Testing & Commissioning

East London Line Project
1. Preamble
2. Progressive Commissioning
   • IRN Process
   • WAD Process
   • ROWL & Test Log Process
4. System Integration
5. Test Running
6. Progress & JV Expectations
Preamble

At this stage of any project Testing & Commissioning is not usually considered as a priority as people focus on delivering the Design and in commencing Construction!

However, past experience shows that identifying the main risks in relation to T&C activities at an early stage is vital to the successful delivery of complex railway projects.
T&C Key Principles

1. PROGRESSIVE COMMISSIONING
   CoC - Manufacturing ITP (FAT) / Installation release Notice / SAT Certificates / Partial Acceptance Certificates

2. COORDINATION AND INTEGRATION OF OTHERS WORKS CONTRACTS
   Overall Commissioning Logic / Acceptance Certificates

3. PLAN AND MANAGE TEST RUNNING USING ROLLING STOCK PROVIDED BY RSP AND OPERATED BY THE PSO IN ORDER TO COMPLETE TESTING OF THE WORKS, INCLUDING ALL WORKS COMPLETED BY OTHERS
   Commissioning Rulebook / Test Running Strategy
Progressive Commissioning

IRN PROCESS
How to Manage Progressive Testing & Commissioning
On the Channel Tunnel Rail Link – Section 1 Project, signing off of IRNs (Installation Released Notice) required 20 weeks compared to the 12 weeks in the original baseline. Analysis of data collected on Section 1 provided evidence to identify the "Definition of Commissioning Lots" as being the most critical stage. This is key to the success of on target IRN delivery.

Based on this experience the IRN process was strictly monitored using KPIs on CTRL Section 2 which lead to the progressive signature of all IRNs associated with the Main Works Contractor in time for the testing & commissioning phase.

The last MWC IRN was signed **11 months** prior to Test Running.
Central & Northern Section: P-Way Construction Programme Dates

Date of Civils Handover:
- 19 Nov 08
- 15 Jul 08
- 17 Jun 08
- 14 Oct 08
- 30 Oct 08
- 6 Nov 08

P-Way Design Approval:
- 30 Jun 08
- APPROVED
- 28 Jul 08
- APPROVED

Civils Handed Over to Rail Systems

Central Section Tunnels, Silwood Triangle and Daleston Station
- 04 February - 22 October: Central Section Ch 4100 to 7350 Tunnels, Excavate and Trackslab construction
- 10 September - 04 November: Southern Section Ch 7860 to 8650 Silwood Triangle, Excavate, Bottom Ballast, Sleepers & Rails
- 19 November - 29 January 08: Northern Section Ch 8810 to 445 Daleston Station and Junction, PRTC & Trackslab construction

Northern Section Euston and Trackslab: Daleston Junction to Valentine Road
- 18 June - 21 July: Northern Section Ch 1450 to 2800 Bottom Ballast, Sleepers and Rails
- 16 July - 08 October: Northern Section Ch 1370 to 880, Drainage, RCTT and Trackslab construction
- 04 October - 04 December: Northern Section Ch 2600 to 3210 Holywell Viaduct, Trackslab construction
- 06 November - 30 December: Northern Section Ch 3040 to 4100, Shoreditch Enhancement/Cutting, Trackslab construction
- 30 October - 11 December: Northern Section Ch 3210 to 3640 Bishopsgate Viaduct, Trackslab construction
Southern Section: P-Way Construction Programme Dates

- **Civils Handed Over to Rail Systems**
  - Civils Handover Date: 10 Sep 08
  - Civils Handover Date: 04 Jul 08
  - Civils Handover Date: 25 Apr 08
  - Civils Handover Date: 05 Aug 08
  - Civils Handover Date: 12 Sep 08

- **P-Way Design for all areas approved**

**Southern Section - Ballast**
- 01 February - 25 April: Southern Section Ch 8720 to 9940 New Cross Branch. Excavate, Bottom Ballast, Sleepers and rails
- 25 April - 04 July: Southern Section Ch 9000 to 9710 New Cross Gate Branch & Depot Headshunt. Excavate, Bottom Ballast, Sleepers and rails
- 04 July - 05 August: Southern Section Ch 9660 to 9600 Surrey Canal Junction. Excavate, Bottom Ballast, Sleepers and rails
- 05 August - 12 September: Carriage Service Depot Berthing Roads 1-8. Bottom Ballast, Sleepers and rails
- 12 September - 22 September: Southern Section Ch. 8710 to 9375 New Cross Gate Flyover. Bottom Ballast, Sleepers and rails
- 22 September - 04 October: Carriage Service Depot Wheel Lathe and Maintenance Sheds. Bottom Ballast, Sleepers and rails

**Top Ballast**
- 28 May - 09 June: Southern Section Ch 8700 to 9940 New Cross Branch
- 25 July - 05 August: Southern Section Ch 9713 to 9000 New Cross Gate Branch and Headshunt
- 08 October - 14 November: Northern Section Ch 1450 to 2800 Kingsland Viaduct.
- 28 August - 09 September: Southern Section Ch 8650 to 9000 Surrey Canal Junction to Cold Blow Lane
- 13 - 24 October: Carriage Service Depot Roads 1-8
- 20 - 27 October: Southern Section Ch. 8710 to 9375 New Cross Gate Flyover.
- 14 November to 25 November: Silwood Triangle Ch. 7660 to 8630
ComLot Breakdown

System

SYSTEM 1  →  SYSTEM 2  →  SYSTEM 3  →  SYSTEM 4

ComLot
Sub-System
ComLot
Sub-System
ComLot
Sub-System
ComLot
Sub-System
ComLot

IRN
Work Authorisation Document
WAD Principles

From the time that an IRN is issued for a Commissioning Lot, all works carried out on the ComLot will be subject to a Work Authorisation Document (“WAD”), whether to complete a test, or to complete, repair, maintain the ComLot.

A WAD procedure will ensure there is controlled access to areas of live, or potentially live, Equipment and Plant and Materials, systems, or Equipment and Plant and Materials or systems which are under test or which may be activated from remote locations.

In most cases WAD will coincide with the powering up of an equipment
1. Under CDM regulations the Principal Contractor must take reasonable measures to ensure that no unauthorised person enters the work area. Only people who are explicitly authorised, individually or collectively, by the Principal Contractor, should be allowed access to the site.

2. In order to provide a coordinated approach to the work to ensure that a safe system of work is in place, a WAD meeting is chaired by the WAD coordinator of the Principal Contractor who is responsible for the area in which the ComLots are located.

3. The Principal Contractor manages authorisation of other Contractors & Sub-Contractors in the work area to be accessed, via Principal Contractor Authorisation (PCA).
WAD Register

1. A database is to be set up to identify all Systems’ ComLots specifying the Principal Contractor (BBCJV or Others) in charge and the area where they are installed.

2. This register gathers in particular all the ComLots IRN dates and their status (signed/not signed), the reference to the IRN Certificate and the dates when WAD process is applicable.

3. The WAD Coordinator is in charge of updating the Comlots status for each area concerned.

4. Records of WAD Acknowledgement are identified in the register – No works can take place until all acknowledgements are confirmed back by all the relevant parties.

5. The WAD Register is available to all subcontractors and it is their responsibility to identify whether they plan to work on a WADed Comlot or within a WADed area.
Remedial & Outstanding Work List / Test Log
An IRN is issued when a Commissioning Lot has been fully and properly installed and is ready to be commissioned. An IRN may be issued together with a ROWL & Test Log of outstanding items to be completed in accordance with the Accepted Programme.

The ROWL & Test Log will contain details of the outstanding items to be completed together with information as to who is responsible for clearing the items, the planned date for their clearance and the classification of the items.

Items on the ROWL or Test Log will be prioritised P1 (Low), P2 (Intermediate) or P3 (High)
1. The first IRN ROWL or Test Log shall be generated at the time of the IRN and will be attached to the IRN form for every Commissioning Lot should outstanding items which have appeared during the manufacturing and Installation phases remain to be cleared.

2. Upon completion of the T&C Phases (IRN, PAC, AC) a ROWL or Test Log will be generated at each Phase to be attached to the different Certificates of Acceptance.

3. Each item shall be categorised with regard to the constraints it induces on the performance of the following Testing Phase:

   - **P3:** Those items which must be completed before Testing & Commissioning can move forward to the next Phase (Ph1, Ph2.1, Ph2.2 …etc).
   - **P2:** Those items which will allow Testing and commissioning to move into the next phase but must be completed within that phase.
   - **P1:** Those items which can be completed to an agreed timescale independent of the Test & Commissioning phase.
SYSTEM INTEGRATION
• Major difficulties always arise on management of external interfaces. A consistent jointly approved programme must be developed and detailed with sufficient contingency for each interface.

• System Architecture Diagrams consistent with latest design developments, basis to any Commissioning Logic are to be finalised

• Overall system commissioning logic for Level 3 Integration must be produced when each system logic is robust enough

• Overall system commissioning schedule for visibility to secure start of Test Running – starting with IRN delivery
Relationship with Assurance

Railway System

Rolling Stock
- Passenger RS
- Engineering RS

Infrastructure
- MWI Technical Case
  - MWI L4
  - MWI TC L4

Operations
- LU/NR/EdF Technical Case
- LRC technical Case
- NO Technical Case
Progressive Assurance

Level (n-1) Technical Case

Progressive Assurance Approval

Level ‘n’ Technical Case

Transfer into Service

Decommission & Disposal

Requirements Definition

Preliminary Product Specification

Detailed Product Specification

Product Creation

Product Test

Proving (In-situ) Test

Install

Acceptance Test

Level ‘n’ Engineering Product Lifecycle
TEST RUNNING
Test Running Pre-requisites

- Technical Documentation
- Safe Method of Working
- Resources (Availability/Competency)
- Infrastructure Ready for Test Running
- Testing Programme
- Necessary Approvals

Start Test Running
RISKS DUE TO THE ROLLING STOCK mitigated by:
- Appropriate VSSC
- Appropriate maintenance regime
- Regular inspections

RISKS DUE TO TRAIN / INFRASTRUCTURE INTERACTION mitigated by:
- Appropriate Testing Process
- Pass/Fail criteria

RISKS DUE TO THE INFRASTRUCTURE mitigated by:
- Validation of Design
- Appropriate Installation / Testing
- Appropriate Maintenance

OPERATING RISKS mitigated by:
- Appropriate Operating Instructions
- Personnel Competence

4 Different types of Risk had to be controlled and mitigated
Test Running Strategy

• A dedicated ELR Commissioning Rulebook will be developed

• Safe Methods of Working for the running of trains at line speed based on the commissioning status of key systems, in particular Signalling and at the NR interfaces will be produced. Key point is a programme of submissions to Network Rail with a list of SMOWS areas

• Management of direct and adjacent interfaces with the ELR and associated mitigation measures must be established enough in advance

• Infrastructure and Rolling Stock Safety Cases will be required in advance of the runs to confirm the both are fit for purpose

• Route familiarisation of drivers will have to be organised prior to test Running under the lead of a BB-CJV pilot
Test Running Risk management

• One Single train at all times until Signalling full certification on all routes and completion of testing with one single train
• Runs across NR interfaces under possession – avoid train paths
• Monitoring 3rd Party Infrastructure (NRIL, LUL) during 1st Test Runs
• Points clipped and scotched wherever Interlocking not validated and/or as required by Test Logs
• All tests within Test AREA to be controlled by nominated Track Test Manager – one single person in charge and one only
• Start and end of runs clearly indicated to the driver and Pilot by designated locations and/or flashing lights
Resources & Plant

TRAINS:

- BT Trains
- Drivers
- BT Train Technicians
- BT Tester(s) in Charge
- BBCJV Tester(s) in Charge
- Test Train Leader (pilot/shunter)

- Route knowledge (TTL); Route
- Familiarisation (TI/Driver); training;
- compatible driver roster; train availability;
- maintenance regime; NXG Depot availability

ON-SITE:

- WAS
- Authorised / Nominated Persons
- Infrastructure EMC/EMI Teams

- Possession booking & management /
- competent personnel; Safety of Personnel on
- site while train running; training safety rules;

CONTROL ROOM(S):

OBC: ELLP Signaller (core route) / Track Te
- Safe Method of Working; Training;
- competent personnel; Standards applicable
- re. safety rules;

Control Room: ELLP “Electrical Controller Op
Manager / Observers
Progress so far

• T&C plan approved

• IRN / WAD concept adopted by key sub-contractors (Thales, Westinghouse, Mansell, BBRail, Brecknell-Willis, PMES…)

• Commissioning Lot definition completed for Pway and Signalling, started for Building Services (Hoxton) and Power Supply (400V, 33kV and DC)

• Commissioning logic under review for Pway

• ELR Energisation Strategy issued to TfL for approval

• Informal copy of Test Running programme including RSP requirements issued

• Discussions with RSP, Lorol and NR are on-going

• Relationship with Assurance and Technical Cases established
JV expectations at this stage

General:

• TfL to expedite outstanding T&C documentation that serves as a basis to the overall Strategy for testing and commissioning the ELR

Energisation:

• TfL to confirm ASAP decision about Electrical Control Room which is driving the delivery of further detailed T&C documents

Test Running:

• TfL to specify Test Running tests not within the lead of the MWC
• TfL to confirm RSP stage 2 testing is 19 calendar days indeed
• TfL to set up workshop regarding hoarding at Canada Water
• Discussion needs to take place re. Test Running Technical Case content