

THE CITY OF EDMONTON

**PROJECT AGREEMENT
VALLEY LINE WEST LRT**

Schedule 5 – D&C Performance Requirements

Part 7: LRV Integration Requirements

TABLE OF CONTENTS

PART 7 : LRV INTEGRATION REQUIREMENTS.....7-1

SECTION 7-1 –INTEGRATION REQUIREMENTS OF ALL PARTIES7-1

7-1.1 Scope7-1

7-1.2 Project Co Integration Requirements7-1

7-1.3 City Integration Obligations7-2

7-1.4 LRV Supplier Integration Obligations7-5

PART 7: LRV INTEGRATION REQUIREMENTS

SECTION 7-1-INTEGRATION REQUIREMENTS OF ALL PARTIES

7-1.1 SCOPE

- A. This Section describes the responsibilities of Project Co, the City, and the LRV Supplier regarding integration of the Infrastructure being supplied by Project Co under this Agreement with the Stage 1 LRVs and Stage 2 LRVs to be used on the Valley Line LRT.

7-1.2 PROJECT CO INTEGRATION REQUIREMENTS

7-1.2.1 Infrastructure Integration Requirements

- A. Project Co shall:

1. provide all details relating to the Integration of the Infrastructure and the Stage 1 LRVs and Stage 2 LRVs in the Integration Management Sub-Plan described in Section 5.2.2.1 [*Integration Management Sub-Plan*] of Schedule 4 [*Design and Construction Protocols*] of this Agreement;
2. ensure that the Infrastructure is physically and electrically integrated with the LRVs in accordance with this Schedule;
3. ensure that the Infrastructure software and firmware configuration is integrated with the LRV software and firmware configuration in accordance with Part 6 [*Systems*] of this Schedule;
4. ensure that the Infrastructure and the LRVs meet the environmental requirements of Section 1-2.3 [*Electromagnetic Compatibility*] of this Schedule; and
5. perform all Infrastructure Integration testing in accordance with Section 9 [*Commissioning*] of Schedule 4 [*Design and Construction Protocols*] and this Schedule;
 - a. where Infrastructure Integration testing requires the use of one or more LRVs, Project Co shall only use Accepted Stage 2 LRVs and Stage 1 LRVs as applicable to the Infrastructure Integration testing being performed; and
 - b. where an Accepted Stage 2 LRV with outstanding deficiencies is used for Infrastructure Integration testing, Project Co shall provide written confirmation from the LRV Supplier that the outstanding deficiencies on such Stage 2 LRV will not invalidate the outcome of the Infrastructure Integration test such Stage 2 LRV is being used to conduct.

7-1.2.2 Gerry Wright OMF Readiness and Integration Requirements

- A. Project Co shall:

1. achieve Phase 1 Construction Completion by the Target Phase 1 Construction Completion Date; and
2. coordinate with the Operator and the City in order to promptly correct Phase 1 Construction Completion Deficiencies and perform Warranty Work in respect of Phase 1 Project Work after the Phase 1 Construction Completion Date in accordance with this Agreement and so as to not interfere with LRV Commissioning.

7-1.2.3 Voice Radio System and Data Radio System

A. Project Co shall:

1. define any space requirements, electrical connections, and onboard equipment needed for the Voice Radio System and Data Radio System for the LRV Supplier; and
2. perform all configurations of these systems and equipment in coordination with the LRV Supplier.

7-1.3 CITY INTEGRATION OBLIGATIONS

A. The City shall:

1. provide the following information with respect to Stage 1 LRVs:
 - a. Stage 1 LRV dimensioned general arrangement drawings showing:
 - i. LRV length, height, width;
 - ii. bogie and axle locations and spacings;
 - iii. position of sanding points;
 - iv. wheel dimensions and profile; and
 - v. position of major roof-mounted components;
 - b. Stage 1 LRV lifting locations including:
 - i. locations of bogies on the LRV for in ground bogie lifts; and
 - ii. locations of all body lifting points;
 - c. Stage 1 LRV clearance envelopes including:
 - i. the vehicle static envelope for all AW masses;
 - ii. the vehicle dynamic envelope;
 - iii. the track clearance envelopes and maximum inswing and outswing for curves from 35 m to 300 m in 25 m increments, 350 m to 800 m in 50 m increments, and 900 m to 1200 m in 100 m increments;
 - iv. underfloor clearances to top of track level on new wheels; and
 - v. side skirt and roof skirt clear opening dimensions.
 - d. Stage 1 LRV and component masses including:
 - i. LRV at AW0 and AW4;
 - ii. axle loading at AW0;
 - iii. power bogie;
 - iv. trailer bogie;
 - v. traction control unit;
 - vi. auxiliary control unit;

- vii. pantograph assembly;
- viii. brake resistor assembly; and
- ix. HVAC;
- e. Stage 1 LRV performance characteristics including:
 - i. acceleration and deceleration characteristics at AW0 through AW3 loadings;
- f. Stage 1 LRV power requirements including:
 - i. tractive effort curves with 50 VDC increments from 500 VDC to 900 VDC;
 - ii. current draw curves with 50 VDC increments from 500 VDC to 900 VDC;
 - iii. continuous auxiliary power draw while connected to the overhead catenary system; and
 - iv. details required to power the LRV using a stinger connection;
- g. Stage 1 LRV pantograph characteristics including:
 - i. pantograph position on the Stage 1 LRV;
 - ii. width of pantograph carbons; and
 - iii. pantograph working range and upwards pressure at all heights;
- h. Stage 1 LRV details for overrun protection including:
 - i. dimensioned drawings of the coupler showing the LRV coupler in extended and stowed positions;
 - ii. dimensioned drawings of the anti-climbers showing the anti-climber and their locations relative to the centerline of Stage 1 LRV and top of rail; and
 - iii. details of crash energy management systems that involve, or in the event of an impact may cause repositioning of elements of, the coupler, draft gear, anti-climber, and front structure of the LRV;
- i. Stage 1 LRV noise and vibration report; and
- j. Stage 1 LRV platform interface investigations;
- 2. provide the following information with respect to Stage 2 LRVs:
 - a. Stage 2 LRV dimensioned general arrangement drawings showing:
 - i. LRV length, height, width;
 - ii. door locations and widths;
 - iii. bogie and axle locations and spacings;
 - iv. position of sanding points;
 - v. wheel dimensions and profile; and
 - vi. position of major roof-mounted components;

- b. Stage 2 LRV clearance envelopes including:
 - i. the vehicle static envelope for all AW masses;
 - ii. the vehicle dynamic envelope;
 - iii. the track clearance envelopes and maximum inswing and outswing for curves from 25 m to 300 m in 25 m increments, 350 m to 800 m in 50 m increments, and 900 m to 1200m in 100 m increments;
 - iv. underfloor clearances to top of track level on new wheels; and
 - v. side skirt and roof skirt clear opening dimensions;
- c. Stage 2 LRV and component masses including:
 - i. LRV mass at AW0;
 - ii. axle loading at AW0; and
 - iii. powered and unpowered bogie masses;
- d. Stage 2 LRV power requirements including:
 - i. tractive effort curves with 50 VDC increments from 500 VDC to 900 VDC;
 - ii. current draw curves with 50 VDC increments from 500 VDC to 900 VDC;
 - iii. LRV continuous auxiliary power draw while connected to the overhead catenary system; and
 - iv. details required to power the LRV using a stinger connection in the Gerry Wright OMF Part B including the power and loading requirements, location, or locations, the stinger will plug into on the LRV, and the connection and protection strategy;
- e. Stage 2 LRV pantograph characteristics including:
 - i. pantograph position on the Stage 2 LRV;
 - ii. width of pantograph carbons; and
 - iii. pantograph working range and upwards pressure at all heights;
- f. Stage 2 LRV details for overrun protection including:
 - i. dimensioned drawings of the Stage 2 LRV coupler showing the LRV coupler in extended and stowed positions;
 - ii. dimensioned drawings of the Stage 2 LRV anti-climbers showing the anti-climber and their locations on the Stage 2 LRV relative to the centerline of Stage 2 LRV and top of rail; and
 - iii. details of crash energy management systems on the Stage 2 LRV that involve, or in the event of an impact may cause repositioning of elements of, the coupler, draft gear, anti-climber, and front structure of the Stage 2 LRV;
- g. Stage 2 LRV lifting locations including:
 - i. locations of bogies on the Stage 2 LRVs for in-ground bogie lifts; and

- ii. locations of all body lifting points;
- h. Stage 2 LRV special tooling requirements including:
 - i. all large, fixed in place, special tools along with space requirements, masses, and mounting requirements;
 - ii. bench test equipment; and
 - iii. any system and component specific tooling required for system and component overhaul;
- i. dimensions and masses of major Stage 2 LRV components including:
 - i. the traction control unit (TCU);
 - ii. the HVAC units;
 - iii. the auxiliary power unit (APU);
 - iv. the pantograph; and
 - v. the powered and unpowered bogies; and
- j. Stage 2 LRV noise and vibration specifications;
- 3. provide all other Stage 2 LRV design criteria identified by Project Co in the Stage 2 LRV OMF B Design Criteria document in accordance with Section 6.1 [*General Design Considerations*] of Schedule 4 [*Design and Construction Protocols*] of this Agreement; and
- 4. provide two (2) Stage 1 LRVs for Phase 1 Commissioning Work including the YCS, Yard TPSS, Yard Track, and Yard OCS.

7-1.4 LRV SUPPLIER INTEGRATION OBLIGATIONS

- A. The Parties acknowledge that the obligations described in Section 7-1.4.2 [*Stage 1 LRV General Integration Requirements*] and Section 7-1.4.3 [*LRV System Specific Integration Requirements*] of this Schedule are obligations of the LRV Supplier.

7-1.4.1 Not Used

7-1.4.2 Stage 2 LRV General Integration Requirements

- A. The LRV Supplier shall manage all aspects of Commissioning the Stage 2 LRVs at the Gerry Wright OMF Part B and on whichever of the Valley Line LRT Stage 1 or Valley Line LRT Stage 2 track is being used for testing and commissioning.
- B. The LRV Supplier shall support Project Co during Stage 2 LRV-related Infrastructure Integration and during the resolution of any related issues.

7-1.4.3 Stage 2 LRV System Specific Integration Requirements

7-1.4.3.1 Train Control System (TCS) and Yard Control System (YCS) Integration Requirements

- A. The LRV Supplier shall provide Stage 2 LRVs that are compatible with the TCS, as defined in Section 6-1.3 [*Train Control System (TCS)*] of this Schedule, and YCS, as defined in Section 6-1.3.2 [*Yard Control System*] of this Schedule.

7-1.4.3.2 Train Routing and Priority System (TRPS) Integration Requirements

- A. The LRV Supplier shall provide Stage 2 LRVs that are compatible with the TRPS as defined in Section 6-1.3 [*Train Control System (TCS)*] of this Schedule and will be installing all onboard equipment required by the TRPS wayside infrastructure on the Stage 2 LRVs.

7-1.4.3.3 CCTV System Integration Requirements

- A. The LRV Supplier shall provide an on-board CCTV system that is compatible with the wayside Valley Line CCTV system as described in Section 6-1.11.2 [*Valley Line CCTV System*] of this Schedule.

7-1.4.3.4 Radio System Integration Requirements

- A. The LRV Supplier shall install on-board configured components of the Voice Radio System and Data Radio System into the Stage 2 LRVs as prescribed by Project Co.

42194688.2