OTTAWA LIGHT RAIL TRANSIT PROJECT
SYSTEM INTEGRATION PROGRAM PLAN

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Revision History

Rev	Date	Description	Prepared by	Approved by	Approved by
A	2016-06-01	Initial rev for comment	JB,RS	Roger Schmidt	Humberto Ferrer
B	2017-05-17	Note added to Appendix B	JB	Roger Schmidt	

Contents

1. Introduction

1.1 Background

The Confederation Line is a new LRT system for the City of Ottawa that covers over 12 km, includes 13 passenger stations and is designed to ultimately carry 24,000 pphpd. The alignment generally follows the existing bus transit way but requires a new alignment through the 2km tunnel in the downtown core. Likewise, stations consist of new construction and renovations of existing BRT stations.

The Line is being delivered by a P3 model in which RTG and its affiliates deliver a system to the City to operate during the concession period and beyond. RTG's responsibilities include production of an initial fleet of 34 vehicles. The City will operate the Line using a set of rules and procedures developed by RTG/RTM but ultimately adopted by the City and RTG/RTM will maintain the system throughout the concession period.

The systems used to move passengers, control the Line and interface with its users are developed based on industry best practices as well as definitive requirements contained in the Project Agreement. The systems are based on existing technologies. Overall, the system should have known elements to integrate with those having readily available interface and standard functions. Some components of the system are new: predominantly a new to North America vehicle and this project being the first time that vehicle has been automatically controlled.

The City does not approve designs but during design development all systems have received multiple formal reviews by the City (the ultimate operator).

It is imperative that the various systems and sub-systems work together as a cohesive system. This document describes the strategy to provide for system integration.

1.1.1 Scope

This plan applies to the system portion of the project which is defined as the electro-mechanical and human set of connected things or parts forming a complex whole which is intended to perform according to the Project Agreement.

This document is applicable during the design, installation and commissioning phases. It is not specific to any one service agreement or sub-contract but is not intended to contradict the terms of those sub-contracts. The System includes the following:

> Vehicles, Signaling (CBTC), Trackwork, MSF, active portions of Stations, including Fire alarms and Passenger Information (PID/PA)[1]. The System also includes SCADA, PS&D, Tunnel ventilation,

[1] Fare control is not included in this list as it is an element that is not specifically required for revenue service and not provided by RTG.

CTS, BMS/BAS, Works Vehicle Detection, Voice Radio, High Speed Data Radio,) CCTV, IAC, GIDS (LIDS), Telephones, , ATIS and Operational Strategy.

1.1.1.1 Design for these sub-systems is provided by the following entities:

- Alstom
- Thales
- RTGEJV
- The City (P25)

1.1.1.2 Installation of these sub-systems generally provided for by Alstom and OLRTC.

1.1.1.3 Testing and Commissioning for these elements is provided by the following entities:

- Alstom (Vehicles)
- Thales (Signaling system)
- OLRTC
- The City (P25, HOL)

Operational Strategy for the line is being developed and documented by RTM for ultimate adoption by the City.

1.1.2 Purpose

The purpose of this document is to clearly communicate an over-arching plan for system integration - including responsibilities - that will apply throughout the design, testing and commissioning period through to Revenue Service.

1.1.3 Reference Documents

1.1.3.1 Design Basis Documents

Project Agreement as modified by approved Variations – see appendix A
Canadian Standards and Regulations

1.1.3.2 Design Integration Documents

1.1.3.2.1 RTGEJV Integration Documents

Scope Split Matrix - REJ-30-0-0000-REP-0181_ (A) – not current, OLRTC comments outstanding
Interface Management System Spreadsheet; Appendix YYYY↓

1.1.3.2.2 Alstom Integration Documents

Alstom Subcontract No 507528-P001 – Appendix K
Approved SCR's (Specification Change Requests)

1.1.3.2.3 Thales Integration Documents

Thales Subcontract No 507528-P002 – Schedule N
3CU 05018 0056 DTZZA_01 Hardware external equipment requirements
3CU_05018_0060_PEZZA Network design Description
3CU 05018 0037 DSZZA System Architecture Specification
Note the above are the fundamental docs – others may apply.

1.1.3.2.4 RTM Interface Documents

OLRT/ RTM Interface Agreement (Feb 12, 2013)
Initial Train Service Plan – RTM-17-0-0000-MPL-0004

1.1.3.2.5 OLRTC Integration Documents

System Safety Program Plan – OLR-05-0-0000-MPL-0006
EMI/EMC Management Plan – OLR-74-0-0000-MPL-0002

1.2 Design Integration

1.2.1 Background

Design scope is generally performed by one of the following entities

- The City – is performing design for some system elements such as P25 and is providing final signalling design at roadway intersections. The City also provides key criteria for the design including those provided by Hydro Ottawa Limited
- Alstom – is performing the design of the vehicle, including dynamic aspects of vehicle /rail interface and vehicle/wayside data transmission but specifically not including vehicle remote control
- Thales – is performing design of the CBTC signalling system including vehicle control, scheduling and vehicle safe separation but specifically not including vehicle performance, alignment and communication network.
- RTGEJV is performing all other design for the project including but not limited to, stations, trackwork – including vehicle rail interface, PS&D, CTS, IAC, PIDS, BAS/BMS, SCADA, Telephony, fire alarm, Tunnel ventilation, but specifically not including vehicle design, signaling system design, Voice Radio design, and GIDS design.

1.2.2 Integration Strategy

The goal of systems integration is that ultimately, and with the least amount of re-work, that sub-systems work together to form one functioning system: a system that meets the project performance requirements and other PA requirements.

The integration strategy program requires each design entity to provide integrated sub-systems within their realm of responsibility and, in addition, to confirm what is critically required from other systems outside their realm for their system to function. Lastly each entity must clearly communicate those parameters.

The design entities – from the perspective of this document – do not provide their subsystems and critical requirements to OLRTC, they provide them to the other entities.

OLRTC provides clear lines of communication between the design entities to provide a forum to ensure questions can be raised, and issues resolved. OLRTC also directly manages the integration between the train and the signaling systems, and GIDS.

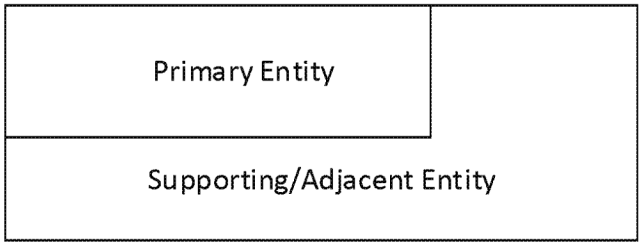
Thus OLRTC is responsible for untimely data, and for erroneous data. The design entity, being the expert in their field, has responsibility to ask for what they need and to raise concerns when data appears missing.

OLRTC has responsibilities in system integration, as noted above, but RTGEJV has the largest, most multi-disciplined design scope thus is the key organization in the system integration equation.

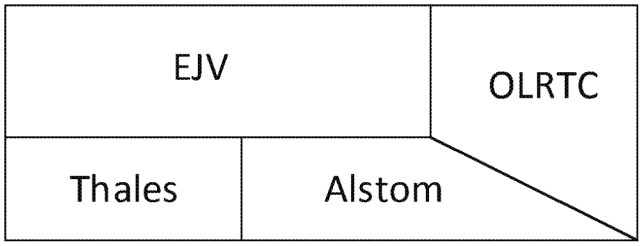
1.2.3 Integration Roles and Responsibilities

Each nominated discipline or subsystem, has a designer who is assigned primary responsibility. Likewise each organization is assigned primary design responsibility. There are also other coordinating designers and organizations who wish to coordinate their subsystem with the nominated subsystem. It is the responsibility of the prime system designer to interface with all other systems that have physical, electrical, software or functional relations.

Integration occurs when clear communication occurs across these borders and can be thought of via these representative diagrams:

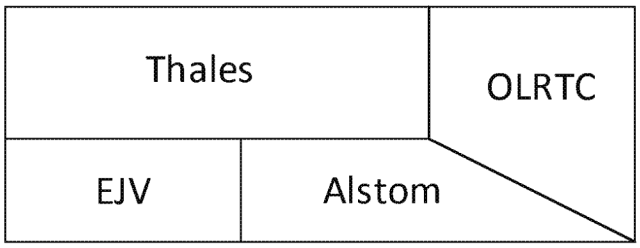


Example 1: This diagram would illustrate the case in which RTGEJV is responsible, for example, for designing trackwork but needs to communicate interface parameters regarding rail profile (for use by Alstom) and track configuration and switch arrangements (for use by Thales and OLRTC).



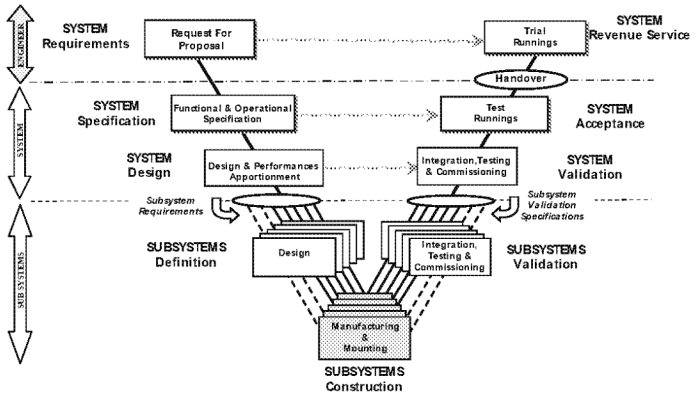
Example 2: This diagram would illustrate the case in which Thales is responsible, for example, for designing the CBTC signalling system but needs to communicate interface parameters regarding

connection to the VOBC (for use by Alstom) and minimum switch arrangements (for use by EJV and OLRTC).



As noted earlier, each designer (or organization) must to provide integrated sub-systems within their realm of responsibility and, in addition, confirm what is critically required from other systems outside their realm for their system to function. Lastly each designer (or organization) must clearly communicate those parameters.

The "V" matrix as shown below is to be followed. The first part of the V is the design process, the second part is the validation process. The tests will be conducted by OLRT using EJV's procedure. The design process should not be broken down. OLRT expect EJV to complete all tasks for the first part of the V.



1.2.4 Integration Management

In order to facilitate design integration the following list of systems and the roles of the primary designers and the coordinating designers

See Scope Responsibility Matrix: Appendix B

1.3 Procurement

- Procurement of all systems and other materials will be managed by OLRTC
- Thales and Alstom Equipment is pre-procured so this activity relates to items within EJV scope
- Technical specification will be produced by RTGEJV
- Technical vendor evaluation will be produced by RTGEJV
- RTGEJV will suggest potential vendors and express their preferences after vendor evaluation.

OLRT will provide procurement services for the overall system but the supplier data integration is EJV's responsibility. In no case does the system technical orientation and performance be managed by OLRT. EJV is the engineering of record and the technical performance of the vendor is controlled by EJV.

1.4 Construction

- All primary installation design and documents including any supplier shop drawings adopted for this purpose will be by RTGEJV.
- Final documentation for construction will be supplied by RTGEJV. This includes reviewed supplier drawings, vendor assembly drawings and schematics.
- Construction, installation and PICO testing will be supported by RTGEJV as necessary
- Planning and construction/installation coordination of work will be performed by OLRTC

1.5 Testing / Commissioning

- Testing will be planned and performed by OLRTC.
- Site Acceptance Test (SAT) will be performed by the vendor supported by OLRTC.
- Site Integration Test (SIT) will be performed by OLRTC, with Integration test plans written by RTGEJV.
- Configuration management process during T&C will be led by OLRTC, and needs to be supported by Thales, Alstom and RTGEJV
- Design changes necessary during T&C will require timely input by the nominated designer and design manager – these to be nominated in advance for each discipline.

1.6 Operations and Maintenance

- Operations strategy is developed by RTM and is largely documented in RTM-17-0-0000-MPL-0004, and subsequently adopted by the City, OLRTC, Thales, Alstom and RTGEJV.
- Operation of the system will be performed by OCTranspo. The main interface with the operator will be through the TSCC (Transit System Control Center) and BCC (Back-up Control center). All system controls will be performed from those locations. The integration of those control centers will be completed by RTGEJV. Inputs from OCTranspo and OLRTC must be taken into account.
- Maintenance will be performed by RTM (Rideau Transit Maintenance). All controls for the yard and maintenance facility will be performed in the YCC (Yard Control Center). Integration of the YCC will be completed by RTGEJV. Inputs from RTM and OLRT must be taken into account. All systems will be maintained by RTM, therefore, controls and monitoring must be possible from the YCC.

2. Control of Documents

2.1 Document Copies and Retention

As per OLRTC document retention policy

2.2 Document Review

As per OLRTC Design Management Plan

3. References

[1]

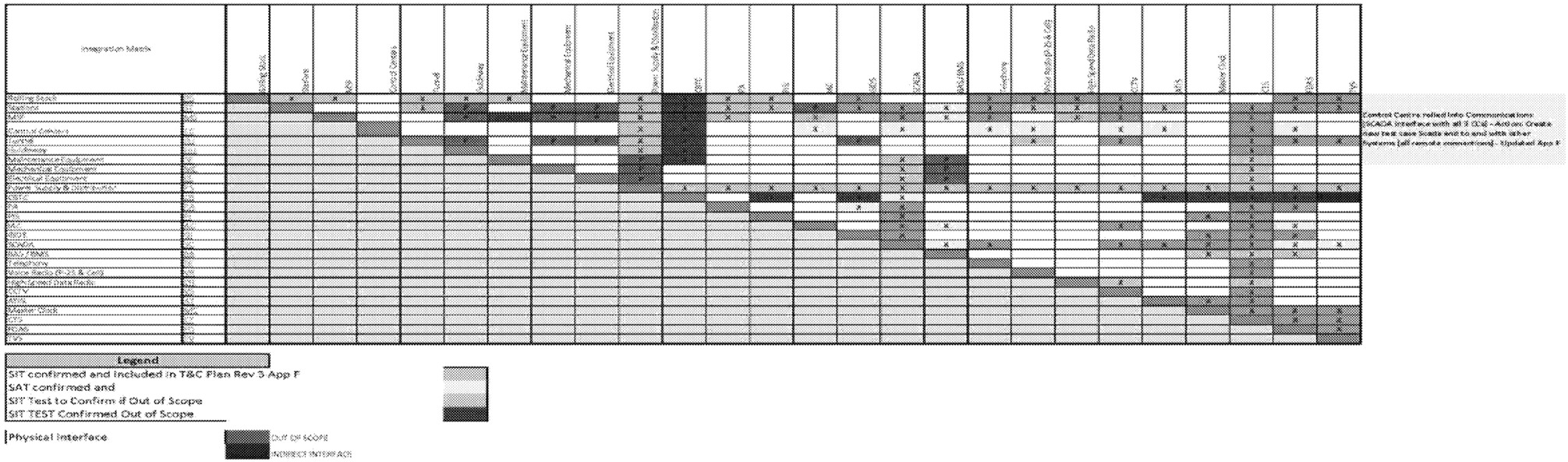
[2]

4. Appendix A — Variations

VE Description
Design, Build, Maintain Additional Elevator at Pimisi Station
Place de Ville Integrated Station Entrance at Queen St. and Kent Street
Relocation of the downtown West Station- West Entrance
Parking Lot Construction Lees Avenue
Vermiculite (asbestos) at 2 Belfast Road Buildings # 645 & 737
Underground Fuel Tank at 767 Belfast Road
Design & Construct 406mm Watermain Connection, Tremblay Road/ Belfast Road
Bus Shelter Pad- West of Waller, North of Laurier
Pimisi Station - Various Items
Rideau Station Vertical Circulation
Downtown Stations Various
West Portal 1500mm Watermain Defect
Accommodation of Multi Use Pathway- Belfast Road
Lyon Station West Entrance – Lyon Street Works
Vehicle Intelligent Mapping
Vehicle Cast Iron Truck Components (VN-21)
Vehicle - Installation of Tri-Poles
Vehicle - Mobile Device Charging Points
Bayview Station/O-Train connecting pathway at the temporary Bayview Station
East Portal Temporary Shoring Requirements (VN-27)
Rideau Station- Integrated Station Entrance- Cadillac Fairview
Milestone Payment # 2 Description and Acceptance Criteria (VN-32)
Booth Street Detour (Preston Street Extension) Provision of MUP
Milestone Payment # 3 Description and Acceptance Criteria Modification (VN-39)
Parliament East Vent Shaft
Bayview O-Train Platform Canopy
Lees station MUP Canopy
Booth street Bridge- Additional Utility Duct Capacity
Integrated Bus Shelters- Lyon & Parliament Stations
Lyon Station West Entrance –Over excavation for future Claridge Building
Retail Shell Space for Stations
Trenching & Electrical Lighting - East Portal Detour Nicholas & Laurier
Preston Street Detour
Vehicle Deadman's Handle Function- Additional Alertness Function in ATO
Tunnel- Additional ductwork and associated infrastructure
Intermediate Shaft Staging area – Contaminated Soil/ Ground Water
Additional Column Works - Lyon Station East - Place De Ville
uOttawa Station- Reconfiguration of Lower Concourse
Transitway Design Manual (VN-28)
Public Art- Phase 2 Non-Integrated Art
Relocation of TPSS at West Portal

Morguard ISE
Parliament East- New Integrated Station Entrance (Morguard)
West BRT MUPs
Watermain Abandonment Tremblay/ Belfast
PADI Log 2015-01-16 Version 1
Lyon Station- Accommodate HOL Equipment in Switchgear Room
Contaminated Material Scott Street (VN-64)
Scott Street Widening - Tactile Walking Surface Indicators (TWSI)
Belfast/ Tremblay Large Diameter Watermain Relocations- Additional Constraints (VN-57)
Goldenrod Sidewalk
Closed Aqueduct- Booth St. (VN-62)
Removal of Existing Bridge on East Leg of VIA Station D-Road
VIA Canopy
University of Ottawa Tunnel (Utilidor) (VN-65)
Tunney's Pasture Bus Loop Modifications
Scott Street Temporary Fencing
Lyon West ISE- Lyon Street Entrance
Scott Street MUP Overlay
1500mm Feedermain Isolation Valve for Hurdman Bridge Pumping Station
Rideau Street Streetscaping Design
406 Dia. Watermain Works - Parliament East Station
East BRT Detour - Additional Bus Shelter Pads
Vehicle Cabrody Steel
Nominated Vehicle Motor (VN-70)

5. Appendix B – Scope Responsibility Matrix



Alstom Comments – Please Note:

Appendix B - Scope of Responsibility Matrix: it is not clear to Alstom on how to interpret this table. If there is any action expected from Alstom as a result of this Table, more information would be required from OLRTC to allow Alstom to comment on it.