilst following the provided instructions when creating their Commissioning Lot Asset Sheet.

Furthermore, as part of each IRN submission, the *Contractor* is required to confirm that;

- All asset tags are named
- All asset tag labels are in place (where relevant)
- All equipment has been installed against Asset Tags
- All serialised equipment is labelled
- All Station, Portal and Shaft rooms and/or spaces have been related to Asset Tags
- 95% of asset attributes have been collected
- The 1st submission of O&M information templates are in place

All Contractors are required to aim to achieve the above requirements, however it may be agreed by CRL that some steps are not going to be achieved in time to meet the T&C schedule constraints. In this case, the teams are to agree and record a timescale to be completed, but must not go beyond acceptance of phase 2.3 PAC. Outstanding actions are to be tracked and progress of the template is to be reported at agreed intervals.

6.3.4 Review and Sign-off

The inability to provide the documents listed on the package listing and the defects/snag list will prevent the sign-off of the IRN.

The Contractor signatories must be in accordance with the Competency Matrix or Competency Management Plan.

CRL will need a list of Delegated Competent Persons who are nominated to sign IRNs in the absence of the PM or *Supervisor's Rep* PFE.

Notes for clarification on sections of the IRN template are given in fig. 3

6.3.5 IRN process alterations

6.3.5.1 Containment installed for a follow-on contractor to pull their cables

The Contractor may opt to adapt the IRN process to make the acceptance dates more efficient where there is a route of containment (CMS) to be used by another contractor (e.g. C650) and provides the appropriate assurance to all parties that the installation meets requirements. This process does not apply to C660 interface.

The *Contractor* shall;

- Produce a package of tests reports as per the ITP e.g. Pull Tests and inspection check sheets, for the assurance that the CMS meets requirements. This pack must include a contents list.
- Produce a completed hard-copy of the Red-Line drawing, or an in-progress marked up drawing. These can be provided if further mark-ups for future CMS installation are required.
- MCRs should already be Code 1 in eB and are not necessary for these IRNs
- Create an IRN for the route(s).
- Provide hard-copy visibility of these records to the interested parties e.g. C650, typically in hard copy.

- Conduct a walk-down with all parties concerned in accordance with the Room Handover and Inspection Request Form (IRF) processes.
- Sign the IRN and provide to CRL to accept that it the process has been followed and verification records provided.
- A representative from the interested party shall sign the room/route handover checklist as appropriate. They and their CRL C6xx counterpart are not required to sign the IRN.
- The signed IRN, checklist and outstanding works list (where applicable) is to be uploaded to eB, submitted for acceptance and CRL to accept Code 1.
- The associated test records may be uploaded to eB, submitted for acceptance and CRL to accept Code 1 or 4, depending on the level of review taken. Or they may be part of a larger file which will be submitted upon completion. Both options require a structure to the information e.g. a contents page for traceability purposes.
- The details are to be transferred to a “Master IRN” for the CMS, which may include multiple route IRNs (or “mini IRNs) and then submitted as per the standard IRN process. The Master IRN also provides the opportunity to capture any changes that have occurred since signing the ‘mini’ IRN and avoids the need to revise a mini IRN.
- The “mini IRNs” must be scheduled and tracked like all IRNs.

Best practice shows that a Master IRN and package listing be generated for specific interested parties e.g. grouping together all the CMS “mini” IRNs for C650, however one IRN for a specific area, with multiple interested parties (C610, C620 & C650) may be more appropriate (e.g. Station X Levels 1-4 Back of House).

See Figure 3 below for additional guidance on completing the IRN template.

Extra template notes


		Installation Release Notice (IRN) part 1 of 2 Crossrail Central Section			Contractor Logo																																				
IRN Ref. Number:		Cxxx-xxx-xx-NOX-xxxxx-xxxxx-x.x			MDL NO.																																				
<p>1 This Commissioning Lot has been installed in accordance with the agreed Design and Installation criteria, has satisfactorily passed construction technical verifications and is ready for the next phase to start either further installation or commissioning. This IRN is a notification of Transfer of Ownership from a Contractor's Installation Team to the receiving Installation or Commissioning Team. The Tier 1 T&C Representative's signature confirms that the Commissioning Lot is ready to be energised.</p> <p>Commissioning Lot description and location:</p> <p>Add description of what the IRN covers. Com Lot number(s) only is insufficient. Add a location where installed.</p> <p>Record Package Listing: Attached <input type="checkbox"/> Tick if attached at time of signing Signed <input type="checkbox"/> Tick if signed at time of signing</p> <p>Commissioning Lot: Ref. Number: if multiple numbers, then add all numbers</p> <table border="1"> <tr> <td>Outstanding Work List</td> <td>Not Applicable <input type="checkbox"/></td> <td>Attached <input type="checkbox"/></td> <td>Ref. Number:</td> <td>if list not attached to IRN, add EB Ref.</td> </tr> </table> <p>The plant and materials described above has been the subject of a joint IRN inspection by the contractor's installation team and the receiving contractor's installation or commissioning team as applicable and it has been agreed that they are in a suitable state of readiness for further installation works or commissioning tests to commence as appropriate.</p> <p>NO WORKS CAN TAKE PLACE ON THE COMLOT BEFORE THE WAD COORDINATOR HAS SIGNED IN PART 3 UNLESS WAD EXEMPTION APPLIES</p> <p>2.1</p> <table border="1"> <thead> <tr> <th>Contract No</th> <th>Name</th> <th>Date</th> <th>Signature</th> </tr> </thead> <tbody> <tr> <td></td> <td>A Rep from Install Team</td> <td>e.g. Tier 2</td> <td></td> </tr> <tr> <td></td> <td>Tier 1 Quality Rep</td> <td>e.g. LOR Q. Manager, or ATC Q. Engineer</td> <td></td> </tr> <tr> <td></td> <td>A Rep from the receiving T&C Team</td> <td>e.g. Tier 2 or Cbxx</td> <td></td> </tr> <tr> <td></td> <td>Tier 1 Rep who manages the MEP or T&C Process</td> <td></td> <td></td> </tr> </tbody> </table> <p>2.2 CRL Statement: I accept Parts 1 and 2 of this IRN are complete and signed by competent individuals in accordance with the Contractor's Competency Management Plan. Agreed Defects have been captured in the Outstanding Works List identified in Section 7 of Part 2 and attached to this document, where applicable.</p> <p>3 CRL Supervisor / Project Manager or delegated competent person¹ Position: CRL Rep, can be a delegated F.A.E, for the contract responsible for the install e.g. CS12</p> <p>Planned Implementation Date: Time: Day: Month: Year: Sufficient time to be given for WAD Manager to inform all of changes to the Com Lot Status (where applicable)</p> <p>ComLot / Area Owner: (if different from Receiving Contractor)</p> <p>Declaration: By the time and date shown in part 3, all relevant personnel have been informed of the changes in Commissioning Lot status as defined below :</p> <ul style="list-style-type: none"> The change of conditions of the above plant and materials from quiescent to operating. That this will be deemed to take effect from the date shown. That any future works on this plant and equipment will require to be identified in the WAD. That any access into the controlled area surrounding this plant and material will require a WAD. <table border="1"> <thead> <tr> <th>Accepted by</th> <th>Contract No.</th> <th>Name</th> <th>Date</th> <th>Signature</th> </tr> </thead> <tbody> <tr> <td>WAD Manager / Coordinator (2) Actual Implementation Date</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p>Notes: ¹ refer to the Contractor's Competency Management Plan and Authorised Signatories and CRL Competent persons list ² delete as appropriate</p>							Outstanding Work List	Not Applicable <input type="checkbox"/>	Attached <input type="checkbox"/>	Ref. Number:	if list not attached to IRN, add EB Ref.	Contract No	Name	Date	Signature		A Rep from Install Team	e.g. Tier 2			Tier 1 Quality Rep	e.g. LOR Q. Manager, or ATC Q. Engineer			A Rep from the receiving T&C Team	e.g. Tier 2 or Cbxx			Tier 1 Rep who manages the MEP or T&C Process			Accepted by	Contract No.	Name	Date	Signature	WAD Manager / Coordinator (2) Actual Implementation Date				
Outstanding Work List	Not Applicable <input type="checkbox"/>	Attached <input type="checkbox"/>	Ref. Number:	if list not attached to IRN, add EB Ref.																																					
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	A Rep from the receiving T&C Team	e.g. Tier 2 or Cbxx																																							
	Tier 1 Rep who manages the MEP or T&C Process																																								
Accepted by	Contract No.	Name	Date	Signature																																					
WAD Manager / Coordinator (2) Actual Implementation Date																																									

Fig. 3

6.3.6 Uploading to eB

Upon completion and acceptance of the IRN, package listing and snag list, they are to be scanned and uploaded into eB by the Installation *Contractor*. The MS Excel native file of the package listing is also to be included so that this may be provided to the CRL Handover Information Team and the Infrastructure Managers. The scanned copies of Parts 1 and 2 and the snag list are placed under the one IRN eB number, the MS Excel native file must also be attached to the metadata which is then sent to CRL for acceptance under a decal page*.

CRL Delivery Team to sample check documentation not uploaded to eB before acceptance of the IRN (e.g. Red Line Drawings) has been uploaded and accepted. If complete and accurate, the CRL *Supervisor's Rep* is to accept the decal and metadata as code 1.

- Note the use of a decal page is recommended for all IRN, PCC, PAC and AC certification packages where the PFE is not signing the certificates, however this is at the discretion of the individual *Supervisor's Rep* (PFE).

6.4 Pre-Commissioning Certificates Phase 2.2

6.4.1 General

Once the Static Tests are carried out during installation and successfully performed, the Power-on tests can be undertaken when the elementary components are energised to bring the Commissioning Lot into a functional state.

When the Pre-commissioning Static Tests are successfully completed for a specific comLot, PCC can be issued and signed.

The PCC cannot be issued until a joint inspection by the Testing & Commissioning teams and CRL (where possible) has taken place, and any outstanding items agreed and documented by way of a defects/snagging works list. The list will state clearly all outstanding items and a time scale for their completion. This will be attached to the PCC.


Best practice is for the snag list (or punch list) to be initialled or signed by the same parties signing the PCC as evidence the list has been agreed.

The inability to provide the pre-requisite documents, the test results and the defects/snag list will prevent the sign-off of the PCC.

If the *Contractor* or Subcontractor for the follow-on Phase 2.3 of the T&C works then a representative must sign the PCC to accept the tests in Phase 2.2 have been carried out as per the Works Information and the testing procedures.

If the commissioning logic requires both phases 2.2 and 2.3 the Contractor may choose to include the Phase 2.2 documentation details on the Package Listing for Phase 2.3 (PAC part 2/2), therefore making a Package Listing for Phase 2.2 not applicable. A Package Listing is required if there is no Phase 2.3 or where Phase 2.3 is carried out by another Contractor.

Notes for clarification for the template are given in figure 4 below.

		Pre-Commissioning Certificate (PCC) Crossrail Central Project Part 1 of 2		(Insert Supplier Company logo) RP	
Ref. Number: Internal PCC Ref. if different to EB Ref eg #71		Cxxx-xxx-xx-CER-xxxxx-xxxxx-xx EB Ref		MDL No.	
Is this certificate for Interim Acceptance?		Yes <input type="checkbox"/>		No <input type="checkbox"/>	
The sub-system is energised and pre-commissioning tests confirm that the sub-system functions in accordance with requirements. It can now be put into operation to provide its functionality and to facilitate testing of other sub-systems or Commissioning Lots to complete an elementary system. This Pre-Commissioning Certificate is a prerequisite for the acceptance by the CRL Project Manager of plant and materials in accordance with the Contract.					
Sub-system description and location: Add description + location See attached test sheet pack ref. Cxxx-xxx-x-xxx-xxxxx-xxxxx					
IRN ¹ Reference(s) ² :		Add EB Refs of applicable IRNs			
Sub-system ¹ Reference ² :		N/A or Other PCCs * see note			
Package Listing is:		Attached <input type="checkbox"/>		Signed <input type="checkbox"/>	
Outstanding Works List is:		Not Applicable <input type="checkbox"/>		Attached <input type="checkbox"/>	
				Ref. Number: if not attached, then EB Ref	
The plant and materials described above have been the subject of a joint inspection by the Contractor's testing and commissioning team and the CRL Project Manager (or a delegated competent person). It has been agreed that they are in a suitable state of readiness for further commissioning tests to commence as appropriate. At the time of the review items such as these below are identified on the associated Remedial or Outstanding Works List (ROWL)-					
<ul style="list-style-type: none"> • incomplete items of plant and materials; • non-conformances; • pending modifications or changes; • temporary devices or modifications; • missing documentation; 					
Conditions/restrictions of use?		Details: Any conditions/restrictions that are to be noted by Phase 2.3 Testers			
Yes <input type="checkbox"/>		No <input type="checkbox"/>			
		Sub/C (if applicable)		Name	
				Signature	
				Date	
Phase 2.2 T&C Lead Engineer/Manager ³		Tier 2 e.g. CML Sustain			
Phase 2.2 T&C Manager (Tier 1) ³		Tier 1 MEP or TFC Manager who oversees process eg LOR			
Phase 2.3 T&C Rep (if different from above) ³		If same Tier 2 tester for phase 2.3 as 2.2, then N/A			
CRL Statement: I accept Part 1 and 2 of this PCC have been populated and signed by competent individuals in accordance with the Contractor's Competency Management Plan, and agreed Defects have been captured in the Outstanding Works List identified in Section 7 of Part 2 of this document attached to this certificate - NOTHING APPROPRIATE FOR NO PART 2					
CRL Supervisor's Rep (PFE)/ Project Manager or Delegated Competent person		Position:		Name:	
				Signature:	
				Date:	
Review Date:		Time:		Day:	
				Month:	
				Year:	
Notes: (1) If multiple IRNs or Sub-systems insert ref. numbers in "Sub-system description and location box" (2) In accordance with the relevant commissioning logic (3) Signed in accordance with the Contractor's Competency Plan					

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* Package Listing is N/A if Same Contractor, or Sub contractor, is doing the PAC.

Fig. 4

6.4.2 Uploading to eB

Upon completion and acceptance of the PCC, package listing (if applicable) and snag list, the PCC is to be scanned and uploaded into eB by the T&C *Contractor* (for phase 2.2). The MS Excel file of the package listing is also to be included eB so that this may be provided to the CRL Handover Information Team and the Infrastructure Managers. Both the scanned copy and MS Excel file are under the one PCC eB number which is then sent to CRL for acceptance under a decal page.

CRL Delivery Team to check all remaining documentation not uploaded to eB before acceptance of the PCC has been uploaded and accepted. If complete and accurate, the CRL *Supervisor's Rep* is to accept the decal as code 1.


6.5 Partial Acceptance Certificates Phase 2.3

When the System Static Tests (phase 2.3) are successfully completed for a specific comLot, subsystem or elementary system the PAC can be issued and signed. A Package Listing is required for all PACs and if a Package Listing was not attached to a PCC, the details of such must be included here. The requirements given for the PCC above in 6.4 are to be applied for the PACs.

For clarification of completing the template, see figure 5 below.

Learning Legacy Document

Fig. 5

		Partial Acceptance Certificate (PAC) Crossrail Central Project Part 1 of 2		(Insert Supplier Company logo)
Ref. Number: <i>Internal Ref eg # 20</i>		Cxxx-xxx-xx-CER-xxxxx-xxxxx-xx <i>eb Ref</i>		MDL No.
Is this certificate for Interim Acceptance? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		<i>Choose applicable box</i>		
The tests for this partial acceptance confirm that all sub-systems that comprise the elementary system are connected, by simulation only, and verify the sub-systems concerned function on an integrated basis. This Partial Acceptance Certificate is a prerequisite for the acceptance by the CRL Project Manager of plant and materials in accordance with the Contract.				
Sub-system description and location: <i>Add detailed description and location</i>				
Com Lot ¹ Reference(s) ² :		<i>Add IRN Nos. (eb Ref)</i>		
Sub-system ¹ Reference(s) ² :		<i>Add PCC Nos. (eb Ref)</i>		
Package Listing	Attached <input type="checkbox"/>	Signed <input type="checkbox"/>	<i>Select the applicable at time of signing</i>	
Outstanding Works List is:	Not Applicable <input type="checkbox"/>	Attached <input type="checkbox"/>	Ref. Number:	<i>attach to PAC or add eb Ref.</i>
The plant and materials described above have been the subject of a joint inspection by the Contractor's testing and commissioning team and the CRL Project Manager (or delegated competent person) and it has been agreed that they are in a suitable state of readiness for further commissioning tests to commence as appropriate. At the time of the review items such as these below are identified on the associated Remedial or Outstanding Works List (ROWL):-				
<ul style="list-style-type: none"> • incomplete items of plant and materials; • non-conformances; • pending modifications or changes; • temporary devices or modifications; • missing documentation; 				
Conditions/restrictions of use?		Details:		
Yes <input type="checkbox"/>	No <input type="checkbox"/>	<i>Add details required by Phase 3 tester</i>		
		Sub/C (if applicable)	Name	Signature
				Date
Phase 2.3 T&C Lead Engineer/Manager ³		<i>Tier 2</i>	<i>T&C Manager, or similar, who manages the testing process</i>	
Phase 2.3 T&C Manager (Tier 1) ³		<i>Tier 1</i>	<i>T&C or MEP Manager who manages MEP process</i>	
Phase 3 T&C Rep (if different from above) ³		<i>if another Tier 2 or Tier 1, else N/A</i>		
CRL Statement: I accept Parts 1 and 2 of this PAC are complete and signed by Competent Individuals in accordance with the Contractor's Competency Management Plan, and agreed Defects have been captured in the Outstanding Works List identified in Section 7 of Part 2 of this document.				
CRL Supervisor's Rep (PFE) / Project Manager or delegated competent person		Position:	Name:	Signature:
				Date:
Review Date:		Time:	Day:	Month:
				Year:
<i>CRL Rep for team responsible for 2/3 test, may be delegated F.A.E.</i>				
Notes:				
(1) If multiple Sub-system then insert ref numbers in "Sub-system Description and location" box.				
(2) In accordance with the relevant commissioning logic				
(3) Signed in accordance with the Contractor's Competency Plan				
© Crossrail Limited		<i>* If Interim,</i>		CRL RESTRICTED
Template: CRL1-XRL-0-ZFM-CRG03-50003 Rev 3.0		<i>this certificate becomes an iPAC</i>		

6.6 Acceptance Certificates Phase 3


Phase 3 Static Integration Tests are undertaken when the interfaces between Elementary Systems, including the interfaces with systems provided by 3rd parties are fully connected. The tests performed in phase 3 are a development from the systems static tests, at this stage the relevant systems would have been installed and connected. This includes interfacing with the systems of others, including CRL Systemwide contractors. The completion and acceptance by the *Supervisor and Project Manager* of all Acceptance Certificates allows phase 4 Dynamic Tests to commence.

The principles and assurance in 6.3.1, 6.3.2 and 6.3.3 above apply to each Acceptance Certificate. The clarification on the Figure 6 are only given where it differs from the PCC and PAC, else the same notes apply.

If the option is taken to carry out Phase 3 testing on an interim basis, e.g. Temporary Power, then a Risk Assessment must be developed, maintained and updated by the Contractor. This is to be referenced on the iAC or attached. Refer to the CRL T&C Team for further guidance.

Learning Legacy Document

See Figure 6 below for further guidance on the template
Fig. 6

		Acceptance Certificate (AC) Crossrail Central Project		(Insert Supplier Company logo)	
Ref. Number: <i>Internal Ref eg # 4</i>		Cxxx-xxx-xx-CER-xxxxx-xxxxx-xx <i>EB Ref</i>		MDL No.	
TICK RELEVANT BOXES					
Is this certificate for Interim Acceptance? Yes <input type="checkbox"/> No <input type="checkbox"/>		Type of Power Temporary <input type="checkbox"/> Permanent <input type="checkbox"/>		SCADA Interface <input type="checkbox"/>	
This elementary system has satisfied the requirements for static integration tests between all the systems including the interfaces with the systems of third parties. This Acceptance Certificate is a prerequisite for the acceptance by the CRL Supervisor's Rep and Project Manager of plant and materials in accordance with the Contract.					
System description and location: <i>Add detailed description and location</i>					
Record Package Listing is?		Attached <input checked="" type="checkbox"/>		Signed <input checked="" type="checkbox"/>	
Outstanding Works List is:		Not Applicable <input type="checkbox"/> Attached <input type="checkbox"/>		Ref. Number: <i>If Not attached add EB Ref</i>	
The plant and materials described above have been the subject of a joint inspection by the Contractor's testing and commissioning team and the CRL Supervisor's Rep and Project Manager and it has been agreed that they are in a suitable state of readiness for further commissioning tests to commence where applicable. At the time of the review items such as these below are identified on the associated Remedial or Outstanding Works List :- <ul style="list-style-type: none"> • incomplete items of plant and materials; • non-conformances; • pending modifications or changes; • temporary devices or modifications; • missing documentation; 					
Conditions/restrictions of use? Yes <input type="checkbox"/> No <input type="checkbox"/>		Details: <i>Add details that need to be shared with follow-on/receiving parties e.g. C610</i>			
		Sub/C (if applicable)	Name	Signature	Date
Phase 3 T&C Lead Engineer/Manager ¹		<i>Tier 2 T&C Manager, or equivalent, who manages the process. eg T. Clark,</i>			
Phase 3 T&C Manager (Tier 1) ¹			<i>Tier 1 MEP or T&C Manager eg BMW</i>	<i>who manages the whole MEP Process</i>	
CRL Statement: I accept Parts 1 and 2 of this AC have been completed and signed by competent individuals in accordance with the Contractor's Competency Management Plan and all agreed Defects have been captured in the Outstanding Works List identified in Section 7 of Part 2 of this document					
CRL Supervisor's Rep (PFE)		<i>CRL SR (PFE) must sign to accept the system is tested to phase 3.</i>			
CRL Project Manager		<i>CRL PM, as above</i>			
Review Date:		Time:	Day:	Month:	Year:
All CEG Technical Verification (VAPs) Held and Completed?		Yes <input type="checkbox"/> No <input type="checkbox"/>		Outstanding <input type="checkbox"/>	
CRL CEG Acceptance (Lead Discipline Engineer)		Name:		Signature:	
<i>CRL Independent Signatory from CEG</i>		Position:		Date:	
Notes: Conditions/restrictions of use to be a list ¹ Signed in accordance with the Competency Management Plan					
<i>* If Interim, this certificate becomes an iAC.</i>					
© Crossrail Limited			CRL RESTRICTED		
Template: CRL1-XRL-O-ZFM-CRG03-50002 Rev 3.0					

6.7 Monitoring and reporting

As with the principles of construction certification, the *Contractor* is expected to monitor their progress of all of their MEP or Systemwide certification packages. Regular updates are to be provided to CRL each week.

CRL Certification Team will monitor the progress of each Contractor and the performance will be reported each period to the CRL Directorate.

There are Key Performance Indicators for MEP & Systemwide certification packages;

Each certificate (IRN, PCC, PAC and AC) is to have a forecast submission date from the *Contractor*. This submission date is to be in-line with their construction and testing programme and is the date that the *Contractor* states the works and the information will be complete and ready for review by CRL and other parties. It is for the *Contractor* to liaise with the PFE to determine how much time between construction/testing end and submission/inspection is required.

This Forecast Submission Date could also be known as Forecast Inspection Date or Forecast Sign-off Date. If the submission/inspection/sign-off is on or before this date, then the KPI is positive. If the date falls behind programme then the KPI is overdue. These forecasts need to be adjusted in line with the activity programme.

It is possible that there could be documentation, including the certificates that are not in eB at the time of sign-off, to accommodate this there will be an allowance of 28 days post hard copy sign-off of the certificate for the *Contractor* to upload all remaining documentation to eB **and** for CRL Delivery Team to accept and return code 1. Packages that have all documentation and certificates in eB code 1, within 28 days, will be reported as On Time. If this is not achieved then the KPI result will reflect this.

- KPIs =
 - On Time Submission
 - Completed (submitted to eB and accepted Code 1) within 28 days of certificate sign-off

The CRL Certification Team will provide updates alongside the Construction Certification performance each period in the Certification dashboards.

7. Reference Documents

Ref:	Document Title	Document Number:
1.	Certification Package Compilation - Guidance Note	CRL1-XRL-O4-GUI-CR001-50009
2.	Construction Certification for Structures and Civil Engineering Works Procedure	CRL1-XRL-O4-GPD-CR001-50006
3.	Testing and Commissioning Management Plan	CRL1-XRL-Z-STP-CR001-50017
4.	Management of Redlines and As Built Procedure	CRL1-XRL-Z-GPD-CR001-50010
5.	Verification and Validation Plan	CRL1-XRL-O8-STP-CR001-50006
6.		
7.		

8. Standard Forms / Templates

Ref:	Document Title	Document Number:
A.	Installation Release Notice (IRN) Part 1 of 2 Template	CRL1-XRL-O-ZFM-CRG03-50005
B.	Pre-Commissioning Certificate (PCC) Template Part 1 of 2	CRL1-XRL-O-ZFM-CRG03-50004
C.	Partial Acceptance Certificate (PAC) Template Part 1 of 2	CRL1-XRL-O-ZFM-CRG03-50003
D.	Acceptance Certificate Template	CRL1-XRL-O-ZFM-CRG03-50002
E.	MEP & Systemwide Certification 'Records Package Listing' Part 2 of 2	CRL1-XRL-O-ZFM-CRG03-50001
F.	AIMS Contract Based Asset Listing Template	CRL1-XRL-Z3-ZTM-CR001-50007