

**THE CITY OF EDMONTON
VALLEY LINE WEST LRT**

LRV SUPPLY AGREEMENT

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LRV SUPPLY AGREEMENT
THE CITY OF EDMONTON – VALLEY LINE WEST LRT

made effective this 1st day of December, 2021

BETWEEN:
THE CITY OF EDMONTON
(the “**City**”)

AND:

Hyundai Rotem Company
(the “**LRV Supplier**”)

PREAMBLE

Pursuant to the RFQ process and the RFP process, the City has selected the LRV Supplier to design, manufacture, test, supply, deliver and commission the LRVs for use on the Valley Line LRT.

The City and the LRV Supplier therefore agree as follows:

SECTION 1: SCOPE OF LRV SUPPLIER OBLIGATIONS

1.1 LRV SUPPLIER'S OBLIGATIONS

- A. Without limiting any obligations of the LRV Supplier in this Supply Agreement, the LRV Supplier shall do the following, at its own cost and risk:
1. design, manufacture, assemble, test, supply, deliver, and commission the following:
 - a. 40 LRVs;
 - b. All Spare Parts listed in *Table 2: Base Order Spare Parts* in Section 3.3.4 [*Spare Parts*] of Schedule 3 [*Design and Manufacturing Protocols*]; and
 - c. All Special Tools listed in the Recommended Special Tools and Diagnostic Test Equipment List;(the "**Base Order**").
 2. design, manufacture, assemble, test, supply, deliver, and commission any Supplementary LRVs, Spare Parts, and Special Tools purchased pursuant to Section 1.2 [*Option Amounts*] of Schedule 9 [*Pricing and Payment*];
 3. carry out and perform all Work as follows:
 - a. in accordance with this Supply Agreement, including all terms of all Schedules;
 - b. in compliance with Applicable Law;
 - c. so as to satisfy the requirements of this Supply Agreement, including the Bid Extracts as applicable;
 - d. in accordance with Good Industry Practice; and
 - e. with due regard to the health and safety and security of Persons, property, and the environment; and
 4. cooperate with the City in the fulfillment of the purposes and intent of this Supply Agreement, provided, however that, for the avoidance of doubt, the LRV Supplier shall not be under any obligation to perform any of the City's obligations under this Supply Agreement.

1.2 LRVS, SPARE PARTS, AND SPECIAL TOOLS

- A. The LRV Supplier shall supply to the City LRVs, Spare Parts, and Special Tools that meet the requirements of Schedule 3 [*Design and Manufacturing Protocols*], Schedule 4 [*Technical Requirements*], and Schedule 5 [*Integration Requirements*] in consideration of the payments set forth in Schedule 9 [*Pricing and Payment*].

1.3 TRAINING AND SUPPORT SERVICES

- A. The LRV Supplier shall provide the training and support services as outlined in Section 10 [*Systems Support*] of Schedule 3 [*Design and Manufacturing Protocols*].

1.4 RESTRICTED PERSON

- A. Notwithstanding any other provision of this Agreement, at no time during the Term shall the LRV Supplier be or become a Restricted Person.

1.5 ASSUMPTION OF RISK

- A. Except to the extent otherwise expressly allocated to the City by the provisions of this Supply Agreement, all risks, costs, and expenses in relation to the performance by the LRV Supplier of its obligations under this Supply Agreement are allocated to, and as between the City and the LRV Supplier are the exclusive responsibility of, the LRV Supplier.
- B. The LRV Supplier must provide all facilities, personnel, and equipment required to undertake the Work except as specifically set out in this Supply Agreement.

1.6 WARRANTY

- A. The LRV Supplier shall rectify all Warranty Deficiencies during the Warranty Periods as provided in Schedule 7 [*Warranty*].

1.7 INTERFACE AGREEMENT

- A. The City and the LRV Supplier shall enter into the Interface Agreement with the Operator and Project Co no later than the latest of the following:
 - 1. the date the Operator enters into the Services Contract with the City, which shall be no later than six months prior to delivery of the first LRV; and
 - 2. September 30, 2024.

1.8 RESPONSIBILITY FOR PROJECT MANAGEMENT

- A. The LRV Supplier shall be responsible for the complete project management oversight, coordination, and integration of all elements and activities comprising the Work.

SECTION 2: PERFORMANCE OF THE WORK

2.1 CONTRACT WORK SCHEDULE

- A. The LRV Supplier shall perform and carry out the Work in conformity with the Contract Work Schedule, as the same may be amended from time to time in accordance with this Supply Agreement.

2.2 SUPPLY AGREEMENT REQUIREMENTS

- A. Notwithstanding any other provision of this Supply Agreement, the LRV Supplier's obligation to perform and carry out the Work is absolute, and cannot be modified or waived except by amendment of this LRV Supply Agreement or Changes made in accordance with Section 3 [*Modifications, Change Orders, and Interface*], Schedule 13 [*Changes*], or as otherwise expressly permitted in accordance with this Supply Agreement.
- B. If the LRV Supplier asserts that any aspect of the Supply Agreement is uncertain or ambiguous, either Party may require that the interpretation of that aspect be determined by the Dispute Resolution Procedure if they are not able to resolve the matter through their respective representatives.

2.3 LRV SUPPLIER SOLELY RESPONSIBLE FOR COSTS

- A. The LRV Supplier is solely responsible for paying all costs, fees, and charges of any nature whatsoever required to perform the Work except as follows:
 - 1. where costs, fees and charges are expressly set forth in this Supply Agreement as not being the responsibility of the LRV Supplier; or
 - 2. costs, fees, and charges of the City's own personnel, consultants, and professional advisors in respect of the City acting as a counterparty to any Project Document.
- B. Notwithstanding Section A.2 above, the LRV Supplier will be responsible for payment of costs, fees, and charges of the City's own personnel if
 - 1. the costs, fees, and charges are in respect of the City acting as a Governmental Authority; or
 - 2. the costs, fees, and charges of the City are expressly set forth in this Supply Agreement as being the responsibility of the LRV Supplier.

2.4 DELIVERY AND WORK MILESTONES

- A. The LRV Supplier shall deliver LRVs to the City in accordance with the schedule included in Section 1.2 [*Delivery Schedule*] of Schedule 8 [*Shipping and Delivery*].
- B. The LRV Supplier acknowledges that the failure to complete certain portions of the Work by certain Key Dates will cause the City to suffer damage and incur costs.
- C. The LRV Supplier will pay to the City the following amounts as liquidated damages in respect of damages suffered and costs incurred by the City related to the LRV Supplier's failure to complete the following portions of the Work by the following Key Dates:
 - 1. [REDACTED] for each day following the LRV Design Information Secondary Package Date until such date as the LRV Supplier has submitted the LRV Design Information Secondary Package and such LRV Design Information Secondary Package has been Accepted by the City;

2. [REDACTED] for each day following the First Conditional Acceptance Date until such date as at least one LRV has received Conditional Acceptance;
 3. [REDACTED] for each day following the LRV Ready for Integration Date until such date as at least four LRVs have received Conditional Acceptance;
 4. [REDACTED] for each day following the VLW Service Commencement Date until such date as both of the following requirements have been met:
 - a. all LRVs included in the Base Order have achieved Conditional Acceptance; and
 - b. all Spare Parts and Special Tools included in the Base Order have been Accepted; and
 5. [REDACTED] for each day following the VLW Service Commencement Date for each LRV included in the Base Order which has not achieved Conditional Acceptance until each such LRV has achieved Conditional Acceptance;
- (the “**Liquidated Damages**”).
- D. The maximum aggregated Liquidated Damages payable by the LRV Supplier shall not exceed an amount equal to 10% of the Capital Cost Amount.

2.5 TERM

- A. Unless this Supply Agreement is terminated earlier in accordance with its terms, the term shall commence on NTP and shall expire on the expiry of the last of the Warranty Periods for the Primary LRV Warranty (the “**Expiry Date**”). Notwithstanding the foregoing, this Supply Agreement shall terminate solely with respect to a component of the Work on the date that the Warranty Period for that component expires.

2.6 CITY’S ENVIRONMENTAL POLICY

- A. The LRV Supplier will comply with the City’s Environmental Policy C512.
- B. The LRV Supplier will be required to sign an acknowledgement confirming the LRV Supplier’s environmental responsibility in performing the Work.

2.7 FOREIGN WORKERS

- A. Notwithstanding anything else in this Supply Agreement, if the LRV Supplier has foreign employees, agents, or Subcontractors entering into Canada to perform the Work or any portion thereof, the City shall not be liable in any way whatsoever to the LRV Supplier in the event that the LRV Supplier or an LRV Supplier Person does not receive admission into Canada to perform any of the LRV Supplier’s obligations under this Supply Agreement.
- B. At the request of the LRV Supplier, the City will provide appropriate information to the LRV Supplier or a Governmental Authority to assist the LRV Supplier in arranging entry to Canada for its foreign workers. Unless otherwise provided in the Supply Agreement, the City shall not be liable for any consequences arising from the failure of the LRV Supplier or any LRV Supplier Person to gain entry to Canada.
- C. If an LRV Supplier Person performing Work under this Supply Agreement is performing the Work in Canada under the “International Mobility Program” administered by the Government of Canada, the LRV Supplier will fully cooperate with the City in the event of an employer compliance inspection, which cooperation will include promptly providing any records or information requested by the City or the inspectors.

- D. The LRV Supplier hereby consents, for the purposes of the employer compliance inspection, to allow the City to provide to inspectors conducting the employer compliance inspection any Project Record or any other record or information in the City's custody relating to the LRV Supplier.

2.8 WORKER HEALTH AND SAFETY

- A. When requested by the City, the LRV Supplier shall provide such evidence of compliance with all requirements of the Workers' Compensation Act, R.S.A. 2000, c. W-15, including payments due thereunder by the LRV Supplier or a LRV Supplier Person.
- B. If the LRV Supplier is from a jurisdiction other than Alberta whose workers are not eligible to receive benefits under the Workers' Compensation Act, R.S.A. 2000, c. W-15 and no LRV Supplier Person is carrying such coverage on the LRV Supplier's behalf, then the LRV Supplier will provide, within 14 days of receiving notice by the City to provide such information, written verification that the workers' compensation plan of its jurisdiction will provide comparable workers' compensation benefits to its workers while working in Alberta, if applicable. Alternatively, at the City's sole discretion, the LRV Supplier shall provide evidence that the LRV Supplier's insurance has been endorsed to provide employers' liability coverage for the Term.
- C. The LRV Supplier shall comply with all Applicable Laws regarding health and safety, and the Contractor shall be the general representative and agent to the City for the purposes of ensuring compliance with Applicable Laws relating to safety for LRV Supplier Persons.
- D. The LRV Supplier shall bring to the attention of all LRV Supplier Persons the provisions of the Occupational Health and Safety Act, SA 2017, c O-2.1. For greater certainty, this provision is not to be construed as designating the LRV Supplier as prime contractor for the purposes of the OH&S Act.
- E. If requested by the City, the LRV Supplier shall meet with the safety representatives of the City for the purpose of reviewing and clarifying the safety procedures.
- F. The LRV Supplier shall immediately notify the City in the event of any incident arising in the performance of the Work having the potential to result, or actually resulting, in injury requiring emergency medical services, death or property damage.

2.9 SUSTAINABLE PROCUREMENT POLICY

- A. The LRV Supplier acknowledges that it has reviewed and it understands the City's Sustainable Procurement Policy (C556A) and shall adhere to the City's Supplier Code of Conduct. These documents are located at:
 - 1. https://www.edmonton.ca/business_economy/selling_to_the_city/sustainable-purchasing-policy.aspx.

SECTION 3: MODIFICATIONS, CHANGE ORDERS, AND INTERFACE

3.1 MODIFICATION AND CHANGE ORDERS

3.1.1 CHANGE ORDERS

- A. If the City wishes to modify the requirements of this Supply Agreement, it shall proceed as provided in Schedule 13 [*Changes*].
- B. The LRV Supplier may also submit an Innovation Proposal in respect of the Supply Agreement for consideration by the City in accordance with Schedule 13 [*Changes*].

3.1.2 CITY DIRECTIONS

- A. Notwithstanding Section 3.1.1 [*Change Orders*], the LRV Supplier shall, subject to and in accordance with Schedule 13 [*Changes*], be entitled to a Change if a written direction issued by or on behalf of the City to the LRV Supplier results in a variation, addition, reduction, substitution, omission, modification, deletion, removal, or other change to the whole or any part of the Work.

3.2 INTERFACE

3.2.1 INFRASTRUCTURE INTERFACE

- A. The LRV Supplier shall, promptly on the City's request, liaise and cooperate in good faith with Project Co in accordance with the requirements outlined in the Interface Agreement and with any other party as reasonably notified by the City from time to time to facilitate the smooth and efficient operation and development of the relevant Valley Line Stage 2 infrastructure from time to time, including making available or granting access to all Project Records as are or may be relevant subject to confidentiality restrictions and provided Sensitive Information is redacted.

3.2.2 OPERATIONS INTERFACE

- A. The LRV Supplier shall, promptly on the City's request, liaise and cooperate in good faith with the Operator in accordance with the requirements outlined in the Interface Agreement and with any other party as reasonably notified by the City from time to time to facilitate the smooth and efficient operation and maintenance of Valley Line Stage 2 from time to time, including making available or granting access to all Project Records as are or may be relevant subject to confidentiality restrictions and provided Sensitive Information is redacted.

3.2.3 VALLEY LINE STAGE 1 INTERFACE

- A. The LRV Supplier shall, promptly on the City's request, liaise and cooperate in good faith with TransEd Partners and any other party as reasonably notified by the City from time to time to facilitate the smooth and efficient operation of the LRVs and all components of the Work in relation to Valley Line Stage 1 from time to time, including making available or granting access to all Project Records as are or may be relevant subject to confidentiality restrictions and provided Sensitive Information is redacted.

3.2.4 INTERFACE RELIEF EVENT

- A. Except as otherwise contemplated in Schedule 6 [*Interface Agreement*], if the LRV Supplier is prevented, hindered, or delayed from performing its obligations under this Supply Agreement by reason of Legal Fault of the Operator, Project Co, or TransEd Partners in relation to the interface obligations under this Supply Agreement, the LRV Supplier may claim a Relief Event.

SECTION 4: PAYMENT

4.1 PRICING AND PAYMENT

- A. All payments made by the City or the LRV Supplier pursuant to this Supply Agreement will be made in accordance with Schedule 9 [*Pricing and Payments*].

SECTION 5: INSURANCE

5.1 INSURANCE REQUIREMENTS

- A. The LRV Supplier shall take out, maintain in force, and renew, or cause to be taken out, maintained in force, and renewed, all such insurance as set out in Schedule 11 [*Insurance and Performance Security Requirements*].

5.2 NO RELIEF FROM LIABILITIES AND OBLIGATIONS

- A. Neither compliance nor failure to comply with the insurance provisions of this Supply Agreement shall relieve the LRV Supplier or the City of their respective liabilities and obligations under this Supply Agreement.

SECTION 6: FORCE MAJEURE

6.1 GENERAL

- A. If a Force Majeure Event occurs, then notwithstanding any other provision of this Supply Agreement, the following shall apply:
1. subject to Section 6.2 E [*Procedure on Force Majeure Event*], no liability or right of termination, other than either Party's right to terminate this Supply Agreement pursuant to Section 12.3 [*Termination Upon Force Majeure*], shall arise under this Supply Agreement by reason of any failure by a Party to perform any of its obligations under this Supply Agreement, but only to the extent that such failure to perform is caused by the occurrence of a Force Majeure Event (it being acknowledged and agreed by the Parties that, except as specifically provided in this Section 6 [*Force Majeure*], all other rights and obligations of the Parties under this Supply Agreement remain unaffected by the occurrence of a Force Majeure Event) and a Party shall only be relieved of its obligations under this Supply Agreement arising from any delay or failure in performing any of such obligations to the extent, if any, provided for in this Section 6 [*Force Majeure*];
 2. subject to the provisions of this Section 6 [*Force Majeure*] (including the LRV Supplier's mitigation obligations), if the Force Majeure Event or multiple Force Majeure Events cause a delay (as demonstrated by Forensic Schedule Analysis and contemporary records) in achieving a Key Date for an aggregate period of at least 21 days within the Term (the "**Force Majeure Waiting Period**"), then the Key Dates affected shall be extended by a period equal to the period of delay in excess of the Force Majeure Waiting Period caused by the relevant Force Majeure Events, provided, however, that in no event shall any such extension be granted unless the Forensic Schedule Analysis demonstrates that the Force Majeure Event has caused a delay to a Key Date, and then only once all related schedule float is consumed, and provided, however, that in no event shall any such extension exceed the necessary extension of the critical path resulting from the Force Majeure Event;
 - a. For clarity, if two or more Force Majeure Events occur concurrently, then for the period of concurrency and for the purposes of calculating the Force Majeure Waiting Period, only one of the Force Majeure Events will be counted;
 3. the LRV Supplier shall not be entitled to receive any compensation for Losses following the occurrence of a Force Majeure Event;
 4. provided that the LRV Supplier complies with its obligations under Section 6.2 [*Procedure on Force Majeure Event*], any failure by the LRV Supplier to perform any affected Work in accordance with the requirements of this Supply Agreement shall not constitute a Default and the following shall apply:
 - a. the LRV Supplier shall be relieved of any liability or obligations under Section 2.4 [*Delivery and Work Milestones*] and Section 11.1 A.1 [*LRV Supplier's Indemnity*]; and
 - b. the City shall not be entitled to exercise its rights or remedies under Section 11.7 [*City's Remedial Rights*] or Section 12.1 A [*Termination by City*];in each case only to the extent that and for so long as the relevant Force Majeure Event prevents the LRV Supplier from being able to perform such Work in accordance with the requirements of this Supply Agreement; and
 5. if the LRV Supplier anticipates that the Force Majeure Event will delay its performance of Work associated with a Key Date but is of the opinion that the delay can be avoided or mitigated through extraordinary measures, the LRV Supplier must propose to the City that such

extraordinary measures be taken by the LRV Supplier at the City's expense, and the City may, in its sole discretion, direct the LRV Supplier to take any or all of such extraordinary measures.

6.2 PROCEDURE ON FORCE MAJEURE EVENT

- A. A Party shall provide written notice to the other Party within five Business Days of becoming aware of the occurrence of a Force Majeure Event. The Party providing notice shall, within 15 Business Days after such notification, provide further written details to the other Party which shall include the following:
1. a statement of which Force Majeure Event the claim is based upon;
 2. details of the event or circumstances forming the basis for the Party's claim;
 3. details of the contemporary records that such Party shall maintain to substantiate its claim for relief;
 4. details of the consequences (whether direct or indirect, financial or non-financial) that such Force Majeure Event may have upon such Party and its obligations under this Supply Agreement, accompanied by copies of all supporting records in such Party's custody or available to such Party that substantiate or support such Party's claim; and
 5. details of any measures the Party proposes to adopt to mitigate the consequences of such Force Majeure Event.
- B. In addition to the requirements of Section 6.2 A, if the LRV Supplier provides such notice, then the LRV Supplier shall do the following:
1. submit to the City a Current Schedule within 15 Business Days (or other timeline as agreed between the Parties on a case-by-case basis) after such notification;
 2. for a Force Majeure Event that continues for longer than 30 days, provide a monthly update of the impact of the Force Majeure Event to the Current Schedule, which shall include a detailed description of the impact to the Work;
 3. submit to the City a Current Schedule within 10 Business Days (or other timeline as agreed between the Parties on a case-by-case basis) after the Force Majeure Event ceases to affect the LRV Supplier's performance of the Work; and
 4. submit a forensic schedule analysis in accordance with AACE International Recommended Practice No. 29R-03 (a "**Forensic Schedule Analysis**") within 10 Business Days (or other timeline as agreed to between the Parties on a case by case basis) of the conclusion of the Force Majeure Event or the portion of the Force Majeure Event that impacts the Current Schedule. The Forensic Schedule Analysis shall include adequate justification for the selected forensic schedule analysis method and demonstrate that it produces an accurate assessment of the event impact.
- C. As soon as possible, but in any event within three Business Days, of the Party providing notice (the "**Notifying Party**") receiving, or becoming aware of, any supplemental information that may further substantiate or support its claim, it shall submit further particulars including copies of all related available records associated with such information to the other Party (the "**Notified Party**").
- D. The Notified Party shall, after receipt of written details under Section 6.2 A or Section 6.2 B, be entitled by written notice to require the Notifying Party to provide such further supporting particulars as it may reasonably consider necessary. The Notifying Party shall provide the required supporting particulars to the Notified Party as soon as practicable and, in any event, no later than 20 Business Days (failing which, the notice of the Force Majeure Event provided by the LRV Supplier pursuant to

Section 6.2 A shall be deemed to have been withdrawn) after receiving the written notice and afford the Notified Party reasonable facilities for investigating the validity of its claim, including on-site inspection.

- E. If a Party is (or claims to be) affected by a Force Majeure Event, it shall, and shall require its respective LRV Persons or City Persons, as applicable, to take and continue to take commercially reasonable steps:
 - 1. to eliminate or mitigate the consequences of such event upon the performance of its obligations under this Supply Agreement;
 - 2. to continue to perform its obligations under this Supply Agreement to the extent possible; and
 - 3. to resume performance of its obligations under this Supply Agreement affected by the Force Majeure Event as soon as practicable.
- F. To the extent that a Party does not comply with its obligations under this Section 6.2 [*Procedure on Force Majeure Event*], such failure (including, without limitation, the effect of such failure on the other Party's ability to mitigate such Force Majeure Event) shall be taken into account in determining such Party's entitlement to relief that might otherwise be provided under this Section 6 [*Force Majeure*] and shall be reduced to the extent the other Party is prejudiced by such failure to comply.
- G. The time periods for provision of notices and responses pursuant to this Section 6.2 [*Procedure on Force Majeure Event*] may be revised by written agreement of the Parties as may be required for a particular Force Majeure Event.

6.3 EXCLUSIONS FROM FORCE MAJEURE EVENT

- A. Notwithstanding any other provision of this Supply Agreement, including the definition of Force Majeure Event in Schedule 1 [*Definitions and Interpretation*], neither the LRV Supplier nor the City shall have the right to claim relief (as provided for in this Section 6 [*Force Majeure*]) from any liability or consequence arising from its inability to perform the obligation that is prevented, hindered, or delayed by the Force Majeure Event to the extent that one of the following applies:
 - 1. in the case of the LRV Supplier, the Supply Agreement expressly requires or contemplates that the LRV Supplier was or is expected to perform the obligations in question notwithstanding the occurrence of the Force Majeure Event;
 - 2. the Party claiming the relief could have avoided (in whole or in part) the event, occurrence, or circumstance or could have mitigated the related liability, consequences, or impacts by complying with its obligations under this Supply Agreement, including any applicable prevention or control obligations and its mitigation obligations; or
 - 3. such event, occurrence, circumstance, or the related liability, consequence, or impact arises or is contributed to, directly or indirectly, as a result of any Legal Fault of the Party claiming the relief.

6.4 NO FORCE MAJEURE EVENT AT NTP

- A. The LRV Supplier acknowledges and agrees that any circumstances from or relating to the existence of an Epidemic as at NTP will not, in the absence of any change thereto, give rise to or cause the occurrence of a Force Majeure Event.

SECTION 7: RELIEF EVENTS

7.1 GENERAL

- A. In this Supply Agreement, “**Relief Event**” means any of the following events, conditions, or circumstances if and to the extent that it interferes adversely with, delays, or causes a failure of, the carrying out of the Work by the LRV Supplier or any LRV Supplier Person:
1. breach of any provision of this Supply Agreement by the City;
 2. except as otherwise contemplated in Schedule 6 [*Interface Agreement*], the Relief Event referred to in Section 3.2.4 [*Interface Relief Event*];
 3. an order granted by a court of competent jurisdiction directly resulting from any proceeding brought by a third party against the City or to which the City is a party; or
 4. interference by an Other Contractor.

7.2 EXCLUSIONS FROM RELIEF EVENTS

- A. Notwithstanding any other provision of this Supply Agreement, the LRV Supplier shall have no right to claim relief (as provided for in Section 7 [*Relief Events*]) from any liability or consequence arising from a Relief Event to the extent that:
1. the requirements of the Supply Agreement expressly require or contemplate that the LRV Supplier was or is expected to perform the obligations in question notwithstanding the occurrence of the Relief Event;
 2. the LRV Supplier could have avoided the event, occurrence, circumstance or the related liability, consequences or impacts, by complying with its obligations under this Supply Agreement, including any applicable prevention or control obligations, and its mitigation obligations; and
 3. such event, occurrence, circumstance, or the related liability, consequence, or impact arises or is contributed to, directly or indirectly, as a result of any Legal Fault by the LRV Supplier, or an LRV Supplier Person.

7.3 CONSEQUENCES OF RELIEF EVENTS

- A. If a Relief Event occurs, then:
1. no right of termination shall arise under this Supply Agreement by reason of any failure by the LRV Supplier to perform any of its obligations under this Supply Agreement, but only to the extent that such failure to perform is caused by the occurrence of a Relief Event (it being acknowledged and agreed by the Parties that, except as specifically provided in this Section 7.3 [*Consequences of Relief Events*], all other rights and obligations of the Parties under this Supply Agreement remain unaffected by the occurrence of a Relief Event), and the LRV Supplier shall only be relieved of its obligations under this Supply Agreement arising from any delay or failure in performing any of such obligations to the extent, if any, provided for in this Section 7.3 [*Consequences of Relief Events*];
 2. subject to the provisions of this Section 7 [*Relief Events*] (including the LRV Supplier’s obligations pursuant to Section 7.4 G [*Procedure on Relief Events*]), if the Relief Event causes a delay (as demonstrated by Forensic Schedule Analysis and contemporary records) in achieving a Key Date for a period of at least five consecutive days, then the applicable Key Date shall be extended by the period of delay which exceeds five days, provided, however, that in no event shall any such extension be granted unless the Forensic Schedule Analysis demonstrates that the Relief Event has caused a delay to a Key Date, and then only once all related schedule float

is consumed, and provided, however, that in no event shall any such extension exceed the necessary extension of the critical path resulting from the Relief Event;

3. provided that the LRV Supplier complies with its obligations under Section 7.4 [*Procedure on Relief Events*], any failure by the LRV Supplier to perform any affected Work in accordance with the requirements of this Supply Agreement shall not constitute a Default and the following apply:
 - a. the LRV Supplier shall be relieved of any liability or obligations under Section 2.4 [*Delivery and Work Milestones*] and Section 11.1 A.1 [*LRV Supplier's Indemnity*]; and
 - b. the City shall not be entitled to exercise its rights or remedies under Section 11.7 [*City's Remedial Rights*] or Section 12.1 A [*Termination by City*];

in each case only to the extent that and for so long as the relevant Relief Event prevents the LRV Supplier from being able to perform Work in accordance with the requirements of this Supply Agreement;

4. if the Relief Event, when aggregated with the effect of any other Relief Event or Relief Events occurring in the same calendar year and not previously claimed for by the LRV Supplier, increases the LRV Supplier's costs of performing the Work by at least \$25,000 in such calendar year, then subject to Section 7.4 [*Procedure on Relief Events*] and subject in every case to the LRV Supplier's obligation to take reasonable steps to mitigate the increase in its costs, the City shall, as soon as practicable following receipt from the LRV Supplier of appropriate documentation establishing the amount payable, pay to the LRV Supplier compensation in respect of the Relief Event calculated on the basis that the LRV Supplier will be placed in no better and no worse position than it would have been in had the relevant Relief Event not occurred and taking into consideration the following (without duplication):
 - a. reasonable Direct Losses incurred by the LRV Supplier as a direct result of the Relief Event (including the amount of any applicable insurance deductibles); and
 - b. any net increase or decrease in the costs of LRV Supplier performing the Work resulting directly from the Relief Event;

except that:
 - c. Avoidable Costs and applicable proceeds from insurance and insurance proceeds which the LRV Supplier would have recovered in connection with the Relief Event if it had complied with the requirements of this Supply Agreement or any policy of insurance maintained or required to be maintained under this Supply Agreement will be deducted therefrom, which deduction, for greater certainty, shall not include any excess or deductibles or any amount over the maximum amount insured under any such insurance policy; and
 - d. no Indirect Losses will be taken into consideration; and
5. if the LRV Supplier anticipates that the Relief Event will delay a Key Date but is of the opinion that the delay can be avoided or mitigated through extraordinary measures that would not otherwise be required under this Supply Agreement, the LRV Supplier must propose to the City that such extraordinary measures be taken by the LRV Supplier at the City's expense, and the City may, in its sole discretion, direct the LRV Supplier to take any or all of such extraordinary measures.

7.4 PROCEDURE ON RELIEF EVENTS

- A. The LRV Supplier shall provide written notice to the City within five Business Days of becoming aware of the occurrence of a Relief Event.

- B. The LRV Supplier shall within 15 Business Days after such notification in Section 7.4 A provide further written details to the City that include the following:
1. a statement of which Relief Event the claim is based upon;
 2. details of the event or circumstances forming the basis of the LRV Supplier's claim;
 3. details of the contemporary records the LRV Supplier shall maintain to substantiate its claim for relief;
 4. details of the consequences (whether direct or indirect, financial or non-financial) such Relief Event may have upon the LRV Supplier and its obligations under this Supply Agreement, accompanied by copies of all supporting records in the LRV Supplier's custody or available to the LRV Supplier that substantiate or support the LRV Supplier's claim; and
 5. details of any measures the LRV Supplier proposes to adopt to mitigate the consequences of such Relief Event.
- C. In addition to the requirements of Section 7.4 A and Section 7.4 B, the LRV Supplier shall do the following:
1. submit to the City a Current Schedule within 15 Business Days (or other timeline as agreed between the Parties on a case-by-case basis) after such notification;
 2. for a Relief Event that continues for longer than 30 days, provide a monthly update of the impact of the Relief Event to the Current Schedule, which shall include a detailed description of the impact;
 3. submit to the City a Current Schedule within ten Business Days (or other timeline as agreed between the Parties on a case-by-case basis) after the Relief Event ceases to affect the LRV Supplier's performance of the Work; and
 4. submit to the City a Forensic Schedule Analysis within ten Business Days (or other timeline as agreed to between the Parties on a case by case basis) of the conclusion of the Relief Event.
- D. As soon as possible but in any event within five Business Days of the LRV Supplier receiving, or becoming aware of, any supplemental information that may further substantiate or support the LRV Supplier's claim, the LRV Supplier shall submit further particulars including copies of all related available records associated with such information to the City.
- E. The City shall, after receipt of written details under Sections 7.4 B.3 or Section 7.4 C, be entitled by written notice to require the LRV Supplier to provide such further supporting particulars as the City may reasonably consider necessary.
- F. The LRV Supplier shall provide the required supporting particulars to the City no later than 10 Business Days after receiving the written notice (failing which the notice of the Relief Event provided by the LRV Supplier pursuant to Section 7.4 A shall be deemed to have been withdrawn) and shall afford the City reasonable facilities for investigating the validity of the LRV Supplier's claim, including on-site inspection.
- G. At all times, if the LRV Supplier is (or claims to be) affected by a Relief Event or any other adverse event or condition, the LRV Supplier shall, and shall require all LRV Supplier Persons to, take and continue to take commercially reasonable steps:
1. to eliminate or mitigate the consequences of such event or condition upon the performance of its obligations under this Supply Agreement;
 2. to continue to perform the Work to the extent possible; and

3. to resume performance of its obligations under this Supply Agreement affected by the Relief Event as soon as practicable.
- H. To the extent that the LRV Supplier does not comply with its obligations under this Section 7.4 [*Procedure on Relief Events*], such failure (including without limitation the effect of such failure on the City's ability to mitigate such Relief Event) shall be taken into account in determining the LRV Supplier's entitlement to relief that might otherwise be provided under this Section 7 [*Relief Events*] and such relief shall be reduced accordingly.

7.5 CITY DETERMINATION OF ENTITLEMENT

- A. Within 30 days of the City's receipt of all requested information pursuant to Section 7.4 [*Procedure on Relief Events*] (including any supporting information as the City may reasonably consider necessary to make a determination), the City shall provide the LRV Supplier with written notice of the City's determination of the LRV Supplier's entitlement to claim relief for a particular event.
- B. If the City determines that the LRV Supplier is not entitled to claim relief (as provided for in this Section 7 [*Relief Events*]) for a particular event, the City may provide written notice to the LRV Supplier of this determination with reasons.
 1. Unless the LRV Supplier initiates the Dispute Resolution Procedure within 30 days of receiving the City's determination, the LRV Supplier will not be entitled to claim relief (as provided for in this Section 7 [*Relief Events*]) for that event.

SECTION 8: CHANGE IN LAW

8.1 GENERAL

- A. Following any and all Changes in Law, the LRV Supplier shall perform the Work in accordance with the terms of this Supply Agreement, including in compliance with Applicable Law.
- B. On the occurrence of a Designated Change in Law, either Party shall be entitled to seek compensation for any increase or decrease (as the case may be) in the net cost to the LRV Supplier of performing the Work so as to put such Party in no better and no worse position than it would have been in had the Designated Change in Law not occurred. Any such compensation shall be calculated in accordance with Section 8.2 [*Designated Change in Law*].

8.2 DESIGNATED CHANGE IN LAW

- A. On the occurrence of a Designated Change in Law, the following apply:
 - 1. either Party may give notice to the other of the need for a Change as a result of such Designated Change in Law;
 - 2. the Parties shall meet within 10 Business Days of such notice to consult with respect to the effect of the Designated Change in Law and to reach an agreement on whether a Change is required as a result of such Designated Change in Law;
 - 3. if the Parties have not, within 10 Business Days of this meeting, reached an agreement, either Party may refer the question of whether a Designated Change in Law has occurred or the effect of any Designated Change in Law for resolution in accordance with Schedule 14 [*Dispute Resolution Procedure*]; and
 - 4. the City shall, within 10 Business Days of agreement or determination that a Change is required, issue a Change Enquiry and the relevant provisions of Schedule 13 [*Changes*] shall apply except that the following apply:
 - a. the LRV Supplier may only object to any such Change Enquiry on the grounds that the implementation of the Change would not enable it to comply with the Designated Change in Law or as provided in Section 1.6 [*Restrictions on Changes*] of Schedule 13 [*Changes*];
 - b. the City shall not be entitled to withdraw any such Change Enquiry unless the Parties otherwise agree;
 - c. the LRV Supplier shall proceed to implement the Change within such period as will enable it to comply with the Designated Change in Law as soon as reasonably practicable;
 - d. the Parties shall, without prejudice to their respective general obligations to comply with the terms of this Supply Agreement, do the following:
 - i. use commercially reasonable efforts to mitigate the adverse effects of any Designated Change in Law and take commercially reasonable steps to minimize any increase in costs arising from such Designated Change in Law; and
 - ii. use commercially reasonable efforts to take advantage of any positive or beneficial effects of any Designated Change in Law and take commercially reasonable steps to maximize any reduction in costs arising from such Designated Change in Law; and
 - e. any entitlement to compensation payable shall be in accordance with this Section 8, and any calculation of compensation shall take into consideration, inter alia, the following:

- i. any failure by a Party to comply with Section 8.2 A.4.d;
 - ii. any Avoidable Costs; and
 - iii. any increase or decrease in its costs resulting from such Designated Change in Law.
- B. The LRV Supplier shall not be entitled to any payment, compensation, or relief in respect of any Designated Change in Law, or the consequences thereof, other than in accordance with this Section 8 [*Change in Law*].

8.3 CHANGES TO TECHNICAL STANDARDS

- A. Where this Supply Agreement requires the LRV Supplier to comply with a technical standard in respect of the Work, and that standard has changed between the Bid Response Date and the date that such compliance is required, then the LRV Supplier or the City shall give notice to the other Party of such change.
 - 1. If, after such notice, the City requires compliance with the changed standard (rather than the standard applicable as of the Bid Response Date), then, to the extent such change affects the Work and would not have otherwise been taken into account by compliance with Good Industry Practice, such changed standard shall, subject to and in accordance with Schedule 13 [*Changes*], result in a Change.
 - 2. If the City does not require compliance with the changed standard, then the LRV Supplier shall continue to comply with the standard applicable as of the Bid Response Date, without a Change therefor. This Section 8.3 shall not apply where a change in a technical standard is also a Designated Change in Law.
- B. If the City does not require compliance with the changed standard, then the LRV Supplier shall not be responsible for complying with the changed standard and will not be responsible for any liability arising as a result of non-compliance with the changed standard.

SECTION 9: LRV SUPPLIER'S REPRESENTATIONS AND OBLIGATIONS

9.1 LRV SUPPLIER'S REPRESENTATIONS

- A. The LRV Supplier represents and warrants to the City that, as of NTP and continuing throughout the Term, the following are true:
1. it is duly incorporated and validly existing under [REDACTED] law;
 2. it has full power and authority to enter into this Supply Agreement and the Project Documents;
 3. all necessary corporate actions have been taken by the LRV Supplier to approve the entering into of this Supply Agreement and the performance of its obligations thereunder, and this Supply Agreement constitutes a legal, valid, and binding obligation of the LRV Supplier enforceable against it in accordance with its terms;
 4. the LRV Supplier's Bid, to the extent it consists of statements of fact, is at the time of NTP in every material respect true and not misleading (except as has been disclosed in writing to and accepted in writing by the City prior to NTP);
 5. the LRV Supplier, either in the LRV Supplier's Bid or in formal communications with the City under the RFP, has made accurate and true disclosure to the City of all facts and circumstances regarding the LRV Supplier, LRV Supplier Persons, and its intended Subcontractors, and the LRV Supplier has not knowingly failed to disclose to the City any fact that if learned by the City would be reasonably expected to be material to the willingness of the City to enter into this Supply Agreement with the LRV Supplier having regard to the information requested by the City in the RFP;
 6. the LRV Supplier and LRV Supplier Persons, collectively, have extensive experience and are knowledgeable in the supply of LRVs and projects similar to the Work in scale, scope, type, and complexity, and have the required ability, experience, skill, and capacity to perform the Work in a timely and professional manner as set out in this Supply Agreement;
 7. the execution, delivery, and performance by the LRV Supplier of this Supply Agreement does not and will not violate, conflict with, or constitute a default under the following:
 - a. its constating, formation, or organizational documents, including any bylaws;
 - b. any Applicable Law; or
 - c. any covenant, contract, agreement, or understanding to which it is a party or by which it or any of its properties or assets is bound or affected;
 8. any Intellectual Property in the Work does not and shall not infringe any Intellectual Property Rights of any third party;
 9. there are no actions, suits, proceedings, or investigations pending or threatened against the LRV Supplier or, to the LRV Supplier's knowledge, any LRV Supplier at law or in equity before any Governmental Authority or arbitral body (whether or not covered by insurance) that individually or in the aggregate could result in any impairment of its ability to perform its obligations under this Supply Agreement, and the LRV Supplier has no knowledge of any violation or default with respect to any order, writ, injunction, or decree of any Governmental Authority or arbitral body that could result in any such impairment;
 10. the LRV Supplier has carefully reviewed the whole of this Supply Agreement and all other documents made available to the LRV Supplier by or on behalf of the City, and, to the LRV Supplier's knowledge, nothing contained herein or therein inhibits or prevents the LRV Supplier

from completing the Work in accordance with this Supply Agreement in a good and safe manner to achieve and satisfy the requirements of this Supply Agreement;

11. the Guarantor has full power and authority to enter into the Guarantee; and
12. the LRV Supplier will not restrict its Subcontractors or any supplier of Spare Parts from entering into agreements or direct selling arrangements with the City for the supply of any Spare Parts that may be required for the LRVs or Special Tools to be provided pursuant to this Supply Agreement.

9.2 REPORTING REQUIREMENTS

- A. In addition to all specific reports and notices required by Schedule 3 [*Design and Manufacturing Protocols*], the LRV Supplier shall provide to the City the following reporting in relation to any aspect of the business of the LRV Supplier, the Work, or Project Documents to the City:
 1. supplemental reports requested from time to time by the City, acting reasonably;
 2. copies of the LRV Supplier's quarterly financial statements and annual audited financial statements (each of which may be delivered in confidence), in each case prepared in accordance with generally accepted accounting principles;
 3. such other reports as the City may from time to time reasonably require in order to provide required reporting to a Contribution Agreement Party; and
 4. timely responses to any inquiry reasonably made by the City in relation to any aspect of the business of the LRV Supplier, the Work, or this Supply Agreement in order to reasonably facilitate the City's performance of its obligations under this Supply Agreement; to support the City's communication plans and activities; and to facilitate the proper exercise of the City's review, inspection, audit, and remedial rights as set out in the Supply Agreement.
- B. Subject to Section 13.6 [*Disclosure of Confidential Information*], to the extent that any of the foregoing reporting includes commercially sensitive information, the LRV Supplier may deliver such information in confidence and expressly mark or label the parts of the information as confidential according to Section 13.5 [*Confidential Information*].

9.3 ACCESS, INSPECTION, AND TESTING

- A. The LRV Supplier acknowledges and agrees that, at all times until the end of the Term, the City and City Persons, subject to complying with all reasonable safety procedures and reasonable site rules, shall have full and free access to, on reasonable prior notice, any site occupied by the LRV Supplier or a Subcontractor where plant, goods, products, commodities, materials, supplies, machinery, equipment, apparatus, or other tangible property to be used in the Work are fabricated or stored, for the purpose of inspection so as to be able to determine compliance by the LRV Supplier with the terms of this Supply Agreement.
- B. For the purpose of such inspection, the City may at all reasonable times perform any measurement, test, or other observation or investigation. The LRV Supplier shall provide reasonable cooperation to arrange and facilitate any such measurements, tests, or other observations or investigations.
- C. Except as otherwise provided in this Supply Agreement, the City shall conduct all such measurements, tests, and other observations or investigations at its own expense and in a manner that will not materially disturb, interfere with, or disrupt the Work.

9.4 GENERAL AUDIT OBLIGATIONS

- A. The LRV Supplier shall provide and shall cause each Subcontractor to provide to the City all information, reports, documents, records, and the like, in the possession of, or available to, the LRV Supplier or such Subcontractor as the City may reasonably require from time to time for any purpose in connection with this Supply Agreement. The LRV Supplier shall use commercially reasonable efforts to ensure that, for such purpose, all such information, reports, documents, records, and the like in the possession of or available to the Subcontractors shall be available to the LRV Supplier, and the LRV Supplier shall include relevant terms in all Subcontracts to this effect.
- B. The LRV Supplier shall also provide to the City, and shall require each Subcontractor to provide to the City (at the City's reasonable cost), all information, reports, documents, records, and the like required to be provided pursuant to Section 9.4 A that subsequently come into the possession of, or become available to, the LRV Supplier or each Subcontractor, as the City may reasonably require from time to time to enable the City to provide reports, notices, returns, and the like pursuant to Applicable Law, including information and documentation pertaining to the physical condition of the Work, security, health and safety, fire safety, emergency preparedness, environmental matters, employees, and human resources related matters, other than Sensitive Information.
- C. The LRV Supplier shall promptly after receipt provide the City with a copy of any material notice, order, direction, requirement, or other similar communication received by it or by any Subcontractor from any Governmental Authority in relation to any of the Work, and the LRV Supplier shall include relevant terms in all Subcontracts to this effect.
- D. The LRV Supplier shall promptly notify the City of any actions, suits, proceedings, or investigations commenced, pending, or threatened against the LRV Supplier or, to the LRV Supplier's knowledge, any LRV Supplier Person at law or in equity before any Governmental Authority or arbitral body (whether or not covered by insurance) that individually or in the aggregate could result in any material adverse effect on the business, properties, or assets, on the condition, financial or otherwise, of the LRV Supplier, or in any impairment of its ability to perform its obligations under this Supply Agreement.
- E. All information, reports, documents, and records in the possession of, or available to, the LRV Supplier that are required to be provided to or available to the City hereunder shall be subject and open to inspection and audit by the City upon reasonable notice at any time and from time to time, which inspection and audit shall take place during normal business hours and at the LRV Supplier's normal places of business unless the City and the LRV Supplier otherwise agree.
 - 1. The City shall also have the right to monitor and audit the performance of any and all the activities within the Work wherever located and during times when the Work is being performed, and the LRV Supplier shall cooperate with, and shall require each Subcontractor to cooperate with, and provide access to the representatives of the City monitoring and auditing the Work, including providing them with access and copies (at the City's reasonable cost) of all relevant information, reports, documents, and records pertaining to the performance of the activities within the scope of the Work.
 - 2. Except as otherwise provided herein, all of the City's costs for the inspections, audits, and monitoring shall be borne by the City.
- F. In conducting an audit of the LRV Supplier under this Section 9.4 [*General Audit Obligations*] or as otherwise provided under this Supply Agreement, the City shall have all rights necessary or incidental to conducting an audit, including the right to have access to and inspect and take copies (at the City's reasonable cost) of all books and records of the LRV Supplier required to be provided to or available to the City hereunder, upon reasonable notice and at reasonable times.
 - 1. The LRV Supplier shall fully cooperate with the City and its auditors in the conduct of any audits, including by making available all such records and accounts (other than Sensitive Information) in

existence at that time as they may require to perform a full and detailed audit, and the LRV Supplier further agrees to promptly review and settle with the City all matters arising from such audits, including the refunding of monies to the City where applicable.

2. At the reasonable request of the City's auditors, the LRV Supplier shall provide such information, reports, documents, and records as the City's auditors may reasonably require, other than Sensitive Information.
- G. The City's rights pursuant to this Section shall be in addition to, and shall not limit, any other audit, information, inspection, or similar rights under this Supply Agreement.

9.5 GENERAL DUTY OF THE LRV SUPPLIER TO MITIGATE

- A. In all cases under this Supply Agreement where the LRV Supplier is entitled (or claims to be entitled) to receive from the City any compensation for any Losses, extensions of time, or other relief from its performance obligations, the LRV Supplier shall use all commercially reasonable efforts to mitigate the amount of Losses the length of the extension of time, or the extent of relief of its performance.
- B. Upon request from the City, the LRV Supplier shall promptly submit a detailed description, supported by all such documentation as the City may reasonably require, of the measures and steps taken, and intended to be taken, by the LRV Supplier to meet its mitigation obligations under this Section 9.5 [General Duty of the LRV Supplier to Mitigate] and any other provision of this Supply Agreement that applies to the circumstance in question.

SECTION 10: CITY'S REPRESENTATIONS AND OBLIGATIONS

10.1 CITY'S REPRESENTATIONS

- A. The City represents and warrants to the LRV Supplier, as of NTP, the following:
1. the City has full capacity, power, and authority to enter into, carry out all transactions contemplated by, and duly observe and perform all its obligations contained in this Supply Agreement and all other documents, instruments, and agreements required to be executed and delivered by the City hereunder; and
 2. this Supply Agreement has been duly authorized, executed, and delivered by or on behalf of the City, and upon execution and delivery constitutes a legal, valid, and binding obligation of the City enforceable in accordance with its terms subject to the following:
 - a. limitations by bankruptcy, insolvency, liquidation, reorganization, reconstruction, and other similar laws of general application affecting the enforceability of remedies and rights of creditors; and
 - b. the availability of equitable remedies such as specific performance and injunction that are in the discretion of a court.

10.2 CITY ROLES

- A. The City will participate in the Valley Line LRT in various capacities, and for clarification, as a counterparty to this Supply Agreement, the City will act through and on the delegated authority of the City's Representative, as a member of the City's LRT Expansion & Renewal Branch and no other City department, office, agency, or representative shall represent the City as counterparty to this Supply Agreement with any authority to exercise, perform, represent, satisfy any right or obligation, or bind the City in any way under or pursuant to this Supply Agreement, except as expressly authorized or confirmed in writing by the City's Representative.
- B. Other City officials, departments, offices, agencies, and representatives shall be considered as arm's length Governmental Authorities.

10.3 CITY DUTY TO MITIGATE

- A. In all cases under this Supply Agreement where the City is entitled to receive from the LRV Supplier any compensation, costs, or damages, but not in any other case, the City shall use all commercially reasonable efforts to mitigate such amount required to be paid by the LRV Supplier to the City (or deducted by the City) under this Supply Agreement, provided that such obligation shall not require the City to do any of the following:
1. take any action that is contrary to the public interest, as determined by the City in its discretion; or
 2. undertake any mitigation measure that might be available arising out of its status as a public body, but which measure would not normally be available to a private commercial party.
- B. The City shall have no obligation to mitigate, implied or otherwise, under this Supply Agreement or Applicable Law, except as set out in this Section 10.3 [*City Duty to Mitigate*] or as otherwise expressly set out in this Supply Agreement.

10.4 LRV SUPPLIER RECOURSE

- A. The City acknowledges and agrees that the LRV Supplier shall be entitled (without prejudice to any of the LRV Supplier's obligations hereunder) to claim and/or otherwise initiate and carry out proceedings

against any third party that causes or contributes to any damage to the Work or otherwise causes or contributes to any loss incurred by the LRV Supplier. The City shall, in response to any reasonable request by the LRV Supplier and at the LRV Supplier's cost, provide all reasonable information and assistance to enable the LRV Supplier to assert and manage any such claims and/or proceedings.

SECTION 11: DEFAULT, REMEDIES, AND TERMINATION EVENTS

11.1 LRV SUPPLIER'S INDEMNITY

- A. Subject to Section 11.4 [*Exclusivity of Specified Remedies*], the LRV Supplier shall indemnify and hold harmless the City and the City Persons against all Direct Losses arising from any of the following:
1. the LRV Supplier's breach of or non-compliance with any provision of this Supply Agreement or a Project Document;
 2. any Legal Fault of the LRV Supplier or any LRV Supplier Person in performing its obligations under this Supply Agreement other than the LRV Supplier's breach of or non-compliance with any provision of this Supply Agreement or a Project Document;
 3. subject to Section 18.10 [*Intellectual Property Rights Indemnities*], any third party claim alleging infringement by the LRV Supplier or a LRV Supplier Person, in relation to the Work, of any Intellectual Property Rights of third parties;
 4. any physical loss of or damage to all or any part of the Work, assets, or other property related thereto arising out of or in consequence of or involving or relating to the Legal Fault of the LRV Supplier or any LRV Supplier Person;
 5. the death or personal injury of any Person arising out of or in consequence of or involving or relating to the Legal Fault of the LRV Supplier or any LRV Supplier Person;
 6. any physical loss of or damage to property or assets of any third party arising out of or in consequence of or involving or relating to the Legal Fault of the LRV Supplier or any LRV Supplier Person;
 7. any other loss or damage of any third party arising from or in consequence of any act or omission of the LRV Supplier or any LRV Supplier Person in respect of the performance of the Work that is not in compliance with the requirements set out in this Supply Agreement and Applicable Law;
 8. the breach by the LRV Supplier or any LRV Supplier Person of or non-compliance with Applicable Law;
 9. any obligations of the LRV Supplier to satisfy judgments and pay costs resulting from liens or claims arising from the performance of the Work or actions brought in connection with any such liens, or in connection with any other claim or lawsuit brought against the City by any Person who provided services or materials that constituted part of the Work; or
 10. any other matter for which the LRV Supplier shall indemnify the City as set out in this Supply Agreement;

except to the extent the Direct Losses were caused, or contributed to, by non-compliance by the City with any provision of this Supply Agreement or other Legal Fault of the City or a City Person or compliance by the LRV Supplier with a lawful instruction or direction by the City or a City Person.

11.2 CITY'S INDEMNITY

- A. Subject to Section 11.4 [*Exclusivity of Specified Remedies*], the City shall indemnify and hold harmless the LRV Supplier and any LRV Supplier Person against all Direct Losses that may be suffered, sustained, incurred, or brought against them as a result of, in respect of, or arising out of any one or more of the following:

1. the death or personal injury of any Person arising, directly or indirectly, out of Legal Fault of the City or any City Person, except to the extent caused, or contributed to, by the breach of this Agreement by or other Legal Fault of the LRV Supplier or any LRV Supplier Person;
2. any physical loss of or damage to all or any part of any property or assets of the LRV Supplier or any LRV Supplier Person, arising, directly or indirectly, out of Legal Fault of the City or any City Person, except to the extent caused, or contributed to, by the breach of this Supply Agreement by or other Legal Fault of the LRV Supplier or any LRV Supplier Person; and
3. any physical loss of or damage to property or assets of any third party, or any other loss or damage of any third party, arising, directly or indirectly, out of Legal Fault of the City or any City Person, except to the extent caused, or contributed to, by the breach of this Supply Agreement by or other Legal Fault of the LRV Supplier or any LRV Supplier Person;

provided that there shall be excluded from the indemnity given by the City any liability for the occurrence of risks against which the LRV Supplier is required to insure under this Supply Agreement to the extent of the proceeds available or that should have been available but for a failure by the LRV Supplier to comply with its obligations to properly insure under this Supply Agreement.

11.3 NO INDIRECT LOSSES

- A. Without prejudice to the City's rights under Schedule 9 [*Pricing and Payment*] or the Parties' rights in respect of payments provided for herein (including the City's entitlement to liquidated damages pursuant to Section 2.4 [*Delivery and Work Milestones*], the indemnities under this Supply Agreement shall not apply, and there shall be no right to claim damages for breach of this Supply Agreement, in tort or on any other basis whatsoever, for Indirect Losses.

11.4 EXCLUSIVITY OF SPECIFIED REMEDIES

- A. Every right to claim compensation or indemnification or reimbursement under this Supply Agreement shall be construed so that recovery is without duplication to any other amount recoverable under this Supply Agreement.
- B. Notwithstanding anything else in this Supply Agreement, the City's sole remedies for delays in the performance of the Work shall be the Termination Events set out in Section 11.8 [*Termination Events*], the applicable remedial rights set out in Section 11.7 [*City's Remedial Rights*], the City's entitlement to Liquidated Damages pursuant to Section 2.4 [*Delivery and Work Milestones*], and the right to Termination Payments.

11.5 MAXIMUM LIABILITY

- A. Subject to Section 11.5 B, the maximum aggregate liability of the LRV Supplier in respect of all claims under Section 11.1 [*LRV Supplier's Indemnity*] shall not exceed an amount equal to 30% of the Capital Cost Amount. This limit shall be index linked and shall be exclusive of any insurance or Performance Security proceeds received or that will be received pursuant to Performance Security or policies maintained in accordance with Schedule 11 [*Insurance and Performance Security Requirements*].
- B. The limitation of liability in Section 11.5 A shall not apply in respect of the following:
 1. Termination Payments; or
 2. wilful misconduct or deliberate acts of wrongdoing.
- C. The maximum aggregate liability of the City in respect of all claims under Section 11.2 [*City's Indemnity*] shall not exceed an amount equal to 30% of the Capital Cost Amount. This limit shall be index linked and shall be exclusive of any insurance proceeds received or that will be received

pursuant to policies maintained in accordance with Schedule 11 [*Insurance and Performance Security Requirements*]. This limit shall not apply in cases of wilful misconduct or deliberate acts of wrongdoing.

- D. Nothing in this Section 11.5 [*Maximum Liability*] shall restrict, limit, prejudice, or in any other way impair the rights and/or remedies of the Parties under any other provision of this Supply Agreement.

11.6 EXCLUSIVITY OF TERMINATION PROVISIONS

- A. Neither Party shall have any right to terminate this Supply Agreement except as expressly set out in Section 12.1 [*Termination by City*], Section 12.2 [*Termination by the LRV Supplier*], or Section 12.3 [*Termination Upon Force Majeure*], and without limiting the generality of the foregoing, neither Party shall in any event be entitled to terminate this Supply Agreement on the basis of fundamental breach.

11.7 CITY'S REMEDIAL RIGHTS

- A. Without limiting any other rights and remedies of the City in this Supply Agreement, the City shall have the following remedial rights at all times during the Term:
1. *Increased Monitoring and Reporting.* If the City is of the opinion, acting reasonably, that there are defects in the Work or that the LRV Supplier has failed to comply, in any material respect, with the requirements of this Supply Agreement, the City may, without prejudice to any other right or remedy available to it, by notice to the LRV Supplier, require the LRV Supplier to increase the level and frequency of the LRV Supplier's reporting and monitoring of its own performance of its obligations under this Supply Agreement to such level as the City considers reasonable taking into account the nature of the relevant defect or failure until such time as the LRV Supplier shall have demonstrated, to the City's satisfaction, that it is capable of performing and will perform, in all material respects, its obligations under this Supply Agreement.
 2. *Triggering Events.* If at any time during the Term the City reasonably believes that any of the following events or circumstances has occurred, it may exercise the remedial rights set out in Section 11.7 A.3:
 - a. a Default by the LRV Supplier, or any act or omission of the LRV Supplier or any LRV Supplier Person, does or can reasonably be expected to cause a Material Adverse Effect;
 - b. the LRV Supplier or any LRV Supplier Person is preventing or interfering with the discharge or performance by the City or any City Person or other Governmental Authority of a statutory duty;
 - c. if the LRV Supplier, any LRV Supplier Person, or Key Individual has been identified by the City as a Restricted Person or has committed a Prohibited Act that may result in a material interruption or impairment to the conduct or performance of the Work; or
 - d. failure by the LRV Supplier to comply with any written direction issued by or on behalf of the City.
 3. *Remedial Action.* Without prejudice to the City's rights under this Section 11 [*Default, Remedies, and Termination Events*] or Section 12 [*Termination*] or any other rights of the City pursuant to this Supply Agreement, the City may, upon notice to the LRV Supplier (which notice shall specify pertinent details of the intended action), require the LRV Supplier to take such action (the "**Remedial Action**") in relation to the Work as the City reasonably considers necessary to mitigate the risk or the impact of one or more of the foregoing developments, and in that event, the following shall occur:
 - a. the City shall provide the LRV Supplier with written notice of its intentions to exercise its rights under this Section 11.7 [*City's Remedial Rights*] and shall provide the LRV Supplier an

opportunity to promptly respond to this notice and advise the City of the LRV Supplier's willingness, capacity, and capability to take the necessary Remedial Action to satisfactorily mitigate and manage the risk and impact of the relevant development as identified by the City;

- b. the notice provided by the City shall specify the time by which the City requires this response from the LRV Supplier as the City may reasonably determine having regard to the urgency of the situation and the potential for adverse impacts to occur if Remedial Action is not attended to in a prompt and effective manner;
 - c. after providing the notice described in the Section 11.7 A.3.b and considering the LRV Supplier response, if any, the City may do either of the following:
 - i. if it considers that there is sufficient time and that it is likely that the LRV Supplier will be willing and able to provide assistance, require the LRV Supplier to take such steps as are necessary or expedient to perform the Remedial Action, and the LRV Supplier shall use all commercially reasonable efforts to comply with the City's requirements as soon as reasonably practicable; or
 - ii. if it considers, acting reasonably, that there is not sufficient time, or that the LRV Supplier is not likely to be willing and able to take the necessary steps, issue a Notice of Default to the LRV Supplier.
4. *Rectification Rights.* Without prejudice to any of its other rights or remedies pursuant to this Section 11.7 [*City's Remedial Rights*], if the City gives notice of Remedial Action to the LRV Supplier under Section 11.7 A.2 and the LRV Supplier does either of the following:
- a. does not confirm, within five Business Days of such notice, or such shorter period as is appropriate in the case of an Emergency, that it is willing to perform the Remedial Action as required in such notice or present an alternative plan to the City to mitigate, rectify, and protect against the breach, event, circumstance, or other matter described in such notice that the City may, within a further five Business Days, accept or reject, acting reasonably; or
 - b. fails to perform the Remedial Action as set out in such notice or as confirmed in an accepted alternate plan within such time as set out in such notice or accepted alternate plan or within such time as the City, acting reasonably, will stipulate;

then the City may issue a Notice of Default to the LRV Supplier.

5. *Ongoing Performance.* The exercise by the City of any of its rights under this Section 11.7 [*City's Remedial Rights*] will not reduce or affect in any way the LRV Supplier's responsibility and obligations in respect of the Work.
6. *Deferral of Rights.* The LRV Supplier has no right to require a determination of whether or not the City is entitled under the terms of this Supply Agreement to exercise its rights pursuant to this Section 11.7 [*City's Remedial Rights*] until the LRV Supplier has complied with all of the City's requirements by performing or taking the Remedial Action. Only concurrently with or after complying with the City's requirements shall the LRV Supplier be entitled, as applicable, to claim a Relief Event or Change, or refer any Dispute for resolution in accordance with Schedule 14 [*Dispute Resolution Procedure*].
7. *Costs and Expenses.* Subject to Section 11.7 A.8 below, the LRV Supplier shall bear all costs and expenses incurred by the LRV Supplier in relation to the exercise of the City's rights pursuant to this Section 11.7 [*City's Remedial Rights*], and the LRV Supplier shall reimburse the City for all reasonable costs and expenses incurred by the City in relation to the exercise of the City's rights pursuant to this Section 11.7 [*City's Remedial Rights*].

8. *Reimbursement if Improper Exercise of Rights.* If the City exercises its rights pursuant to this Section 11.7 [*City's Remedial Rights*], but the City was not entitled to do so, the City shall reimburse the LRV Supplier for the reasonable costs and expenses directly incurred by the LRV Supplier over and above those that would otherwise have been incurred by the LRV Supplier in the proper performance of its obligations under this Supply Agreement and that are directly and reasonably incurred by the LRV Supplier in complying with those written requirements of the City issued as a result of the City having exercised such rights.

11.8 TERMINATION EVENTS

- A. The following shall constitute Termination Events, except where solely caused directly and specifically by either the City withholding without lawful cause any amount due and payable under this Supply Agreement except to the extent disputed by the City in good faith, or Legal Fault of the City or City Person:
 1. if the LRV Supplier is declared or adjudged bankrupt, makes a general assignment for the benefit of creditors, or takes the benefit of any legislation in force for any of the following reasons:
 - a. protection against creditors;
 - b. orderly payment of debts; or
 - c. winding up or liquidation;
 2. if a receiver or receiver-manager is appointed for the business of the LRV Supplier, unless the appointment is canceled within 21 days;
 3. if any material part of the property of the LRV Supplier is seized or attached, and such seizure or attachment is not successfully contested by the LRV Supplier within 21 days;
 4. if the LRV Supplier ceases active business operations or ceases performing a substantial portion of its business that will have a Material Adverse Effect on its ability to perform its obligations under this Supply Agreement;
 5. if the LRV Supplier, upon receiving a Notice of Default from the City where the specified Default has a Material Adverse Effect, fails to do one of the following:
 - a. cure the Default within 21 days;
 - b. where the Default cannot by reasonable commercial efforts be cured within 21 days, communicate to the City and initiate within that 21 days a commercially reasonable course of action designed to cure the Default which is acceptable to the City, and thereafter diligently pursue that course of action until the Default is cured; or
 - c. where the Default is an Incurable Default, within 21 days communicate to the City and initiate a commercially reasonable course of action designed to mitigate the consequences of the Incurable Default to the maximum extent practicable which is acceptable to the City, and thereafter diligently pursue that course of action until the consequences of the Incurable Default have been so mitigated;
 6. if there is an Incurable Default by the LRV Supplier that has a Material Adverse Effect that cannot be mitigated by the LRV Supplier;
 7. if the LRV Supplier, any LRV Supplier Person, or Key Individual is identified by the City in accordance with Section 11.7 [*City's Remedial Rights*] to be a Restricted Person or has

committed a Prohibited Act that is not appropriately managed or remedied by the LRV Supplier to the City's satisfaction as provided for in Section 11.7 [*City's Remedial Rights*]; or

8. if the LRV Supplier fails to successfully achieve CDR within 90 days of the date specified in the Contract Work Schedule for achieving CDR;
9. if the LRV Supplier fails to successfully achieve FDR within 180 days of the date specified in the Contract Work Schedule for achieving FDR;
10. if the LRV Supplier fails to obtain Conditional Acceptance of at least four LRVs within 270 days of the LRV Ready for Integration Date;
11. if the LRV Supplier fails to obtain Conditional Acceptance of all LRVs included in the Base Order within one year of the VLW Service Commencement Date.
12. if the LRV Supplier fails to obtain Final Acceptance of all LRVs included in the Base Order within 180 days of obtaining Conditional Acceptance of all LRVs included in the Base Order;
13. if the LRV Supplier fails to comply with any of its payment obligations under this Supply Agreement (including any obligation to pay liquidated damages) such that an undisputed sum in an aggregate amount of at least \$50,000 is outstanding for a period of at least 30 Business Days after the due date relating to such aggregate amount and if such event has not been remedied within 30 Business Days of notice to the LRV Supplier of the occurrence of such event;
14. if an assignment or transfer of the rights or obligations of the LRV Supplier under this Supply Agreement occurs in breach of Section 19.1 [*Limitations on Assignment*];
15. other than pursuant to Section 19.3 [*Limitations on Change in Control*], the occurrence of a Change in Ownership of the LRV Supplier;
16. the failure to obtain or maintain any Performance Security or insurance required under this Supply Agreement;
17. failure to comply with any determination, order or award made against the LRV Supplier in accordance with Schedule 14 [*Dispute Resolution*].

SECTION 12: TERMINATION

12.1 TERMINATION BY CITY

- A. The City may terminate this Supply Agreement by notice to the LRV Supplier as follows:
1. upon or within a reasonable time (having regard to Section 15.3 [*Termination and Dispute Resolution Procedure*]) after the City becomes aware of the occurrence of a Termination Event (“**Termination for LRV Supplier Default**”); or
 2. at any time upon 30 days advance written notice to the LRV Supplier, in the absolute and unfettered discretion of the City and for any reason whatsoever or for no reason at all, and at the convenience of the City (“**Termination for Convenience**”).
- B. No notice of termination under this Section 12.1 [*Termination by City*] shall be effective unless, in the case of a Termination for LRV Supplier Default, it specifies the Termination Event relied on, and in the case of a Termination for Convenience, it states that the termination is for convenience.

12.2 TERMINATION BY THE LRV SUPPLIER

- A. Subject to Section 12.3 [*Termination Upon Force Majeure*], the LRV Supplier may suspend or terminate this Supply Agreement by notice to the City and in accordance with the terms of this Section 12.2 [*Termination by the LRV Supplier*] only if the following occur:
1. the City has failed to pay any sum or sums due to the LRV Supplier under this Supply Agreement, which sum or sums are not being disputed in accordance with Schedule 14 [*Dispute Resolution Procedure*] or have not been set off by the City pursuant to Schedule 9 [*Pricing and Payment*] either singly or in the aggregate, exceed(s) \$250,000 (index linked) and such failure continues for continues for 60 days, in any such case, from receipt by the City of a notice of non-payment from the LRV Supplier; or
 2. the City is in breach of Section 19.7 [*Assignment by City*].
- B. Upon the occurrence of any of the events listed in Section 12.2 A.1, or Section 12.2 A.2 above and while the same is continuing, the LRV Supplier may give notice to the City of the occurrence of the event and, at the LRV Supplier’s option and without prejudice to its other rights and remedies under this Supply Agreement, may do the following:
1. suspend performance of the Work until such time as the City has remedied such event; or
 2. if such event has not been remedied within 30 days of receipt by the City of notice of the occurrence of such event, terminate this Supply Agreement in its entirety by notice in writing having immediate effect.

12.3 TERMINATION UPON FORCE MAJEURE

- A. Either Party may by notice to the other terminate this Supply Agreement if any Force Majeure Event directly causes the LRV Supplier to be unable to perform all or a material part of the Work for an aggregate of 120 days falling within any 180 day period as established in accordance with Section 6 [*Force Majeure*].

12.4 CONSEQUENCES OF TERMINATION

12.4.1 TERMINATION FOR LRV SUPPLIER DEFAULT

- A. If there is a Termination for LRV Supplier Default prior to Conditional Acceptance of at least eight LRVs,
1. the LRV Supplier shall, no later than 30 days after receipt of the notice of termination, refund and pay to the City the following amounts:
 - a. an amount equal to all payments paid by the City to the LRV Supplier under this Supply Agreement together with interest on each such payments for the period since the date on which the City paid such payment to the LRV Supplier to the date of repayment by the LRV Supplier at the Default Rate of Interest; and
 - b. an amount equal to the City's reasonable estimate of the aggregate of all Losses suffered, sustained or incurred by the City as a result of the termination of the Supply Agreement and arising out of the termination together with all costs of entering into a new supply agreement to complete the Works on substantially the same terms and conditions as the Supply Agreement, except that the LRV Supplier shall not be liable to the City for Indirect Losses incurred by the City as result of such termination; and
 2. the LRV Supplier shall arrange for return from the City of all LRVs, Spare Parts, Special Tools and any other components of the Work delivered to the City prior to termination.
- B. Upon confirmation from the City that the LRV Supplier has irrevocably paid the City in full all amounts due under the Supply Agreement, possession of, and such title that the LRV Supplier has transferred to the City in the Work handed back to the LRV Supplier, shall be transferred to the Supplier without further act, free and clear of any security interest created by the City but otherwise without any warranty.
- C. If there is a Termination for LRV Supplier Default after Conditional Acceptance of at least eight LRVs, but prior to Final Acceptance of all LRVs,
1. the LRV Supplier shall arrange for return from the City of all LRVs that have not achieved Conditional Acceptance that had been delivered to the City prior to termination;
 2. the City shall retain title and possession of all
 - a. LRVs that have achieved Conditional Acceptance;
 - b. Special Tools and Spare Parts delivered; and
 - c. all other components of the Work delivered;
 3. the Supplier shall continue to be responsible for Warranty Deficiencies for the components of the Work retained by the City until the end of the relevant Warranty Periods;
 4. the LRV Supplier shall, no later than 30 days after receipt of the notice of termination, refund and pay to the City the following amounts:
 - a. an amount equal to all payments paid by the City to the LRV Supplier under this Supply Agreement less any amounts for the LRVs, Special Tools and Spare Parts that are not returned to the LRV Supplier together with interest on each such payments for the period since the date on which the City paid such payment to the LRV Supplier to the date of repayment by the LRV Supplier at the Default Rate of Interest; and
 - b. an amount equal to the City's reasonable estimate of the aggregate of all Losses suffered, sustained or incurred by the City as a result of the termination of the Supply Agreement and

arising out of the termination together with all costs of entering into a new supply agreement to complete the Work on substantially the same terms and conditions as the Supply Agreement, except that the LRV Supplier shall not be liable to the City for Indirect Losses incurred by the City as result of such termination; and

5. all Performance Security shall remain in effect until the end of the Warranty Periods applicable to the Work retained by the City.

12.4.2 TERMINATION FOR CONVENIENCE OR BY LRV SUPPLIER

- A. If there is a Termination for Convenience or the LRV Supplier terminates this Supply Agreement pursuant to Section 12.2 [*Termination by the LRV Supplier*],
 1. The City shall be liable to the LRV Supplier for payment of the following amount, as of the date of termination without duplication:
 - a. the amounts set out in this Supply Agreement for all parts of the Work delivered to the City prior to termination and for which the City has not made any payment;
 - b. the amount of the LRV Supplier's costs incurred in providing the work-in-progress, less any amounts recovered from sale or repurpose of the work-in-progress, with respect to any components of the Work that have not been delivered and for which the City has not made any payment;
 - c. the LRV Supplier's reasonable out-of-pocket costs of demobilization; and
 - d. the amount of 3% of that portion of the Capital Cost Amount that has not yet been paid by the City prior to termination.
 2. On payment of any amounts pursuant to this Section 12.4.2 [*Termination for Convenience or by LRV Supplier*], title to all the parts of the Work that have been delivered but that have not yet vested in the City, will vest automatically in the City and any such Work performed and capable of delivery to the City shall be delivered to the City.
 3. The amounts for which the City is liable pursuant to Section 12.4.2A.1 shall be set off from the amounts paid by the City to the LRV Supplier prior to termination pursuant to this Supply Agreement. The LRV Supplier shall reimburse the City for all amounts paid prior to termination which exceed amounts for which the City is liable under Section 12.4.2A.1.
 4. Except as provided in Section 12.4.2A.1, the LRV Supplier shall not be entitled to recover any Losses from the City as a result of Termination for Convenience or by LRV Supplier.
- B. Any payment made by the City pursuant to this Section 12.4.2 [*Termination for Convenience or by LRV Supplier*] and accepted by the LRV Supplier shall be in full and final settlement of any claims, demands and proceedings of the LRV Supplier, and the LRV Supplier shall release the City from all liability in relation to any breaches of this Supply Agreement by the City or other events leading to such termination of this Supply Agreement, and the circumstances leading to such breach or termination, and the LRV Supplier shall be precluded from exercising all other rights and remedies in respect of any such breach or termination whether in contract, tort, restitution, statute, at common law or otherwise.

12.4.3 TERMINATION UPON FORCE MAJEURE

- A. If there is a termination pursuant to Section 12.4.3 [*Termination Upon Force Majeure*],
 1. The City shall be liable to the LRV Supplier for payment of the following amount, as of the date of termination without duplication:
 - a. the amounts set out in this Supply Agreement for all parts of the Work delivered to the City and for which the City has not made any payment; and

- b. the amount of the Supplier's costs incurred in providing the work-in-progress, less any amounts recovered from sale or repurpose of the work-in-progress, with respect to any components of the Work that have not been delivered and for which the City has not made any payment.
2. The amounts for which the City is liable pursuant to Section 12.4.3A.1.a shall be set off from the amount paid by the City to the LRV Supplier pursuant to this Supply Agreement. The LRV Supplier shall reimburse the City for all amounts paid which exceed the value of the Work delivered.
3. On payment of any amounts pursuant to this Section 12.4.3 [*Termination Upon Force Majeure*], title to all the parts of the Work that have been delivered but that have not yet vested in the City, will vest automatically in the City and any such Work performed and capable of delivery to the City shall be delivered to the City.

12.5 SURVIVAL OF RIGHTS AND OBLIGATIONS

- A. All rights and obligations under this Supply Agreement that necessarily extend beyond termination of this Supply Agreement in order to fully achieve their intended purpose shall survive termination of this Supply Agreement, including, without limiting the generality of the foregoing, the following:
 1. all indemnification and hold harmless rights and obligations, insofar as they apply to events that occurred prior to termination of this Supply Agreement;
 2. the rights and obligations of the City and the LRV Supplier under Section 12.4 [*Consequences of Termination*];
 3. the rights and obligations of the Parties in relation to Confidential Information set out in Section 13.5 [*Confidential Information*], Section 13.6 [*Disclosure of Confidential Information*], and Section 13.7 [*Public Disclosure of Agreement*];
 4. the rights and obligations of the Parties set out in Schedule 7 [*Warranty*];
 5. the rights and obligations set out in Section 18 [*Intellectual Property*] that expressly or by necessary implication survive termination of this Supply Agreement; and
 6. the rights and obligations of the Parties in relation to the Dispute Resolution Procedure set out in Section 15 [*Dispute Resolution*] to the extent required to resolve any Disputes in respect of the foregoing.

SECTION 13: COMMUNICATIONS

13.1 NOTICES

- A. Any notice, consent, approval, or other communication under any provision of this Supply Agreement (each, a “**Notice**”) must be in writing to be effective, and is effective when delivered by any means, including e-mail, to the following respective addresses:

if to the City:

[REDACTED]
INTEGRATED INFRASTRUCTURE SERVICES | LRT Expansion & Renewal
19th Floor, MNP Tower | 10235 – 101 Street | Edmonton AB T5J 3G1
Email: [REDACTED]

With a copy to:

[REDACTED]
OFFICE OF THE CITY MANAGER | LEGAL SERVICES
9th Floor, Chancery Hall | 3 Sir Winston Churchill Square | Edmonton AB T5J 2C3
Email: [REDACTED]

if to the LRV Supplier:

[REDACTED]
HYUNDAI ROTEM COMPANY | PROJECT DIRECTOR
37, Cheoldobangmulgwan-ro, Uiwang-si, Gyeonggi-do, 16082, Korea
Email: [REDACTED]

With a copy to:

[REDACTED]
HYUNDAI ROTEM COMPANY | PROJECT MANAGER
37, Cheoldobangmulgwan-ro, Uiwang-si, Gyeonggi-do, 16082, Korea
Email: [REDACTED]

- B. Either Party may change its address information by giving Notice to the other in the above manner.

13.2 DOCUMENT MANAGEMENT SYSTEM

- A. In lieu of providing Notice to the addresses noted in Section 13.1 [*Notices*], the Parties may provide Notice to each other through the Document Management System.

13.3 PUBLIC ANNOUNCEMENTS, COMMUNICATIONS, AND ENGAGEMENT

- A. All communications and engagement with the public and all third parties shall be managed and carried-out in accordance with the protocols and requirements established by the City and in accordance with the requirements outlined in Section 1.9 [*Communications and Marketing*] of Schedule 3 [*Design and Manufacturing Protocols*].
- B. The LRV Supplier shall not make and shall not cause or permit any LRV Supplier Person to make any public announcement relating to this Supply Agreement except as approved in advance by the City, acting reasonably, provided, however, that nothing herein shall preclude the LRV Supplier from making such disclosure as may be required pursuant to applicable stock exchange rules and securities laws and further provided that the LRV Supplier shall, to the extent practicable, provide reasonable prior notice to the City of any such required disclosure.

13.4 FREEDOM OF INFORMATION AND PROTECTION OF PRIVACY

13.4.1 LRV SUPPLIER'S ROLE

- A. As the LRV Supplier is contracted to provide Work under this Supply Agreement for the City, the LRV Supplier is deemed by the FOIP Act to be the City's employee and any Project Records held by the LRV Supplier or a LRV Supplier Person are deemed to be within the City's custody and control and subject to the FOIP Act.
- B. The LRV Supplier agrees to manage Project Records in accordance with the requirements of the FOIP Act, and, without limitation, the LRV Supplier shall:
 - 1. ensure the security of any record containing personal information within its custody or control;
 - 2. retain and be able to produce Project Records, unless they are destroyed in accordance with a records retention and destruction schedule agreed to by the City;
 - 3. meet the FOIP Act's requirements for the collection, use, or disclosure of any record containing personal information;
 - 4. prohibit the disclosure of third party business information if it meets the requirements for non-disclosure under the FOIP Act; and
 - 5. cooperate with the City's FOIP head (the City Manager) or delegate to ensure that the City is able to perform its duties and functions under the FOIP Act, regardless of the physical location of Project Records.
- C. The LRV Supplier shall not destroy Project Records, except in accordance with a mutually agreed upon retention and destruction schedule, or with the City's express written consent.
- D. The LRV Supplier shall incorporate the provisions of this Section 13.4 [*Freedom of Information and Protection of Privacy*] into Subcontracts.

13.4.2 DISCLOSURE OF PROJECT RECORDS

- A. If the City receives a request for Project Records that are within the LRV Supplier's custody or control, the LRV Supplier shall provide to the City such Project Records as are requested by the City within seven days of receipt of a written request from the City, in order to provide for sufficient time for the City to meet its statutory obligations and timelines for redacting and disclosing records or engaging third parties as required by the FOIP Act.
- B. The LRV Supplier may make representations to the City if it considers that any such Project Records contain business or other information that meets the requirements for non-disclosure under the FOIP Act.

- C. The LRV Supplier may not disclose Project Records that are within the LRV Supplier's custody or control to third parties without the City's express written consent, except as provided in this Section 13.4 [*Freedom of Information and Protection of Privacy*], or as otherwise required to comply with a subpoena, warrant or order made by a court, person or body having jurisdiction in Alberta to compel production of information, or with an Alberta rule of court that relates to the production of information, provided that the LRV Supplier, to the extent possible, first provides the City with notice of the subpoena, warrant, order, or rule.
- D. The LRV Supplier may only disclose Project Records within its custody or control to LRV Supplier Persons and their employees who need the information in the Project Records to perform their functions, and otherwise only in accordance with the City's express written consent.
- E. The LRV Supplier shall not disclose Project Records containing personal information, third party business information, or intergovernmental affairs information, except as provided for in this Supply Agreement or as expressly directed by the City.

13.4.3 PERSONAL INFORMATION

- A. The LRV Supplier may only collect and use or access personal information in strict compliance with the requirements for collection and use as provided in the FOIP Act.
- B. The LRV Supplier must ensure the security of Project Records containing personal information within its custody or control by making reasonable arrangements to protect it from unauthorized collection, use, access, disclosure or destruction, and shall provide to the City specific information regarding the steps taken to fulfill this requirement.
- C. The LRV Supplier shall make changes requested by the City for the purpose of meeting current or new technological change or privacy and records best practices and due diligence requirements in relation to the collection, use, access, disclosure, storage or destruction of Project Records within the custody or control of the LRV Supplier containing personal information.
- D. The LRV Supplier shall not store personal information from or in Project Records on cloud based solutions or outside of Canada without the City's prior express written consent, such consent not to be unreasonably withheld.
- E. The LRV Supplier shall provide the City with any information or assistance the City requires in order to conduct privacy impact assessments, due diligence or evaluations as part of the City determining whether or not to provide consent.
- F. Promptly upon the City's request, the LRV Supplier shall provide to the City copies of the LRV Supplier's and its Subcontractor's privacy policies, procedures, practices, guidelines and similar documents to allow the City to perform due diligence requirements under the FOIP Act in relation to the collection, use, access, disclosure, storage and destruction of Project Records within the custody or control of the LRV Supplier.
- G. The LRV Supplier shall immediately notify the City of any unauthorized use, access, or disclosure of Project Records containing personal information or third party business information, and shall provide as much detailed information as the City requests in relation to the breach. The LRV Supplier shall take prompt mitigation steps as directed by the City.

13.5 CONFIDENTIAL INFORMATION

- A. Each Party shall, upon delivering any information to the other that includes information delivered in confidence, identify the information delivered in confidence (the "**Confidential Information**"). The receiving Party shall maintain (and shall ensure its City Persons, in the case of the City, and the LRV Supplier Persons, in the case of the LRV Supplier) the confidentiality of the Confidential Information, with the exception of information that is as follows:

1. at the time of the disclosure to the receiving Party, without an obligation of confidentiality, was in the public domain;
2. after disclosure to the receiving Party became part of the public domain through no fault of the receiving Party or those for whom it is responsible at law;
3. was in the possession of the receiving Party without an obligation of confidentiality at the time of disclosure to it, as demonstrated by written records; or
4. was received by the receiving Party from a third party who had a lawful right to disclose the information.

13.6 DISCLOSURE OF CONFIDENTIAL INFORMATION

- A. Neither Party shall disclose Confidential Information delivered by the other except as follows:
1. the City or the LRV Supplier may disclose or grant access to such information to its professional advisers and consultants, to the extent necessary, to enable it to perform, to cause to be performed, or to enforce its rights or obligations under this Supply Agreement, and provided further that the LRV Supplier may, subject to obtaining confidentiality restrictions similar to those set out in this Supply Agreement, do the following:
 - a. provide to lenders, equity providers, underwriters, arrangers, investment dealers, hedging parties, and their respective advisors or agents such documents and other information as are reasonably required by them in connection with raising financing necessary to perform the Work; and
 - b. provide to a Subcontractor and its advisors, or provide or cause to be provided to other third parties, Confidential Information that is necessary to enable the LRV Supplier to perform, or to cause to be performed, its obligations under this Supply Agreement;
 2. as required by FOIP or Applicable Law;
 3. as contemplated in Section 13.4 [*Freedom of Information and Protection of Privacy*];
 4. subject to the City requesting confidentiality, to a Contribution Agreement Party in connection with any obligations of the City pursuant to a Contribution Agreement, and in the event of such disclosure, the LRV Supplier acknowledges that the Contribution Agreement Parties may be subject to FOIP, *Access to Information Act (Canada)*, or other Applicable Law in respect of the use, protection, and/or disclosure of such information;
 5. by the City, to the extent such disclosure is required pursuant to City policy concerning the City's Confidential Information, the details of which have been provided to the LRV Supplier in writing prior to the disclosure;
 6. by the City, in respect of authorizing other Persons to access and use Intellectual Property and related Intellectual Property Rights in accordance with this Supply Agreement;
 7. by the City, to the extent such disclosure is required to the following parties:
 - a. to the Operator in connection with the operation or maintenance of the LRVs;
 - b. to Project Co in connection with the design and construction of Valley Line Stage 2; and
 - c. to TransEd Partners in connection with the operation and interface with Valley Line Stage 1;
or
 8. where the disclosure is consented to in writing by the other Party.

- B. Without prejudice to any other rights and remedies that the other Party may have, each of the Parties agrees that damages may not be an adequate remedy for a breach of Section 13.6 [*Disclosure of Confidential Information*] and that the other Party will, in such case, be entitled to the remedies of injunction, specific performance, or other equitable relief for any threatened or actual breach of Section 13.6 [*Disclosure of Confidential Information*].

13.7 PUBLIC DISCLOSURE OF AGREEMENT

- A. Notwithstanding Section 13.5 [*Confidential Information*] and Section 13.6 [*Disclosure of Confidential Information*], the LRV Supplier agrees that the City will be at liberty to disclose all information contained in this Supply Agreement, excepting only any Schedules or portions thereof that the LRV Supplier has established to the satisfaction of the City, acting reasonably, contain business information that meets the requirements for non-disclosure under FOIP (the “**Sensitive Information**”). In the event of a request under FOIP for access to any of the Sensitive Information, the LRV Supplier will be given notice of the request pursuant to FOIP and will be given an opportunity to make representations as to why the Sensitive Information should not be disclosed.
- B. The City acknowledges that the financial, commercial, and technical information contained in the LRV Supplier’s Bid has been submitted to the City in confidence.

SECTION 14: CONTRACT ADMINISTRATION

14.1 CONTRACT ADMINISTRATION

- A. The LRV Supplier will appoint a Project Manager and the City will appoint a City Representative in accordance with, and having the rights and responsibilities set out in, Schedule 10 [*Representatives and Key Individuals*].
- B. The LRV Supplier and the City shall jointly establish the committees and working groups contemplated in this Supply Agreement, and, without limiting any provisions of this Supply Agreement expressly creating a committee or working group, each committee and working group shall have the responsibilities and authorities delegated to it by the City and the LRV Supplier.

14.2 MUTUAL COOPERATION

- A. In administering, interpreting, and carrying out their respective obligations under this Supply Agreement, the Parties mutually undertake to deal fairly and in good faith, and to act at all times in a spirit of mutual cooperation.

14.3 CONDUCT OF INDEMNIFIED CLAIMS

- A. Where either Party to this Supply Agreement is entitled to indemnification or a claim for compensation for Direct Losses arising from a third party claim against that Party (which for the purposes of this Section 14.3 [*Conduct of Indemnified Claims*] shall be deemed to be a claim for indemnification) under this Supply Agreement, (“**Indemnified Party**”) and determines that an event has occurred giving rise or that may give rise to a right of indemnification in favor of the Indemnified Party (an “**Indemnity Claim**”), the Indemnified Party shall promptly notify the Party obligated to provide indemnification (the “**Indemnifying Party**”) of such Indemnity Claim (a “**Claim Notice**”), describing in reasonable detail the facts giving rise to the claim for indemnification, and shall include in such Claim Notice (if then known) the amount or the method of computation of the amount of such Indemnity Claim; provided that the failure of an Indemnified Party to give timely notice thereof shall not affect any of its rights to indemnification nor relieve the Indemnifying Party from any of its indemnification obligations except to the extent the Indemnifying Party is materially prejudiced by such failure.
- B. Any obligation to provide indemnification under this Supply Agreement shall be subject to the following terms and conditions:
 - 1. upon receipt of a Claim Notice, the Indemnifying Party shall, at its cost and expense and upon notice to the Indemnified Party within 30 days of its receipt of such Claim Notice (or such shorter time period as the circumstances warrant), assume and control the defense, investigation, compromise, and settlement of such Indemnity Claim, including the management of any proceeding relating thereto, and shall employ and engage legal counsel reasonably acceptable to the Indemnified Party; provided that if there exists a material conflict of interest (other than one of a monetary nature) or if the Indemnified Party has been advised by counsel that there may be one or more legal or equitable defenses available to it that are different from or additional to those available to the Indemnifying Party that in either case would make it inappropriate for the same counsel to represent both the Indemnifying Party and the Indemnified Party, then the Indemnified Party shall be entitled to retain its own counsel at the cost and expense of the Indemnifying Party (except that the Indemnifying Party shall not be obligated to pay the fees and expenses of more than one separate counsel, other than local counsel, for all Indemnified Parties, taken together); and
 - 2. the Indemnified Party may, at its own cost and expense, participate in the defense of the Indemnity Claim, and shall cooperate with the Indemnifying Party in such efforts and make available to the Indemnifying Party all witnesses, records, materials, and information in the Indemnified Party’s possession, under its control, or to which it may have access as may be

reasonably required by the Indemnifying Party. The Indemnifying Party will keep the Indemnified Party reasonably informed of the progress of the defense of the Indemnity Claim. If the Indemnifying Party, contrary to Section 14.3.B.1 fails to assume the defense and investigation of the Indemnity Claim, then the following apply:

- a. the Indemnified Party shall have the right to undertake the defense, investigation, compromise, and settlement of the Indemnity Claim on behalf of, and at the cost and expense of and for the account and risk of, the Indemnifying Party;
 - b. the Indemnifying Party shall cooperate with the Indemnified Party in such efforts; and
 - c. the Indemnified Party will keep the Indemnifying Party reasonably informed of the progress of the defence of the Indemnity Claim.
- C. The Indemnifying Party shall not, without the written consent of the Indemnified Party, do the following:
1. settle or compromise any Indemnity Claim or consent to any final judgment that does not include as an unconditional term thereof the delivery by the claimant or plaintiff of a written release or releases from all liability in respect of such Indemnity Claim of all Indemnified Parties affected by such Indemnity Claim; or
 2. settle or compromise any Indemnity Claim if the settlement imposes equitable remedies or material obligations on the Indemnified Party other than financial obligations for which such Indemnified Party will be indemnified hereunder. No Indemnity Claim that is being defended in good faith by the Indemnifying Party shall be settled or compromised by the Indemnified Party without the written consent of the Indemnifying Party.

SECTION 15: DISPUTE RESOLUTION

15.1 DISPUTE RESOLUTION PROCEDURE

- A. Unless otherwise agreed to in writing between the City and the LRV Supplier, all Disputes shall be determined in accordance with the Dispute Resolution Procedure set out in Schedule 14 [*Dispute Resolution Procedure*]. The right to refer disagreements to the Dispute Resolution Procedure shall not be limited to provisions of this Supply Agreement that expressly refer to the Dispute Resolution Procedure, and all such express provisions shall be construed as having been included only for greater certainty.

15.2 EXCEPTION

- A. Where under the provisions of this Supply Agreement a Party has an unfettered discretion to exercise a right or take an action, the decision of that Party to exercise the right or take the action is not subject to review under the Dispute Resolution Procedure; but where any decision or discretion is expressly required to be made or exercised reasonably (or is otherwise qualified), then the reasonableness (or other qualification) of the decision made or the discretion exercised may be referred to the Dispute Resolution Procedure for determination.

15.3 TERMINATION AND DISPUTE RESOLUTION PROCEDURE

- A. A Party may refer to the Dispute Resolution Procedure for advance determination of the question as to whether it has valid grounds for terminating this Supply Agreement. However, the submission of that question to the Dispute Resolution Procedure shall not prevent either Party from terminating this Supply Agreement in accordance with its provisions prior to determination of that question by the Dispute Resolution Procedure.
- B. If either Party has purported to terminate this Agreement in accordance with its provisions, the other Party may submit to the Dispute Resolution Procedure the question of whether such termination was made in accordance with this Supply Agreement, and request either of the following:
 - 1. a ruling that this Supply Agreement has not been terminated; or
 - 2. the payment of a Termination Payment.

SECTION 16: ADDITIONAL PROJECT TERMS

16.1 KEY INDIVIDUALS

- A. In accordance with Schedule 10 [*Representatives and Key Individuals*], the LRV Supplier shall confirm the appointment of its Key Individuals responsible for the Work and confirm the roles and responsibilities for these individuals during the Term. Any proposed change to these appointments is subject to the protocols and conditions set out in Schedule 10 [*Representatives and Key Individuals*].

16.2 APPROVALS AND AUTHORIZATIONS

- A. The LRV Supplier shall have full responsibility for obtaining all necessary permits, approvals, and authorizations to perform the Work in accordance with Applicable Law.

16.3 LOBBYING, CORRUPT PRACTICES, AND OTHER PROHIBITED ACTS

- A. The term “Prohibited Act” means:
1. offering, giving, or agreeing to give to the City or any public body (or anyone employed by or acting on their behalf), or to any family member of any such Person, any gift or consideration of any kind as an inducement or reward:
 - a. for doing or not doing, or for having done or not having done, any act in relation to the obtaining or performance of this Supply Agreement or any other agreement with the City or any Governmental Authority in connection with this Supply Agreement or the Work; or
 - b. for showing or not showing favour or disfavour to any Person in relation to this Supply Agreement or any other agreement with the City or any Governmental Authority in connection with the Work;

provided that this Section 16.3 A.1 shall not apply to the LRV Supplier or any LRV Supplier Person providing consideration to the City or any Governmental Authority in the ordinary course, or as reasonably necessary, to fulfill or comply with the obligations and liabilities of the LRV Supplier under this Supply Agreement or any other agreement with the City or any Governmental Authority in connection with the Work;

2. entering into this Supply Agreement or any other agreement with the City or any public body in connection with the Work if a commission or a fee has been paid or has been agreed to be paid by the LRV Supplier, or on its behalf or to its knowledge, to the City or any Governmental Authority (or anyone employed by or acting on their behalf, including a Subcontractor), or to any family member of any such Person, unless, before the relevant agreement is entered into, particulars of any such commission or fee have been disclosed in writing to the City, provided that this Section 16.3 A.2 shall not apply to a fee or commission paid by the LRV Supplier (or anyone employed by or acting on its behalf) to the City or any Governmental Authority pursuant to an agreement where such fee or commission is paid in the ordinary course, or as reasonably necessary, to fulfill or comply with the obligations and liabilities of the LRV Supplier under this Supply Agreement or any other agreement with the City or any Governmental Authority in connection with the Work without contravening the intent of this Section 16.3 A.2;
3. breaching or committing any offense under Applicable Law in respect of corrupt, fraudulent acts, or criminal behaviour or conduct in relation to this Work or any other agreement with the City or any Governmental Authority in connection with the Work; or
4. defrauding, attempting to defraud, or conspiring to defraud the City or any other Governmental Authority.

- B. If the LRV Supplier or any LRV Supplier Person commits any Prohibited Act, such Prohibited Act shall be considered a Termination Event for the purposes of this Supply Agreement unless the LRV Supplier demonstrates to the City's satisfaction, acting reasonably, that appropriate remedial action has been taken to ensure the best interests of the City are protected.
- C. Nothing contained in this Section 16.3 [*Lobbying, Corrupt Practices, and Other Prohibited Acts*] shall prevent the LRV Supplier or any other Person from paying any proper commission, fee, or bonus whether to its employees within the agreed terms of their employment or otherwise, and such commission, fee, or bonus shall not constitute a Prohibited Act.
- D. The LRV Supplier shall notify the City of the occurrence and details of any Prohibited Act promptly on the LRV Supplier becoming aware of its occurrence.

16.4 LRV SUPPLIER'S RELIANCE ON INFORMATION

- A. Neither the City nor any City Person gives any representation, warranty, or undertaking of whatever nature in respect of any Disclosed Data and, specifically (but without limitation), neither the City nor any City Person represents or warrants that the Disclosed Data represents all of the information in its possession or power (either during the conduct of the procurement process for the Project or at NTP) that is or might be relevant or material to or in connection with the Work or the obligations of the LRV Supplier under this Supply Agreement or under any of the Project Documents.
- B. It is the LRV Supplier's responsibility to have conducted its own investigations, analysis, and review of the Project, the Disclosed Data, the Work, and the risks it assumes hereunder, and before the execution of this Supply Agreement, to have taken all steps it considers necessary to satisfy itself as to the accuracy, completeness, sufficiency, fitness for purpose, and applicability of any Disclosed Data upon which it places reliance and to assess all risks related to the Project in relation to the Work.
- C. Except as otherwise expressly provided in Section 16.4 D:
 - 1. Neither the City nor any City Person shall be liable to the LRV Supplier for, and the LRV Supplier shall not make, and shall ensure that no LRV Supplier Person shall make, any claim against the City or any City Person (including any claim in damages, for extensions of time, or for additional payments under this Supply Agreement) or seek to recover from the City, any damages, losses, costs, liabilities, expenses, or other compensation of any nature that may arise (whether in contract, tort, or otherwise) from the adoption, use, or application of the Disclosed Data by, or on behalf of, the LRV Supplier or on the following grounds:
 - a. of any misunderstanding or misapprehension in respect of any Disclosed Data; or
 - b. that the Disclosed Data (or any part thereof) was incorrect, incomplete, inapplicable, or insufficient; or
 - c. that information relating to the Disclosed Data given to the LRV Supplier by any Person other than the City was inaccurate, incomplete, insufficient, or inapplicable;

nor shall the LRV Supplier be relieved from any of its obligations under this Supply Agreement on any such grounds.
 - 2. Neither the City nor any City Person shall be liable to the LRV Supplier in respect of any of the following failures, whether before, on, or after NTP:
 - a. to disclose or make available to the LRV Supplier any information, documents, or data;
 - b. to review or update the Disclosed Data or any part thereof; or

- c. to inform the LRV Supplier of any inaccuracy, error, omission, defect, or inadequacy in the Disclosed Data or any part thereof.
- D. The City agrees that if, at NTP, except as disclosed in any Disclosed Data or as otherwise disclosed by the City or any City Person, or known by the LRV Supplier or any LRV Supplier Person, there is relevant information in the possession or control of the City that the City has knowingly not disclosed to the LRV Supplier that, if disclosed to the LRV Supplier, would make any of the information in the Disclosed Data incorrect, then, to the extent such undisclosed information would reasonably be expected to materially adversely affect the LRV Supplier's cost of performing the Work, such incorrect information shall, subject to and in accordance with Schedule 13 [*Changes*], result in a Change.

SECTION 17: PERFORMANCE SECURITY

17.1 GENERAL REQUIREMENTS

- A. The LRV Supplier and the City shall comply with the provisions of Schedule 11 [*Insurance and Performance Security Requirements*].

17.2 PERFORMANCE GUARANTEE

- A. **DELETED.**

17.3 ADVANCE PAYMENT AND PERFORMANCE LETTER OF CREDIT

- A. The LRV Supplier shall, prior to NTP, deliver one or more irrevocable letters of credit substantially in the form of Appendix 11B [*Form of Letter of Credit*] of Schedule 11 [*Insurance and Performance Security Requirements*] and in compliance with the requirement outlined in Section 4.1 [*Letters of Credit*] of Schedule 11 [*Insurance and Performance Security Requirements*] as security for
1. the payments made by the City to the LRV Supplier in advance of the LRV Supplier providing LRVs that have received Conditional Acceptance; and
 2. the performance of the LRV Supplier's obligations pursuant to this Supply Agreement.
- (the "**Advance Payment and Performance Letter of Credit**").
- B. The Advance Payment and Performance Letter of Credit shall be in an aggregate amount equal to 30% of the Capital Cost Amount.
- C. The Advance Payment and Performance Letter of Credit shall remain in effect until all LRVs in the Base Order have received Conditional Acceptance.
- D. The City shall be entitled to draw on the Advance Payment and Performance Letter of Credit in amounts equal to costs incurred by the City as a result of the non-performance of the LRV Supplier of its obligations pursuant to this Supply Agreement, including:
1. in an amount equal to any Termination Payment following a Termination pursuant to Section 12.4.1 [*Termination for LRV Supplier Default*];
 2. in an amount equal to any costs incurred by the City to rectify any Warranty Deficiencies pursuant to Section 2.2 [*Rectification*] of Schedule 7 [*Warranty*];
 3. in an amount equal to any costs incurred by the City to rectify any Deficiencies in the Work not otherwise rectified by the LRV Supplier; and
 4. in an amount equal to any costs incurred by the City as a result of and upon the occurrence of
 - a. the LRV Supplier's Default; or
 - b. the failure of the LRV Supplier to renew the Advance Payment and Performance Letter of Credit.
- E. The City may make multiple calls on the Advance Payment and Performance Letter of Credit.
- F. Unless the Advance Payment and Performance Letter of Credit is fully drawn by the City in accordance with the provisions of this Supply Agreement, the City shall, upon receipt of a written request from the LRV Supplier, release and deliver the Advance Payment Performance Letter of

Credit to the LRV Supplier on the next Business Day following the receipt of such request; provided that such request shall not be made prior to the date on which both the following conditions are met:

1. all LRVs in the Base Order have received Conditional Acceptance; and
2. the LRV Supplier has provided the Warranty Letter of Credit to the City.

17.4 WARRANTY LETTER OF CREDIT

- A. When all LRVs in the Base Order have received Conditional Acceptance, the LRV Supplier shall deliver one or more irrevocable letters of credit substantially in the form of Appendix 11B [*Form of Letter of Credit*] of Schedule 11 [*Insurance and Performance Security Requirements*] and in compliance with the requirement outlined in Section 4.1 [*Letters of Credit*] of Schedule 11 [*Insurance and Performance Security Requirements*] as security for the LRV Supplier's obligations during the Warranty Periods for the Primary LRV Warranty (the "**Warranty Letter of Credit**").
- B. The Warranty Letter of Credit shall be in an aggregate amount equal to 10% of the Capital Cost Amount.
- C. The Warranty Letter of Credit shall remain in effect until the expiry of all Warranty Periods applicable for the Primary LRV Warranty.
- D. The City shall be entitled to draw on the Warranty Letter of Credit and retain the proceeds in amounts equal to costs incurred by the City as a result of the non-performance of the LRV Supplier of its obligations pursuant to this Supply Agreement, including:
 1. in an amount equal to any Termination Payment following a Termination pursuant to Section 12.4.1 [*Termination for LRV Supplier Default*];
 2. in an amount equal to any costs incurred by the City to rectify any Warranty Deficiencies pursuant to Section 2.2 [*Rectification*] of Schedule 7 [*Warranty*];
 3. in an amount equal to any costs incurred by the City to rectify any Deficiencies in the Work not otherwise rectified by the LRV Supplier; and
 4. in an amount equal to any costs incurred by the City as a result of and upon the occurrence of
 - a. the LRV Supplier's Default; or
 - b. the failure of the LRV Supplier to renew the Warranty Letter of Credit.
- E. The City may make multiple calls on the Warranty Letter of Credit.
- F. Unless the Warranty Letter of Credit is fully drawn by the City in accordance with the provisions of this Supply Agreement, the City shall, upon receipt of a written request from the LRV Supplier, release and deliver the Warranty Letter of Credit to the LRV Supplier on the next Business Day following the receipt of such request; provided that such request shall not be made prior to the expiry of all applicable Primary LRV Warranty Periods.

SECTION 18: INTELLECTUAL PROPERTY

18.1 CITY IP

- A. The City is and will be the exclusive owner of all of the following and all Intellectual Property Rights therein throughout the world (collectively, the “**City IP**”)
 - 1. all of the City Background Intellectual Property;
 - 2. any Changes, and anything otherwise agreed by the Parties in writing, as being owned by the City;
 - 3. all Intellectual Property, including information that is Confidential Information or that may be protected by Intellectual Property Rights, that is or was first conceived, developed or reduced to practice by or on behalf of the City (excluding by the LRV Supplier) in connection with this Supply Agreement; and
 - 4. any and all improvements to any of the foregoing.
- B. All right, title and interest, including all Intellectual Property Rights, in the City IP (including City IP described in Section 18.1 A will vest in the City, immediately upon creation and regardless of the state of completion of such City IP.
- C. To the extent the ownership of the City IP does not automatically vest in the City, the LRV Supplier hereby assigns, transfers, and conveys, or agrees to cause to be assigned, transferred and conveyed, and will assign, transfer, and convey, all right, title and interest in the City IP to the City from the moment of creation, and waives, and agrees to cause all authors to waive, in favour of the City all moral rights in the City IP and Works.
- D. The LRV Supplier will acquire no rights to any City IP other than the license rights expressly granted in Section F below.
- E. The LRV Supplier shall ensure that any agent, LRV Supplier Person, or employee of a LRV Supplier Person shall have waived all moral rights in any City IP, and assigned to the City any rights in City IP.
- F. The City grants to the LRV Supplier, during the Agreement Term, a limited, revokable, nonexclusive, non-transferable, royalty free license to access, use, copy, support, maintain, and, to the extent reasonably necessary to perform the Works, modify the City IP solely for the purpose of fulfilling Supplier’s obligations under this Agreement.

18.2 LRV SUPPLIER IP

- A. Except as otherwise provided for in a Change, and except for City IP, the LRV Supplier is and will be the exclusive owner of all of the following information and all Intellectual Property Rights therein throughout the world (collectively, the “**LRV Supplier IP**”):
 - 1. all of the LRV Supplier Background Intellectual Property;
 - 2. Foreground Intellectual Property; and
 - 3. any and all improvements to the foregoing (other than City IP).
- B. All right, title and interest, including all Intellectual Property Rights, in the LRV Supplier IP will vest in the LRV Supplier, immediately upon creation and regardless of the state of completion of such LRV Supplier IP.
- C. The City will acquire no rights to any LRV Supplier IP other than the license rights expressly granted under or in respect of this Supply Agreement.

18.3 LICENSES GRANTED BY THE LRV SUPPLIER TO THE CITY

- A. Except in respect of Software that is LRV Supplier IP which will be licensed pursuant to Section 18.5 [*Software*], the LRV Supplier hereby grants to the City, a perpetual, irrevocable, fully paid-up, royalty-free, non-exclusive, non-transferable (except as permitted in accordance with Section 18.7 [*Transfer of Licenses*]) license to access, use, copy, support, maintain, modify, sublicense (solely as permitted in accordance with Section 18.4 [*Sub-licenses*]), assign (solely as permitted in accordance with Section 18.7 [*Transfer of Licenses*]), or otherwise exploit any LRV Supplier IP that is integrated with, embedded in, forms part of, or is otherwise required in order to access, use, copy, support, maintain, modify, sublicense (solely as permitted in accordance with Section 18.4 [*Sub-licenses*]), assign (solely as permitted in accordance with Section 18.7 [*Transfer of Licenses*]), sell or otherwise exploit in whole or in part the Work for the following purposes:
1. to use and operate the applicable Work (which includes for the purposes of training personnel);
 2. to service, maintain, repair, overhaul, refurbish (as contemplated in this Supply Agreement) and modify/upgrade (at the City's own risk) the Work, or to have such actions performed by a Permitted Sub-licensee;
 3. to ensure effective systems integration between the Work and any Software, equipment and systems provided with the Work with the City's other software, equipment and systems;
 4. to comply with the request (having provided the LRV Supplier with a notice of such request) of a Governmental Authority acting under Applicable Law for access to the Deliverable Materials;
 5. to make a reasonable number of copies for back-up purposes;
 6. to copy and modify (at the City's own risk) the Deliverable Materials to the extent necessary to perform any of the above (including for the production of staff manuals);
 7. to use such materials for the performance of audits as may be required; and
 8. to manufacture spare or replacement components for the Work which become unavailable for purchase (the term "unavailable for purchase" means that a spare or replacement component is no longer being manufactured by the LRV Supplier, or inventory of the part in sufficient quantities to meet the City's needs is not available for purchase from LRV Supplier, or the LRV Supplier will not sell a part to the City according to a market standard delivery schedule, or that the LRV Supplier will not offer the parts at a commercially reasonable price).
- (the "**Licensed Purposes**").

- B. Except as set out in Section 18.3 A.8, none of the licenses granted under this Section 18.3 [*Licenses Granted by the LRV Supplier to the City*] shall extend to the manufacture or the completion of the manufacture of the LRVs or of the components of LRVs.

18.4 SUB-LICENSES

- A. The City is permitted to sublicense the rights granted under Section 18.3 [*Licenses Granted by the LRV Supplier to the City*] and Section 18.5 [*Software*], to the Operator, or any other person carrying out any of the Licensed Purposes for or on behalf of the City, or Operator (each a "Permitted Sub-licensee"), but only to the extent that the granting of such sub-license is for the purpose of enabling or facilitating the City to procure or permit the performance of one or more of the Licensed Purposes and then only to the extent that the Permitted Sub-licensee agrees to adhere to the provisions of this Section 18 [*Intellectual Property*].
- B. Any sub-license referred to in Section 18.4 A shall automatically terminate upon the expiry or termination of the equivalent license granted to the City and the rights granted by the sub-license shall in no event be broader than the rights granted to the City by the applicable license.

18.5 SOFTWARE

- A. The LRV Supplier hereby grants to the City, a perpetual, irrevocable, fully paid-up, royalty-free, non-exclusive license to access, use, copy, support, maintain, modify (solely to address an obsolescence issue), sublicense (solely as permitted in accordance with Section 18.4 [*Sub-licenses*]), assign (solely as permitted in accordance with Section 18.7 [*Transfer of Licenses*]), or otherwise exploit, for the Licensed Purposes, all Software that is LRV Supplier IP.
- B. The LRV Supplier shall ensure that all Software:
 - 1. conforms to those standard industry interfaces and protocols specified by the City to permit interchangeability of systems and subsystems;
 - 2. is capable of maintenance, modification and upgrades in accordance with conventional software standards and practices;
 - 3. utilizes conventional command sequence and structure; and
 - 4. in all respects meets the software standards requirements set out in Schedule 3 [*Design and Manufacturing Protocols*] and Schedule 4 [*Technical Requirements*].
- C. During the Warranty Period, at no additional cost to the City, the LRV Supplier shall:
 - 1. provide all available updates to the Software;
 - 2. revise and deliver all Software that is Vital to mitigate all discovered safety related issues; and
 - 3. submit documentation for revised Software in accordance with the requirements of this Supply Agreement.

18.6 THIRD PARTY INTELLECTUAL PROPERTY

- A. The LRV Supplier shall ensure that no Open Source Materials or Third Party IP (including, for clarity, Third Party Software) will be embedded, incorporated or otherwise included in or will be required for the City to access, use, copy, support, maintain, modify, or otherwise exploit in whole or in part the Work unless such Open Source Materials and Third Party IP are approved by the City.
- B. In the event that any Open Source Materials or Third Party IP or any modification thereof embedded, incorporated or otherwise included in or will be required for the City to access, use, copy, support, maintain, modify, or otherwise exploit in whole or in part the Work, then the LRV Supplier shall ensure that the City is granted a license in respect of such Open Source Materials or Third Party IP on terms that include all rights, are not less restrictive, and are not less favorable to the City in all respects, than the license granted by the LRV Supplier under Section 18.3 [*Licenses Granted by the LRV Supplier to the City*], Section 18.4 [*Sub-licenses*], and Section 18.5 A [*Software*], mutatis mutandis.

18.7 TRANSFER OF LICENSES

- A. Each of the licenses granted to the City by or on behalf of the LRV Supplier under Section 18.3 [*Licenses Granted by the LRV Supplier to the City*], Section 18.4 [*Sub-licenses*], Section 18.5 [*Software*], and Section 18.6 [*Third Party Intellectual Property*] shall be assignable in whole or in part to any purchaser, transferee, lender or lessee of all or any of the Work, provided that,
 - 1. any transferee shall not be a direct competitor of the LRV Supplier; and
 - 2. any such assignment shall not place any more onerous obligations on the LRV Supplier than existed prior to the assignment.

- B. The City shall ensure that any person to whom the benefit of any license is assigned takes such assignment subject to the limitations of such license.

18.8 JOINT DEVELOPMENT AND RESIDUAL RIGHTS

- A. The Parties will not engage in any joint development of Intellectual Property Rights under this Supply Agreement except as the Parties may separately agree, in writing. In the absence of such written agreement, any Intellectual Property jointly developed shall be City IP.
- B. Subject to the terms and conditions of this Supply Agreement, the Parties agree that either Party may use general ideas, concepts, know how, methodologies, processes, technologies, algorithms or techniques which were received, acquired, developed or created in the course of performing or receiving the Work and which is retained in the unaided memory of such Party's personnel, provided that nothing permits the LRV Supplier to use any of the City's Confidential Information pertaining to customers, suppliers, technology or business or personal information of the City or City Persons and further provided no license is provided under this Section 18.8 [*Joint Development and Residual Rights*] to any materials to the extent they are protected by Intellectual Property Rights.

18.9 INTELLECTUAL PROPERTY RIGHTS WARRANTIES

- A. The LRV Supplier warrants to the City that:
 - 1. the design, construction and use of the Work, the Deliverable Materials and the LRV Supplier's performance of the Works or other services shall not infringe, violate or misappropriate any Intellectual Property Rights of third parties, provided that the Supplier shall have no liability to the City to the extent the infringement, violation or misappropriation results from and would not have arisen but for:
 - a. breach by the City of the City's obligations under this Supply Agreement;
 - b. improper use of the Works; or
 - c. modifications to the Works other than by or on behalf of the LRV Supplier or as approved by the LRV Supplier; and
 - 2. it is the owner of the LRV Supplier IP and all rights granted to the City hereunder, and in cases where it is not the owner and in respect of Third Party IP, it warrants that it has the right to use and to license same as set out in this Section 18 [*Intellectual Property*].

18.10 INTELLECTUAL PROPERTY RIGHTS INDEMNITIES

- A. The LRV Supplier shall indemnify, defend and save harmless the City, City Persons, and Permitted Sub-licensees from and against any and all claims asserted against and Losses by any of them directly or indirectly arising from or in connection with or relating to any claim by a third party alleging that:
 - 1. the Work, Deliverable Materials or other materials or deliverables provided or made available by the LRV Supplier hereunder, or the City's access, use, operation and maintenance thereof as permitted pursuant to this Supply Agreement; or
 - 2. the Supplier's performance or the receipt by the City of the Works or other services provided by the LRV Supplier under this Supply Agreement;infringes, violates, or misappropriates any Intellectual Property Right of the third party.
- B. Without limiting the indemnity obligation in Section 18.10 A, if all or any part of the Work, Deliverable Materials, or other materials or deliverables provided or made available by the LRV Supplier

hereunder or the LRV Supplier's performance or the receipt by the City of the Works or other services provided by LRV Supplier under this Supply Agreement becomes, or in LRV Supplier's or the City's reasonable opinion is likely to become, the subject of a claim described in Section 18.10 A, the LRV Supplier, at its own expense, and without prejudice to the other rights the City may have under this Supply Agreement, will promptly:

1. procure for itself and for the City to the extent required the right to use the allegedly infringing material as contemplated in this Supply Agreement;
 2. modify the allegedly infringing material to make it non-infringing, provided that any such modification will not affect the quality, performance or functionality of the infringing material; or
 3. replace the allegedly infringing material with a substitute of equal quality, performance and functionality.
- C. The obligations of the LRV Supplier set out in Section 18.10 A will not apply to the extent that a claim by a third party is:
1. based on the unauthorized use by the City of the applicable item in a manner not permitted by this Supply Agreement, if such claim would not have arisen but for such unauthorized use by the City;
 2. based on the modification of the applicable item by or on behalf of the City in a manner not permitted by this Supply Agreement, if such claim would not have arisen but for such modification; or
 3. based on specific requirements or specifications provided by the City, if such claim would not have arisen but for such specifications or requirements and the requirements or specifications could not have been complied with in a non-infringing manner.

SECTION 19: GENERAL PROVISIONS

19.1 LIMITATIONS ON ASSIGNMENT

- A. The LRV Supplier will not assign, transfer, or otherwise dispose of any interest in this Supply Agreement or a Project Document, except as follows:
1. as security for any loan made to the LRV Supplier provided that the City provided a direct agreement with the lender;
 2. by way of a Subcontract that is not a Subcontract of all or substantially all of the obligations under the Supply; or
 3. with the written consent of the City, not to be unreasonably withheld; and
- provided that in the case of an assignment, the assignee assumes all the obligations of the LRV Supplier under this Supply Agreement or Project Document, as applicable.
- B. Notwithstanding any other provision of this Supply Agreement, the LRV Supplier shall not assign, transfer, or otherwise dispose of any interest in this Supply Agreement or a Project Document to a Person who is a Restricted Person.

19.2 LIMITATIONS ON CHANGE IN OWNERSHIP

- A. No Change in Ownership of the LRV Supplier, or any Person owning, directly or indirectly, beneficially or otherwise, any of the shares or units or any other ownership interest in the LRV Supplier or any such Person, shall be permitted to occur, except in respect of a transaction referred to in Section 19.3 [*Limitations on Change in Control*].

19.3 LIMITATIONS ON CHANGE IN CONTROL

- A. No Change in Control of the LRV Supplier will be permitted (whether by the LRV Supplier or otherwise) to occur during the Term where,
1. such Change in Control would, in the opinion of the City, have a material adverse effect on the Work or the City, or
 2. no prior written notice was provided to the City.
- B. The factors outlined in Section 19.4 [*Factors the City May Consider*] shall be considered in determining whether such Change in Control would have a material adverse effect on the Work or the City.

19.4 FACTORS THE CITY MAY CONSIDER

- A. In determining whether to provide its consent under Section 19.1 A.3, it will be reasonable for the City to refuse its consent if any of the following apply:
1. the proposed assignee or the new party in control of the LRV Supplier, as the case may be, or any of their Affiliates, is a Restricted Person or a Person who has been found by a lawful authority to have committed, or who is being investigated at the time, in respect of a Prohibited Act with the City, any Governmental Authority, or any other Person unless the LRV Supplier and the proposed assignee have demonstrated to the City's satisfaction, acting reasonably, that appropriate remedial action has been taken to properly manage this circumstance or development;

2. by reference to the qualification requirements and criteria applied by the City in the RFQ (including the confirmation of any applicable Performance Security), the proposed assignee or the new party in control of the LRV Supplier, as the case may be, is, in the reasonable opinion of the City, not sufficiently creditworthy or financially stable to perform or support and cause the performance of the LRV Supplier's obligations under this Supply Agreement;
3. the City is of the opinion that the proposed assignment or Change in Control might hinder or prevent the LRV Supplier performing the Work;
4. by reference to the qualification requirements and criteria applied by the City in the RFQ (including the confirmation of any applicable Performance Security), the proposed assignee or the new party in control of the LRV Supplier, as the case may be, is, in the reasonable opinion of the City, not reasonably, technically, or commercially capable of performing or causing the performance of the LRV Supplier obligations under this Supply Agreement; or
5. if the value of any Performance Security might be impaired or diminished as a consequence of the proposed assignment or Change in Control.

19.5 COSTS OF REQUEST FOR CONSENT

- A. If the LRV Supplier requests consent to an assignment, transfer or disposition pursuant to Section 19.1 [*Limitations on Assignment*] or to a Change in Control pursuant to Section 19.3 [*Limitations on Change in Control*], the LRV Supplier will pay the City's reasonable internal administrative and personnel costs and all reasonable out-of-pocket costs in connection with considering any such request. At the time of such request, the LRV Supplier will make a payment to the City in the amount of \$15,000 as an advance against (and not in satisfaction of) its obligations under this Section 19.5 [*Costs of Request for Consent*]. After the City renders its decision, the City will either refund any over payment or invoice the LRV Supplier for any additional amounts owing under this Section 19.5 [*Costs of Request for Consent*] and the LRV Supplier will promptly pay such amount to the City. Within 30 Business Days after the City renders its decision, the City will either refund any overpayment or invoice the LRV Supplier for any additional amounts owing under this Section 19.5 [*Costs of Request for Consent*] and the LRV Supplier will promptly pay such amount to the City. Concurrently with providing such refund or invoice the City will provide the LRV Supplier with a breakdown of the City's costs in connection with its consideration of the LRV Supplier's request for consent.

19.6 LRV SUPPLIER PERSONS AND SUBCONTRACTORS

- A. The LRV Supplier will, as between itself and the City, be responsible for, and not relieved of its obligations hereunder by, the acts, omissions, and Legal Fault of each LRV Supplier Person, and all references in this Supply Agreement to any act, omission, or Legal Fault of the LRV Supplier will be construed accordingly to include any such act, omission, or Legal Fault of or committed by a LRV Supplier Person.
- B. Without limiting Section 19.6 A [*LRV Supplier Persons and Subcontractors*], the City acknowledges that the LRV Supplier shall carry out the Work by contracting such obligations to the Subcontractors who in turn may contract all or part of their obligations to one or more Subcontractors. Notwithstanding the use of Subcontractors, the following apply:
 1. The LRV Supplier will not be relieved or excused from any of its obligations or liabilities under this Supply Agreement; and
 2. The LRV Supplier will remain principally liable to the City for the due observance and performance of all the covenants, obligations, agreements and conditions of this Supply Agreement that are to be observed and performed by the LRV Supplier.

- C. In respect of the Work, the LRV Supplier will not contract with, or allow any of its Subcontractors to contract with, any Person who is a Restricted Person.

19.7 ASSIGNMENT BY CITY

- A. The City may assign, transfer, dispose of, or otherwise alienate any interest in this Supply Agreement or any agreement in connection with this Supply Agreement to which the LRV Supplier and the City are parties as follows:
 - 1. as may be required to comply with Applicable Law;
 - 2. to a corporation, all of the shares of which are owned by the City, provided that in such event, the City shall remain liable for all its obligations under this Supply Agreement;
 - 3. to a regional services commission created under the Municipal Government Act (Alberta), or other similar entity, provided that in such event, the City shall remain liable for all its obligations under this Agreement;
 - 4. to any minister or agency of the Province of Alberta or the Government of Canada having the legal capacity, power, authority, and ability to become a party to and to perform the obligations of the City under this Agreement; or
 - 5. with the prior written consent of the LRV Supplier.
- B. Notwithstanding the foregoing, the City may assign its rights with respect to certain provisions of this Supply Agreement, including its rights to require rectification of Deficiencies or Warranty Deficiencies, to the Operator or any other City Person at the discretion of the City and upon notice to the LRV Supplier.

19.8 APPLICABLE LAW AND JURISDICTION

- A. This Agreement shall be governed by the laws in force in Alberta, including the federal laws of Canada applicable therein. Subject to Section 15 [*Dispute Resolution*], Alberta courts shall have exclusive jurisdiction over all matters arising in relation to this Supply Agreement, and each Party accepts the jurisdiction of Alberta courts.

19.9 AMENDMENT AND WAIVER

- A. No amendment of this Agreement is effective unless made in writing and signed by a duly authorized representative of each of the City and the LRV Supplier. No waiver of any provision of this Supply Agreement is effective unless made in writing, and any such waiver has effect only in respect of the particular provision or circumstance stated in the waiver. No representation by either of the Parties with respect to the performance of any obligation under this Supply Agreement is capable of giving rise to an estoppel unless the representation is made in writing.

19.10 ADDITIONAL ASSURANCES

- A. The City and the LRV Supplier each agree to from time to time do all such acts and provide such further assurances and instruments as may reasonably be required to carry out the provisions of this Supply Agreement according to their spirit and intent; but this Section 19.10 [*Additional Assurances*] shall not in any event be construed as obligating the City to amend or enact any statute or regulation.

19.11 COUNTERPARTS

- A. This Supply Agreement may be executed in counterparts, in which case the following apply:

1. the counterparts together shall constitute one agreement; and
2. communication of execution by electronic transmission of a PDF copy shall constitute good delivery.

19.12 JOINT AND SEVERAL

- A. Where two or more Persons execute this Agreement as the LRV Supplier, the liability under this Supply Agreement of such Persons executing this Supply Agreement shall be joint and several.

19.13 NO DEROGATION OF CITY'S SEPARATE OBLIGATIONS

- A. The LRV Supplier acknowledges and agrees that although the City is a Party to this Supply Agreement, the City is and shall remain an independent planning authority and municipality with all requisite powers and discretion provided under Applicable Law.

19.14 INTERPRETATION

- A. In this Supply Agreement, unless the context otherwise requires, capitalized terms will have the meanings set out in Schedule 1 [*Definitions and Interpretation*]. This Supply Agreement will be interpreted and construed in accordance with the provisions set out in Schedule 1 [*Definitions and Interpretation*].

19.15 ORDER OF PRECEDENCE

- A. In the event of any ambiguity, conflict, or inconsistency between or among any of the provisions of this Supply Agreement, the provisions shall govern in the following order of precedence with each taking precedence over those listed subsequently:
1. the provisions of amendments in writing to this Supply Agreement signed by the Parties and Change Order Confirmations shall govern and take precedence only over those specific provisions of this Supply Agreement expressly amended thereby;
 2. any provision establishing a higher standard of safety, reliability, durability, performance, quality, or service shall take precedence over a provision establishing a lower standard of safety, reliability, durability, performance, quality, or service;
 3. the body of this Supply Agreement;
 4. Schedule 1 – Definitions and Interpretation;
 5. Schedule 14 – Dispute Resolution Procedure;
 6. Schedule 9 – Pricing and Payment;
 7. Schedule 3 – Design and Manufacturing Protocols;
 8. Schedule 4 – Technical Requirements;
 9. Schedule 7 – Warranty;
 10. Schedule 5 – Integration Requirements;
 11. Schedule 8 – Shipping and Delivery;
 12. Schedule 11 – Insurance Requirements;

13. Schedule 13 – Changes;
 14. Schedule 2 – Submittal Requirements and Review Procedure;
 15. Schedule 6 – Interface Agreement;
 16. Schedule 10 – Representatives and Key Individuals, and
 17. Schedule 12 – Bid Extracts.
- B. Subject to Section 19.15 A [*Order of Precedence*], if the ambiguity, conflict, or inconsistency is between a provision of general application and a provision that applies only to a specific part of the Work, the provision that applies to the specific part of the Work shall govern for that specific part of the Work.
- C. If any ambiguity, conflict, or inconsistency is not readily resolved by the foregoing provisions of this Section 19.15 [*Order of Precedence*], then either Party, upon discovery of same, shall immediately give notice to the other Party. The City's Representative shall, within 10 Business Days after the giving or receipt of such notice, make a determination of which provision governs and give notice of such determination, in writing, to the LRV Supplier.
- D. The City and the LRV Supplier shall comply with the determination of the City's Representative pursuant to this Section 19.15 [*Order of Precedence*] unless the City or the LRV Supplier disputes the decision of the City's Representative, in which event such Dispute may be referred for resolution in accordance with Schedule 14 [*Dispute Resolution Procedure*].

19.16 CHOICE OF LANGUAGE

- A. It is the express wish of the Parties that this document and any related documents be drawn up and executed in English. Les parties aux présentes ont expressément demandé que ce document et tous les documents s'y rattachant soient rédigés et signés en anglais.

[signature pages follow]

The Parties have therefore signed this Agreement, by their respective duly authorized officers, as of the day and year first above written.

CITY OF EDMONTON

Legally Reviewed and Approved
as to Form:



Legal Services

Per:

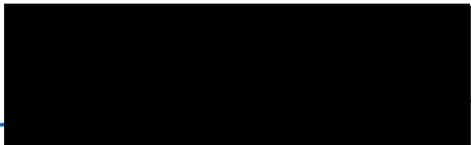


Title: Deputy City Manager,
Integrated Infrastructure Services

Approved as to Content:



LRT Expansion & Renewal



LRT Expansion & Renewal



Corporate Procurement and Supply Services

HYUNDAI ROTEM COMPANY



Rail Solution Division

**THE CITY OF EDMONTON
VALLEY LINE WEST LRT**

LRV SUPPLY AGREEMENT

Schedule 1 – Definitions and Interpretation

**VALLEY LINE WEST LRT
SCHEDULE 1 – DEFINITIONS AND INTERPRETATION**

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LIST OF FIGURES

Not applicable.

LIST OF TABLES

Not applicable.

SECTION 1: DEFINITIONS

In this Supply Agreement, unless the context otherwise requires:

- 1.1** All documents listed in the CDRL reference the title included in the CDRL, and any reference to the title will be considered a reference to that document.
- 1.2** “**Accepted**” or “**Accept**” or “**Acceptance**” means,
- a. as it relates to a Submittal, that the Submittal has been submitted pursuant to the Submittal Review Procedure and received an endorsement of either “Accepted”, “Accepted with Notes”, or deemed Accepted;
 - b. as it relates to LRVs, that the requirements for Conditional Acceptance, or Final Acceptance have been confirmed to have been completed by the City, or when the City uses the LRVs for Revenue Service;
 - c. as it relates to Special Tools, that the requirements for Special Tool Acceptance have been confirmed to have been completed by the City, or when the City uses the Special Tools for its intended purpose; and
 - d. as it relates to Spare Parts, that
 - i. the requirements for Spare Parts Acceptance have been confirmed to have been completed by the City; or
 - ii. ten Business Days have elapsed from the Spare Parts Inspection without issuance by the City of its decision not to issue the Spare Parts Acceptance Certificate in accordance with Section 9.4.9 B [*Spare Parts Acceptance Process*] of Schedule 3 [*Design and Manufacturing Protocols*].
- 1.3** “**Advance Payment and Performance Letter of Credit**” has the meaning given in Section 17.3 [*Advance Payment and Performance Letter of Credit*] of the Supply Agreement.
- 1.4** “**Affiliate**” means any other Person that, directly or indirectly, through one or more intermediaries, controls, is controlled by, or is under common control with, such first Person where “control” means, with respect to the relationship between or among two or more Persons, the possession, directly or indirectly or as trustee, personal representative, or executor, of the power to direct or cause the direction of the affairs or management of the first Person, whether through the ownership of voting securities, as trustee, personal representative or executor, by statute, contract, credit arrangement or otherwise, including the ownership, directly or indirectly, of securities having the power to elect a majority of the board of directors or similar body governing the affairs of such first Person.
- 1.5** “**APEGA**” means the Association of Professional Engineers and Geoscientists of Alberta.
- 1.6** “**Applicable Law**” means:
- a. any statute or proclamation or any delegated or subordinate legislation, including for greater certainty City by-laws;
 - b. any order, direction, directive, request for information, policy, code, protocol, administrative interpretation, guideline, standard, rule, treaty, decree, consent, by-law, or authorization of or by any Governmental Authority; and

- c. any judgment, order, or decision of a relevant court of law, board, arbitrator, or administrative agency which is a binding precedent in the Province of Alberta;

in each case, in force in the Province of Alberta, applicable to the Work or otherwise binding on the LRV Supplier or the City.

- 1.7 “**Arbitrator**” has the meaning given in Section 4.2.2 [*Single Arbitrator*] of Schedule 14 [*Dispute Resolution Procedure*].
- 1.8 “**Avoidable Costs**”, when used in relation to an event or circumstance, means all costs and expenditures which:
 - a. are saved or avoided as a result of the event or circumstance or its effects; or
 - b. if the LRV Supplier acted reasonably and in accordance with this Supply Agreement (including Section 9.5 [*General Duty of the LRV Supplier to Mitigate*] of this Supply Agreement), would have been saved or avoided as a result of the event or circumstance or its effects.
- 1.9 “**AW0**” means the weight of an empty LRV.
- 1.10 “**AW1**” means AW0 plus the weight of the driver, all seats occupied, assuming an average weight of 75 kg per seated passenger.
- 1.11 “**AW2**” means AW1 plus the weight of four standing passengers per square metre, assuming an average weight of 75 kg per standing passenger.
- 1.12 “**AW3**” means AW1 plus the weight of six standing passengers per square metre, assuming an average weight of 75 kg per standing passenger.
- 1.13 “**AW4**” means AW1 plus the weight of eight standing passengers per square metre, assuming an average weight of 75 kg per standing passenger.
- 1.14 “**Base Order**” means the LRVs, Spare Parts, and Special Tools described in Section 1.1 [*LRV Supplier’s Obligations*] of this Supply Agreement.
- 1.15 “**Base Order Payment Milestones**” means the milestones listed in Section 3.2 A [*Base Order Payment Milestones*] of Schedule 9 [*Pricing and Payment*] that will be the basis of payment for the Capital Cost Amount.
- 1.16 “**Bid Extracts**” means the documents, or parts thereof, described as such in Schedule 12 [*Bid Extracts*].
- 1.17 “**Bid Response Date**” means the date which is the Response Deadline for the Price Submission as provided in the RFP.
- 1.18 “**Business Day**” means a day other than a Saturday, Sunday, or statutory holiday in Alberta.
- 1.19 “**Canadian GAAP**” means the generally accepted accounting principles from time to time approved by the Canadian Institute of Chartered Accountants, or any successor institute, applicable as at the date on which such calculation is made or required to be made in accordance with generally accepted accounting principles, as such principles may be amended or varied by International Financial

Reporting Standards then in effect in Canada, in any case consistently applied from one period to the next.

- 1.20** “**Capital Cost Amount**” is the amount, in Canadian nominal dollars, related to the total cost applicable for the Base Order as indicated in Section 1.1 [*Capital Cost Amount*] of Schedule 9 [*Pricing and Payment*], as the same may be adjusted pursuant to a Change Order Confirmation.
- 1.21** “**CDR Document List**” means the list contained in the Design Review Plan that lists all the documents to be submitted for CDR.
- 1.22** “**Change**” means a variation, addition, reduction, substitution, modification, deletion, removal, or other change to the whole or any part of the Work.
- 1.23** “**Change Enquiry**” means a written notice and description of a proposed Change by the City pursuant to Schedule 13 [*Changes*].
- 1.24** “**Change Estimate**” means a detailed breakdown, estimate, and other information attributable to a proposed Change, prepared by the LRV Supplier pursuant to Section 2.2 [*Delivery of Change Estimate*] and in accordance with Section 2.3 [*Change Estimate Requirements*] of Schedule 13 [*Changes*].
- 1.25** “**Change Directive**” means a written instruction and description of a proposed Change which is issued on a form designated as a “Change Directive Form” and signed by the City directing the LRV Supplier to immediately proceed with the work attributable to the Change, pending the finalization and issuance of a Change Order Confirmation for that Change.
- 1.26** “**Change in Control**” means with respect to a non-individual Person (the “Person”), any direct or indirect change in the ownership or control of any legal, beneficial, or equitable interest in any or all of the shares, units, or equity in the Person (including the control over the exercise of voting rights conferred on equity share capital, unit interests, or equity interests or the control over the right to appoint or remove directors, a general partner or other managers), including changes arising from assignment or transfer of existing shares, units or equity, issuance of new shares, units or equity or amalgamation, merger consolidation, amendment of a limited partnership certificate or other reorganization, or any other direct or indirect change, which results in a Person or group of Persons, other than the equity holders of the Person immediately prior to the change, directly or indirectly:
- a. controlling the composition of the majority of the board of directors or other governing body of the Person or of a general partner or manager of the Person;
 - b. controlling the decisions made by or on behalf of the Person, including by contractual means or rights or by controlling the voting power of the board of directors or other governing body or by controlling the voting power of any class of shareholders or equity holders of any of the Person, a general partner of the Person or a manager of the Person or otherwise;
 - c. holding equity, either beneficially or otherwise, of that Person with a subscribed value (taking into account contributions to be made in the case of a limited partnership) of more than one half of the subscribed value (taking into account contributions to be made in the case of a limited partnership) or equity (either beneficially or otherwise) of that Person with more than one half of the voting rights; or
 - d. having the ability through contractual means or rights or otherwise to direct or cause the direction of the management, actions, decisions, or policies of the Person.

- 1.27 “**Change in Law**” means the coming into effect or repeal (without enactment or consolidation) in Alberta of any Applicable Law, or any amendment or variation of any Applicable Law, in each case after the Bid Response Date.
- 1.28 “**Change in Ownership**” means, with respect to a Person, any change in ownership, whether beneficial or otherwise, of any of the shares or units of ownership of such person, or in the direct or indirect power to vote or transfer any of the shares or units of ownership of such person.
- 1.29 “**Change Management Subplan**” means the change management subplan of the Program Management Plan that describes the processes to manage Changes, and is described in Section 1.2 B [*Program Management Plan*] of Schedule 3 [*Design and Manufacturing Protocols*].
- 1.30 “**Change Order Confirmation**” means confirmation provided by the City of a Change Estimate pursuant to Section 2.4 [*Change Order Confirmation*] of Schedule 13 [*Changes*].
- 1.31 “**City**” means the City of Edmonton.
- 1.32 “**City Background Intellectual Property**” means any Intellectual Property that is not Third Party IP, is not Foreground Intellectual Property, and is owned by the City prior to the date of this Supply Agreement. For greater certainty, the City Background Intellectual Property includes any Intellectual Property Rights in the Disclosed Data.
- 1.33 “**City IP**” has the meaning given in Section 18.1 [*City IP*] of the Supply Agreement.
- 1.34 “**City Person**” means:
- a. any elected official, officer, employee, or agent of the City; and
 - b. any representative, advisor (including any legal and financial advisor) of the City, subcontractor, or consultant (of any tier) of the City in any such Person’s capacity as provider of services directly or indirectly to the City in connection with the Valley Line LRT, excluding the LRV Supplier and the LRV Supplier Persons;
- but does not include Project Co or the Operator.
- 1.35 “**City Deficiency Report**” means the report generated by the City to identify potential Deficiencies, as described in Section 2.5.2.2 [*City Deficiency Reports*] of Schedule 3 [*Design and Manufacturing Protocols*].
- 1.36 “**City Indemnities**” means the indemnities provided by the City pursuant to Section 11.2 [*City’s Indemnities*] of the Supply Agreement.
- 1.37 “**City Representative**” means [**insert name of City Rep**], or such substitute as may be appointed by the City pursuant to Section 1.2 [*Change of the City Representative*] of Schedule 10 [*Representatives and Key Individuals*].
- 1.38 “**Claim Notice**” has the meaning given in Section 14.3 [*Conduct of Indemnified Claims*] of the Supply Agreement.
- 1.39 “**Closed Circuit Television**” or “**CCTV**” means closed circuit television.
- 1.40 “**Commissioning**” means inspection and testing of the Work, including all components, systems and subsystems, for the purpose of verifying the performance of the Work and confirming that the Work

complies with the requirements of the Supply Agreement and “Commission” and “Commissioned” shall have corresponding meanings.

- 1.41** “**Commissioning Manager**” means the Key Individual described in Section 2.8 [*Commissioning Manager*] of Schedule 10 [*Representatives and Key Individuals*].
- 1.42** “**Commissioning Training**” means the portion of training that occurs prior to the delivery of the first LRV, in accordance with Section 10.4.1G [*Training Programs*] of Schedule 3 [*Design and Manufacturing Protocols*], that trains the Drivers who will be assisting with the delivery and Commissioning and the maintainers for the first Conditionally Accepted LRV.
- 1.43** “**Conceptual Design Certificate**” means the certificate issued by the City in accordance with Section 4.1.3 G [*Design Review Process*] of Schedule 2 [*Submittal Requirements and Review Procedure*].
- 1.44** “**Conceptual Design Review**” or “**CDR**” means a Design Review in accordance with the requirements of Section 4.1.3 of Schedule 2 [*Submittal Requirements and Review Procedure*].
- 1.45** “**Conditional Acceptance** or “**Conditionally Accepted**” means that the LRV satisfies all the requirements stated in Section 9.4.1 [*Conditions Precedent to LRV Conditional Acceptance*] of Schedule 3 [*Design and Manufacturing Protocols*].
- 1.46** “**Conditional Acceptance Inspection**” means an inspection conducted in accordance with Section 2.6.12 [*Conditional Acceptance Inspection*] of Schedule 3 [*Design and Manufacturing Protocols*].
- 1.47** “**Confidential Information**” has the meaning given in Section 13.5 [*Confidential Information*] of the Supply Agreement.
- 1.48** “**Configuration and Data Management Program**” means the program that provides the functions described in Section 1.5 [*Configuration and Data Management Program*] of Schedule 3 [*Design and Manufacturing Protocols*].
- 1.49** “**Contract Deliverables Requirements List**” or “**CDRL**” means the list of Submittals outlined in Appendix 2A [*Contract Deliverables Requirements List*] of Schedule 2 [*Submittal Requirements and Review Procedure*].
- 1.50** “**Contract Work Schedule**” or “**CWS**” has the meaning given in Section 1.6.1 [*General*] of Schedule 3 [*Design and Manufacturing Protocols*].
- 1.51** “**Contribution Agreement**” means an agreement between the City and a Contribution Agreement Party pursuant to which such Contribution Agreement Party has agreed to provide funds to the City for the Project.
- 1.52** “**Contribution Agreement Parties**” means Her Majesty the Queen in Right of Canada as represented by the Minister of Infrastructure, Her Majesty the Queen in Right of Alberta as represented by the Minister of Transportation and the Minister of Infrastructure and “Contribution Agreement Party” means any one of them.
- 1.53** “**Corrective Action**” means the action to rectify a Deficiency.
- 1.54** “**Corrective Action Plan**” means the plan submitted by the LRV Supplier to rectify a Deficiency.

- 1.55 “**Current Schedule**” has the meaning given in Section 1.6.1 [*General*] of Schedule 3 [*Design and Manufacturing Protocols*].
- 1.56 “**Custom Software**” means any Software created by the LRV Supplier, or by a Subcontractor, as part of the Work.
- 1.57 “**Cut-Out**” means the isolation of an LRV system such that the functions of other LRV systems will be unaffected by the isolated system.
- 1.58 “**Data Room**” means the database established by the City for the RFP containing or referring to Disclosed Data.
- 1.59 “**Default**” means any breach or non-compliance by the LRV Supplier of or with any provision of the Supply Agreement, including the material inaccuracy, when made, of any representation or warranty given by the LRV Supplier in the Supply Agreement.
- 1.60 “**Default Rate of Interest**” means Prime plus 2%.
- 1.61 “**Deficiency**” or “**Deficient**” means any defect, deficiency, error, or fault, including omission, in the Work (including in the design or manufacturing thereof) or any failure of the Work (or any part thereof) or any error, fault, or failure of a process or procedure to comply with the Supply Agreement.
- 1.62 “**Deficiency Report**” means a report prepared by the LRV Supplier that identifies a Deficiency and the Corrective Action taken to rectify that Deficiency, as described in Section 2.5.2.5 [*Deficiency Report Requirements*] of Schedule 3 [*Design and Manufacturing Protocols*].
- 1.63 “**Deficiency Status Report**” means the report included in the Quality Management System Report that includes all the information described in Section 2.5.3 C [*Deficiency Tracking System*] of Schedule 3 [*Design and Manufacturing Protocols*].
- 1.64 “**Deficiency Tracking System**” means the system described in Section 2.5.3 [*Deficiency Tracking System*] of Schedule 3 [*Design and Manufacturing Protocols*] that tracks the number and status of all Deficiencies.
- 1.65 “**Deliverable Materials**” means all data, documentation, and submissions required to be supplied to the City pursuant to this Supply Agreement, including all CDRLs.
- 1.66 “**Design Drawings**” means technical drawings used to fully and clearly define the requirements of an engineered item, excluding shop or fabrication details.
- 1.67 “**Design Guide**” means the Valley Line LRT Stage 2 LRV Design Guide dated May 27, 2021 that provides guidance and imagery for the LRVs.
- 1.68 “**Design Quality Manager**” means the Person responsible for the duties described in Section 2.3.2 D [*Quality Managers*] of Schedule 3 [*Design and Manufacturing Protocols*].
- 1.69 “**Design Review**” means the process used for conducting a thorough evaluation of the proposed LRV design in relation to the requirements of the Supply Agreement at the various levels of design of the systems engineering life cycle, consisting of CDR, PDR, and FDR.
- 1.70 “**Design Review Submittal**” means the Submittals identified in the CDR Document List, PDR Document List, and FDR Document List.

1.71 “**Design Service Life**” means the period of time for which a component of the Work is expected to function properly at its designated capacity without major repairs or performance of compounding unscheduled maintenance activities.

1.72 “**Designated Change in Law**” means the following and no other changes in Applicable Law in force in Alberta arising after the Bid Response Date:

- a. a change, including new or supplemental laws or regulations, that specifically requires a higher or different standard of performance or higher or different quality of material, in the performance of the Work compared to what was required under Applicable Law or the requirements of the Supply Agreement at NTP, provided such change could not have been reasonably anticipated based on publicly available information and reasonable due diligence prior to the Bid Response Date;
- b. a change, including new or supplemental laws or regulations or administrative policy requirements of a Governmental Authority, that results in the requirement for additional or supplemental environmental approvals or authorizations, or a change in the terms or conditions of such approvals, that makes it more costly or more onerous to perform the Project Work;
- c. the enactment of an emergency order by a Governmental Authority or statutory body having jurisdiction over the Work in relation to the occurrence of an Epidemic that disrupts, interferes with, or delays the LRV Supplier’s performance of the Work so as to prevent all or substantially all of the LRV Supplier’s activities;
- d. a change specifically in response to the occurrence of an Epidemic, including new or supplemental laws or regulations or administrative policy requirements of a Governmental Authority, that results in the requirement for additional or supplemental occupational health and safety requirements that makes it more costly, more time-consuming or more onerous to perform the Work; or
- e. a change directed specifically at the LRV manufacturing industries in Canada or directed specifically at the LRV Supplier, or arrangement of the nature of this Supply Agreement.

For certainty, “Designated Change in Law” does not include (except as contemplated in Section 1.72d above) any Change in Law related to occupational health and safety, including the *Workers’ Compensation Act* (Alberta), *Occupational Health and Safety Act* (Alberta), the *Occupational Health and Safety Regulations* (Alberta), the *Occupational Health and Safety Code* (Alberta), the *Safety Codes Act* (Alberta), the *NBC(AE)*, or the enactment or implementation of a carbon tax.

1.73 “**Direct Losses**” means all damages, losses, liabilities, penalties, fines, assessments, claims, actions, costs, expenses (including costs incurred in respect of fuel, labour costs, vehicle wear and tear, and the cost of legal or professional services, legal costs being on a substantial indemnity basis, finance, bank and surety costs and expenses), proceedings, demands, judgements, and charges whether arising under statute, contract, or at common law, excluding however Indirect Losses.

1.74 “**Disclosed Data**” means any and all information, data, reports, and documents from time to time disclosed, provided, or made available by the City to the LRV Supplier or a LRV Supplier Person, in connection with or pertaining to the Work, the requirements of any Governmental Authority, or any obligations undertaken by the LRV Supplier under this Supply Agreement, and whether disclosed, provided or made available before, on or after NTP, and including without limitation:

- a. any design information provided, or made available, by the City;
- b. any and all plans, drawings, materials, books, records, files, correspondence, studies, tests, test results, test data, certificates, investigations, samples, surveys, reports, statements, documents, facts, information, projections, and traffic information (including volume counts, classification counts, origin and destination data, speed and travel time information, and vehicle jurisdiction data), including any of the foregoing stored electronically or on computer-related media);
- c. the data, reports, and documents referred to in the Supply Agreement including in any Schedule;
- d. any of the foregoing provided in connection with the RFP; and
- e. anything contained in the Data Room before, on or after the Bid Response Date, and any information, data, report, or document specifically referred to in the Data Room.

- 1.75** “**Dispute**” means and includes all disputes, controversies, or claims arising out of or relating to any provision of the Agreement; the failure of the Parties to reach agreement when specifically contemplated by or provided for in the Supply Agreement; the alleged wrongful exercise or failure by a Party to exercise discretion or power reasonably where required to be so exercised under the Supply Agreement; or the interpretation, enforceability, performance, breach, termination, or validity of the Supply Agreement, or any other matter referred to for resolution pursuant to and in accordance with the requirements of the Dispute Resolution Procedure in Schedule 14 [*Dispute Resolution Procedure*]; provided a Dispute does not include any right of complaint, challenge, or dispute in respect of the wrongful exercise of a discretion or power given under the Supply Agreement to the City, the City’s Representative or any City Person, where the Supply Agreement does not require such discretion or power to be exercised or to be exercised reasonably.
- 1.76** “**Dispute Notice**” has the meaning given in Section 1.2 [*Dispute Notice and Response*] of Schedule 14 [*Dispute Resolution Procedure*].
- 1.77** “**Dispute Resolution Procedure**” has the meaning given in Section 1.1 [*Procedures*] of Schedule 14 [*Dispute Resolution Procedure*].
- 1.78** “**Document Management System**” has the meaning given in Section 1.8 [*Document Management System*] of Schedule 3 [*Design and Manufacturing Protocols*].
- 1.79** “**Driver**” means a Person having exclusive control over the operation of an LRV or Train.
- 1.80** “**Dwell Time**” means the amount of time a Train is stationary at a Stop or Station, inclusive of doors opening and doors closing to allow Passengers to board or disembark the Train.
- 1.81** “**Edmonton Transit Service**” or “**ETS**” means the operator of the public transportation system provided by the City of Edmonton.
- 1.82** “**Electromagnetic Compatibility**” or “**EMC**” refers to the ability of electronic or electrical equipment, component, system, and subsystem to work as intended in its environment without generating electromagnetic disturbances which may influence other electronic or electrical equipment, components, systems, or subsystems.

- 1.83** “**Eligibility Requirements for Milestone Payment**” means the requirements listed in *Table 2: Base Order Payment Milestone Eligibility Requirements* of Section 3.3 B of Schedule 9 [*Pricing and Payment*] that result in achievement of a Base Order Payment Milestone.
- 1.84** “**Eligibility Requirements for Supplementary LRV Milestone Payment**” means the requirements listed in *Table 9B-2: Eligibility Requirements for Supplementary LRV Payment Milestones* of Appendix 9B.3.3 [*Payment for Supplementary LRVs*] of Schedule 9 [*Pricing and Payment*] that result in achievement of a Supplementary LRV Payment Milestone.
- 1.85** “**Epidemic**” means an epidemic occurring in Canada which constitutes a “pandemic” as declared by the World Health Organization or which constitutes a “communicable disease” (as such term is defined by Regulation 238/85 to the Public Health Act (Alberta) as at the date of this Supply Agreement), whether or not known or declared as of the date of this Supply Agreement and including, for clarity, the 2019 novel coronavirus disease.
- 1.86** “**Expiry Date**” has the meaning given in Section 2.5 [*Term*] of the Supply Agreement.
- 1.87** “**Excluded Deficiency**” means a Deficiency arising during a Warranty Period as a result of:
- a. operation or maintenance of the Work not in accordance with good industry practice or the applicable documentation and training provided by the LRV Supplier pursuant to this Supply Agreement;
 - b. Valley Line LRT infrastructure not being maintained in accordance with good industry practice;
 - c. an accident not arising as a result of the Deficiency (including suicide or attempted suicide);
 - d. an act of vandalism;
 - e. modifications to the Work not approved by the LRV Supplier, unless such modifications are required by Applicable Law or Good Industry Practice;
 - f. normal wear and tear (which shall be determined in accordance with good industry practice applicable to light rail transit systems of a similar design and operations); or
 - g. Legal Fault of the City.
- 1.88** “**FAI Completion Certificate**” means the certificate issued by the City certifying that all FAIs have been completed.
- 1.89** “**FDR Document List**” means the list contained in the Design Review Plan that lists all the documents to be submitted for FDR.
- 1.90** “**Final Acceptance**” means that the LRV satisfies all the requirements stated in Section 9.4.3 [*Conditions Precedent for Final Acceptance*] of Schedule 3 [*Design and Manufacturing Protocols*].
- 1.91** “**Final Acceptance Inspection**” means an inspection conducted in accordance with Section 2.6.13 [*Final Acceptance Inspection*] of Schedule 3 [*Design and Manufacturing Protocols*].
- 1.92** “**Final Design Certificate**” means the certificate issued by the City certifying that the FDR has been completed.

- 1.93** “**Final Design Review**” or “**FDR**” means a formal review to evaluate the readiness of the design to proceed with manufacturing.
- 1.94** “**First Conditional Acceptance Date**” means November 3, 2025.
- 1.95** “**First LRV**” means the first LRV produced by the manufacturing process and selected to undergo FAIs and Type Testing.
- 1.96** “**Fleet Acceptance Certificate**” means the certificate issued by the City certifying that the requirements outlined in Section 9.4.5 [*Fleet Acceptance*] of Schedule 3 [*Design and Manufacturing Protocols*] have been met.
- 1.97** “**Fleet Warranty Deficiency**” means a Warranty Deficiency that affects 15% of the LLRUs of the same type within a consecutive 12-month period.
- 1.98** “**FOIP Act**” means the *Freedom of Information and Protection of Privacy Act* RSA 2000 c F-25.
- 1.99** “**Foreground Intellectual Property**” means any Intellectual Property, including Confidential Information, created, conceived, developed, or reduced to practice by or on behalf of the LRV Supplier pursuant or in relation to the Supply Agreement.
- 1.100** “**Force Majeure Event**” means the occurrence after NTP of one or more of the following events which directly causes either Party to be unable to perform all or a material part of its obligations under the Supply Agreement:
- a. war, invasion, insurrection, armed conflict, act of foreign enemy, revolution, terrorist act, interference by military authorities, riot, or civil commotion;
 - b. pressure waves caused by devices traveling at supersonic speeds;
 - c. fire, explosion, lightning, storm, tempest, hurricane, tornado, ionizing radiation, or earthquake;
 - d. Epidemic; or
 - e. a general strike or other labour disruption in Alberta that is applicable broadly to the manufacturing, construction or logistics sector in Alberta or that is specifically directed at the City, but excluding any strike or labour disruption by LRV Supplier Persons against the LRV Supplier that is not part of the foregoing scope of general strike or labour disruption.
- 1.101** “**Forensic Schedule Analysis**” has the meaning given in Section 6.2 [*Procedure on Force Majeure Event*] of the Supply Agreement.
- 1.102** “**Gerry Wright OMF**” means the LRT operations, maintenance, and storage facility located at the Gerry Wright OMF Site, and includes Gerry Wright OMF Part A and Gerry Wright OMF Part B.
- 1.103** “**Gerry Wright OMF Part A**” means all infrastructure for the Gerry Wright OMF which is provided by Valley Line LRT Stage 1.
- 1.104** “**Gerry Wright OMF Part B**” means all infrastructure for the Gerry Wright OMF which is provided by Valley Line LRT Stage 2.
- 1.105** “**Good Industry Practice**” means using standards, practices, methods, and procedures to a good commercial standard, conforming to Applicable Law and exercising that degree of skill and care,

diligence, prudence, and foresight which would reasonably and ordinarily be expected from a qualified, skilled, and experienced supplier of light rail vehicles and related spares and services for large infrastructure projects in major metropolitan areas.

- 1.106** “**Governmental Authority**” means any federal, provincial, territorial, regional, municipal, or local governmental authority, quasi-governmental authority, court, government, or self-regulatory organization, commission, board, tribunal, organization, or any regulatory, administrative, or other agency, or any political or other subdivision, department, or branch of any of the foregoing, having legal jurisdiction in any way over the City, any aspect of the performance of the Supply Agreement or to the extent it has or performs legislative, judicial, regulatory, administrative, or other functions within its jurisdiction.
- 1.107** “**GST**” means the value-added tax imposed pursuant to Part IX of the Excise Tax Act (Canada), and any successor legislation thereto.
- 1.108** “**Hold Point Inspection**” means an inspection conducted in accordance with Section 2.6.9 [*Hold Point Inspection*] of Schedule 3 [*Design and Manufacturing Protocols*].
- 1.109** “**HST**” means the value-added tax imposed pursuant to Part IX of the Excise Tax Act (Canada), and any successor legislation thereto.
- 1.110** “**Incurable Default**” means a Default that is by its nature or by reason of prevailing circumstances incapable of being cured in all material respects, but does not include any Default that is a failure to carry out a particular obligation by a particular date or within a particular period where it is possible to subsequently perform that obligation, albeit not by or within the relevant date or period.
- 1.111** “**Indemnified Party**” has the meaning given in Section 14.3 [*Conduct of Indemnified Claims*] of the Supply Agreement.
- 1.112** “**Indemnifying Party**” has the meaning given in Section 14.3 [*Conduct of Indemnified Claims*] of the Supply Agreement.
- 1.113** “**Indemnity Claim**” has the meaning given in Section 14.3 [*Conduct of Indemnified Claims*] of the Supply Agreement.
- 1.114** “**Independent Performance Demonstration Certifier**” means the independent performance demonstration certifier appointed by the City, Project Co, the Operator, and the LRV Supplier pursuant to Article 7 [*Independent Performance Demonstration Certifier*] of Schedule 6 [*Interface Agreement*].
- 1.115** “**Independent Performance Demonstration Certifier Agreement**” means the agreement between the City, Project Co, the Operator, the LRV Supplier, and the Independent Performance Demonstration Certifier on the terms generally as set out in Appendix 6A [*Independent Performance Demonstration Certifier Agreement*] to Schedule 6 [*Interface Agreement*].
- 1.116** “**Indirect Losses**” means losses for punitive, exemplary, or aggravated damages, for loss of profits, anticipated profits, loss of product, loss of goodwill, loss of fare revenue, loss of production, economic loss, loss of business, or loss of business opportunity sustained by a Party (but does not include any loss of profit of the LRV Supplier specifically under or in connection to the Supply Agreement and this Project) and not by third parties, or for consequential loss or for indirect loss of any nature suffered or allegedly suffered by either Party.

- 1.117** “**Individual Milestone Payment Amount**” means the pro-rated sum of each Base Order Payment Milestone pursuant to *Table 1: Base Order Payment Milestones, Milestone Payment Value and Milestone Payment Amounts* of Section 3.2 A of Schedule 9 [*Pricing and Payment*].
- 1.118** “**Individual Milestone Payment Value**” means the pro-rated percentage of the Capital Cost Amount that will be paid in respect of a particular Base Order Payment Milestone pursuant to *Table 1: Base Order Payment Milestones, Milestone Payment Value and Milestone Payment Amounts* of Section 3.2 A of Schedule 9 [*Pricing and Payment*].
- 1.119** “**Infrastructure Integration Committee Meetings**” means the meetings hosted by Project Co to resolve integration issues that the Integration Manager may attend at the request of the City.
- 1.120** “**Infrastructure Performance Demonstration**” means the verification of the Valley Line LRT Stage 2 reliability and availability for Revenue Service operation being completed by Project Co.
- 1.121** “**Infrastructure Performance Demonstration Period**” means the timeframe in which the Infrastructure Performance Demonstration shall be conducted.
- 1.122** “**Initial Submission**” has the meaning given in Section 3.4 [*Referee Submissions*] of Schedule 14 [*Dispute Resolution Procedure*].
- 1.123** “**Initiating Party**” has the meaning given in Section 1.2 [*Dispute Notice and Response*] of Schedule 14 [*Dispute Resolution Procedure*].
- 1.124** “**Innovation Proposal**” has the meaning given in Section 5.1 [*Innovation and Value Engineering*] of Schedule 13 [*Changes*].
- 1.125** “**Integrated Control System**” or “**ICS**” means a central control room system that manages, controls and supervises Train movements on the mainline over its defined route limits.
- 1.126** “**Integration Committee**” means the committee described in Section 2.2 [*Integration Committee*] of Schedule 5 [*Integration Requirements*].
- 1.127** “**Intellectual Property**” means any ideas, concepts, devices, algorithms, information, materials, methods, processes, data, computer programs, software, databases, know-how, discoveries, developments, designs, images, artwork, technical specifications, drawings and technical descriptions, research and development data, manufacturing methods and data, formulae, prototypes and research materials, techniques in any material form or support and any other works, output, creations ,and things, whether tangible or intangible, including any enhancements, modifications, or additions thereto, and, including products and services owned, licensed, sold, marketed, or used, whether patentable or not, and all Intellectual Property Rights therein.
- 1.128** “**Intellectual Property Rights**” means all trade secrets, copyrights, trade-marks, domain names, industrial designs, mask work rights, rights in integrated circuit topographies, patents, and other intellectual property rights recognized by the laws of any jurisdiction or country, as well as any interest and rights to use (including by way of license) in the Intellectual Property, including applications, registrations, titles, renewals, issues, re-issues, and extensions of the rights thereto.
- 1.129** “**Interface Agreement**” means the interface agreement to be entered into by the City, Project Co, the Operator, and the LRV Supplier, substantially in the form attached as Schedule 6 [*Interface Agreement*].

- 1.130** “**Key Date**” means any of the following:
- a. LRV Design Information Secondary Package Date;
 - b. First Conditional Acceptance Date;
 - c. LRV Ready for Integration Date; and
 - d. VLW Service Commencement Date.
- 1.131** “**Key Individual**” means each of the individuals named in Section 2.3 [*Key Individuals General Requirements*] of Schedule 10 [*Representatives and Key Individuals*].
- 1.132** “**Legal Fault**” means negligence, nuisance, wilful misconduct, breach of, non-compliance with, or default under any Applicable Law, or any other basis in law or equity by which one Party may be liable to another, whether by act or omission, and with respect to the LRV Supplier shall include the Legal Fault of a LRV Supplier Person and with respect to the City shall include the Legal Fault of a City Person.
- 1.133** “**Lewis Farms Storage Facility**” means the LRT operations, maintenance, and storage facility described in Section 1.1.6 [*Lewis Farms Storage Facility*] of Schedule 4 [*Technical Requirements*].
- 1.134** “**Licensed Purposes**” has the meaning given in Section 18.3 [*Licenses Granted by the LRV Supplier to the City*] of the Supply Agreement.
- 1.135** “**Light Rail Vehicle**” or “**LRV**” refers to a single bi-directional passenger rail transit vehicle being supplied as part of the Work.
- 1.136** “**Liquidated Damages**” has the meaning set out in Section 2.4 [*Delivery and Work Milestones*] of the Supply Agreement.
- 1.137** “**Losses**” means any and all damages, losses, loss of revenue, loss of passenger revenue, loss of profit, loss of business opportunity, liabilities, charges, judgments, court orders, penalties, fines, assessments, costs (including finance costs), and expenses (including legal and other professional charges and expenses on a full indemnity basis and including reasonable costs of mitigation incurred in complying with any obligation to mitigate losses) of any nature and kind whatsoever and howsoever arising, whether under statute or contract, at common law, in equity, in connection with judgments or criminal or quasi criminal proceedings, or otherwise, and whether direct, indirect, or consequential, and “Loss” will be construed accordingly.
- 1.138** “**LRV Conditional Acceptance Certificate**” means the certificate issued by the City certifying that the LRV has been Conditionally Accepted by the City.
- 1.139** “**LRV Delivery Start Date**” means June 1, 2025.
- 1.140** “**LRV Design Information Package**” means the LRV information package described in Appendix 4A [*LRV Design Information Package*] of Schedule 4 [*Technical Requirements*].
- 1.141** “**LRV Design Information Secondary Package Date**” means June 5, 2022.
- 1.142** “**LRV Final Acceptance Certificate**” means the certificate issued by the City certifying that the LRV has achieved Final Acceptance.

- 1.143 “**LRV Ready for Integration Date**” means December 15, 2025.
- 1.144 “**LRV Supplier**” means **Hyundai Rotem Company**.
- 1.145 “**LRV Supplier Background Intellectual Property**” means any Intellectual Property that is not Third Party IP, is not Foreground Intellectual Property, and is owned by the LRV Supplier prior to the date of this Supply Agreement.
- 1.146 “**LRV Supplier Indemnities**” has the meaning set out in Section 11.1 [*LRV Supplier’s Indemnities*] of the Supply Agreement.
- 1.147 “**LRV Supplier IP**” has the meaning set out in Section 18.2 [*LRV Supplier IP*] of the Supply Agreement.
- 1.148 “**LRV Supplier Payment Certificate**” means the form of Appendix 9A [*LRV Supplier Payment Certificate*] to Schedule 9 [*Pricing and Payment*].
- 1.149 “**LRV Supplier Person**” means:
- a. Subcontractors;
 - b. any Person engaged by the LRV Supplier or Subcontractor, from time to time as may be permitted by the Supply Agreement to procure or manage the provision of the Work (or any of them); and
 - c. in respect of each of the above, their Subcontractors of any tier, agents, employees, officers, and directors.
- 1.150 “**LRV Supplier’s Bid**” means the Bid provided by the LRV Supplier in response to the RFP as defined in the RFP.
- 1.151 “**Maintainability Demonstration**” means the demonstration described in Section 3.3.3 [*Maintainability Demonstration*] of Schedule 3 [*Design and Manufacturing Protocols*].
- 1.152 “**Maintenance Facility**” means the Gerry Wright OMF and the Lewis Farms Storage Facility.
- 1.153 “**Maintenance Key**” means a handheld tool used by a maintainer or Driver for accessing interior access panels housing onboard LRV equipment, or exterior hatches and skirts.
- 1.154 “**Maintenance Level 1**” is defined in Clause 3.3.1.B(1)(a) [*General*] of Schedule 3 [*Design and Manufacturing Protocols*].
- 1.155 “**Maintenance Level 2**” is defined in Section 3.3.1.B(1)(b) [*General*] of Schedule 3 [*Design and Manufacturing Protocols*].
- 1.156 “**Maintenance Level 3**” is defined in Section 3.3.1.B(1)(c) [*General*] of Schedule 3 [*Design and Manufacturing Protocols*].
- 1.157 “**Major Deficiency**” means any Deficiency, other than a Warranty Deficiency or Excluded Deficiency, that:
- a. impacts safety or safe operation of the LRV;

- b. impacts the operation where the Deficiency would result in a service affecting impact or delay to a single or multiple Trains, as well as impacting the ability to monitor the status of any system;
 - c. is a major defect in installation or quality resulting in non-operational impacts that have a direct impact to the public; or
 - d. has cumulative value for rectification of which exceeds \$300,000 across all LRVs or \$70,000 for an individual LRV.
- 1.158** “**Manufacturing Quality Manager**” means the Person responsible for the duties described in Section 2.3.2 [*Quality Managers*] of Schedule 3 [*Design and Manufacturing Protocols*].
- 1.159** “**Master Clock**” means the single network connected reference time source for the Valley Line LRT.
- 1.160** “**Material Adverse Effect**” occurs when a Default, on its own or taken together with any other Defaults:
- a. creates a material risk to public safety or to the environment;
 - b. creates a material risk of significant liability to third parties for the City; or
 - c. demonstrates a marked or persistent inability or unwillingness on the part of LRV Supplier to adhere to its obligations under the Supply Agreement.
- 1.161** “**Mean Time to Restore**” or “**MTTR**” means the statistical mean of the time taken to restore any product, component subsystem or system, or any combination thereof back to operational service, excluding the time required to diagnose the fault and to marshal personnel, equipment, and material to site.
- 1.162** “**Milestone Payment for Supplementary LRV**” means the payments that the City shall pay to the LRV Supplier in accordance with Appendix 9B.3.3 [*Payment for Supplementary LRVs*] of Schedule 9 [*Pricing and Payment*] for each Supplementary LRV.
- 1.163** “**Milestone Payments**” means the payments that the City shall pay to the LRV Supplier in accordance with Section 3 [*Milestone Payments*] of Schedule 9 [*Pricing and Payment*].
- 1.164** “**Minor Deficiency**” means a Deficiency, other than a Warranty Deficiency or Excluded Deficiency, that is not a Major Deficiency.
- 1.165** “**Negotiation Period**” has the meaning given in Section 1.3 [*Diligent Negotiation*] of Schedule 14 [*Dispute Resolution Procedure*].
- 1.166** “**No Motion**” means an LRV’s speed is 0.5 km/h or less.
- 1.167** “**Non-Resident**” means a Person that is, at the relevant time, a non-resident of Canada for the purposes of the Income Tax Act (Canada).
- 1.168** “**Notice**” has the meaning given in Section 13.1 [*Notices*] of the Supply Agreement.
- 1.169** “**Notice of Default**” means a notice from the City to the LRV Supplier specifying a Default.
- 1.170** “**Notice to Proceed**” or “**NTP**” means the effective date of this Supply Agreement.

- 1.171 “**Notified Party**” has the meaning given in Section 6.2 [*Procedure on Force Majeure Event*] of the Supply Agreement.
- 1.172 “**Notifying Party**” has the meaning given in Section 6.2 [*Procedure on Force Majeure Event*] of the Supply Agreement.
- 1.173 “**Open Source Materials**” means software code that is subject to license terms that require the software to be generally:
- a. disclosed in source code form to third parties;
 - b. licensed to third parties for the purpose of making derivative works; or
 - c. redistributable to third parties, at no charge, or that require attribution be given for the use of such software.
- 1.174 “**Operator**” means the Person that is selected by the City to operate and maintain the Valley Line LRT.
- 1.175 “**Option**” means the ability to purchase Spare Parts, Special Tools, and Supplementary LRVs pursuant to Section 1.2 [*Option Amounts*] and in accordance with Appendix 9B [*Options*] of Schedule 9 [*Pricing and Payment*].
- 1.176 “**Option Payment**” means the amount owing for payment of an Option for Spare Parts, Special Tools, and Supplementary LRVs, in accordance with Appendix 9B.3 [*Option Payments*] of Schedule 9 [*Pricing and Payment*].
- 1.177 “**Other Contractor**” means a City Person or other contractor or consultant that is engaged in the performance of other work in relation to the Valley Line LRT, excluding Project Co and the Operator.
- 1.178 “**Own Forces Work**” has the meaning given in Section 4.1 [*Cost Plus Percentage Valuation*] in Schedule 13 [*Changes*].
- 1.179 “**Party**” means the LRV Supplier or the City, as applicable and “**Parties**” means both of them.
- 1.180 “**Passenger**” means a Person using Trains to travel in a manner consistent with intended use.
- 1.181 “**Passenger Experience**” means Passenger comfort, convenience, and satisfaction while boarding, riding, and exiting the LRV.
- 1.182 “**PDR Document List**” means the list contained in the Design Review Plan that lists all the documents to be submitted for PDR.
- 1.183 **DELETED.**
- 1.184 “**Performance Security**” means the Advance Payment and Performance Letter of Credit and the Warranty Letter of Credit and all other any and all security instruments, agreements or arrangements in any form, including without limitation guarantees, indemnities, performance bonds, payment bonds, letters of credit, letters of guarantee and security interests in real or personal property expressly required pursuant to this Supply Agreement.
- 1.185 “**Permitted Letter of Credit Provider**” means either:

- A. any Schedule I Bank whose senior debt subject to conversion under the Canadian bank recapitalization "bail-in" regime is rated by at least two of Standard and Poor's, Moody's, Fitch, or DBRS at or above the following levels, in each case without negative outlook:
- a. A- or higher by Standard and Poor's;
 - b. A3 or higher by Moody's;
 - c. A- or higher by Fitch;
 - d. A (low) by DBRS,
- or if no Schedule I Bank has such a credit rating, then:
- e. the then-highest rated Schedule I Bank, provided that such bank shall have a minimum rating of BBB or its equivalent from at least two Rating Agencies.

OR

- B. any Schedule II Bank:
- a. whose senior debt is rated by at least two of S&P, Moody's, Fitch or DBRS at or above the levels of Schedule I Banks, in each case without negative outlook, described in section A above, and
 - b. who maintains throughout the Term, to the satisfaction of the City, a branch in Edmonton or a corresponding bank relationship with a Schedule I Bank having a branch in Edmonton; and
 - c. the City, in its sole discretion, has approved as a Permitted Letter of Credit Provider Prior to NTP.

- 1.186** "Permitted Sub-licensee" has the meaning given in Section 18.4 [*Sub-licenses*] of the Supply Agreement.
- 1.187** "Person" means an individual, legal personal representative, corporation, body corporate, firm, partnership, trust, trustee, syndicate, joint venture, unincorporated organization, co-owners arrangement or other business entity.
- 1.188** "Platform" means that portion of the Station or Stop designated for Passengers to board and alight from Trains.
- 1.189** "Preliminary Design Certificate" means the certificate issued by the City in accordance with Section 4.1.3 H [*Design Review Process*] of Schedule 2 [*Submittal Requirements and Review Procedure*].
- 1.190** "Preliminary Design Review" or "PDR" means a formal review to Accept that the planned technical approach will meet the requirements of the Supply Agreement. It evaluates the readiness of the design to proceed with detailed design.
- 1.191** "Preventive Action" means action to eliminate the cause of a potential Deficiency or other undesirable situation in order to prevent its occurrence.
- 1.192** "Primary LRV Warranty" has the meaning provided in Section 1 [*Warranties*] of Schedule 7 [*Warranty*].

- 1.193** “**Professional Engineer**” means a professional engineer licensed by the APEGA to practice in the Province of Alberta.
- 1.194** “**Prohibited Act**” has the meaning given in Section 16.3 [*Lobbying, Corrupt Practices and Other Prohibited Acts*] of the Supply Agreement.
- 1.195** “**Progress Report**” means a report as set out in Section 1.4 [*Progress Reports*] of Schedule 3 [*Design and Manufacturing Protocols*].
- 1.196** “**Project Co**” means Marigold Infrastructure Partners Limited Partnership.
- 1.197** “**Project Documents**” means this Supply Agreement and the Performance Security; and “**Project Document**” means any one of such Project Documents.
- 1.198** “**Project Manager**” means the Key Individual identified in Section 2.4 [*Project Manager*] of Schedule 10 [*Representatives and Key Individuals*].
- 1.199** “**Project Records**” means any Record created or collected pursuant to this Supply Agreement or any Project Document and includes any document, information, data, plan, record, report, appendix, specification, schedule, procedure, protocol, design package, calculation, drawing, graph, and model created for the Work, and all other forms of communication from the LRV Supplier, and their Subcontractors, to the City.
- 1.200** “**QMS Team**” means the personnel responsible for managing, applying, and enforcing the QMS throughout the Work and is comprised of those listed in Section 2.3.1 [*General*] of Schedule 3 [*Design and Manufacturing Protocols*].
- 1.201** “**Qualified Insurers**” means reputable insurers of good standing in Canada, the United States, the United Kingdom, Europe or Australia having a credit rating of
- a. A- or better for three out of the previous five years but no lower than B during the previous five years and a Financial Size Category not lower than VII by AM BEST;
 - b. A- for three out of the previous five years but not less BBB during those five years in respect of long-term financial strength or A-3 for three out of the previous five years but not less than BB+ at any time during those five years in respect of short-term financial strength by Standard and Poor’s;
 - c. the equivalent thereof by any other recognized insurance rating agency; or
 - d. an insurer acceptable to the City, acting reasonably.
- 1.202** “**Quality**” means the totality of characteristics of a product or service that bear on its ability to satisfy stated and implied requirements or needs.
- 1.203** “**Quality Assurance**” or “**QA**” means all the planned and systematic actions and processes needed to provide adequate confidence that products or services will fulfill the requirements of the Supply Agreement for Quality.
- 1.204** “**Quality Audit**” means the systematic, independent, and documented process for obtaining information to verify the proper operation of the Quality Management System.

- 1.205** “**Quality Director**” means the Key Individual described in Section 2.7 [*Quality Director*] of Schedule 10 [*Representatives and Key Individuals*].
- 1.206** “**Quality Management System**” or “**QMS**” means the organizational structure, responsibilities, procedures, processes and resources necessary to manage the quality function effectively for the Work in accordance with Section 2 [*Quality Assurance*] of Schedule 3 [*Design and Manufacturing Protocols*].
- 1.207** “**Quality Management System Report**” is the report described in Section 2.2.5 [*Quality Management System Report*] of Schedule 3 [*Design and Manufacturing Protocols*].
- 1.208** “**Quality Managers**” means the quality personnel described in Section 2.3.2 [*Quality Managers*] of Schedule 3 [*Design and Manufacturing Protocols*].
- 1.209** “**Quality Manual**” means the manual described in Section 2.2.2 [*Quality Manual*] of Schedule 3 [*Design and Manufacturing Protocols*].
- 1.210** “**Quality Objectives**” means the objectives related to Quality that are measurable and consistent with the Quality Policy and which are to be formally expressed and recorded in the Quality Manual in accordance with Section 2.2.2 [*Quality Manual*] of Schedule 3 [*Design and Manufacturing Protocols*].
- 1.211** “**Quality Policy**” means the overall intentions and direction of the LRV Supplier related to quality of the Work that are formally expressed and recorded in the Quality Manual, in accordance with Section 2.2.2 [*Quality Manual*] of Schedule 3 [*Design and Manufacturing Protocols*], and as further defined in the ISO 9000 series standard.
- 1.212** “**Quality Records**” means the Records described in Section 2.4.6 [*Quality Records*] of Schedule 3 [*Design and Manufacturing Protocols*].
- 1.213** “**RAMS Program**” means the program, described in Section 3.1 [*RAMS Program*] of Schedule 3 [*Design and Manufacturing Protocols*], to ensure the Work fulfills the reliability, availability, maintainability, and safety requirements of the Supply Agreement.
- 1.214** “**Rebuttal Submission**” has the meaning given in Section 3.4 [*Referee Submissions*] of Schedule 14 [*Dispute Resolution Procedure*].
- 1.215** “**Receiving Party**” has the meaning given in Section 1.2 [*Dispute Notice and Response*] of Schedule 14 [*Dispute Resolution Procedure*].
- 1.216** “**Record**” has the meaning given to it in the Freedom of Information and Protection of Privacy Act (Alberta).
- 1.217** “**Record of Comments and Observations Form**” or “**ROCO Form**” has the meaning given in Section 3.5 [*Record Of Comments and Observations (ROCO) Form*] of Schedule 2 [*Submittal Requirements and Review Procedure*].
- 1.218** “**Rectification Period**” has the meaning given in Section 2.2 [*Rectification*] of Schedule 7 [*Warranty*].
- 1.219** “**Rectification Plan**” has the meaning given in Section 2.2C [*Rectification*] of Schedule 7 [*Warranty*].
- 1.220** “**Referees**” has the meaning given in Section 2.1 [*Appointment of Referees*] of Schedule 14 [*Dispute Resolution Procedure*].

- 1.221** “**Referee Initiating Party**” has the meaning given in Section 3.2 [*Referee Selection*] of Schedule 14 [*Dispute Resolution Procedure*].
- 1.222** “**Referee Notice**” has the meaning given in Section 3.1 [*Referee Notice*] of Schedule 14 [*Dispute Resolution Procedure*].
- 1.223** “**Referee Receiving Party**” has the meaning given in Section 3.2 [*Referee Selection*] of Schedule 14 [*Dispute Resolution Procedure*].
- 1.224** “**Reference Wheelchair**” means a wheelchair with dimensions described in Section 1.6.5 [*Reference Wheelchair Space and Movement Requirement*] of Schedule 4 [*Technical Requirements*].
- 1.225** “**Rejected**” has the meaning given in Section 3.7.3 [*Submittal Endorsed “Rejected”*] of Schedule 2 [*Submittal Requirements and Review Procedure*].
- 1.226** “**Relief Event**” has the meaning given in Section 7 [*Relief Events*] of this Supply Agreement.
- 1.227** “**Response**” has the meaning given in Section 1.2 [*Dispute Notice and Response*] of Schedule 14 [*Dispute Resolution Procedure*].
- 1.228** “**Restricted Person**” means any Person who (or any member of a group of persons acting together, any one of which):
- a. has, directly or indirectly, its principal or controlling office in a country that is subject to any economic or political sanctions imposed by Canada for reasons other than its trade or economic policies;
 - b. is or has been involved in the illegal manufacture, sale, distribution or promotion of narcotic substances or arms, or is or has been involved in the promotion, support or carrying out of terrorism;
 - c. in the case of an individual, he or she (or in the case of a legal entity, any of the members of the board of directors or its senior executive managers) has been sentenced to imprisonment or otherwise given a custodial sentence (other than a suspended sentence) for any criminal offence (other than minor traffic offences or misdemeanours) less than 5 years prior to the date at which the determination of whether the Person falls within this definition is being made;
 - d. has as its primary business the acquisition of distressed assets or investments in companies or organizations which are or are believed to be insolvent or in a financial standstill situation or potentially insolvent;
 - e. is subject to any claim of the City or the Province of Alberta in any proceedings (including regulatory proceedings) which have been concluded or are pending at the time at which the determination of whether the Person falls within this definition is being made and which (in respect of any such pending claim, if it were to be successful) would, in the City’s view, in either case, be reasonably likely to materially affect the ability of the LRV Supplier to perform its obligations under this Supply Agreement; or
 - f. has been convicted of an offence under the *Proceeds of Crime (Money Laundering) and Terrorist Financing Act* (Canada), or has been convicted of the commission of a money laundering offence or a terrorist activity financing offence under the *Criminal Code* (Canada).

- 1.229** “**Revenue Service**” means that the Train is in the state of being in passenger service operation on the Valley Line LRT.
- 1.230** “**Review Period**” has the meaning given in Section 3.4 [*Time for City Review*] of Schedule 2 [*Submittal Requirements and Review Procedure*].
- 1.231** “**Review Procedure**” means the procedure set out in Section 3 [*Submittal Review Process*] of Schedule 2 [*Submittal Requirements and Review Procedure*].
- 1.232** “**RFP**” means the sourcing event No 2883070326 issued by the City on March 15, 2021, in respect of the Supply Agreement.
- 1.233** “**RFQ**” means the sourcing event No 2709919135 for the Valley Line West Light Rail Vehicles Project issued by the City on November 23, 2020.
- 1.234** “**Routine Tests**” refers to all the tests required to demonstrate that the equipment at LRU, system and vehicle levels meets the functional and operational requirements of the Work and “Routine Testing” shall have a corresponding meaning.
- 1.235** “**Sensitive Information**” has the meaning given in Section 13.7 [*Public Disclosure of Agreement*] of the Supply Agreement.
- 1.236** “**Service Training**” means the portion of training that occurs after the delivery of the first LRV, in accordance with Section 10.4.1G [*Training Programs*] of Schedule 3 [*Design and Manufacturing Protocols*], that trains the Drivers and maintainers.
- 1.237** “**Services Contract**” means the contract between the Operator and the City for, inter alia, the operation and maintenance of the Valley Line West LRT.
- 1.238** “**Software**” means a computer program, whether in object code or otherwise but excluding any Source Code Materials, or compilation of data that is fixed in any medium of expression or any storage medium from which the program may be perceived, reproduced, run, or otherwise communicated, whether directly or indirectly, including, using a device, program or feature that reads computer code, that is:
- a. a component of the Work;
 - b. integrated with, embedded in, forms part of, or is otherwise required in order to use, support, maintain, modify or otherwise exploit any component of the Work; or
 - c. otherwise provided by the LRV Supplier in connection with the Work, and any upgrades or revisions of such software that the LRV Supplier provides in fulfilment of a specific written commitment or otherwise.
- 1.239** “**Source Code Materials**” means the human readable version of any Software, from which the object code, or other usable, version of the Software may be derived following compilation, assembly or other change, recorded in printed format or on any medium of expression or any storage medium containing no passwords or other devices that would prevent or prohibit the use of the source code, with, as applicable, commentary, instructions, programmer specifications, notes (technical or otherwise), manuals, quick reference guides, tutorial literature, explanations, annotations and other documentation including without limitation, general flow charts, input and output layouts, field descriptions, volumes and sort sequences, data dictionary, file layouts, calculation formulae and

details of all algorithms and all software, compilers and developer's tools required to compile and generate object or other usable code.

- 1.240** “**Spare Parts**” means those spare parts and replacement components which are identified in the Spare Parts List.
- 1.241** “**Spare Parts Acceptance**” means that the Spare Parts satisfies all the requirements stated in Section 9.4.8 [*Conditions Precedent to Spare Parts Acceptance*] of Schedule 3 [*Design and Manufacturing Protocols*].
- 1.242** “**Spare Parts Acceptance Certificate**” means the certificate issued by the City certifying that a Spare Part has been Accepted.
- 1.243** “**Spare Parts Acceptance Inspection**” means an inspection conducted in accordance with Section 2.6.16 [*Spare Parts Acceptance Inspection*] of Schedule 3 [*Design and Manufacturing Protocols*].
- 1.244** “**Special Tools**” means equipment and tooling designed specifically to maintain the LRV, including DTE, and supplied as part of the Work.
- 1.245** “**Special Tool Acceptance**” means that the Special Tools satisfies all the requirements stated in Section 9.4.6 [*Conditions Precedent to Special Tools Acceptance*] of Schedule 3 [*Design and Manufacturing Protocols*].
- 1.246** “**Special Tool Acceptance Certificate**” means the certificate issued by the City certifying that the Special Tool has been Accepted.
- 1.247** “**Special Tool Acceptance Inspection**” means an inspection conducted in accordance with Section 2.6.15 [*Special Tool Acceptance Inspection*] of Schedule 3 [*Design and Manufacturing Protocols*].
- 1.248** “**Stage 1 LRV**” means an LRV procured under the Valley Line LRT Stage 1 contract.
- 1.249** “**Stage 2 LRV OMF-B Design Criteria**” means the document created by Project Co detailing the required LRV information to design and manufacture the Maintenance Facilities.
- 1.250** “**Standard Due Diligence**” means the reasonable due diligence investigations and enquiries that would ordinarily be conducted by an experienced contractor entering into a contract for work similar to the Work taking into account the information in the Disclosed Data as well as information that is reasonably identifiable:
- a. by an experienced supplier that could have been made by a Person earnestly trying to understand a topic or mitigate a potential issue and any restrictions and limitations on the conduct of supplemental due diligence expressly set out in the RFP or necessarily arising from the terms and conditions of the RFP including the procurement timetable; or
 - b. using means available to the experienced supplier (e.g. online materials through google searches) or other inquiries that reasonably could have been made by a Person earnestly trying to understand a topic or mitigate a potential issue.
- 1.251** “**Station**” means a location where Trains will pick up or drop off Passengers on an elevated Platform at which utilization of stairs, elevators and/or escalators is required to access the Platform.

- 1.252** “**Stop**” means a location where Trains will pick up or drop off Passengers at-grade, where only ramps are required to access the Platform.
- 1.253** “**Subcontract**” means a contract entered into by the LRV Supplier or a Sub-contractor of any tier, with one or more Persons in connection with the carrying out of the LRV Supplier’s obligations under the Supply Agreement, as such Subcontract may be amended or replaced from time to time.
- 1.254** “**Sub-contractors**” or “**Subcontractors**” means any subcontractor of the LRV Supplier engaged by or through the LRV Supplier to perform any of the Work, including any subcontractor at any tier.
- 1.255** “**Submittal**” has the meaning given in Section 1.1 [*Application*] of Schedule 2 [*Submittal Requirements and Review Procedure*].
- 1.256** “**Submittal Register**” has the meaning given in Section 2 [*Submittal Register*] of Schedule 2 [*Submittal Requirements and Review Procedure*].
- 1.257** “**submitted**” means submitted in accordance with the Review Procedure and “submit” shall have a corresponding meaning.
- 1.258** “**Supplementary LRV**” means any LRV that exceeds the quantity included in the Base Order and that is purchased as an Option pursuant to Section 1.2 [*Option Amounts*] and in accordance with Appendix 9B [*Options*] of Schedule 9 [*Pricing and Payment*].
- 1.259** “**Supplementary LRV Milestone Payment Amount**” means the sum of all Supplementary LRV Payment Milestones pursuant to *Table 9B-1: Supplementary LRV Payment Milestones* of Appendix 9B.3.3 C [*Payment for Supplementary LRVs*] to Schedule 9 [*Pricing and Payment*].
- 1.260** “**Supplementary LRV Milestone Payment Value**” means the percentage that will be paid in respect of a Supplementary LRV Payment Milestone pursuant to *Table 9B-1: Supplementary LRV Payment Milestones* of Appendix 9B.3.3 [*Payment for Supplementary LRVs*] to Schedule 9 [*Pricing and Payment*].
- 1.261** “**Supplementary LRV Payment Milestone**” means the milestones listed in *Table 9B-1: Supplementary LRV Payment Milestones* of Appendix 9B.3.3 C [*Payment for Supplementary LRVs*] of Schedule 9 [*Pricing and Payment*] that will be the basis of payment for each Supplementary LRV.
- 1.262** “**Supply Agreement**” means this agreement entered into between the City and the LRV Supplier, including all schedules, appendices and attachments thereto, as amended, supplemented or restated from time to time.
- 1.263** “**Sustainable Urban Integration**” or “**SUI**” means a focus on the mutually-supportive integration of the infrastructure into the urban context within which it exists.
- 1.264** “**Surrebuttal Submission**” has the meaning given in Section 3.4 [*Referee Submissions*] of Schedule 14 [*Dispute Resolution Procedure*].
- 1.265** “**Taxes**” means any and all taxes, levies, imposts, duties, fees, withholdings, assessments, deductions or whatsoever, imposed, assessed, levied or collected by any Governmental Authority, together with interest thereon and penalties with respect thereto, and includes all GST and HST except where stated to the contrary.

- 1.266** “**Technical Manual Completion Certificate**” means the certificate issued by the City once the requirements of Section 10.1 [*Technical Manuals*] of Schedule 3 [*Design and Manufacturing Protocols*] have been met.
- 1.267** “**Term**” means that period of time commencing at NTP and ending on the Expiry Date.
- 1.268** “**Termination**” means termination of this Supply Agreement by the City or the LRV Supplier pursuant to Section 12 [*Termination*] of the Supply Agreement prior to the Expiry Date.
- 1.269** “**Termination Date**” means the date of Termination pursuant to Section 12 [*Termination*] of the Supply Agreement.
- 1.270** “**Termination Event**” has the meaning given in Section 11.8 [*Termination Events*] of the Supply Agreement.
- 1.271** “**Termination for LRV Supplier Default**” has the meaning given in Section 12.1 [*Termination by the City*] of the Supply Agreement.
- 1.272** “**Termination for Convenience**” has the meaning given in Section 12.1 [*Termination by the City*] of the Supply Agreement.
- 1.273** “**Termination Payment**” means a payment to be made by the City or the LRV Supplier pursuant to Section 12.4 [*Consequences of Termination*] of the Supply Agreement.
- 1.274** “**Test Procedures**” means those procedures prepared by the LRV Supplier pursuant to Section 8.2.2 [*Test Procedures*] of Schedule 3 [*Design and Manufacturing Protocols*].
- 1.275** “**Third Party IP**” means Intellectual Property that is not City IP or LRV Supplier IP.
- 1.276** “**Third Party Software**” is Software that is Third Party IP.
- 1.277** “**Total Milestone Payment Amount**” means the cumulative sum of all Base Order Payment Milestones pursuant to Table 1: Base Order Payment Milestones, Milestone Payment Value, and Milestone Payment Amounts of Section 3.2 A of Schedule 9 [*Pricing and Payment*]. This amount is equivalent to the Capital Cost Amount, as set out in Section 1.1 A of Schedule 9 [*Pricing and Payment*].
- 1.278** “**Total Milestone Payment Value**” means the cumulative percentage of the Capital Cost Amount that will be paid in respect of a particular Base Order Payment Milestone pursuant to *Table 1: Base Order Payment Milestones, Milestone Payment Value, and Milestone Payment Amounts* of Section 3.2 A of Schedule 9 [*Pricing and Payment*].
- 1.279** “**Train**” means one or more LRVs operating as a single unit.
- 1.280** “**Train Control System**” or “**TCS**” means a Vital system for enforcement of train separation, in which the governing devices are activated by the movements of Trains into and out of specified limits of Track.
- 1.281** “**Train Delay**” means an incident or failure on the Valley Line LRT which causes any of the following:
- a. a delay, or delays, of an individual Train operating in Revenue Service, or multiple Trains operating in Revenue Service, that cumulatively exceed ten minutes at any point on the line;

- b. a Train operating in Revenue Service to be canceled either at its original terminus or en route;
- c. a Train operating in Revenue Service to be rerouted; or
- d. an unscheduled reduction of the consist size of a Train operating in Revenue Service.

- 1.282** “**Training Program Completion Certificate**” means the certificate issued by the City once the requirements of Section 10.4 [*Training Programs*] of Schedule 3 [*Design and Manufacturing Protocols*] have been met.
- 1.283** “**TransEd Partners**” means the consortium that entered into a contract with the City to design, build, finance, operate, maintain and rehabilitate Valley Line LRT Stage 1.
- 1.284** “**Type Test**” means the conformance testing, and associated activities, used to validate that the Work complies with the requirements of the Supply Agreement.
- 1.285** “**Valley Line LRT**” means the full line from Mill Woods to Lewis Farms, including both Valley Line LRT Stage 1 and Valley Line LRT Stage 2.
- 1.286** “**Valley Line LRT Stage 1**” or “**Valley Line SE LRT**” means the portion of the Valley Line from Mill Woods to Downtown that is currently under construction and expected to be in operation during the Term that is described in Section 1.1.3 [*Description of the Valley Line LRT Stage 1*] of Schedule 4 [*Technical Requirements*].
- 1.287** “**Valley Line LRT Stage 2**” or “**Valley Line West LRT**” means that portion of the Valley Line LRT from Downtown to Lewis Farms that is being construction by Project Co as described in Section 1.1.4 [*Description of the Valley Line LRT Stage 2*] of Schedule 4 [*Technical Requirements*].
- 1.288** “**Vigilance Device**” means the device described in Section 3.3.4 [*Vigilance System*] of Schedule 4 [*Technical Requirements*].
- 1.289** “**Vital**” means safety-critical and is applied to a system or a function, whereby every identified failure mode (or combinations of failures where the first failure is undetected) of the function or system which can lead directly to a Category I or II hazard shall be mitigated by forcing the system to assume a state known to be safe. This is to be interpreted as the function or system providing an equivalent level of safety as Safety Integrity Level (SIL) 4 as defined within IEC 61508.
- 1.290** “**VLW Operations & Maintenance Concept**” means the most current version of the Draft Operations & Maintenance Concept document located in the Data Room that provides details about the intended operations and maintenance of the Valley Line LRT.
- 1.291** “**VLW Service Commencement Date**” means June 30, 2027.
- 1.292** “**Voice Radio System**” means the radio system provide by Project Co that provides voice communication between the LRV and the wayside.
- 1.293** “**Warranty**” means the warranty provided by the LRV Supplier pursuant to Section 1 [*Warranties*] of Schedule 7 [*Warranty*] for the Work.
- 1.294** “**Warranty Deficiency**” means any Deficiency that occurs during the Warranty Period but does not include Excluded Deficiencies.

- 1.295** “**Warranty Letter of Credit**” has the meaning given in Section 17.4 [*Warranty Letter of Credit*] of the Supply Agreement.
- 1.296** “**Warranty Notice**” means the notification from the City to the LRV Supplier, informing the LRV Supplier that a Warranty Deficiency has been identified.
- 1.297** “**Warranty Period**” means the periods of time for which Warranty is applicable to each component of the Work as outlined in subsection C of Section 1 [*Warranties*] of Schedule 7 [*Warranty*].
- 1.298** “**Warranty Spares**” means the spare parts kept by the LRV Supplier to be used to rectify Warranty Deficiencies.
- 1.299** “**Wi-Fi O&M Data Radio System**” means the data radio system that provides data communications between the LRV and the wayside.
- 1.300** “**Work**” means, depending on context, at least one of:
- a. all the obligations of the LRV Supplier under this Supply Agreement, including but not limited to design, manufacturing, shipping, delivering, and commissioning of the LRVs, Spare Parts and Special Tools, including loading and unloading, testing, scheduling, Submittals, rectifying Deficiencies, furnishing of all equipment, items, materials, parts, systems, data, design, services, Warranty Spares, and other matters and things necessary or the required labour and management to be done by the LRV Supplier, in each case pursuant to this Supply Agreement; and
 - b. the LRVs, Spare Parts and Special Tools, and other deliverables resulting from the foregoing activities or otherwise created pursuant to this Supply Agreement.

SECTION 2: INTERPRETATION

2.1 WAIVER OF CONTRA PROFERENTUM

- A. The parties waive the application of any rule of law which otherwise would be applicable in connection with the construction of the Supply Agreement that ambiguous or conflicting terms or provisions should be construed against the party who (or whose counsel) prepared the executed Supply Agreement or any earlier draft of the same, or against the party benefiting from such terms or provisions.

2.2 HEADINGS

- A. The tables of contents, headings, marginal notes and references to them in the Supply Agreement are for convenience of reference only, shall not constitute a part of the Supply Agreement, and shall not be taken into consideration in the interpretation of, or affect the meaning of, the Supply Agreement.

2.3 SCHEDULES AN INTEGRAL PART

- A. The Schedules to the Supply Agreement are an integral part of the Supply Agreement and a reference to the Supply Agreement includes a reference to the Schedules.

2.4 SCHEDULE REFERENCES

- A. All references in the Supply Agreement to a Schedule shall be to a Schedule of the Supply Agreement. All references to Sections within a Schedule refer to Sections within that Schedule unless otherwise indicated.

2.5 CROSS REFERENCES

- A. Except where the context requires otherwise (irrespective of whether some, but not all, references in a Schedule specifically refer to that Schedule or to other portions of the Supply Agreement) references to specific Sections, Clauses, Paragraphs, Subparagraphs, Schedules, and other divisions of the Supply Agreement are references to such Sections, Clauses, Paragraphs, or Subparagraphs of, Schedules to, or divisions of the Supply Agreement and the terms Section and Clause are used interchangeably and are synonymous.
- B. Except where the context requires otherwise, references to specific Sections, Clauses, Paragraphs, Subparagraphs, Schedules, and other divisions of the Supply Agreement followed by a number are references to the whole of the Section, Clause, Paragraph, Subparagraphs, Schedule or other division of the Supply Agreement as applicable, bearing that number, including all subsidiary provisions containing that same number as a prefix.

2.6 DEFINED TERMS

- A. All capitalized terms used in the Supply Agreement shall have the meanings given to such terms in this Schedule 1 [*Definitions and Interpretation*] unless stated otherwise in a particular Schedule in which case such definition shall have the meaning given to it in that Schedule solely for the purposes of that Schedule.

2.7 DIRECTION TO LRV SUPPLIER

- A. The language of Schedule 4 [*Technical Requirements*] and other documents comprising the Supply Agreement is in many cases written in the imperative for brevity. Clauses containing instructions, directions or obligations are directed to the LRV Supplier and shall be construed and interpreted as if the words LRV Supplier shall immediately preceded the instructions, directions or obligations.

2.8 REFERENCE TO PERSON OR PARTIES

- A. Words importing persons or parties are to be broadly interpreted and include an individual, corporation, limited liability company, joint stock company, firm, partnership, joint venture, trust, unincorporated organization, Governmental Authority, unincorporated body of persons or association and any other entity having legal capacity, and the heirs, beneficiaries, executors, administrators or other legal representatives of a person in such capacity.

2.9 GENDER AND NUMBER

- A. Unless the context otherwise requires, wherever used herein the plural includes the singular, the singular includes the plural, and each of the masculine, feminine and neuter genders include all other genders.

2.10 ACCOUNTING TERMS

- A. Unless otherwise provided in the Supply Agreement, all accounting and financial terms used in the Supply Agreement shall be interpreted and applied in accordance with Canadian GAAP.

2.11 REFERENCES TO DOCUMENTS

- A. References to any standard, principle, agreement or document include (subject to all relevant approvals and any other provisions of the Supply Agreement concerning amendments) a reference to that standard, principle, agreement or document as amended, supplemented, restated, substituted, replaced, novated or assigned.

2.12 REFERENCES TO APPLICABLE LAW

- A. References to any Applicable Law, including any statutes or other Applicable Law specifically referred to herein, whether or not amendments or successors to such Applicable Law are referred to herein, are to be construed as references to that Applicable Law as from time to time amended or to any Applicable Law covering the same or similar subject matter from time to time replacing, extending, consolidating or amending the same.

2.13 REFERENCE TO STATUTES

- A. References to a statute shall include all regulations, by-laws, ordinances and orders made under or pursuant to the statute.

2.14 SUCCESSORS AND ASSIGNS

- A. References to Persons shall include their successors and assigns.

2.15 REFERENCE TO PUBLIC ORGANIZATIONS

- A. References to a public organization shall include their successors and assigns, and if a public organization ceases to exist or ceases to perform its functions without a successor or assign, references to such public organization shall be deemed to include a reference to any public organization or any organization or entity which has taken over either or both the functions and responsibilities of such public organization.

2.16 REFERENCE TO OFFICE OF A GOVERNMENTAL BODY

- A. Each reference to a minister, ministry, office, branch, agency, board, commission or similar body of any Governmental Authority shall be deemed to be a reference to any successor or replacement in function of such minister, ministry, office, branch, agency, board, commission, or similar body.

2.17 REFERENCE TO CORPORATE ENTITY

- A. Any reference to a corporate or other legal entity includes and is also a reference to any entity that is a successor to such entity.

2.18 REFERENCE TO STATUTORY OR PUBLIC DUTIES OR FUNCTIONS

- A. References to statutory or public duties or functions are references to such duties or functions (including powers and discretions) from time to time and include any common law duties and functions (including powers and discretions).

2.19 REFERENCE TO RIGHT OR DUTY OF A GOVERNMENTAL AUTHORITY

- A. A reference in the Supply Agreement or in any Project Contract to any right, power, obligation or responsibility of any Governmental Authority shall be deemed to be a reference to the Governmental Authority that, pursuant to Applicable Law has such right, power, obligation or responsibility at the relevant time.

2.20 REFERENCE TO DELIBERATE OR NEGLIGENT ACTS OR OMISSION

- A. References to a deliberate act or omission or deliberate or negligent act or omission of any City Person shall be construed having regard to the interactive nature of the activities of the City Persons and LRV Supplier and further having regard to:
 - 1. acts contemplated by the Supply Agreement;
 - 2. acts or omissions in the ordinary course of the governmental activities of the City and expressly or reasonably inferred from the Supply Agreement to be taken into account by the LRV Supplier in the performance of the Work; or
 - 3. acts otherwise provided for in the Supply Agreement.

2.21 NATURAL MEANING

- A. The words in the Supply Agreement shall bear their natural meaning.

2.22 SEPARATE OBLIGATIONS

- A. Each of LRV Supplier's and the City's respective obligations shall be construed as separate obligations owed to the other.

2.23 WORDS OF INCLUSION

- A. References containing terms such as:
 - 1. hereof, herein, hereto, hereinafter, and other terms of like import are not limited in applicability to the specific provision within which such references are set forth but instead refer to the Supply Agreement taken as a whole; and

1. includes and including, whether or not used with the words without limitation or but not limited to, shall not be deemed limited by the specific enumeration of items but shall, in all cases, be deemed to be without limitation and construed and interpreted to mean includes without limitation and including without limitation.

2.24 EJUSDEM GENERIS

- A. In construing the Supply Agreement, the rule known as the ejusdem generis rule shall not apply nor shall any similar rule or approach apply to the construction of the Supply Agreement and, accordingly, general words introduced or followed by the word other or including or such as or in particular shall not be given a restrictive meaning because they are followed or preceded (as the case may be) by particular examples intended to fall within the meaning of the general words.

2.25 PERFORMANCE TO STANDARDS

- A. Any requirement for anything or action to be “in accordance with”, “in conformity with” or “in compliance with” any standard, code, criteria, specification or other requirement or stipulation, and any requirement expressed using words or phrases of similar import, means that such thing or action is to exceed or at least equal that standard, code, criteria, specification or other requirement or stipulation.

2.26 WHEN OBLIGATIONS ARE TO BE PERFORMED

- A. Where the Supply Agreement states that an obligation shall be performed no later than or within or by a stipulated date or event which is a prescribed number of days after a stipulated date or event, the latest time for performance shall be 5:00 p.m. on the last day for performance of the obligation concerned, or, if that day is not a Business Day, 5:00 p.m. on the next Business Day.
- B. Where the Supply Agreement states that an obligation shall be performed no later than or by a prescribed number of days before a stipulated date or event or by a date which is a prescribed number of days before a stipulated date or event, the latest time for performance shall be 5:00 p.m. on the last day for performance of the obligation concerned, or if that day is not a Business Day, 5:00 p.m. on the next Business Day.
- C. Where the Supply Agreement states that an obligation shall be performed on a stipulated date, the latest time for performance shall be 5:00 p.m. on that day, or, if that day is not a Business Day, 5:00 p.m. on the next Business Day.
- D. Where the Supply Agreement stipulates neither a time nor date for the performance of an obligation or delivery of a document, the latest time for performance or delivery shall be 5:00 p.m. on the day of performance or delivery, or, if that day is not a Business Day, 5:00 p.m. on the next Business Day.

2.27 TIME

- A. Any reference to time of day or date means the local time or date in Edmonton, Alberta.
- B. Unless otherwise indicated, time periods will be strictly construed.

2.28 PERFORMANCE OF OBLIGATIONS

- A. Unless otherwise specified in the Supply Agreement, the Parties shall each perform all of their obligations under the agreement taking, in good faith and with due diligence, all commercially reasonable steps to achieve the objective and to perform the obligation, including doing all that can reasonably be done in the circumstances taking into account each Party’s obligations hereunder to mitigate delays and additional costs to the other Party, and in any event taking no less steps and efforts

than those that would be taken by a commercially reasonable and prudent Person in comparable circumstances but where the whole of the benefit of the obligation and where all the results of taking such steps and efforts accrued solely to that Person's own benefit, provided that the foregoing will not require the City to:

1. take any action which is contrary to the public interest, as determined by the City in its discretion; or
2. undertake any mitigation measure that might be available arising out of its status as a public body that would not normally be available to a private commercial party.

2.29 MANDATORY PROVISIONS

- A. Whenever the terms will or shall are used in the Supply Agreement in relation to LRV Supplier or the City they shall be construed and interpreted as synonymous and to read LRV Supplier shall or the City shall as the case may be.

2.30 COSTS

- A. Without limiting Schedule 9 [*Pricing and Payment*], whenever the Supply Agreement obliges the City to pay any amount to the LRV Supplier in respect of any costs, expenses, fees, charges, liabilities, losses, claims or other sums incurred by LRV Supplier:
1. such obligation shall be construed as applying only to so much of such sums as have been properly incurred on an arm's length commercial basis or, where not incurred on an arm's length commercial basis (including when the payment is made to an Affiliate of LRV Supplier), so much of them as are proper and reasonable; and
 2. The LRV Supplier shall, when requested by the City, provide reasonable supporting evidence of such costs, expenses, fees, charges, liabilities, losses, claims or other sums and of the actions taken by LRV Supplier to mitigate the same.

2.31 CURRENCY

- A. Any reference to currency is to Canadian currency and any amount advanced, paid, or calculated is to be advanced, paid or calculated in Canadian currency.

2.32 UNIT OF MEASUREMENT

- A. Unless otherwise identified in the Supply Agreement, all units of measurement in any documents submitted by the LRV Supplier to the City shall be in accordance with the SI system of units.

2.33 TECHNICAL TERMS

- A. Terms not defined herein and used in the Supply Agreement which have a technical meaning commonly understood by the public light rail transit sector, as applicable, in Alberta will be construed as having that meaning unless the context otherwise requires.

2.34 INFERABLE

- A. The terms properly inferable, readily apparent and readily discoverable as used in the Supply Agreement, in respect of the Work, shall be interpreted by taking into consideration LRV Supplier's and any LRV Supplier Persons' experience and the investigations, inspections and examinations of the

Disclosed Data carried out by LRV Supplier or by any LRV Supplier Person during the RFP process or other due diligence; and by taking into consideration reasonable, normal course and industry standard investigations, inspections or other due diligence; in each case in accordance with Good Industry Practice.

2.35 KNOWLEDGE OF CITY

- A. The City shall not be imputed with knowledge of any fact, matter or thing unless that fact, matter or thing is within the actual knowledge of the City's Representative or within the actual knowledge of those of the City's employees and agents who have responsibilities in connection with the conduct of the Project or the Work.

2.36 KNOWLEDGE OF LRV SUPPLIER

- A. Without limiting the extent of its actual knowledge, the LRV Supplier shall for all purposes of this Supply Agreement be deemed to have such knowledge in respect of the Project and the Work as is held (or ought reasonably to be held) by all persons involved in carrying out the Work, including the LRV Supplier and Subcontractors.

2.37 DECISION OF THE CITY OR THE CITY'S REPRESENTATIVE

- A. Where in the Supply Agreement the City, City's Representative or any City Person is entitled to make a decision or determination or to grant or withhold any consent, approval or acceptance or to exercise any judgement (in this Section, any such decision, determination, grant, withholding or exercise is referred to as a "City Decision") in its "discretion", it shall mean that the City, City's Representative or applicable City Person, as the case may be, shall be entitled to make the relevant City Decision in its sole, absolute, unfettered and subjective discretion, with no requirement to act reasonably or provide reasons.

2.38 SEVERABILITY

- A. Each provision of the Supply Agreement shall be valid and enforceable to the fullest extent permitted by law. If any provision of the Supply Agreement is held to be invalid, unenforceable or illegal to any extent, such provision may be severed and such invalidity, unenforceability or illegality shall not prejudice or affect the validity, enforceability and legality of the remaining provisions of the agreement. If any such provision of the agreement is held to be invalid, unenforceable or illegal, the Parties shall promptly endeavour in good faith to negotiate new provisions to eliminate such invalidity, unenforceability or illegality and to restore the Supply Agreement as nearly as possible to its original intent and effect.

2.39 NO DEROGATION FROM LAWS

- A. No provision of the Supply Agreement is intended to derogate from or be inconsistent with or in conflict with any Applicable Law and no provision of the agreement shall be interpreted in a manner as to result in any such derogation, inconsistency or conflict and, if any such provision is found by a court of competent jurisdiction to be inconsistent with or in conflict with any Applicable Law, the Applicable Law shall prevail and such provision shall be read down or rendered inoperative (either generally or in such particular situation, as appropriate), to the extent of such conflict or inconsistency, as the case may be and, if any such provision is found by a court of competent jurisdiction to derogate from any Applicable Law, then such provision shall be read down or rendered inoperative (either generally or in such particular situation, as appropriate) to the extent of the derogation.

2.40 ENTIRE AGREEMENT

- A. The Supply Agreement is the entire agreement between the Parties regarding the subject matter of the Supply Agreement, and supersedes any previous agreements, negotiations and understandings. There are no agreements, representations, warranties, terms, conditions or commitments regarding the subject matter of the Supply Agreement except as expressed in the Supply Agreement.

2.41 NO AGENCY, ETC.

- A. The Supply Agreement is not intended to and does not constitute either Party as the agent of the other for any purpose, or otherwise create any relationship of agency; constitute or create any joint venture; constitute or create any partnership; constitute the relationship of landlord and tenant; or constitute the relationship of lender and borrower; and neither Party shall allege or assert for any purpose that the agreement constitutes or creates a relationship of agency, joint venture, partnership, landlord and tenant, or lender and borrower.

2.42 LIQUIDATED DAMAGES

- A. Where any provision of the Supply Agreement specifies or otherwise indicates an amount as liquidated damages, both the City and the LRV Supplier agree that such amount represents their genuine mutual pre-estimate of the particular damages arising from the particular event.

APPENDIX 1A: TECHNICAL ACRONYMS AND INITIALISMS

In this Supply Agreement, the following technical acronyms and initialisms shall have the following meanings, unless the context otherwise requires:

AAADS – Automatic Audio Announcement and Display System

AAR – Association of American Railroads

ABMA – American Bearing Manufacturers Association

AC – Alternating Current

AFRRCS – Alberta First Responder Radio Communications System

ANSI – America National Standards Institute

APC – Automatic Passenger Counter

APEGA – Association of Professional Engineers and Geoscientists of Alberta

APS – Auxiliary Power Supply

APTA – American Public Transportation Association

AREMA – American Railway Engineering and Maintenance-of-Way Association

ASME – American Society of Mechanical Engineering

ASTM – American Society of Testing Materials

AWX – weight of LRV

BS – British Standards

BTE – Bench Test Equipment

CAD – Computer Aided Drafting

CCOHS – Canadian Centre for Occupational Health and Safety

CCTV – Closed Circuit Television

CDL – Configuration Data List

CDR – Conceptual Design Review

CDRL – Contract Deliverables Requirements List

COTS – Commercial Off the Shelf

CSA – Canadian Standards Association

CWS – Contract Work Schedule

DC – Direct Current

DIN – Deutsches Institut für Normung

DQMP – Design Quality Management Plan

DTE – Diagnostic Test Equipment

EMC – Electromagnetic Compatibility

EMI – Electromagnetic Interference

EN – European Norm

FAI – First Article Inspection

FDR – Final Design Review

FMECA – Failure Modes, Effects, and Criticality Analyses

FRA – Federal Railroad Administration

FTA – Federal Transit Administration

GAAP – Generally Accepted Accounting Principle

GFCI – Ground-Fault Circuit Interrupter

GPS – Global Positioning System

HMI – Human Machine Interface

HSCB – High Speed Circuit Breaker

HVAC – Heating, Ventilating, and Air Conditioning

ICD – Interface Control Document

ICS – Integrated Control System

IEC – International Electrotechnical Commission

IEEE – Institute of Electrical and Electronics Engineers

IGBT – Insulated Gate Bipolar Junction Transistor

IK – Impact protection rating

IP – Internet Protocol

IP## – Ingress Protection with numbers representing the protection level

ISO – International Organization for Standardization

LED – Light Emitting Diode

LLRU – Lowest Line Replaceable Unit

LRT – Light Rail Transit

LRU – Line Replaceable Unit

LRV – Light Rail Vehicle

LVPS – Low Voltage Power Supply

MDBF – Mean Distance Between Failures

MDBTD – Mean Distance Between Train Delay

MDS – Monitoring and Diagnostic System

MQMP – Manufacturing Quality Management Plan

MTBF – Mean Time Between Failures

MTTR – Mean Time to Repair

NDT – Non-Destructive Testing

NEMA – National Electrical Manufacturers Association

NFPA – National Fire Protection Association

NTP – Notice to Proceed

NVR – Network Video Recorder

OCC – Operations Control Centre

OCS – Overhead Catenary System

OEM – Original Equipment Manufacturer

OMF – Operations and Maintenance Facility

PA – Public Address

PDF – Portable Document Format

PDR – Preliminary Design Review

PEA – Passenger Emergency Alarm

PEI – Passenger Emergency Intercom

PHA – Preliminary Hazard Analysis

PoE – Power over Ethernet

PTU – Portable Test Unit

QMS – Quality Management System

QR – Quick Response

RAM – Reliability, Availability and Maintainability

RAMS – Reliability, Availability, Maintainability, Safety

RMS – Root Mean Square

ROW – Right Of Way

RSQT – Radio Susceptibility Qualification Test

SAT – Site Acceptance Test

SI – Système International

SIL – Safety Integrity Level

SIT – System Integration Test

STIPA – Speech Transmission Index Public Address

SUI – Sustainable Urban Integration

TCE – Track Clearance Envelope

TCRP – Transit Cooperative Research Program

TCN – Train Communication Network

TCS – Train Control System

TOD – Train Operator Display

TOR – Top of Rail

TRPS – Train Routing and Priority System

UGR – Unified Glare Rating

UIC – International Union of Railways

ULC – Underwriters Laboratories Canada

VAC – Voltage Alternating Current

VDC – Voltage Direct Current

VDE – Vehicle Dynamic Envelope

VDV – Verband Deutscher Verkehrsunternehmen

VLAN – Virtual Local Area Network

VMS – Variable Message Sign

VOIP – Voice Over Internet Protocol

VSE – Vehicle Static Envelope

WHMIS – Workplace Hazardous Materials Information System

WLAN – Wireless Local Area Network

APPENDIX 1B: STANDARDS, SPECIFICATIONS, GUIDELINES, AND MANUALS

B.1 LEGISLATION, REGULATIONS, AND CODES

As further detailed and outlined in the requirements of the Supply Agreement, the following legislation, regulations and codes apply to the Work:

1. Alberta Occupational Health and Safety
 - a. Alberta Occupation Health and Safety Code
2. Alberta Transportation (AT)
 - a. Traffic Safety Act (“Traffic Safety Act (Alberta)”)
 - b. AR 122, Vehicle Equipment Regulation (“*Vehicle Equipment Regulations (Alberta)*”)
3. National Building Code (NBC)
 - a. National Building Code – 2019 Alberta Edition (“NBC(AE)”)
4. National Fire Code (NFC)
 - a. National Fire Code – 2019 Alberta Edition (“NFC(AE)”)

B.2 STANDARDS

As further detailed and outlined in the requirements of the Supply Agreement, the following includes a list of applicable standards for reference only.

1. American Railway Engineering and Maintenance-of-Way Association (AREMA)
 - a. Communications & Signals Manual of Recommended Practice (“AREMA Communications Manual”)
5. American Society of Heating and Air-Conditioning Engineers (ASHRAE)
 - a. ASHRAE 34, Designation and Safety Classification of Refrigerants (“ASHRAE 34”)
6. Association of American Railroads (AAR)
 - a. AAR M-107, Wheels, Carbon Steel (“AAR M-107”)
7. American National Standards Institute (ANSI)
 - a. ANSI Z26.1, Safety Glazing Materials for Glazing Motor Vehicles and Motor Vehicle Equipment Operating on Land Highways – Safety Standard (“ANSI Z26.1”)
8. American Public Transportation Association (APTA)
 - a. APTA PR-CS-011-99, Standard for Cab Crew Seating design and Performance (“APTA PR-CS-011-99”)
 - b. APTA PR-E-S-001-98, Standard for Insulation Integrity (“APTA PR-E-S-001-98”)

- c. APTA PR-E-S-010-98, Standard for the Development of an Electromagnetic Compatibility Plan (“APTA PR-E-S-010-98”)
 - d. APTA RT-VIM-S-020-10 Rev 1, Emergency Lighting System Design for Rail Transit Vehicles (“APTA RT-VIM-S-020-10 Rev 1”)
 - e. APTA SS-CCS-RP-001-10, Securing Control and Communications Systems in Rail Transit Environments Part 1 (“APTA SS-CCS-RP-001-10”)
 - f. APTA SS-CCS-RP-0C-13, Securing Control and Communications Systems in Rail Transit Environments Part 2 (“APTA SS-CCS-RP-0C-13”)
 - g. APTA SS-ECS-RP-001-14, Cybersecurity Considerations for Public Transit (“APTA SS-ECS-RP-001-14”)
9. American Society of Mechanical Engineers (ASME)
- a. ASME RT-1, Safety Standard for Structural Requirements for Light Rail Vehicles (“ASME RT-1”)
 - b. ASME Y14.2, Line Conventions and Lettering (“ASME Y14.2”)
 - c. ASME Y14.38, Abbreviations and Acronyms for Use on Drawings and Related Documents (“ASME Y14.38”)
10. ASTM International (ASTM)
- a. ASTM D2047, Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine (“ASTM D2047”)
 - b. ASTM D2240, Standard Test Method for Rubber Property-Durometer Hardness (“ASTM 2240”)
 - c. ASTM D3389, Standard Test Method for Coated Fabrics Abrasion Resistance (Rotary Platform Abrader) (“ASTM D3389”)
 - d. ASTM F925, Standard Test Method for Resistance to Chemicals of Resilient Flooring (“ASTM F925”)
11. Boeing Standard (BSS)
- a. BSS 7239, BSS Fire Test to Aircraft Material – Toxicity (“BSS 7239”)
12. Canadian Standards Association (CSA)
- a. CSA C22.1 26-700, Receptacles (“CSA C22.1 26-700”)
13. Code of Federal Regulations (CFR)
- a. 49 CFR 223, Safety Glazing Standards – Locomotives (“49 CFR 223”)
14. Deutsches Institut für Normung
- a. DIN 6700 Welding of Railway Vehicles and Parts.

15. Economic Commission for Europe of the United Nations (ECE)
 - a. Regulation 43, Uniform Provisions Concerning the Approval of Safety Glazing Materials and Their Installation on Vehicles (“ECE R43”)
16. Electronics Industry Alliance (EIA)
 - a. EIA SE-101, Amplifiers for Sound Equipment (“EIA SE-101”)
 - b. EIA SE-103, Speakers and Sound Equipment (“EIA SE-103”)
 - c. EIA SE-105, Microphones for Sound Equipment (“EIA SE-105”)
17. European Committee for Standardization (CEN)
 - a. EN 10025, Hot rolled products of structural steels (“EN 10025”)
 - b. EN 10027, Designation systems for steel (“EN 10027”)
 - c. EN 12663-1, Railway applications. Structural requirements of railway vehicle bodies. Locomotives and passenger rolling stock (and alternative method for freight wagons) (“EN 12663-1”)
 - d. EN 12299, Railway applications. Ride comfort for passengers. Measurement and evaluation (“EN 12299”)
 - e. EN 13103, Railway applications – Wheelsets and bogies – Non-powered axles – Design guide (“EN 13103”)
 - f. EN 13104, Railway applications. Wheelsets and bogies. Powered axles. Design method (“EN 13104”)
 - g. EN 13232-3, Railway applications – Track – Switches and crossings – Part 3: Requirements for wheel/rail interaction (“EN 13232-3”)
 - h. EN 13260, Railway applications – Wheelsets and bogies – Wheelsets – Product requirements (“EN 13260”)
 - i. EN 13261, Railway applications – Wheelsets and bogies – Axles – Product requirements (“EN 13261”)
 - j. EN 13262, Railway applications – Wheelsets and bogies – Wheels – Product requirements (“EN 13262”)
 - k. EN 13298, Railway applications – Suspension components – Helical suspension springs, steel (“EN 13298”)
 - l. EN 13272, Railway applications – Electrical lighting for rolling stock in public transport systems (“EN 13272”)
 - m. EN 13452-1, Railway applications – Braking – Mass transit brake systems - Part 1: Performance requirements (“EN 13452-1”)

- n. EN 13452-2, Railway applications – Braking – Mass transit brake systems – Part 2: Methods of test (“EN 13452-2”)
- o. EN 13749, Railway applications. Wheelsets and bogies. Method of specifying the structural requirements of bogie frames (“EN 13749”)
- p. EN 13802, Railway applications – Suspension components – Hydraulic dampers (“EN 13802”)
- q. EN 13913, Railway applications. Rubber suspension components. Elastomer-based mechanical parts (“EN 13913”)
- r. EN 14535-1, Railway applications – Brake discs for railway rolling stock – Part 1: Brake discs pressed or shrunk onto the axle or drive shaft, dimensions and quality requirements (“EN 14535-1”)
- s. EN 14750, Railway applications. Air conditioning for urban and suburban rolling stock. (“EN 14750”)
 - i. EN 14750-1, Railway applications. Air conditioning for urban and suburban rolling stock. Comfort parameters (“EN 14750-1”)
 - ii. EN 14750-2, Railway applications. Air conditioning for urban and suburban rolling stock. Type tests (“EN 14750-2”)
- t. EN 14752, Railway applications. Body side entrance systems for rolling stock (“EN 14752”)
- u. EN 14813, Railway applications. Air conditioning for driving cabs. (“EN 14813”)
 - i. EN 14813-1, Railway applications. Air conditioning for driving cabs. Comfort parameters (“EN 14813-1”)
 - ii. EN 14813-2, Railway applications. Air conditioning for driving cabs. Type tests (“EN 14813-2”)
- v. EN 15227, Railway applications. Crashworthiness requirements for railway vehicle bodies (“EN 15227”)
- w. EN 15427, Railway applications – Wheel/rail friction management – Flange lubrication (“EN 15427”)
- x. EN 15595, Railway applications – Braking – Wheel slide protection (“EN 15595”)
- y. EN 15663, Railway applications. Vehicle reference masses (“EN 15663”)
- z. EN 15827, Railway applications. Requirements for bogies and running gears (“EN 15827”)
- aa. EN 16251, Railway application. Environmental conditions. Design and test of rolling stock under severe conditions (“EN 16251”)
- bb. EN 16286-1, Railway applications – Gangway systems between vehicles. Part 1: Main applications

- cc. EN 45545, Railway applications — Fire protection on railway vehicles (“EN 45545”)
- dd. EN 50061 A1, Safety of implantable cardiac pacemakers (“EN 50061 A1”)
- ee. EN 50121, Railway applications. Electromagnetic compatibility (“EN 50121”)
 - i. EN 50121-1-4 in Schedule 3
 - ii. EN 50121-3-1 in Schedule 3
 - iii. EN 50121-3-2, Railway applications. Electromagnetic compatibility. Rolling stock. Apparatus (“EN 50121-3-2”)
- ff. EN 50126 Railway Applications - The Specification and Demonstration of Reliability, Availability, Maintainability and Safety (RAMS) (“EN 50126”)
 - i. EN 50126-1, Railway Applications - The Specification and Demonstration of Reliability, Availability, Maintainability and Safety (RAMS) Part 1: Generic RAMS Process (“EN 50126-1”)
 - ii. EN 50126-2, Railway Applications - The Specification and Demonstration of Reliability, Availability, Maintainability and Safety (RAMS) Part 2: Systems Approach to Safety (“EN 50126-2”)
 - iii. EN 50126-3, Railway applications. The specification and demonstration of Reliability, Availability, Maintainability and Safety (RAMS). Guide to the application of EN 50126-1 for rolling stock RAM (“EN 50126-3”)
- gg. EN 50128, Railway applications - Communications, signalling and processing systems - Software for railway control and protection systems (“EN 50128”)
- hh. EN 50155, Railway applications – Electronic equipment used on rolling stock (“EN 50155”)
- ii. EN 50215, Railway applications. Rolling stock. Testing of rolling stock on completion of construction and before entry into service (“EN 50215”)
- jj. EN 50238, Railway applications. Compatibility between rolling stock and train detection systems (“EN 50238”)
 - i. EN 50238-1, Railway applications - Compatibility between rolling stock and train detection systems - Part 1: General (“EN 50238”)
- kk. EN 50367, Railway applications. Fixed installations and rolling stock. Criteria to achieve technical compatibility between pantographs and overhead contact line (“EN 50367”)
- ll. EN 50657, Railway applications. Rolling stock applications. Software on board rolling stock (“EN 50657”)
- mm. EN 61287-1, Railway applications. Power converters installed on board rolling stock. Characteristics and test methods (“EN 61287-1”)
- nn. EN 61373, Railway applications. Rolling stock equipment. Shock and vibration tests (“EN 61373”)

18. International Electrotechnical Commission (IEC)
- a. IEC 60077, Railway Applications – Electric Equipment for Rolling Stock
 - b. IEC 60310, Railway applications - Traction transformers and inductors on board rolling stock (“IEC 60310”)
 - c. IEC 60349-2, Electric traction – Rotating electrical machines for rail and road vehicles – Part 2: Electronic converter-fed alternating current motors (“IEC 60349-2”)
 - d. IEC 60494-2, Railway applications - Rolling stock - Pantographs - Characteristics and tests - Part 2: Pantographs for metros and light rail vehicles. (“IEC 60494-2”)
 - e. IEC 60571, Railway applications. Rolling stock. Electronic equipment (“IEC 60571”)
 - f. IEC 60850, Railway applications - Supply voltages of traction systems. (“IEC 60850”)
 - g. IEC 61287-1, Railway applications - Power converters installed on board rolling stock Part 1: Characteristics and test methods (“IEC 61287-1”)
 - h. IEC 61373, Railway applications. Rolling stock equipment. Shock and vibration tests (“IEC 61373”)
 - i. IEC 61375, Electronic railway equipment – Train communication network (TCN)
 - i. Part 2-1: Redundant Wire Train Bus (WTB) (“IEC 61375-2-1”)
 - ii. Part 2-5: Redundant Ethernet Train Backbone (ETB) (“IEC 61375-2-5”)
 - iii. Part 3-1: Multifunction Vehicle Bus (MVB) (“IEC 61375-3-1”)
 - iv. Part 3-3: CANOpen Consist Network (CCN) (“IEC 61375-3-3”)
 - v. Part 3-4: Ethernet Consist Network (ECN) (“IEC 61375-3-4”)
 - j. IEC 61881, Railway applications - Rolling stock equipment - Capacitors for power electronics (“IEC 61881”)
 - k. IEC 61991, Railway applications - Rolling Stock - Protective Provisions Relating to Electrical Hazards (“IEC 61991”)
 - l. IEC 62236, Railway applications. Electromagnetic compatibility. Rolling stock. Apparatus (“IEC 62236”)
 - m. IEC 62313, Railway applications - Power supply and rolling stock - Technical criteria for the coordination between power supply (substation) and rolling stock (“IEC 62313”)
 - n. IEC 62973-1, Railway applications – Rolling Stock – Batteries for auxiliary power supply systems (“IEC 62973-1”)
 - o. IEC 62995, Railway Applications - Rolling Stock - Rules for Installation of Cabling (“IEC 62995”)

- p. IEC 62660-1, Secondary lithium-ion cells for the propulsion of electric road vehicles – Part 1: Performance testing (“IEC 62660-1”)

19. Institute of Electrical and Electronics Engineers (IEEE)

- a. IEEE 16, IEEE Standard for Electrical and Electronic Control Apparatus on Rail Vehicles (“IEEE 16”)
- b. IEEE 91/91A, Standard Graphic Symbols for Logic Functions (“IEEE 91/91A”)
- c. IEEE 112, IEEE Standard Test Procedure for Polyphase Induction Motors and Generators (“IEEE 112”)
- d. IEEE 114, IEEE Standard Test Procedure for Single-Phase Induction Motors (“IEEE 114”)
- e. IEEE 315, IEEE Standard for Graphic Symbols for Electrical and Electronics Diagrams (Including Reference Designation Letters) (“IEEE 315”)
- f. IEEE 315A, Supplement to Graphic Symbols for Electrical and Electronics Diagrams (“IEEE 315A”)
- g. IEEE 802.1q, IEEE Standards for Local and Metropolitan Area Networks – Bridges and Bridged Networks (IEEE 802.1q”)
- h. IEEE 802.3af/802.3at, IEEE Standard for Ethernet (“IEEE 802.3af/802.3at”)
- i. IEEE 802.11g-2013, IEEE Standard for Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements – Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications (“IEEE 802.11g”)
- j. IEEE 1012, IEEE Standard for System, Software, and Hardware Verification and Validation (“IEEE 1012”)
- k. IEEE 1473-2010, IEEE Standard for Communications Protocol Aboard Passenger Trains (“IEEE 1473-2010”)
- l. IEEE 1475, IEEE Standard for the Functioning of Interfaces Among Propulsion, Friction Brake, and Train-Borne Control on Rapid Rail Transit Vehicles (“IEEE 1475”)
- m. IEEE 1476, IEEE Standard for Passenger Train Auxiliary Power Systems Interfaces (“IEEE 1476”)
- n. IEEE 1478, IEEE Standard for Environmental Conditions for Transit Railcar Electronic Equipment (“IEEE 1478”)
- o. IEEE 1482.1, IEEE Standard for Rail Transit Vehicle Event Recorders (“IEEE 1482.1”)
- p. IEEE 1558, IEEE Standard for Software Documents for Rail Equipment and Systems (“IEEE 1558”)
- q. IEEE 1698, IEEE Guide for the Calculation of Braking Distances for Rail Transit Vehicles (“EN 13452 -1”)

20. International Organization for Standardization (ISO)

- a. ISO 2631, Mechanical vibration and shock (“ISO 2631”)
- b. ISO 3095, Acoustics - Railway applications - Measurement of noise emitted by railbound vehicles (“ISO 3095”)
- c. ISO 3381, Railway applications - Acoustics - Measurement of noise inside railbound vehicles (“ISO 3381”)
- d. ISO/IEC 7498-1:1994, Information Technology – Open Systems Interconnection – Basic Reference Model: The Basic Model (“ISO/IEC 7498-1”)
- e. ISO 8995-1, Lighting of work places – Part 1: Indoor (“ISO 8995-1”)
- f. ISO 9000, Quality management systems – Fundamentals and vocabulary (“ISO 9000”)
- g. ISO 9001, Quality management systems – Requirements (“ISO 9001”)
- h. ISO 9004, Quality management – Quality of an organization – Guidance to achieve sustained success (“ISO 9004”)
- i. ISO 19011, Guidelines for auditing management systems (“ISO 19011”)

21. International Telecommunication Union (ITU)

- a. ITU-T H.264 (V12), ITU Series H: Audiovisual And Multimedia Systems. Infrastructure of audiovisual services – Coding of moving video – Advanced video coding for generic audiovisual services (“ITU-T H.264 (V12)”)

22. Internet Engineering Task Force (IETF)

- a. RFC 3261, SIP: Session Initiation Protocol (“RFC 3261”)

23. International Union of Railways (UIC)

- a. UIC 515-3, Rolling Stock - Bogies - Running Gear - Axle Design Calculation Method (“UIC 515-3”)
- b. UIC 515-4, Passenger Rolling Stock – Trailer Bogies, Running Gear, Bogie Running Gear, Bogie Frame Structure Strength Tests (“UIC 515-4”)
- c. UIC 541-05, Brakes - Manufacturing specifications for various brake parts - Wheel Slide Protection device (WSP) (“UIC 541-05”)
- d. UIC 615-4, Motive Power Units Bogies and Running Gear Bogie Frame Structure Tests (“UIC 615-4”)

24. London Underground Limited

- a. 1-222, Guidance on Electromagnetic Compatibility (“LUL 1-222”)

25. National Electrical Manufacturers Association (NEMA)
 - a. NEMA MG1, Motors and Generators (“NEMA MG1”)
26. National Fire Protection Association (NFPA)
 - a. NFPA 10, Standard for Portable Fire Extinguishers (“NFPA 10”)
 - b. NFPA 130, Standard for Fixed Guideway Transit and Passenger Rail Systems (“NFPA 130”)
 - c. NFPA 13, Standard for the Installation of Sprinkler Systems (“NFPA 13”)
27. National Institute of Standards and Technology (NIST)
 - a. SP 800-82 Rev. 2, Guide to Industrial Control Systems (ICS) Security (“SP 800-82 Rev. 2”)
28. Standards Australia (AS)
 - a. AS 60849-2004 (Reconfirmed 2016), Sound systems for emergency purposes (“AS 60849”)
29. Transit Cooperative Research Program (TCRP)
 - a. TCRP 155, Track Design Handbook for Light Rail Transit, (“TCRP 155”)
30. US Department of Defense
 - a. MIL-HDBK-217F, Military Handbook: Reliability Prediction of Electronic Equipment (“MIL-HDBK-217F”)
 - b. MIL-HDBK-470A, Department of Defense Handbook: Designing and Developing Maintainable Products and Systems (Volume I) (“MIL-HDBK-470A”)
 - c. MIL-HDBK-472, Military Standardization Handbook: Maintainability Prediction (“MIL-HDBK-472”)
 - d. MIL-STD-882C, System Safety Program Requirements (“MIL-STD-882C”)
 - e. MIL-STD-1629A, Procedures for Performing A failure Mode, Effects & Criticality Analysis (“MIL-STD-1629A”)
31. US Department of Transportation
 - a. DOT-FTA-MA-26-5005-00-01, Hazard Analysis Guidelines for Transit Projects (“DOT-FTA-MA-26-5005-00-01”)
32. Verband Deutscher Verkehrsunternehmen
 - a. VDV 152, Recommendations on the Design for Strength of Urban Rail Rolling Stock According to Bostrab (“VDV 152”)
 - b. VDV 154, Noise from Mass Transit Rail Vehicles According to Bostrab (“VDV 154”)

B.3 GUIDELINES AND MANUALS

As further detailed and outlined in the requirements of the Supply Agreement, the following includes a list of applicable guidelines and manuals for reference only.

1. American Association of Cost Engineering International Recommended Practices
2. International Commission on Non-Ionizing Radiation Protection (ICNIRP)
 - a. ICNIRP Guidelines for limiting exposure to time-varying electric, magnetic and electromagnetic fields (up to 300 Ghz) (“ICNIRP Guidelines”)
 - b. Various guidelines
3. Project Management Institute
 - a. Project Management Body of Knowledge (“PMBOK Guide”)
 - b. Practice Standard for Scheduling

**THE CITY OF EDMONTON
VALLEY LINE WEST LRT
LRV SUPPLY AGREEMENT**

Schedule 2 – Submittal Requirements and Review Procedure

VALLEY LINE WEST LRT
SCHEDULE 2 – SUBMITTAL REQUIREMENTS AND REVIEW PROCEDURE

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SECTION 1: GENERAL

1.1 APPLICATION

A. Any of the following:

1. document, information, or data (including any plan, record, report, appendix, specification, schedule, procedure, protocol, design, or certificate); or
2. proposed course of action on the part of the LRV Supplier;

which, under the terms of

3. this Supply Agreement, is required to be submitted to the City; or
4. any other Project Document is specifically required to be submitted to the City for its review or comment;

either individually or as a package, and any revision or amendment to any of the foregoing (each a "**Submittal**"), shall, unless otherwise specified, be submitted to the City for review in accordance with this Schedule.

1.2 SUBMITTAL REQUIREMENTS

1.2.1 GENERAL

A. The LRV Supplier shall provide each Submittal as follows:

1. include one electronic copy as a searchable PDF and, at the request of the City or as required by the Supply Agreement, one native copy of the file;
2. be prepared and submitted in English;
3. not be combined with any other Submittal;
4. be submitted using the Document Management System and be clearly identified as a Submittal; and
5. be submitted with a cover sheet, in a form acceptable to the City, acting reasonably, that includes the following:
 - a. a unique Submittal tracking number;
 - b. the date on which the Submittal was prepared and the date on which the Submittal was submitted to the City;
 - c. if applicable, the CDRL number identified in the Supply Agreement;
 - d. a list of all documents included with, or required for interpretation of, the Submittal, including details of all attachments and any documents incorporated by reference;
 - e. a description of the purpose of the Submittal, including reference to the relevant provision(s) of this Supply Agreement or other Project Document under which it is being submitted;
 - f. the name of the person or entity that prepared the Submittal; and
 - g. in the case of resubmission, a detailed Submittal history that includes the following:

- i. submission dates and endorsements in respect of each prior version of the Submittal;
 - ii. revision number;
 - iii. the name of the person who prepared the Submittal cover sheet and the persons or entities that prepared the documents, information, and data included in the Submittal and each revision; and
 - iv. details of any previous Submittals superseded by the current Submittal as well as a summary of the changes made in the current Submittal versus the superseded version of the Submittal.
- B. The LRV Supplier shall ensure all documents, information, and data included as part of a Submittal are as follows:
1. include a unique reference number that is maintained through any revisions to such document, information, or data; and
 2. are categorized and identified in accordance with the document classification and naming framework described in Section 2.2 [*Submittal Tracking*].
- C. If a Submittal references another Submittal, the LRV Supplier shall ensure the reference uses the unique Submittal tracking number indicated on the Submittal Register.
- D. The LRV Supplier shall have each Submittal or the applicable documents, data, and other comprising part of a Submittal, as applicable, signed or sealed by persons with appropriate professional designations or authority wherever required by this Supply Agreement, any other Project Document, Applicable Law, or Good Industry Practice.
- E. The LRV Supplier shall include on each Submittal the code in accordance with the submittal tracking classification developed in Section 2.2 [*Submittal Tracking*] to allow tracking in the system, from posting by the LRV Supplier through to the process of review and Acceptance by the City.
- F. The LRV Supplier shall transmit all Submittals to the City via electronic copy posted to the Document Management System.

1.2.2 DRAWINGS

- A. The LRV Supplier shall prepare drawings as follows:
1. in AutoCAD 2018 format using the CAD Standard (CDRL 03-12);
 2. to fit on 11 inches x 17 inches paper; and
 3. using industry standard symbols.
- B. The LRV Supplier shall include the following types of drawings, as applicable, in Submittals:
1. drawings of the completed LRV, systems, subsystems, assemblies, LRUs, and LLRUs;
 2. installation drawings that include fully dimensioned layout plans, showing the vertical and horizontal position of all surrounding components to accurately reflect the installation; and
 3. interface drawings that provide detailed physical, mechanical, electrical, and electronic information to define all system interfaces.

- C. In the event that the LRV Supplier uses typical drawings to describe interfaces, the LRV Supplier shall provide a key plan with typical drawings that defines the specific locations or LRVs for which the drawing is typical.

1.2.3 MATERIAL SAMPLES

- A. The LRV Supplier shall submit material samples to the City's project office, #1900 10235 – 101 St, Edmonton, Alberta, T5J 3G1.
- B. The LRV Supplier shall provide two identical material samples for each Submittal that requires material samples. Materials samples shall be of a size and quantity to illustrate the following:
 - 1. quality and functional characteristics of the material sample;
 - 2. the material sample's integration with other parts; and
 - 3. the full range of colours available with the material sample.
- C. The City will retain any material samples submitted.

1.3 SUBMITTAL REVISION CONTROL

- A. The LRV Supplier shall do the following:
 - 1. establish a means of identifying and tracking the resolution of each comment and observation provided by the City on previously submitted versions of a Submittal and any document, information, or data included as part of a Submittal;
 - 2. identify all revised versions of a Submittal or document, information, or data making up a Submittal by a sequential revision number;
 - 3. ensure all correspondence related to a Submittal references the applicable Submittal's unique tracking number, and revision number;
 - 4. ensure all revised Submittals clearly show all revisions from the previous version of the Submittal;
 - a. if bound documents are provided, including reports and manuals, ensure they contain a preface that states how revisions are marked and the previous revision number against which the revisions have been marked, and submit them to the City's project office, #1900 10235 – 101 St, Edmonton, Alberta, T5J 3G1;
 - 5. use a consistent format for mark-ups of Submittals and of all documents, information, and data included in Submittals (e.g. deletions struck out and additions underscored);
 - 6. mark revised portions of Design Drawings with appropriate means to visually distinguish between the parts of the drawing that are revised and the parts that are not revised, and include the revision number and a description of the revision(s) on each drawing; and
 - 7. keep all Submittals that have been endorsed or deemed to be endorsed "Accepted" current.
 - a. Where a Submittal that has been endorsed, or deemed endorsed, "Accepted" is revised as part of another Submittal, the LRV Supplier shall revise all other Submittals relying on or based on that Submittal and resubmit with the Submittal to which they relate subject to the Review Period noted in Section 3.4 [*Time for City Review*].

SECTION 2: SUBMITTAL REGISTER

2.1 GENERAL

- A. The LRV Supplier shall compile and maintain a real-time register of all Submittals (the “**Submittal Register**”), which shall be accessible to the City at all times through the Document Management System, in accordance with Section 1.8 [*Document Management System*] of Schedule 3 [*Design and Manufacturing Protocols*], commencing no later than two weeks after NTP.
- B. The Submittal Register shall include separate columns for each of the following items:
1. Submittal unique tracking number;
 2. Submittal title;
 3. Supply Agreement paragraph reference;
 4. detailed summary of the Submittal;
 5. approximate page count of the Submittal and file size, to be updated to the actual page count and file size once the Submittal has been submitted;
 6. Submittal due date. Where no Submittal due date is indicated in the Supply Agreement, the LRV Supplier shall determine the Submittal due date required to support the CWS;
 7. actual delivery date;
 8. date of re-submission, if applicable;
 9. required City response date;
 10. actual date of the City’s response;
 11. status of Submittal; and
 12. safety or Commissioning, which shall be marked with an “X” for those Submittals deemed safety-related or those required to provide documentation for Commissioning.
- C. From the Submittal Register, the LRV Supplier shall generate an updated CDRL as an appendix to the monthly Progress Report.

2.2 SUBMITTAL TRACKING

- A. The LRV Supplier shall develop and implement a comprehensive document classification and naming framework for the identification and categorization of Submittals and supporting document, information, and data. The document classification and naming framework shall be as follows:
1. be consistent with the CWS, or as otherwise acceptable to the City;
 2. be acceptable to the City, acting reasonably; and
 3. classify Submittals and supporting documents, information, and data into logical categories that permit the Parties to easily do the following:
 - a. identify the nature and scope of all documents, information, and data;

- b. identify and distribute the documents, information, and data to the appropriate disciplines for review; and
- c. file, store, and retrieve documents, information, and data.

SECTION 3: SUBMITTAL REVIEW PROCESS

3.1 GENERAL

- A. The City shall review all Submittals using the review process flow illustrated in *Figure 1: Submittal Review Process Flow*, unless otherwise identified in this Schedule.

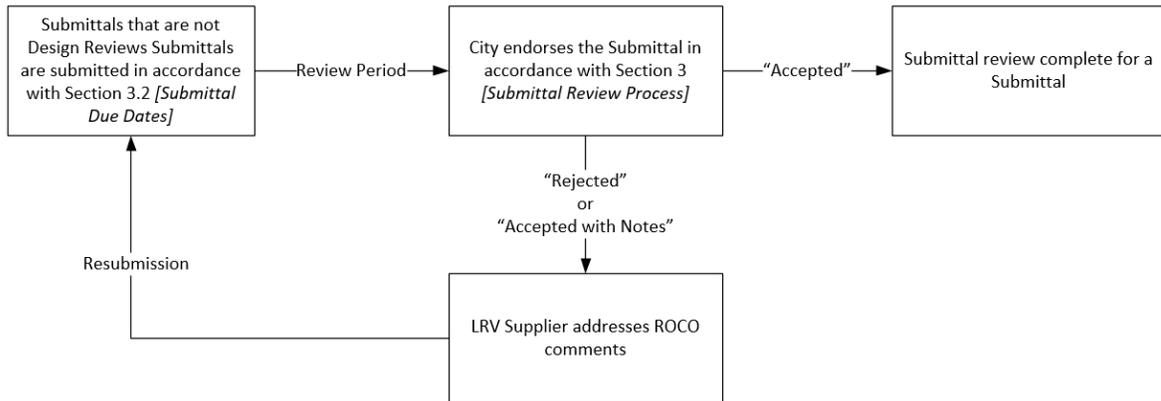


Figure 1: Submittal Review Process Flow

- B. The LRV Supplier shall submit all Submittals in compliance with the most recent Accepted Submittal Register.
- C. The LRV Supplier shall provide for a progressive and orderly flow of Submittals.

3.2 SUBMITTAL DUE DATES

- A. The due dates for Submittals required by Schedule 2 [Submittal Requirements and Review Procedure], Schedule 3 [Design and Manufacturing Protocols], Schedule 4 [Technical Requirements], Schedule 5 [Integration Requirements], and Schedule 8 [Shipping and Delivery] are outlined in Appendix 2A [Contract Deliverables Requirements List].
- B. The LRV Supplier may propose alternate dates in the Submittal Register. Such revised Submittal due dates, if Accepted by the City by way of endorsement of the latest Submittal Register in accordance with the Review Procedure, shall become the updated due date for the respective Submittal.

3.3 THE CITY'S REVIEW RESOURCES

- A. The City Representative may, in reviewing any Submittal, refer such Submittal to, or seek input from, the City, any City Person, the Operator, or Project Co. Any review, consideration, decision, belief, opinion, or determination referred to in this Schedule in relation to the City or the City Representative may be that of the City Representative or any such person upon whose review, consideration, decision, belief, opinion, or determination the City relies.

3.4 TIME FOR CITY REVIEW

- A. Subject to Section 3.4 [*Time for City Review*] and Section 3.6 [*Further Information*], the City shall return the relevant Submittal endorsed “Accepted,” “Accepted with Notes,” or “Rejected” as follows:
1. within 20 Business Days from the date of receipt of the Submittal;
 2. within such longer or shorter period as may be specified in this Supply Agreement or agreed by the Parties; or
 3. as outlined in Section 4 [*Design Reviews*] for Design Review Submittals.
- (each applicable period, the “**Review Period**”).
- B. If the City fails to return a Submittal that is not a Design Review Submittal duly endorsed within the Review Period, as it may be extended by Section 3.4 [*Time for City Review*] or Section 3.6.1 [*Request for Further Information*], the applicable Submittal shall be deemed to have been endorsed “Accepted”, and the LRV Supplier may proceed with implementation of the activities that are the subject matter of the Submittal. There shall be no deemed Acceptance for Design Review Submittals.
- C. If, at any time, any of the following occur, the City shall, within five Business Days of receipt of such Submittal and at the request of the LRV Supplier, provide the LRV Supplier with a reasonable estimate of the time necessary for processing such Submittal, and the Review Period shall be amended accordingly:
1. the LRV Supplier submits in excess of 20% more than the number of Submittals indicated on the Submittal Register;
 2. the volume of information presented in the Submittals exceeds the review workload the City anticipated based on the Submittal Register; or
 3. a Submittal was received for review more than five Business Days later or earlier than indicated in the Submittal Register, such that the City cannot review the Submittal within the time allotted in the Submittal Register.

3.5 RECORD OF COMMENTS AND OBSERVATIONS (ROCO) FORM

- A. A City endorsement may be accompanied by a form recording all comments and observations on the Submittal (a “**Record of Comments and Observations Form**” or “**ROCO Form**”) for Submittals endorsed as “Accepted”, “Accepted with Notes”, or “Rejected”. The ROCO Form will include the following information, at the discretion of the City:
1. Submittal date;
 2. name and tracking number of Submittal;
 3. Submittal references to identify specific documents within the Submittal package;
 4. issues, with each such issue separately provided with the following:
 - a. unique issue ID;
 - b. page or drawing number reference to the specific document within the Submittal;
 - c. package, which may be “General” for issues that are not specific to any document;

- d. reference to section of the Supply Agreement from which the issue arises;
 - e. issue category classification:
 - i. CAT-1: issue is of a serious enough nature, in the opinion of the City, to warrant the City's rejection of the Submittal;
 - ii. CAT-2: issue that must be resolved prior to the LRV Supplier proceeding with those activities to which the identified issue relates, or is resolved through the LRV Supplier's acceptance of accompanying City conditions for acceptance of future, related Submittals that in the opinion of the City would allow the Submittal under review to generally conform to the applicable Supply Agreement requirements; or
 - iii. CAT-4: issue is informational in nature and is provided for the LRV Supplier's consideration and response. The LRV Supplier may incorporate changes addressing these comments in a future resubmission at its discretion, and if the City requests, an informative response documented in the ROCO Form, for the City's information and closure;
 - 5. initials of the City reviewer;
 - 6. date of the City reviewer comment;
 - 7. fields for the LRV Supplier response and proposed closure of the issue; and
 - 8. the City issue closure status, identified as "Open" or "Closed" by the City, and date of latest status.
- B. The LRV Supplier shall provide any required responses in the ROCO Form, which must accompany the latest re-submission of the Submittal. Based on the LRV Supplier's responses on the ROCO Form and the re-submitted Submittal, the City will respond with an updated ROCO Form, including the closure status of all ROCO Form issued through the Document Management System.

3.6 FURTHER INFORMATION

3.6.1 REQUEST FOR FURTHER INFORMATION

- A. Where any further information, data, or documents are required by the City to do the following, the City may request such further information, data, or documents:
 - 1. to appreciate, understand, or review a Submittal; or
 - 2. to understand the Submittal's implications or relationship to other components of the Work.
- B. Where the City requests further information, data, or documents in accordance with this Section, the following shall occur:
 - 1. the LRV Supplier shall, within five Business Days, submit such further information, data, or documents, and take other steps that may be required to satisfy the City that the Submittal complies with the applicable requirements of the Supply Agreement;
 - 2. the remainder of the applicable Review Period shall be postponed until such time as the City has received the requested information, data, or documents, provided that the City shall, at its discretion, have up to 10 additional Business Days beyond the end of the postponed Review Period to complete its review of a Submittal following receipt of all such requested further information, data, or documents; and

3. the LRV Supplier failing to provide the information within the required timeframe may result in a “Rejected” endorsement at the City’s discretion in accordance with Section 3.7.5 [*Grounds For “Rejected” or “Accepted with Notes” Endorsement*].
- C. At the request of the City, the LRV Supplier shall submit the LRV Supplier’s work processes prior to beginning any related Work.
1. Where the LRV Supplier’s work processes are based on OEM installation and manufacturing instructions, submit these as an appendix with the LRV Supplier’s work processes.
- D. At the request of the City, the LRV Supplier shall submit Project Records that confirm the qualifications and certifications of personnel employed to do the Work, including certifications for tradespersons, professionals, technologists, and technicians.

3.6.2 SUBMITTAL MEETINGS AND EXPLANATIONS

- A. At any time, the City may require the LRV Supplier, including the LRV Supplier’s consultants, Subcontractors, and other relevant personnel, to meet with the City to answer questions regarding a Submittal or to explain to the City the intent of such Submittal, including its relation to any design and satisfaction of the applicable requirements of the Supply Agreement.
- B. The LRV Supplier shall, and shall cause its consultants, Subcontractors, and any other relevant personnel to, attend all meetings requested by the City, in person or by appropriate virtual means acceptable to the City, and answer all questions asked by the City in accordance with this Section.

3.7 SUBMITTAL ENDORSEMENTS

3.7.1 SUBMITTAL ENDORSED “ACCEPTED”

- A. The City shall assign the endorsement “Accepted” to those Submittals that, in the opinion of the City, appear to generally conform to the applicable Supply Agreement requirements. The LRV Supplier may proceed with implementation of the activities that are the subject of a Submittal endorsed “Accepted”.

3.7.2 SUBMITTAL ENDORSED “ACCEPTED WITH NOTES”

- A. The City shall assign the endorsement “Accepted with Notes” to those Submittals that, in the opinion of the City, appear to generally conform to the applicable Supply Agreement requirements, subject to correction of issues identified by the City in its review comments.
- B. The LRV Supplier may proceed with implementation of activities that are the subject of a Submittal endorsed “Accepted with Notes” to the extent such activities are not affected by the issues noted in the City’s review.
- C. The LRV Supplier shall update the Submittal Register within five Business Days of the City’s endorsement with the date of re-submission of a Submittal endorsed “Accepted with Notes”.
- D. The LRV Supplier shall correct all identified issues and provide a revised copy of the applicable documents comprising such Submittals to the City prior to implementing those activities to which the identified issues relate.
- E. Where the LRV Supplier revises and resubmits a Submittal endorsed “Accepted with Notes”, the City will review the resubmitted Submittal in accordance with this Schedule, provided that the Review Period shall be 15 Business Days, or such other period as may be specified in, or permitted by, this Supply Agreement, from the date of receipt.

3.7.3 SUBMITTAL ENDORSED “REJECTED”

- A. The City shall assign the endorsement “Rejected” to those Submittals that, in the opinion of the City, contain significant issues or do not generally conform to the applicable requirements of the Supply Agreement.
- B. For Submittals endorsed “Rejected”, the LRV Supplier shall do one of the following:
 - 1. revise and resubmit such Submittal, indicating how the Submittal has been revised to address each issue identified by the City; or
 - 2. dispute the endorsement using the process provided in Section 3.8 [*Disputed Endorsement*].
- C. The LRV Supplier shall update the Submittal Register within five Business Days of the City’s endorsement with the date of re-submission of a Submittal endorsed “Rejected”.
- D. Where the LRV Supplier revises and resubmits a Submittal endorsed “Rejected”, the City will review the resubmitted Submittal in accordance with this Schedule, provided that the Review Period shall be 20 Business Days, or such other period as may be specified in, or permitted by, this Supply Agreement, from the date of receipt.

3.7.4 CITY’S REASONS FOR “REJECTED” OR “ACCEPTED WITH NOTES” ENDORSEMENT

- A. Where the City endorses a Submittal “Rejected” or “Accepted with Notes”, the City will provide reasons for the endorsement, referencing particulars of the sections of the Supply Agreement that the Submittal or portion of the Submittal fails to satisfy.
- B. If requested by the LRV Supplier, the Parties will meet as soon as practicable to discuss the reasons for the endorsement.
- C. In lieu of returning a Submittal, the City may provide written notice to the LRV Supplier of the endorsement assigned to a Submittal and, if such endorsement is “Rejected” or “Accepted with Notes”, the notification will contain comments in sufficient detail, including references to the applicable sections of the Supply Agreement, that the Submittal or portion of the Submittal fails to satisfy.

3.7.5 GROUNDS FOR “REJECTED” OR “ACCEPTED WITH NOTES” ENDORSEMENT

- A. Subject to Section 3.8.2 [*City’s Discretion – No Dispute*], the City may, acting reasonably, endorse “Accepted with Notes” or “Rejected”, as applicable, any Submittal on any of the following grounds:
 - 1. the Submittal has not been prepared in accordance, otherwise conflicts, or is inconsistent with the Supply Agreement or the requirements of any other Project Document, or has been based on erroneous information or data;
 - 2. the Submittal does not conform to the requirements of Section 1.2 [*Submittal Requirements*];
 - 3. the Submittal is inconsistent or conflicts with the contents, requirements, or procedures described in an earlier Submittal accepted by the City pursuant to this Schedule;
 - 4. the Submittal has not been prepared in accordance, otherwise conflicts, or is inconsistent with Good Industry Practice;
 - 5. the LRV Supplier has not provided all information, data, and documents required by the City to fully appreciate, understand, or review the Submittal, including the Submittal’s implications and relationship to other components of the Work, irrespective of whether such information, data, or documents was the subject of a notice by the City in accordance with Section 3.6.2 [*Submittal Meetings and Explanations*]; or

6. the proposed Submittal or the adoption of the proposed document or proposed course of action would, or might reasonably be expected to, do the following:
 - a. conflict or be inconsistent with the statutory or public duties, functions, or obligations of the City;
 - b. materially and adversely affect the ability of the LRV Supplier to perform its obligations under this Supply Agreement or any other Project Document;
 - c. materially and adversely affect any of the following:
 - i. any right or obligation of the City under this Supply Agreement or any other Project Document to perform any of its obligations under this Supply Agreement or any other Project Document;
 - ii. the ability of the City to enforce any right or to perform any of its obligations under this Supply Agreement or any other Project Document; or
 - iii. the ability of the City or any other Governmental Authority to carry out any statutory or public duty, function, or obligation;
 - d. materially and adversely affect any right or obligation of the City under or with respect to any Project Contract; or
 - e. give rise to a breach or be in breach of any Applicable Law.
- B. The City shall always be entitled to endorse a Submittal with "Accepted with Notes" or as "Rejected", as the case may be, on the foregoing grounds, notwithstanding any other provision in this Supply Agreement or any other Project Document.

3.8 DISPUTED ENDORSEMENT

3.8.1 GENERAL

- A. If the LRV Supplier disputes the endorsement issued by the City, or the status of a ROCO Form issue, in respect of a Submittal made under Section 3 [*Submittal Review Process*], the LRV Supplier shall, within five Business Days of receipt of such endorsement or status of a ROCO Form issue, provide written notice to the City of the details of such disputed endorsement and shall submit the reasons why the LRV Supplier believes a different endorsement should be assigned, together with appropriate supporting documentation.
 1. The City will review the Submittal, the LRV Supplier's reasons, and any supporting documentation, and within five Business Days after receipt will either confirm the original endorsement or notify the LRV Supplier of the revised endorsement.
 2. If the City fails to respond within the five Business Day period, the original endorsement shall be deemed to have been confirmed by the City.
- B. If the LRV Supplier fails to provide notice and appropriate supporting documentation regarding a disputed endorsement within five Business Days, the original endorsement shall be deemed to have been accepted by the LRV Supplier.
- C. Nothing in this Section will limit either Party's right to refer a Dispute to the Dispute Resolution Procedure.

3.8.2 CITY'S DISCRETION – NO DISPUTE

- A. Where, in accordance with the terms of this Supply Agreement or any other Project Document, the consideration of a Submittal is stated to be subject to the discretion of the City, the City may make comments in relation to or reject, as applicable, any such Submittal in its sole, absolute, unfettered, and subjective discretion.
- B. Such decision shall not be subject to dispute pursuant to the Dispute Resolution Procedure. Where the City rejects a Submittal pursuant to this Section 3.8.2 [*City's Discretion – No Dispute*], the City shall provide feedback on why the Submittal was rejected.

SECTION 4: DESIGN REVIEWS

4.1.1 GENERAL

- A. All Design Review Submittals shall be reviewed in the structured framework of a kick-off meeting, design review workshops and meetings, and a close-out meeting as illustrated in *Figure 2: Design Review Process Flow*.

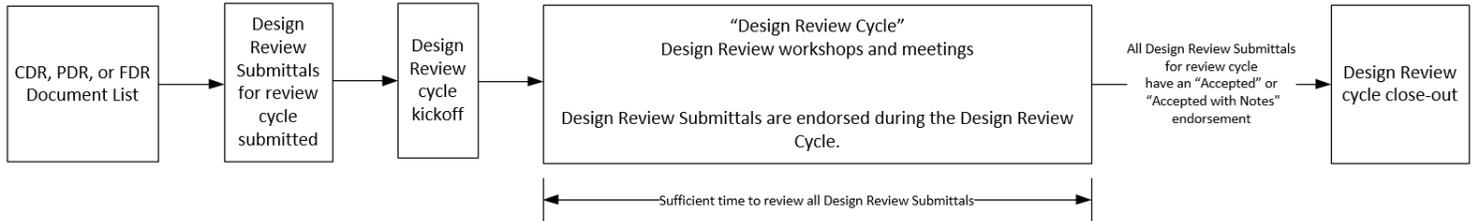


Figure 2: Design Review Process Flow

4.1.2 DESIGN REVIEW PLAN

- A. The LRV Supplier shall submit a Design Review Plan (CDRL 02-01) that includes the following:
1. the scheduled dates for the CDR, PDR, and FDR Design Review cycles, including the dates and duration for each kick-off meeting appropriate to the Design Review cycle;
 2. the proposed naming convention for all Design Review Submittals;
 3. a CDR Document List that lists all the documents to be submitted for CDR in accordance with Section 4.1.4A [*Design Review Cycle Submissions*], and includes the following:
 - a. the date on which each Design Review Submittal is to be submitted in accordance with the Submittal Register;
 - b. the approximate page count and file size of each Design Review Submittal; and
 - c. the anticipated time for the City to review each Design Review Submittal;
 4. a PDR Document List that lists all the documents to be submitted for PDR in accordance with Section 4.1.4B [*Design Review Cycle Submissions*], and includes the following:
 - a. the date on which each Design Review Submittal is to be submitted in accordance with the Submittal Register;
 - b. the approximate page count and file size of each Design Review Submittal; and
 - c. the anticipated time for the City to review each Design Review Submittal; and
 5. an FDR Document List that lists all the documents to be submitted for FDR in accordance with Section 4.1.4B [*Design Review Cycle Submissions*], and includes the following:
 - a. the date on which each Design Review Submittal is to be submitted in accordance with the Submittal Register;
 - b. the approximate page count and file size of each Design Review Submittal; and
 - c. the anticipated time for the City to review each Design Review Submittal.

4.1.3 DESIGN REVIEW PROCESS

- A. The LRV Supplier shall establish a Design Review cycle for the CDR, PDR, and FDR phases of the LRV design. Each Design Review cycle shall be of sufficient duration to allow the following:
1. for the City to review each Design Review Submittal identified in the relevant design phase document list;
 2. to hold Design Review workshops and meetings with the City to discuss and review the appropriate Design Review Submittals;
 3. for each Design Review Submittal submitted during the relevant Design Review cycle to be endorsed “Accepted” or “Accepted with Notes” by the City in accordance with Section 3.7 [*Submittal Endorsements*].
- B. The LRV Supplier shall convene the following kick-off meetings at a level appropriate to the design phase with the following timing and general content:
1. a CDR kick-off meeting prior to the start of the CDR Design Review cycle that includes a presentation and discussion of the following agenda topics:
 - a. an overview of the proposed LRV and the LRV Supplier’s systems and processes used to control the execution of the Work;
 - b. a review of the CDR Document List;
 - c. a review of the proposed CDR review cycle workshop and meeting schedule;
 2. a PDR kick-off meeting prior to the start of the PDR Design Review that includes a presentation and discussion of the following agenda topics:
 - a. an overview of the system-level design of the LRV to allow the City and the LRV Supplier to close out the PDR;
 - b. a review of the PDR Document List; and
 - c. a review of the proposed PDR review cycle workshop and meeting schedule; and
 3. a FDR kick-off meeting prior to the start of the FDR Design Review cycle that includes a presentation and discussion of the following agenda topics:
 - a. an overview of the detailed design of the LRV to allow the City and the LRV Supplier to close out the FDR; and
 - b. a review of the FDR Document List; and
 - c. a review of the proposed FDR review cycle workshop and meeting schedule.
- C. The LRV Supplier shall convene Design Review workshops and meetings as follows:
1. in accordance with the schedule discussed during the relevant kick-off meeting;
 2. at a facility acceptable to the City and, at the request of the City, hosted online to allow remote attendance by City Persons unable to be physically present; and
 3. with the appropriate attendees and subject-matter experts present, in-person or remotely, to resolve and address issues and answer questions on the LRV Supplier’s behalf.

- D. The LRV Supplier shall submit a session agenda, and presentation if applicable, at least five Business Days prior to each Design Review workshop and meeting.
- E. The LRV Supplier shall close out the CDR and PDR Design Review cycles once all relevant Design Review Submittals have been endorsed “Accepted” or “Accepted with Notes” by the City in accordance with Section 3.7 [*Submittal Endorsements*], permitting the LRV Supplier to proceed with the next design phase. The CDR and PDR Design Review cycles can be closed out in one of the following ways:
 - 1. an immediate close out of the Design Review cycle during a Design Review session; or
 - 2. an independent close-out meeting where the LRV Supplier will address all open items to the City’s satisfaction, prior to close out being granted.
- F. The LRV Supplier shall close out the FDR Design Review cycle once all relevant Design Review Submittals have been endorsed “Accepted” by the City in accordance with Section 3.7 [*Submittal Endorsements*], permitting the LRV Supplier to proceed with the next phase. The FDR Design Review cycle can be closed out in one of the following ways:
 - 1. an immediate close out of the FDR Design Review cycle during a Design Review session; or
 - 2. an independent close-out meeting where the LRV Supplier will address all open items to the City’s satisfaction, prior to close out being granted.
- G. The City will issue a Conceptual Design Certificate to the LRV Supplier after all Submittals listed on the CDR Document List have been Accepted.
- H. The City will issue a Preliminary Design Certificate to the LRV Supplier after all Submittals listed on the PDR Document List have been Accepted.
- I. The City will issue a Final Design Certificate to the LRV Supplier after all Submittals listed on the FDR Document List have been Accepted.

4.1.4 DESIGN REVIEW CYCLE SUBMISSIONS

- A. For the CDR, the LRV Supplier shall submit the following:
 - 1. all Design Review Submittals listed in the CDRL to be submitted at CDR;
 - 2. a conceptual LRV package with renderings of the proposed LRV and narratives of project goals including the following:
 - 3. technical design targets;
 - 4. operational targets;
 - 5. RAMS targets; and
 - 6. a general schedule of the activities to be performed between CDR and PDR.
- B. For the PDR, the LRV Supplier shall submit the following:
 - 1. updates to CDR Submittals as requested by the City to address special concerns or problem areas;
 - 2. all Design Review Submittals listed in the CDRL to be submitted at PDR;
 - 3. drawing packages of the LRV and all its systems, including the following:

- a. general arrangements and section drawings of the LRV exterior, interior, and cab showing the LRV layout and variations in cross-section that occur throughout it;
 - b. carbody structural drawings;
 - c. equipment locations and layouts showing where systems, subsystems, and assemblies have movement ranges, and the swept path of the equipment on the LRV to demonstrate clearance with its surroundings;
 - d. interfaces with wayside infrastructure and equipment, include the dynamic performance on horizontal and vertical curves of the coupled and uncoupled ends at various speeds;
 - e. human factors analysis of the driver's cab and passenger area;
 - f. accessibility compliance, as described in Section 1.6 [*Accessibility Requirements*] of Schedule 4 [*Technical Requirements*];
 - g. passenger interfaces described in Section 1.6 [*Accessibility Requirements*] of Schedule 4 [*Technical Requirements*], Section 11 [*Passenger Information System*] of Schedule 4 [*Technical Requirements*], and the Design Guide; and
 - h. passenger loadings and expected LRV mass;
4. material samples of decorative and other materials proposed for use on the LRV, mounted to a backing, as necessary, and assembled into binders;
 5. a general schedule of the activities to be between PDR and FDR;
 6. a 90% complete Software Requirements Specification, described in Section 5.4.1 [*Custom Software*] of Schedule 3 [*Design and Manufacturing Protocols*], that describes all user interfaces and information provided to Drivers and maintainers; and
 7. the structure of the LRV operations, maintenance, and training manuals.
- C. For the FDR, the LRV Supplier shall submit the following:
1. updates to PDR Design Review Submittals as requested by the City to address special concerns or problem areas;
 2. all Design Review Submittals listed in the CDRL to be submitted at FDR;
 3. complete drawings, renderings, and BOM packages for the LRV and its systems;
 4. a configuration baseline for each LRV system;
 5. complete electrical schematics of the LRV and its systems; and
 6. material samples of decorative and other materials proposed for use on the LRV, mounted to a backing, as necessary, and assembled into binders.

SECTION 5: SUBSEQUENT DISCOVERY OF DEFICIENCIES

- A. If at any time after a Submittal has been endorsed, or deemed endorsed, the City or the LRV Supplier discovers that a Submittal contains Deficiencies or otherwise fails to conform to the requirements of this Supply Agreement, the City or the LRV Supplier, as the case may be, shall promptly provide written notice to the other Party of such Deficiencies, and the City may revise the endorsement assigned to such Submittal. If the Parties agree or it is determined in accordance with the Dispute Resolution Procedure that the revised endorsement is correct, the LRV Supplier shall modify the applicable Submittal(s) and rectify any Deficiency in accordance with Section 2.3 [*Deficiencies*] of Schedule 3 [*Design and Manufacturing Protocols*].

SECTION 6: REVIEW, INSPECTION, AND AUDIT BY THE CITY

- A. If any review, inspection, examination, audit, testing, determination, acceptance, certificate, certification, permission, consent, comment, or observation is provided, performed, or made by or on behalf of the City in accordance with this Supply Agreement or any other Project Document, whether pursuant to this Schedule or otherwise, or if no comment or observation is made by or on behalf of the City pursuant to this Schedule or otherwise, the following shall apply:
1. such review, inspection, examination, audit, testing, determination, acceptance, certificate, certification, permission, consent, comment, or observation, or lack of comment or observation shall be for assessment by the City of general compliance by the LRV Supplier with its obligations under this Supply Agreement or the other Project Documents only;
 2. notwithstanding any other provisions of this Supply Agreement, no such review, inspection, examination, audit, testing, determination, acceptance, certificate, certification, permission, consent, comment, or observation, or lack of comment or observation, now or in the future, and whether or not involving any negligent act or negligent omission or error on the part of the City as follows:
 - a. shall relieve or exempt, or be deemed to relieve or exempt, the LRV Supplier or any LRV Supplier Person from any of its obligations and liabilities under this Supply Agreement or any other Project Document or at law or in equity;
 - b. shall constitute a waiver or release, or be deemed to be a waiver or release, by the City of any duty or liability owed by the LRV Supplier or any other person to the City, or of any indemnity given by the LRV Supplier under this Supply Agreement or any other Project Document;
 - c. shall create or impose, or be deemed to create or impose, any requirement, liability, covenant, agreement, or obligation on the City; or
 - d. shall entitle, or be deemed to entitle, the LRV Supplier to make any Claim against the City for, or to recover from the City, any Losses, except as expressly provided otherwise in this Supply Agreement; and
 3. any decision made by the City under this Schedule, once all applicable Disputes arising in respect thereof have been resolved in accordance with this Schedule, shall be final, subject only to being opened up, reviewed, or revised by the City, in its discretion, if errors or further relevant facts are revealed after the decision has been made.
- B. At the request of the City from time to time, the LRV Supplier shall obtain from the Key Individuals and any other persons identified by the City, acting reasonably, prior to any such Party carrying out any part of the Work, waivers of liability substantially on the terms of this Section in favour of the City and in form and substance satisfactory to the City.

SECTION 7: SUBMITTAL IMPLEMENTATION

7.1 DEVIATION FROM SUBMITTALS PROHIBITED

- A. The LRV Supplier shall not deviate from Submittals that have been Accepted by the City in accordance with this Schedule, except in accordance with Section 1.6 [*Engineering and Design Change Management*] of Schedule 3 [*Design and Manufacturing Protocols*] or Schedule 13 [*Changes*].
- B. Where the LRV Supplier proposes that a revision to an Accepted Submittal is required for one of the following reasons:
 - 1. due to unforeseen circumstances;
 - 2. to meet the requirements of the Supply Agreement; or
 - 3. to address additional comments provided by the City;

the LRV Supplier shall submit the revised Submittal to the City, with appropriate supporting documentation, in accordance with this Schedule prior to implementing any changes to the Works.

7.2 NO IMPLEMENTATION PRIOR TO ACCEPTANCE

- A. The LRV Supplier shall not implement or permit the implementation of any activity that is the subject of a Submittal until the applicable Submittal has been “Accepted”, “Accepted with Notes”, or deemed “Accepted” by the City in accordance with this Schedule.

APPENDIX 2A: CONTRACT DELIVERABLES REQUIREMENTS LIST

- A. The CDRLs required by this Supply Agreement are listed below. Detailed requirements for each CDRL are included within the Supply Agreement as referenced in *Table 1, Table 2, Table 3, Table 4,* and *Table 5* below.
- B. The due dates for submission of the initial draft, updated drafts, and final version as applicable to each CDRL are identified in in *Table 1, Table 2, Table 3, Table 4,* and *Table 5* below. Due dates for Submittals are provided in reference to dates for CDR, PDR, or FDR, or to other milestone dates as applicable.
- C. Where a Design Review Submittal is indicated to be submitted at multiple Design Review stages, the following applies:
 - 1. Design Review Submittals submitted at the first Design Review stage indicated are expected to be in a non-final format; and
 - 2. Design Review Submittals submitted at the last Design Review stage indicated are expected to be the final version of the document.

Table 1: Schedule 2 Submittals

CDRL #	Title	Section Reference in Schedule 2	Due Dates
02-01	Design Review Plan	4.1.2 A	No later than 6 weeks after NTP

Table 2: Schedule 3 Submittals

CDRL #	Title	Section Reference in Schedule 3	Due Dates
03-01	Program Organization Chart	1.1 E	No later than 2 weeks after NTP
03-02	Contact List	1.1 F	No later than 2 weeks after NTP
03-03	Program Management Plan	1.2 A	No later than 3 weeks after NTP
03-04	Progress Report	1.4 A	Monthly
03-05	Configuration Management Plan	1.5.2A	CDR
03-06	Configuration Data List	1.5.2B	CDR
03-07	Component Serialization List	1.5.4.6A	PDR, FDR
03-08	Contract Work Schedule	1.6.2.1A	No later than 3 weeks after NTP
03-09	Current Schedule	1.6.3A	Monthly
03-10	Recovery Schedule	1.6.4A.2	As required

CDRL #	Title	Section Reference in Schedule 3	Due Dates
03-11	Drawing Index	1.7.1A	No later than 6 weeks after NTP
03-12	CAD Standard	1.7.1B	No later than 6 weeks after NTP
03-13	Product Data for Materials and Methods of Installation	1.7.2A	PDR and FDR
03-14	Samples of Materials and Methods of Installation	1.7.3A	PDR and FDR
03-15	Public Communications Package	1.9.2B	CDR, PDR, FDR, and quarterly commencing at the start of manufacturing until the Fleet Acceptance Certificate has been issued
03-16	Video Information Plan	1.9.2E	PDR
03-17	Quality Manual	2.2.2A	CDR
03-18	Design Quality Management Plan	2.2.3A	CDR
03-19	Manufacturing Quality Management Plan	2.2.4A	PDR
03-20	Quality Management System Report	2.2.5A	Monthly
03-21	Quality Audit Plan	2.4.1A	CDR
03-22	Software Process Audit Improvement Action Plan	2.4.2D	As required
03-23	Inspection Reports	2.6.2B	As required
03-24	Inspection Plan	2.6.4A	FDR
03-25	First Article Inspection List	2.6.5B	FDR
03-26	Pre-FAI Report	2.6.5E	No later than 20 Business Days prior to each FAI
03-27	Hold Point Inspections List	2.6.9B	No later than 6 weeks prior to the start of LRV manufacturing
03-28	Reliability, Availability, Maintainability, and Safety (RAMS) Program Plan	3.1.1B	CDR
03-29	RAMS Progress Report	3.1.2A	PDR, FDR, first LRV delivery, issuance of Fleet Acceptance Certificate
03-30	RAM Plan	3.1.3A	PDR

CDRL #	Title	Section Reference in Schedule 3	Due Dates
03-31	Reliability Analysis	3.2.2A	PDR and updated at FDR
03-32	Failure Analysis Reports	3.2.3A	As required
03-33	Maintainability Program Plan	3.3.2A	PDR
03-34	Maintainability Demonstration Plan	3.3.3B	FDR
03-35	Maintainability Demonstration Report	3.3.3D	No later than 15 Business Days after conclusion of Maintainability Demonstration
03-36	Recommended Spare Parts List	3.3.4B	FDR
03-37	Safety and Security Certification Plan	3.4.2B	CDR
03-38	Safety Compliance Assessment	3.4.2D	FDR
03-39	Safety and Security Verification Certificate	3.4.2E	Conditional Acceptance of each LRV
03-40	Hazard Log Matrix	3.4.6A	CDR then with Progress Reports in accordance with Section 1.4.B.3.d.vi
03-41	Failure Modes, Effects, and Criticality Analyses Package	3.4.7A	PDR and FDR
03-42	Sneak Circuit Analysis	3.4.7B	PDR and FDR
03-43	Threats and Vulnerability Analysis	3.4.7C	PDR and FDR
03-44	Operations and Maintenance Hazard Analysis	3.4.7D	PDR and FDR
03-45	Preliminary Hazard Analysis	3.4.7E	PDR and FDR
03-46	Fire Hazard Analysis	3.4.7F	FDR
03-47	System Design Description	4 A	PDR and FDR
03-48	Systems Integration Matrix and Testing Plan	4 B	FDR
03-49	Interface Control Document Package	4 C	PDR and FDR
03-50	Software Design Plan	5.1.1A	PDR and FDR
03-51	Software and Licenses of the LRV Systems	5.1.1B	Prior to the issuance of the first Conditional Acceptance Certificate

CDRL #	Title	Section Reference in Schedule 3	Due Dates
03-52	Software Development Process	5.1.2A	CDR
03-53	List of Programming Languages	5.3.1B	FDR
03-54	List of Non-English Code	5.3.1C	Prior to the issuance of the first Conditional Acceptance Certificate
03-55	Software Project Management Plan	5.4.1A.1	PDR, as required
03-56	Software Quality Assurance Plan	5.4.1A.2	PDR, as required
03-57	Software Configuration Management Plan	5.4.1A.3	PDR, as required
03-58	Software Validation and Verification Plan	5.4.1A.4	PDR, as required
03-59	Software Validation and Verification Report	5.4.1A.5	15 Business Days after associated verification and validation activity
03-60	Software Requirements Specification	5.4.1A.6	PDR and FDR, as required
03-61	Software Interface Control Document	5.4.1A.7	PDR and FDR, as required
03-62	Software Design Description	5.4.1A.8	PDR and FDR, as required
03-63	Database Design Description	5.4.1A.9	PDR and FDR, as required
03-64	Software Requirements Traceability Matrix	5.4.1A.10	PDR and FDR, as required
03-65	Software Test Plan	5.4.1A.11	FDR, as required
03-66	Software Test Procedure	5.4.1A.12	10 Business Days prior to the associated test, as required
03-67	Software Test Report	5.4.1A.13	Within 10 Business Days of the associated test, as required
03-68	Software Version Description	5.4.1A.14	With release of any software version
03-69	Software User Manual	5.4.1A.15	Prior to the issuance of the first Conditional Acceptance Certificate and updated with release of any software version
03-70	In-Service Software Modification Documentation	5.4.1C	With any software modification or release of any software version

CDRL #	Title	Section Reference in Schedule 3	Due Dates
03-71	Commercially Available Software Package	5.4.2A	Prior to the issuance of the first Conditional Acceptance Certificate
03-72	Interface Control Document Verification Demonstration Report	5.5 C	2 weeks after associated software test
03-73	Software Process Deviation Request	5.8 B	As required
03-74	Electromagnetic Compatibility Plan	6.1 B	CDR, PDR, FDR, updated as required
03-75	LRV Emissions and Immunity Report	6.1 D	Prior to the issuance of the first Conditional Acceptance Certificate
03-76	EMI/EM Safety Analysis	6.2.1A	PDR and FDR
03-77	Radio Susceptibility Qualification Test Procedure	6.3.2B	In accordance with Section 8.2.1 [General] of Schedule 3 [Design and Manufacturing Protocols]
03-78	Radio Susceptibility Qualification Test Report	6.3.2D	In accordance with Section 8.2.1 [General] of Schedule 3 [Design and Manufacturing Protocols]
03-79	Extremely Low Frequency Emission Demonstration Procedure	6.3.3A	In accordance with Section 8.2.1 [General] of Schedule 3 [Design and Manufacturing Protocols]
03-80	Extremely Low Frequency Compliance Report	6.3.3B	In accordance with Section 8.2.1 [General] of Schedule 3 [Design and Manufacturing Protocols]
03-81	Requirements Traceability Plan	7.1.1A	CDR, PDR, FDR
03-82	Requirement Verification Procedure	7.1.2A	In accordance with Section 8.2.1 [General] of Schedule 3 [Design and Manufacturing Protocols]
03-83	Requirement Verification Report	7.1.2C	In accordance with Section 8.2.1 [General] of Schedule 3 [Design and Manufacturing Protocols]
03-84	Requirement Metrics Report	7.1.2D	Monthly
03-85	Validation and Verification Plan	7.2.1B	PDR and FDR
03-86	Verification (By Analysis) of Design Performance Requirements	7.2.3.4A	Not later than 30 days after completing the associated verification analysis

CDRL #	Title	Section Reference in Schedule 3	Due Dates
03-87	Testing Standards List	8.1 A	PDR, FDR
03-88	Previous Type Test Documentation	8.1 G	As required
03-89	Master Test Plan	8.2.1A	FDR, updated monthly
03-90	Test Procedure	8.2.2A	In accordance with Section 8.2.1 [General] of Schedule 3 [Design and Manufacturing Protocols]
03-91	Test Report	8.2.3A	In accordance with Section 8.2.1 [General] of Schedule 3 [Design and Manufacturing Protocols]
03-92	Commissioning Plan	9.2 A	FDR
03-93	Technical Manuals Program Plan	10.1.2A	FDR
03-94	Web-Based LRV Manual Library	10.1.5.1E	In accordance with Section 10.1.5.2 of Schedule 3 [Design and Manufacturing Protocols]
03-95	Owner's Operating Manual	10.1.7A	In accordance with Section 10.1.5.2 of Schedule 3 [Design and Manufacturing Protocols]
03-96	Owner's Operating Manual (Pocket-Sized)	10.1.7B	In accordance with Section 10.1.5.2 of Schedule 3 [Design and Manufacturing Protocols]
03-97	Illustrated Parts Catalogue	10.1.9A	In accordance with Section 10.1.5.2 of Schedule 3 [Design and Manufacturing Protocols]
03-98	Running Maintenance and Service Manual	10.1.10A	In accordance with Section 10.1.5.2 of Schedule 3 [Design and Manufacturing Protocols]
03-99	Heavy Repair and Overhaul Manual	10.1.11A	In accordance with Section 10.1.5.2 of Schedule 3 [Design and Manufacturing Protocols]
03-100	Wire, Hose, and Cable Numbering System	10.1.12A	In accordance with Section 10.1.5.2 of Schedule 3 [Design and Manufacturing Protocols]

CDRL #	Title	Section Reference in Schedule 3	Due Dates
03-101	Integrated Schematic	10.1.12B	In accordance with Section 10.1.5.2 of Schedule 3 [<i>Design and Manufacturing Protocols</i>]
03-102	Wire, Hose, and Cable Connection Diagram	10.1.12E	In accordance with Section 10.1.5.2 of Schedule 3 [<i>Design and Manufacturing Protocols</i>]
03-103	Electrical Schematics Narrative	10.1.12F	In accordance with Section 10.1.5.2 of Schedule 3 [<i>Design and Manufacturing Protocols</i>]
03-104	Consolidated Electrical Parts List	10.1.12G	In accordance with Section 10.1.5.2 of Schedule 3 [<i>Design and Manufacturing Protocols</i>]
03-105	Hydraulic Schematics Narrative	10.1.12H	In accordance with Section 10.1.5.2 of Schedule 3 [<i>Design and Manufacturing Protocols</i>]
03-106	Consolidated Hydraulic Parts List	10.1.12I	In accordance with Section 10.1.5.2 of Schedule 3 [<i>Design and Manufacturing Protocols</i>]
03-107	Pneumatic Schematics Narrative	10.1.12J	In accordance with Section 10.1.5.2 of Schedule 3 [<i>Design and Manufacturing Protocols</i>]
03-108	Consolidated Pneumatic Parts List	10.1.12K	In accordance with Section 10.1.5.2 of Schedule 3 [<i>Design and Manufacturing Protocols</i>]
03-109	Technical Instruction Manual	10.1.13A	Final Acceptance of the last LRV
03-110	Special Tools and Diagnostic Test Equipment Manual	10.1.14A	In accordance with Section 10.1.5.2 of Schedule 3 [<i>Design and Manufacturing Protocols</i>]
03-111	Vehicle History Book	10.2.1A	Conditional Acceptance of each LRV

CDRL #	Title	Section Reference in Schedule 3	Due Dates
03-112	As-Built Information Package	10.2.2A	Conditional Acceptance of the 6 th LRV, Final Acceptance of the 40 th Base Order LRV
03-113	Recommended Special Tools and Diagnostic Test Equipment List	10.3.1A	PDR, FDR
03-114	Requirement Specification for Portable Test Unit Laptop	10.3.1I	FDR
03-115	Training Records	10.4.1C	At the completion of all training
03-116	Training Schedule	10.4.1G	60 days prior to the training activity
03-117	Training Course Plan	10.4.1H	6 months prior to the first training activity
03-118	Operational Training Material	10.4.1J.1	60 days prior to the specific training activity
03-119	Maintenance Training Material – Service Personnel	10.4.1J.2	60 days prior to the specific training activity
03-120	Maintenance Training Material – Tradespeople/Mechanics	10.4.1J.3	60 days prior to the specific training activity
03-121	Training Audio-Visual Recording	10.4.3A	60 days after the recorded session
03-122	Resumes of Proposed On-Site Technical Support Personnel	10.5.1C	3 months prior to delivery of the first LRV
03-123	Maintenance Management Information	10.5.3A	3 months prior to delivery of the first LRV

Table 3: Schedule 4 Submittals

CDRL #	Title	Section Reference in Schedule 4	Due Dates
04-01	LRV Track Clearance Report	1.4.3.4C	CDR, PDR, FDR
04-02	LRV Swept Path Analysis	1.2.2C	CDR, PDR, FDR
04-03	Substitution of Standards List	1.3.1C	CDR
04-04	Manual Operations and Mitigations Report	1.3.5B	PDR, FDR

CDRL #	Title	Section Reference in Schedule 4	Due Dates
04-05	Human Factors Engineering Report	1.3.6C	PDR, FDR
04-06	Obsolescence Management Plan	1.3.10E	CDR, PDR, FDR
04-07	Climate Plan Package	1.3.14J	PDR, FDR
04-08	Fire and Smoke Load Analysis	1.3.16E	FDR
04-09	LRV Passenger Ingress and Egress Flow Study	1.4.5B	PDR, FDR
04-10	LRV Safe Braking Distance	1.5.1E	FDR
04-11	Duty Cycle Report	1.5.3B	FDR
04-12	Validated LRV Dynamic Simulation Model	1.5.5C.1	PDR
04-13	Wheel Rail Interface	1.5.5D	PDR, FDR
04-14	Wheel Rail Interface – Wheel Maintenance Guidelines	1.5.5G	FDR
04-15	Platform Interface Study	1.6.1C.1	PDR, FDR
04-16	Accessibility Design Report	1.6.9A	PDR, FDR
04-17	Mass Management Program	1.7.3A	CDR
04-18	LRV Mass Ticket	1.7.3C	Conditional Acceptance of the associated LRV
04-19	Exterior Design and Finishing Scheme	1.10.1B	CDR, PDR, FDR
04-20	Anti-Climber Collision Analysis	2.1.1.8B	PDR, FDR
04-21	Crash Energy Management Validation Report	2.1.3.2A	PDR, FDR
04-22	Water Accumulation Analysis	2.1.4G	PDR
04-23	Interior Design Layout Report	2.2.1C	PDR, FDR
04-24	Locking Configuration Design Report	2.2.2.2B	PDR, FDR
04-25	HVAC System Analysis Package	2.4.1D	PDR, FDR
04-26	Driver's Cab Layout Package	3.2.7A	PDR, FDR
04-27	Warning Devices Audio Report	3.2.7B	PDR, FDR
04-28	Windshield and Headlight Washer Proposal	3.3.2G	PDR, FDR

CDRL #	Title	Section Reference in Schedule 4	Due Dates
04-29	HVDC Circuit Design and Functional Description	4.1.1F	PDR, FDR
04-30	Propulsion System Functional Design Description	4.1.1G	PDR, FDR
04-31	Propulsion Thermal Protection Design Description	4.2.2D	PDR, FDR
04-32	Propulsion System EMC Report	4.4D	PDR, FDR
04-33	Propulsion Performance Document	4.5.1D	FDR
04-34	Maintainer Adjustable Propulsion System Parameters	4.5.7.12A	PDR, FDR
04-35	Friction Brake Design	4.8.2.5A	PDR, FDR
04-36	Stub or Portal Axle Design	5.4.1A.2	PDR, FDR
04-37	Coupler and Draft Gear System Mechanical Analysis Report	6.2.3A	PDR, FDR
04-38	Electrical Coupler Design Analysis Report	6.3.5A	PDR, FDR
04-39	Hood Design Report	6.4F	PDR, FDR
04-40	Coupler System Manual Operation Report	6.6C	PDR, FDR
04-41	Pantograph Study	8.4.4A	PDR, FDR
04-42	LRV CCTV Coverage Report	9.2.2C	PDR, FDR
04-43	Recording Protection Event Document	9.2.4.1I	PDR, FDR
04-44	Network Design Document	9.3.1.3D	PDR, FDR
04-45	TOD Screen Arrangement	10.5.1D	PDR, FDR
04-46	Operating Statuses Report	10.5.2.1D	PDR, FDR
04-47	LRV Coverage Study	11.1.1E	PDR, FDR
04-48	LRV PA System Design	11.1.2.2D	PDR, FDR
04-49	Automatic Announcement Database Document	11.1.5.4A	PDR, FDR
04-50	Signalling Equipment Installation and Information Transfer Document	12.1D	PDR, FDR

Table 4: Schedule 5 Submittals

CDRL #	Title	Section Reference in Schedule 5	Due Date
05-01	LRV Design Information Secondary Package	1.3.2A	LRV Design Information Secondary Package Date
05-02	Integration Management Plan	2.1 B	NTP + 6 weeks
05-03	Integration Register	2.1 D	CDR, PDR, FDR, Conditional Acceptance of the first LRV, Final Acceptance of the first LRV, Fleet Acceptance

Table 5: Schedule 8 Submittals

CDRL #	Title	Section Reference in Schedule 8	Due Date
08-01	Delivery Schedule	1.2 B	6 months prior to delivery of the first LRV

**THE CITY OF EDMONTON
VALLEY LINE WEST LRT**

LRV SUPPLY AGREEMENT

Schedule 3 – Design and Manufacturing Protocols

VALLEY LINE WEST LRT
SCHEDULE 3 – DESIGN AND MANUFACTURING PROTOCOLS

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SECTION 1: PROGRAM MANAGEMENT

1.1 GENERAL

- A. The LRV Supplier shall provide program management that covers the following activities:
 - 1. all aspects of the Work related to, but not limited to, the design, manufacturing, Quality Assurance, shipping, delivery, Commissioning, and Warranty of the LRVs; and
 - 2. training the City and the Operator in the operation and maintenance of the LRVs.
- B. The LRV Supplier shall meet the requirements for the Work as outlined in the Supply Agreement, including schedule. Without limiting the generality of the foregoing, the LRV Supplier shall be responsible for the following activities:
 - 1. monitoring the performance to the CWS and updating the Current Schedule as necessary to ensure delivery requirements are met; and
 - 2. submitting Progress Reports to the City as defined in Section 1.4 [*Progress Reports*].
- C. When requested by the City, the LRV Supplier shall make access available to design details, manufacturing facilities, including those of Subcontractors, and production and quality processes and reports.
- D. The LRV Supplier shall manage and coordinate the internal interfaces between on-board systems and the external interfaces between the LRVs and the Valley Line LRT infrastructure in accordance with Schedule 5 [*Integration Requirements*] and Schedule 6 [*Interface Agreement*].
- E. The LRV Supplier shall submit a Program Organization Chart (CDRL 03-01), which shall include names, responsibilities, and qualifications of Key Individuals as well as the LRV Supplier's lead personnel involved in the Work in project management, engineering, manufacturing, Commissioning, and Quality Assurance roles.
- F. The LRV Supplier shall submit a Contact List (CDRL 03-02) with contact details of all people listed in the Program Organization Chart.
- G. The LRV Supplier shall provide an office space, large enough for two people, in its manufacturing facility for the City, provided no later than 10 Business Days prior to the start of manufacturing until manufacturing and facility testing of all LRVs has been completed.
- H. Once the configuration baselines have been established at FDR, the LRV Supplier shall use the process detailed in the Change Management Subplan during any change to the LRVs' hardware, Software, firmware, system, subsystem, and production configuration baselines.
 - 1. The Accepted configuration baseline shall not be changed except by the implementation of a Change Order or rectification of a Fleet Warranty Deficiency.

1.2 PROGRAM MANAGEMENT PLAN

- A. The LRV Supplier shall submit a Program Management Plan (CDRL 03-03) that includes the following information:
 - 1. a description of the LRV Supplier's approach to project management;
 - 2. a description of the processes and procedures to manage the Work;
 - 3. a description of the proposed project management and scheduling tool;

4. an overview of a Design Review process that meets the requirements of Section 4 [*Design Reviews*] of Schedule 2 [*Submittal Requirements and Review Procedure*];
 5. the location and address of the LRV Supplier's facilities, including the following:
 - a. design facilities;
 - b. manufacturing facilities;
 - c. assembly facilities; and
 - d. any other facilities under the LRV Supplier's control where Work will be performed;
 6. the list of Subcontractors; and
 7. the Progress Report form template.
- B. The LRV Supplier shall include a Change Management Subplan in the Project Management Plan that describes the following:
1. the process of managing Changes to the LRVs' configuration baseline and manufacturing processes;
 2. the processes and procedures to implement proposed Changes or Innovation Proposals, in compliance with Schedule 13 [*Changes*];
 3. the general format of Change Estimates and Innovation Proposals;
 4. the process for implementing modifications due to a Change Order or Fleet Warranty Deficiency to an LRV after a Conditional Acceptance Certificate has been issued to that LRV; and
 5. the process for replacing or updating Spare Parts and Special Tools that have been affected by modifications due to a Change Order or Fleet Warranty Deficiency after being issued a Spare Parts Acceptance Certificate or Special Tools Acceptance Certificate, as applicable.
- C. The LRV Supplier shall base the Program Management Plan on the preliminary Program Management Plan included in the Bid Extracts.

1.3 MEETINGS

1.3.1 GENERAL REQUIREMENTS

- A. The LRV Supplier shall participate in and co-chair meetings with the City throughout the execution of the Work.
- B. The LRV Supplier shall convene meetings at a time acceptable to the City, at a location as follows, in order of the City's preference of location:
 1. in person in Edmonton, Alberta, at a facility acceptable to the City;
 2. through videoconference or teleconference, using a software program acceptable to the City; and
 3. at the LRV Supplier's location or one of the Subcontractor locations.
- C. The LRV Supplier shall submit meeting agendas at least three Business Days prior to the meeting that include all topics put forward by LRV Supplier and the City.
- D. The LRV Supplier shall record the minutes of meetings as follows:

1. prepare minutes of all meetings, including recording the City's and LRV Supplier's comments and action items;
 2. with five Business Days following the meeting, submit draft meeting minutes to the City for comments; and
 3. submit the final minutes, incorporating all comments, prior to the next meeting.
- E. For greater certainty, minutes of meetings, including any comments from the City included or addressed therein, will not be considered as agreement between the Parties for any amendment to the Supply Agreement, Change to the Work, or endorsement of a Submittal by the City and will be without prejudice to any of the Parties' rights under the Supply Agreement.
- F. The LRV Supplier shall coordinate and organize the attendees required for participation for the meetings. Unless requested by the City, relationships and discussions between the LRV Supplier and its Subcontractors are not to form part of the meeting's content.

1.3.2 KICK-OFF MEETING

- A. The LRV Supplier shall convene a kick-off meeting within 10 Business Days of NTP and lead the discussion of the following agenda items with the City:
1. discussion of all matters essential to the successful completion of the Work;
 2. assignment of the roles and responsibilities of the LRV Supplier and the City personnel;
 3. definition of the lines of communication between the LRV Supplier and the City;
 4. review of the scope of the Work, including the following:
 - a. CWS;
 - b. Submittal requirements; and
 - c. CDRL schedule;
 5. confirmation of the project control methodology and plans for initial activities before the start of formal progress reporting;
 6. identification of early information needs and decisions required from the City and the LRV Supplier;
 7. review of the LRV Supplier's QMS, including the following:
 - a. review of inspection and testing processes; and
 - b. review of configuration control and data management processes;
 8. identification of the day of the month that the Progress Report will be submitted by the LRV Supplier;
 9. review of the payment schedule; and
 10. presentation to familiarize the City with the LRVs.

1.3.3 PROGRESS MEETINGS

- A. The LRV Supplier shall convene progress and design review meetings at least once in every two-week period and on a more frequent basis when requested by the City.

- B. During progress and design review meetings, the LRV Supplier shall be prepared to discuss with the City all aspects of the LRVs' design and manufacturing and address issues that were raised in the previous Progress Report.
- C. The LRV Supplier shall include the following topics, as are relevant to the current phase of the Work, in the progress and design review meeting agenda:
 - 1. review of, and agreement on, previous meeting minutes;
 - 2. status of Submittals;
 - 3. status of designs;
 - 4. status of the manufacturing of the LRVs;
 - 5. status of the delivery of the LRVs;
 - 6. review of issues picked up by Quality Assurance;
 - 7. queries requiring responses from the LRV Supplier and the City; and
 - 8. update on the status of the CWS that covers the following:
 - a. the Work planned for the next 10, 20, and 40 Business Days; and
 - b. upcoming payment milestones.

1.3.4 TECHNICAL MEETINGS

- A. The LRV Supplier shall convene technical meetings, when requested by either the LRV Supplier or the City, to resolve specific technical matters pertinent to the Work that are too detailed or too complex to cover within the time constraints of the progress and design review meeting.
- B. The LRV Supplier shall ensure LRV Supplier representatives in attendance at the meetings meet the following requirements:
 - 1. the required technical expertise;
 - 2. familiarity with the requirements of the Supply Agreement; and
 - 3. the authority to commit the LRV Supplier to the actions and solutions agreed upon.

1.3.5 PAYMENT REVIEW MEETINGS

- A. The LRV Supplier shall convene payment review meetings when requested by the City or the LRV Supplier.

1.4 PROGRESS REPORTS

- A. The LRV Supplier shall submit a Progress Report (CDRL 03-04) each month on the date of the month determined during the Kick-Off Meeting.
- B. The LRV Supplier shall include the following in each Progress Report:
 - 1. a narrative that describes the following:
 - a. Work accomplished during the reporting period, including an update to the activities that have been started, continued, or completed in the previous period;

- b. percentage of design, manufacturing, delivery, testing, and system support elements completed during the reporting period, and percentage of overall Work completed;
 - c. delays, including Relief Events, incurred during the reporting period, their causes and effects, and the Corrective Actions and Preventive Actions proposed, or taken, to mitigate those delays;
 - d. integration concerns, and resolutions if applicable, raised in an Integration Committee meeting during the reporting period;
 - e. any risks identified, or still in occurrence, since the last reporting period that may affect the Work;
 - f. changes in activity duration from the Current Schedule, if applicable;
 - g. changes in activity dependency and relationship logic from the CWS; and
 - h. Work planned for the next two reporting periods;
2. a detailed look-ahead schedule for the Work to be performed in the next reporting period; and
3. appendices and tables, including the following, that support the narrative:
- a. the Current Schedule, in accordance with Section 1.6.3 [*Current Schedule*];
 - b. an updated Quality Management System Report as defined in Section 2.2.5 [*Quality Management System Report*];
 - c. an updated Total LRV Mass Report in accordance with Section 1.8.3 [*LRV Mass Control Documentation*] of Schedule 4 [*Technical Requirements*]; and
 - d. if changed from the previous reporting period, provide the following as part of the appendices:
 - i. a list of Subcontractors;
 - ii. a summary of all Change Order Confirmations issued by the City to date;
 - iii. a summary of all Change Orders and Innovation Proposals currently being reviewed;
 - iv. an updated CDRL;
 - v. an updated drawing list;
 - vi. an updated Hazard Log Matrix as defined in Section 3.4.6 [*Hazard Log Matrix*];
 - vii. an updated Requirement Metrics Report as defined in Section 7.1.2 [*Requirements Verification Protocols*]; and
 - viii. an update on the status of the Software Submittals described in the Software Design Plan as defined in Section 5.1.1 [*General*].

1.5 CONFIGURATION AND DATA MANAGEMENT PROGRAM

1.5.1 GENERAL

- A. The LRV Supplier shall implement and maintain a Configuration and Data Management Program designed to provide the following:

1. revision control of all documentation, including design details, for the installed systems;
2. control of the LRVs' hardware, Software, and firmware configurations;
3. control of changes to the LRVs' hardware, Software, and firmware configurations; and
4. reporting of the implementation status of changes to the LRVs' hardware, Software, and firmware configurations.

1.5.2 CONFIGURATION MANAGEMENT PLAN

- A. The LRV Supplier shall submit a Configuration Management Plan (CDRL 03-05) that includes the following:
 1. a Configuration and Data Management Program that details the processes, systems, and techniques that will be used to ensure robust configuration management and revision control throughout the duration of the Work;
 2. the numbering scheme for all documents, drawings, hardware, firmware, and Software; and
 3. a controlled document process that ensures that when a new revision is published, all outdated documentation is removed from circulation and documentation with the latest revision is reissued to all recipients.
- B. The LRV Supplier shall submit a Configuration Data List (CDRL 03-06) and update it after each design phase milestone with all changes to the CDL, including all serialization data identified in the Component Serialization List for the installed LRVs' hardware, Software, and firmware configurations.

1.5.3 DOCUMENTATION REVISION CONTROL

- A. The LRV Supplier shall release documentation through a formal release process within the Quality Manual in accordance with Section 2.2.2 [*Quality Manual*].
- B. The LRV Supplier shall control revisions through the allocation of a revision number to each new version of any piece of documentation.
- C. The LRV Supplier shall incorporate a revision control sheet that provides the following information, in all written documentation:
 1. document number;
 2. revision number;
 3. document title;
 4. date of issue;
 5. reviser's name;
 6. reviewers' names;
 7. reason for revision;
 - a. modifications made from previous revision;
 8. history of revisions;
 9. original author; and
 10. original release date.

- D. The LRV Supplier shall ensure each group of drawings controlled under a single index contains the following revision-controlled pages:
1. an index sheet that provides the following information for each index entry:
 - a. sheet number;
 - b. sheet title;
 - c. sheet revision; and
 - d. sheet status; and
 2. a revision history sheet that provides the following information:
 - a. the revision number;
 - b. the sheets affected under that revision's modifications;
 - c. the producer and checker of the modification;
 - d. the date of the modification; and
 - e. a full description of the modifications, including references to any COs, installation or test logs, and other directing documents.

1.5.4 SYSTEM CONFIGURATION

1.5.4.1 General Hardware, Firmware, and Software Configuration Control

- A. The LRV Supplier shall control the configuration of all hardware, firmware, and Software components of the LRV systems through revisions to the defining documentation for the system's hardware, firmware, and Software.
- B. The LRV Supplier shall use a method for configuration control that is compatible with the City's current inventory management system.
- C. The LRV Supplier shall record all configuration control information in the CDL.

1.5.4.2 Configuration Identification

- A. The LRV Supplier shall indicate in the Project Records the current Accepted configuration of hardware, firmware, and Software under development, test, production, and operational use.
- B. The LRV Supplier shall base the configuration identification of computer programs and documentation on established configuration baselines with releases linked to the CWS.

1.5.4.3 Configuration Data List

- A. The LRV Supplier shall build the CDL as an indented list of all documentation necessary to identify the production baseline down to the LLRU level and identify all documentation by drawing or document number, title, and revision in the CDL.
- B. The LRV Supplier shall maintain an electronic version of the CDL throughout the duration of the Work and provide the City with unlimited read access for at least four simultaneous users to the electronic version of the CDL.

1.5.4.4 Hardware ID

- A. From the LLRU level upwards, the LRV Supplier shall ensure all items identified by the same part number meet the following requirements:

1. have the same physical and functional characteristics;
 2. are equivalent in performance and durability; and
 3. are interchangeable without alteration to themselves or associated items other than calibration adjustments, provided that an item is not considered interchangeable if it must be selected for fit or performance.
- B. The CDL shall indicate part numbers such that a single part number will identify a specific item in a specific configuration.
- C. The CDL shall differentiate between old and new LLRU configurations by part number change and update all LLRU documentation.
- D. The CDL shall not use colours, coloured dots, serial numbers, or modification numbers to differentiate between old and new LLRU configurations.

1.5.4.5 Nameplates

- A. The LRV Supplier shall ensure hardware is identified with a nameplate permanently marked with the following information:
1. the manufacturer's name or logo;
 2. equipment name;
 3. part number;
 4. revision indicator;
 5. serial number if applicable; and
 6. a QR code that identifies the manufacturer, equipment name, part number, revision indicator, serial number if applicable, and any other information that is required to completely identify the part.

1.5.4.6 Serialization

- A. The LRV Supplier shall submit a Component Serialization List (CDRL 03-07) that details all LLRUs, LRUs, subsystems, and systems that shall be assigned or have a serial number.
- B. The LRV Supplier shall assign each item on the Component Serialization List an individual serial number in a numeric or alphanumeric sequence established for the type or model series of the equipment being supplied in accordance with the following:
1. duplicate serial numbers within a type or model series shall not be used.
- C. The LRV Supplier shall maintain serialization and configuration records for all items on the Component Serialization List.

1.5.5 CONFIGURATION CONTROL

- A. Once a configuration baseline of documentation is established and Accepted by the City at FDR, the LRV Supplier shall control all proposed changes to this configuration baseline through the change management subplan.

1.6 CONTRACT WORK SCHEDULE

1.6.1 GENERAL

- A. The LRV Supplier shall provide to the City a contract work schedule, configured as a detailed critical path method resource-loaded progress schedule, that represents the sequence, means, methods, techniques, and procedures that the LRV Supplier and its Subcontractors will use to execute the Work and that details the Work in an orderly manner that demonstrates the appropriate time required for planning, organization, execution, and monitoring of the Work within the time required by the Supply Agreement (the “**Contract Work Schedule**”).
- B. At minimum, the LRV Supplier shall submit a schedule, for information only, that accurately reflects and reports the actual performance and progress of the Work in relation to the CWS with each Progress Report (the “**Current Schedule**”).
 - 1. At the request of the City, the LRV Supplier shall submit a Current Schedule within five Business Days of such request.

1.6.2 CONTRACT WORK SCHEDULE REQUIREMENTS

1.6.2.1 Contract Work Schedule Content

- A. The LRV Supplier shall submit the CWS (CDRL 03-08) describing the sequence, dependency, and relationship logic for all of the design, Submittals, material procurement, fabrication, assembly, First Article Inspections, delivery, installation, testing, and Commissioning activities required for the Work, including the following:
 - 1. the start and completion dates of all items of the Work, including milestone dates and constraints;
 - 2. all Work interrelationships and interface activities with Project Co and the Operator;
 - 3. times and durations for Submittals to be prepared by the LRV Supplier and reviewed and Accepted by the City;
 - 4. material procurement activities;
 - 5. Quality Assurance activities; and
 - 6. all dependency and relationship logic interrelationships and durations for each subtask leading to each payment milestone.
- B. The LRV Supplier shall provide a CWS that meets the following requirements:
 - 1. includes all elements of the Work;
 - 2. incorporates LRV Supplier’s special conditions, such as specified non-Work periods, that pertain to the performance of the Work; and
 - 3. roll up to the Key Dates.
- C. The LRV Supplier shall include the following project milestones in the CWS:
 - 1. all Key Dates;
 - 2. milestone payments;

3. manufacturing hold points, in accordance with the Hold Point Inspections List in Section 2.6.9 [*Hold Point Inspection*];
4. all Submittal submission dates;
5. CDR, PDR, and FDR review cycles;
6. when the Subcontractor for each system is to be placed under contract by the LRV Supplier unless otherwise Accepted by the City;
7. FAI for all systems on the First Article Inspection List described in Section 2.6.5 [*First Article Inspections*];
8. completion of initial and final drafts of all manuals listed in Section 10 [*Systems Support*];
9. all LRV, system, and subsystem level Type Testing;
10. for each LRV, the date when the following is to occur:
 - a. begin manufacturing of LRV shell parts;
 - b. begin LRV shell major assemblies;
 - c. complete bare LRV shell prior to painting;
 - d. begin LRV shell final assembly;
 - e. complete equipment installation into LRV shell;
 - f. ship LRV shell to final assembly site, if separated;
 - g. complete all stages of testing and Commissioning in the assembly site;
 - h. complete system integration tests;
 - i. complete bogie frames;
 - j. complete bogie assembly;
 - k. complete final bogie mounting on LRV shell;
 - l. complete all LRV, system, and subsystem level routine testing;
 - m. ship the LRV from the LRV Supplier's manufacturing facility;
 - n. indicate estimated arrival of the LRV at the Gerry Wright OMF;
 - o. indicate start and end of Commissioning;
 - p. complete burn in testing of the LRV;
 - q. complete Conditional Acceptance Inspection;
 - r. indicate anticipated Conditional Acceptance of the LRV;
 - s. complete Final Acceptance Inspection of the LRV;
 - t. indicate anticipated Final Acceptance of the LRV;

11. FAI of the First LRV;
 12. delivery and anticipated Acceptance of Spare Parts;
 13. delivery and anticipated Acceptance of Special Tools;
 14. Maintainability Demonstration, described in Section 3.3.3 [*Maintainability Demonstration*];
 15. completion of LRV-level Type Tests on the First LRV;
 16. completion of Train-level Type Tests on the first coupled pair of LRVs; and
 17. other milestones as proposed by the LRV Supplier and Accepted by the City.
- D. When requested by the City, the LRV Supplier shall expand a part of the CWS to explain and demonstrate the sequence of the forecasted Work and submit this expansion of a portion of the CWS within 10 Business Days of receipt of the City's request.

1.6.2.2 Contract Work Schedule Submittal Format

- A. The LRV Supplier shall configure the CWS, Current Schedule, and Recovery Schedule in an electronic format readable by the Primavera P6 software used by the City, and shall include, at minimum, the following categories:
1. activity duration, using a maximum activity duration of 15 Business Days;
 - a. activities that exceed 15 Business Days shall be broken down to smaller activities until the duration does not exceed 15 Business Days;
 2. activity early start and finish dates;
 3. activity late start and finish dates;
 4. total float and free float time;
 5. identification of long lead items;
 6. all logic and precedence relationships; and
 7. identification of the critical path.
- B. The CWS, the Current Schedule, and each Recovery Schedule shall be in accordance with Good Industry Practice and shall be consistent with the following:
1. PMBOK Guide;
 2. the Practice Standard for Scheduling; and
 3. the American Association of Cost Engineering International Recommended Practices.
- C. The CWS, any Current Schedule, and any Recovery Schedule shall be exportable to a searchable PDF, fitted to be legible on a 11-inch x 17-inch page size, and includes the following columns, as a minimum:
1. task ID;
 2. task name;
 3. task duration;

4. task start date;
 5. task finish date;
 6. task predecessors; and
 7. task successors.
- D. The LRV Supplier shall submit the proposed CWS, any Current Schedule, Recovery Schedule, Forensic Schedule Analysis, or requested expansion of a portion of the CWS by the City, with the following:
1. graphic schedule bar charts sorted by activities and early start, indicating the early dates, remaining duration, and total float of all activities; and
 2. upon request by the City, provide the following:
 - a. network logic diagram or time scaled logic diagram; and
 - b. milestones indicating early and late dates for each activity.

1.6.2.3 Contract Work Schedule Revisions

- A. Once Accepted, the CWS shall become the baseline schedule for the Work.
- B. Once Accepted, the CWS shall not be revised except to incorporate revisions resulting from Changes, Relief Events, or Force Majeure Events.

1.6.3 CURRENT SCHEDULE

- A. The LRV Supplier shall submit a Current Schedule (CDRL 03-09) with each Progress Report.
- B. The Current Schedule shall include the following information:
 1. all content required in Section 1.6.2.1 [*Contract Work Schedule Content*];
 2. details of the performance of all Work activities performed and to be performed until the expiration of the Primary LRV Warranty;
 3. clear identification of all deviations from the CWS, including a narrative explanation of the cause(s) of each such deviation with particular reference to reasons behind any changes to the critical path; and
 4. a Gantt chart comparing current Work progress against the CWS.
- C. No Current Schedule shall amend or replace any information contained in the Accepted CWS. For greater certainty, the City shall not be deemed to have Accepted any changes to the CWS logic, relationships, durations, calendars, Key Dates, or any other information, timeline, or deadline that are reflected in a Current Schedule even if the Current Schedule has been deemed Accepted or endorsed as Accepted by the City.

1.6.4 RECOVERY SCHEDULE

- A. If the LRV Supplier fails to take appropriate action to recover from delays that put the Key Dates in the CWS or the LRV Supplier's critical path at risk, the LRV Supplier shall do the following:
 1. submit written notification of the issue to the City; and
 2. submit a Recovery Schedule (CDRL 03-10) with the next Progress Report, that includes the following:

- a. a narrative describing the cause for the slippage and the actions planned to recover the schedule within the shortest reasonable time; and
 - b. assignment of additional labour, Subcontractors, plant or equipment, shift or overtime work, or expediting of Submittals or deliveries as required to recover the schedule.
- B. If, in the opinion of the City, the Current Schedule indicates that delays are putting the Key Dates in the CWS or the LRV Supplier's critical path at risk, the City may request a Recovery Schedule to be submitted with the next Progress Report prior to receiving notification from the LRV Supplier.
- C. Overlapping of activities and sequencing changes to increase activity concurrence will be appropriate if the LRV Supplier demonstrates that the resources in tradespersons, plant, equipment, and supervision exist to overlap activities.

1.7 DOCUMENTATION FORMAT

1.7.1 DRAWINGS

- A. The LRV Supplier shall submit a Drawing Index (CDRL 03-11) that includes the format for the table of contents, general drawing package structure, and drawing number scheme that will be used for all drawings for the Work.
- B. The LRV Suppliers shall develop and submit a CAD Standard (CDRL 03-12) that is based on the City's CAD Standard. The CAD Standard shall provide the following information:
- 1. the template files, borders, and cell libraries for all drawing types and sizes;
 - 2. the drawing scale, the City's name and logo, the contract name and number, title, drawing name and number, revision number and date, location referred to on the LRVs, equipment or product name, if applicable, and name of the LRV Supplier and Subcontractor originating the drawing in the title block, and a drawing index; and
 - 3. definition of all detailed attribute settings for standardized drawing production, including the following:
 - a. font style, size, justification, line weights, styles, colours, and layers;
 - b. drawing conventions such as grid size, line spacing, cell spacing, colouring, layering, standard layouts, standard scales, and standard sizes; and
 - c. CAD management conventions required to be defined for standardized drawing production including drawing control, revision control, checking process, and plotter settings.

1.7.2 PRODUCT DATA

- A. The LRV Supplier shall develop and submit Product Data for Materials and Methods of Installation (CDRL 03-13) proposed for use on the LRVs, including the following:
- 1. product data sheets identified with the contract number, date, the LRV Supplier's name, sheet number, and description of product; and
 - 2. literature and data that demonstrate that systems and materials comply with the following:
 - a. applicable standards;
 - b. reliability, availability, maintainability, durability, and environmental requirements; and
 - c. specified values and parameters.

1.7.3 MATERIAL SAMPLES

- A. The LRV Supplier shall submit Samples of Materials and Methods of Installation (CDRL 03-14) proposed for use on the LRVs that meet the following requirements:
1. represent the materials, equipment, and work quality by which the completed Work is evaluated; and
 2. are identified with the contract number, date, the LRV Supplier's name, origin of the sample, sample number, description of sample, intended use in the work, and the sections of Schedule 4 [*Technical Requirements*] that are applicable to the sample.

1.8 DOCUMENT MANAGEMENT SYSTEM

- A. The LRV Supplier shall prepare, retain, and maintain all Project Records, as follows:
1. in accordance with this Supply Agreement;
 2. in English;
 3. in an accurate, complete, legible, readily identifiable, readily retrievable, and organized manner, complete with computer-generated and searchable metadata;
 4. in a form that is capable of audit; and
 5. in accordance with the requirements of Good Industry Practice and all Applicable Law.
- B. Within seven days after NTP, the LRV Supplier shall implement and maintain a comprehensive computerized information management system, which shall include all Project Records, including correspondence and notices between the Parties (the "**Document Management System**").
- C. The LRV Supplier shall provide a Document Management System that provides at least the following functionality:
1. maintain electronic copies of all correspondence;
 2. support assignment of responsible responders;
 3. support email for the following features:
 - a. document announcement;
 - b. notification announcement;
 - c. response assignment; and
 - d. due date reminder;
 4. support the ability to search and automatically generate search summaries on a user-by-user basis; and
 5. allow remote access for the City using a secure browser-based method.
- D. The LRV Supplier shall provide a Document Management System that allows the designated City Persons to set up, control, and provide access to a City-administered portal within the overall Document Management System that will receive Project Records for redistribution within the City to permit review and comment. The City-administered portal within the overall Document Management System shall allow the City to set up, manage, and implement workflows for reviews.

- E. After the last Primary LRV Warranty has expired, the LRV Supplier shall submit an archive of the Document Management System, containing all Project Records, within 20 Business Days.

1.9 COMMUNICATION AND MARKETING

1.9.1 GENERAL

- A. The City shall lead all public communications and local marketing efforts related to the LRVs.
- B. The LRV Supplier shall collaborate with the City to fulfill the communications and marketing requirements outlined in this Section.

1.9.2 COMMUNICATIONS INFORMATION AND MATERIALS REQUIREMENTS

- A. For greater certainty and without limiting the City's rights pursuant to Section 18 [*Intellectual Property*] of the Supply Agreement, the LRV Supplier shall provide to the City the right to use renderings and information included in the LRV Supplier's Bid for public communications and local marketing purposes.
- B. The LRV Supplier shall submit a Public Communications Package (CDRL 03-15). Each Public Communications Package shall include the following information:
 - 1. a summary of overall project progress and a summary of the LRV Supplier's activities completed that quarter;
 - 2. information about any key LRV features related to that quarter's activities or that the public may otherwise find interesting, including but not limited to, the vehicle interior, the vehicle exterior, accessibility, comfort, safety, ability to function in our climate, and environmental sustainability;
 - 3. up-to-date, high-quality, artist's renderings of the interior and exterior of the LRVs for the CDR, PDR, and FDR submissions; and
 - 4. professional high-resolution photos showcasing key activities from that quarter or features of the LRVs during manufacturing, testing, and Commissioning.
- C. The LRV Supplier shall provide each Public Communications Package written in plain language and targeted at a layperson. A brief description of the photo shall be included with each photo.
- D. The LRV Supplier shall submit at least eight videos, of which three shall be time lapse videos, about the manufacturing, testing, and Commissioning processes.
 - 1. The videos shall, at minimum, included the following topics:
 - a. an overview of the manufacturing process;
 - b. the climate chamber testing of subsystems and the LRVs, if applicable;
 - c. an LRV undergoing painting;
 - d. an overview of the static testing process;
 - e. arrival and unloading of the LRVs in Edmonton; and
 - f. dynamic testing of the LRVs on the Valley Line.
 - 2. All videos shall be produced with 4K cameras.
 - 3. The City reserves the right to collaborate with the LRV Supplier on the production of the videos.

4. The LRV Supplier acknowledges that these videos shall be repackaged and branded as City products. The City is open to acknowledging the LRV Supplier's contributions.
- E. The LRV Supplier shall submit a Video Information Plan (CDRL 03-16) that provides the following information:
1. the topic and content of the videos described in Section 1.9.2D [*Communications Information and Materials Requirements*];
 2. the proposed submission date for each video described in Section 1.9.2D [*Communications Information and Materials Requirements*]; and
 3. a narrative describing how the LRV Supplier plans to collaborate with the City to produce each video described in Section 1.9.2D [*Communications Information and Materials Requirements*].
- F. Upon Conditional Acceptance of the first LRV, the LRV Supplier shall provide all developed communications material to the City including the following:
1. all final art shall be provided to the City in InDesign format or another format as agreed by the City;
 2. all edited and raw photography files shall be delivered to the City uncompressed via hard drive or file share;
 3. all raw footage and final video files shall be provided to the City in uncompressed MP4 format;
 4. all photo and video files shall be tagged with the shoot name and other relevant content keywords specific to each image for the City's stock management photo system; and
 5. all photo and video files shall be accompanied by executed City of Edmonton releases, as required by the City.

1.9.3 COMMUNICATIONS AND MARKETING RESOURCING

- A. The LRV Supplier shall identify a communications and marketing lead in the Program Organization Chart, in accordance with Section 1.1 E [*General*].
- B. The designated communications and marketing lead shall act as the LRV Supplier's primary liaison with the City's communications and marketing personnel.

1.9.4 SPECIAL EVENTS

- A. The LRV Supplier shall support the City with up to four public events in Edmonton to allow the public to see and interact with the LRVs or the passenger mock-up of the LRVs as provided pursuant to Section 2.2.3 [*Passenger Area Mock-Up*] of Schedule 4 [*Technical Requirements*] for the purposes of public communication and special events.
 1. The City will provide the LRV Supplier with at least 20 business days notice of any public event where LRV Supplier support will be required.
 2. The LRV Supplier shall support the City with up to six additional media events related to the LRVs.
- B. The LRV Supplier shall provide support including the following for special events:
 1. providing relevant and up-to-date content and Work information to support event planning and execution; and
 2. providing access to communications staff, media spokesperson(s), and technical experts, as required by the City, in support of the planning and execution of these events.

SECTION 2: QUALITY ASSURANCE

2.1 GENERAL

- A. The LRV Supplier shall develop and implement a Quality Management System to oversee the Work to ensure the LRVs meet all the requirements of the Supply Agreement.
- B. The LRV Supplier shall ensure the QMS complies with the requirements and principles of ISO 9000 series standard and Good Industry Practice.

2.2 QUALITY MANAGEMENT SYSTEM REQUIREMENTS

2.2.1 GENERAL

- A. The LRV Supplier shall submit the following documents as part of the QMS:
 - 1. monthly Quality Management System Reports;
 - 2. the Quality Manual, described in Section 2.2.2 [*Quality Manual*];
 - 3. the Design Quality Management Plan, described in Section 2.2.3 [*Design Quality Management Plan*];
 - 4. the Manufacturing Quality Management Plan, described in Section 2.2.4 [*Manufacturing Quality Management Plan*]; and
 - 5. the Inspection Plan, described in Section 2.6.4 [*Inspection Plan*].
- B. The LRV Supplier shall ensure compliance with the QMS at all levels of the LRV Supplier's organization and by all Subcontractors throughout the duration of the Term.
- C. The LRV Supplier shall ensure the QMS includes processes to record, track, and implement or close out all identified opportunities for improving the effectiveness of the QMS.

2.2.2 QUALITY MANUAL

- A. The LRV Supplier shall submit a Quality Manual (CDRL 03-17) that describes the QMS for all aspects of the LRVs, including the manufacturing, inspecting, testing, and Commissioning phases, and Primary LRV Warranty.
- B. The LRV Supplier shall include the following in the Quality Manual:
 - 1. the Quality Policy and Quality Objectives for all aspects of the Work;
 - a. Quality Objectives shall be measurable and linked to the needs and performance expectations of the City;
 - b. all processes required to achieve the Quality Objectives will be subject to Quality Audits;
 - 2. a description of the Subcontractor roles involved in performing the Work;
 - 3. a description of the methods to ensure compliance with the QMS by the LRV Supplier and each Subcontractor;
 - 4. a detailed description of the processes and procedures that will be used to identify and rectify Deficiencies in accordance with the requirements set out in Section 2.5 [*Deficiencies*];

5. in accordance with the requirements of ISO 9001, a description of the processes that will be established, implemented, controlled, and continuously improved to achieve the stated Quality Objectives and the continuous improvement processes shall be compliant with ISO 9004;
 6. the procedures for initiating Corrective Actions for rectifying Deficiencies and for verifying that the Deficiencies have been rectified;
 7. the procedures for training and certifying the QMS Team, in accordance with Section 2.3.4 [*Quality Training*];
 8. an organization chart showing the Key Individuals involved with the DQMP, the MQMP, and the Inspection Plan, accompanied by a narrative describing the roles and responsibilities for all members of the QMS Team;
 9. a records retention policy for Quality Records; and
 10. a narrative describing in detail how key management personnel involved with the Work will interface with the QMS Team to achieve the Quality Objectives.
- C. The LRV Supplier shall include document control measures in the Quality Manual to ensure all documentation is current and available to the City upon request. Document control measures shall include the following:
1. review of documents by authorized personnel;
 2. distribution and storage of documents;
 3. elimination of superseded documents;
 4. control of changes to documents; and
 5. formal document release processes, including appropriate authentication by a Professional Engineer in accordance with APEGA guidelines.
- D. The LRV Supplier shall define in the Quality Manual the revision control measures for, at a minimum, the following documentation types:
1. drawings;
 2. design reports;
 3. specifications;
 4. inspection procedures;
 5. Test Procedures;
 6. special work instructions;
 7. operating procedures; and
 8. QMS plans and procedures.
- E. The LRV Supplier shall use revision control measures that meet the requirements of Section 1.5.3 [*Documentation Revision Control*].
- F. The LRV Supplier shall define in the Quality Manual the reporting function and authority of the Quality Managers and the Quality Director, who will liaise with the City and act as the single point of contact for all matters relating to quality management of the Work.

2.2.3 DESIGN QUALITY MANAGEMENT PLAN

- A. The LRV Supplier shall develop and submit a comprehensive Design Quality Management Plan (CDRL 03-18) that describes how the design activities will be managed in accordance with the Quality Manual, ISO 9001, and all requirements of the Supply Agreement.
- B. The LRV Supplier shall include in the DQMP detailed QMS procedures and process flow charts presented in a consistent format, for the following:
 - 1. the review and development of the design requirements, taking into consideration the manufacturability, operability, and maintainability, including a resolution process for any identified ambiguities in the design requirements;
 - 2. the validation and verification of the design to ensure the design requirements, including all derived requirements, have been met as defined in the requirement tracking system detailed in the Accepted Requirements Traceability Plan;
 - 3. the control of changes to the design requirements and the design throughout the scope of the Work;
 - 4. the quality assessment and procurement of the Subcontractors responsible for portions of the Work;
 - 5. the Quality Audits; and
 - 6. the identification and implementation of Corrective Actions, Preventive Actions, and opportunities for improvement.
- C. The LRV Supplier shall identify in the DQMP the following:
 - 1. the person(s) responsible for creating, implementing, and enforcing the QMS procedures and process flow charts; and
 - 2. the evidence required to be included in the Quality Records that the QMS procedures were followed.
- D. The LRV Supplier shall specify in the DQMP how the City will interface with key personnel producing the design.

2.2.4 MANUFACTURING QUALITY MANAGEMENT PLAN

- A. The LRV Supplier shall develop and submit a comprehensive Manufacturing Quality Management Plan (CDRL 03-19) that describes how the manufacturing activities will be managed in accordance with the Quality Manual, ISO 9001, and all the requirements of the Supply Agreement.
- B. The LRV Supplier shall establish and implement procedures to comply with the MQMP, including procedures for the following actions:
 - 1. ensuring Deficiencies are promptly identified and corrected;
 - 2. implementing Corrective Actions and Preventive Actions to achieve the following:
 - a. address the Deficiencies to a level appropriate with the risk;
 - b. prevent the Deficiencies from reoccurring; and
 - c. make changes in procedures resulting from Corrective Actions;
 - 3. ensuring purchasing products, equipment, and services conform to the specified requirements;

4. describing how procured products and equipment are received, inspected, stored, and maintained;
5. identifying and controlling items of production, such as batch, materials, and components, to prevent the use of Deficient items to do the following:
 - a. provide product identification and traceability during the various production phases from receipt of raw materials or components, through the manufacturing process, to delivery of final products or systems;
 - b. confirm that assemblies in production shall be traceable to their specific LRV;
 - c. ensure raw materials and components are traceable back to a particular batch number, test lot, shipment number, packing slip, or invoice and are accompanied by applicable test data sheets and material certifications;
 - d. assign identification to all products; and
 - e. produce and verify the Work, provided that where future inspection will not reveal the Deficiencies, provide continuous monitoring and conformance checks during special processes where the results may impact quality of the final product; and
6. preparing each LRV for shipment.

2.2.5 QUALITY MANAGEMENT SYSTEM REPORT

- A. The LRV Supplier shall append a monthly Quality Management System Report (CDRL 03-20) to the Progress Report, approved by the Quality Director, that summarizes the Quality Assurance activities performed that month.
- B. The Quality Management System Report shall include the following information:
 1. the Deficiency Status Report described in Section 2.5.3 [*Deficiency Tracking System*];
 2. the Quality Audits performed since last QMS Report; and
 3. the upcoming scheduled Quality Audits.

2.3 QMS TEAM

2.3.1 GENERAL

- A. The LRV Supplier shall retain appropriately qualified personnel to fill the following QMS Team roles:
 1. Quality Director;
 2. Quality Managers; and
 3. quality staff.
- B. The LRV Supplier shall ensure the QMS Team members are independent of the design, manufacturing, and Commissioning teams.

2.3.2 QUALITY MANAGERS

- A. The LRV Supplier shall retain Quality Managers to fill the following roles:
 1. a Design Quality Manager for the DQMP;
 2. a Manufacturing Quality Manager for the MQMP and Commissioning; and

3. any other Quality Managers as required to fulfil the quality requirements of the QMS and the Supply Agreement.
- B. The LRV Supplier shall require that all Quality Managers report directly to the Quality Director.
 - C. The LRV Supplier shall ensure all Quality Managers are certified as quality professionals from certifying bodies, with a minimum successful completion of an ISO 9001 Lead Auditor Course.
 - D. The LRV Supplier shall ensure the Design Quality Manager is a Professional Engineer with a minimum of five years' experience overseeing the design of LRVs. The Design Quality Manager shall be responsible for the following:
 1. preparing, reviewing, and implementing the DQMP; and
 2. ensuring the reviews, checks, and approvals are undertaken for all designs, manuals, and product documentation.
 - E. The LRV Supplier shall ensure the Manufacturing Quality Manager has a minimum of 10 years of experience as a quality manager or quality control manager for the manufacturing of an LRV. The Manufacturing Quality Manager shall be responsible for the following:
 1. preparing, reviewing, and implementing the MQMP and the Inspection Plan;
 2. supervising the quality staff; and
 3. ensuring quality staff have the required qualifications and experience to undertake the quality control requirements as set out in the QMS.

2.3.3 QUALITY STAFF

- A. The LRV Supplier shall retain quality staff in accordance with the Quality Manual to be responsible for the review requirements of the DQMP and the inspection and testing requirements set out in the MQMP and the Inspection Plan.
- B. The LRV Supplier shall ensure all quality staff responsible for inspection and testing requirements under this Supply Agreement hold an ASQ Certified Quality Inspector certification, or Accepted equivalent, and have five years of experience on LRV manufacturing projects.

2.3.4 QUALITY TRAINING

- A. The LRV Supplier shall ensure the Quality Director establishes and maintains procedures for the training and certification of the QMS Team, including procedures for the following:
 1. identification of training requirements; and
 2. frequency of recertification for each QMS Team role.
- B. The LRV Supplier shall include these procedures in the Quality Records and in the Quality Manual.

2.4 QUALITY AUDITS AND OVERSIGHT

2.4.1 GENERAL

- A. The LRV Supplier shall develop and submit a Quality Audit Plan (CDRL 03-21) that details the Quality Audits that will be conducted by the LRV Supplier and an independent third party of the LRV Supplier's own processes and those of Subcontractors, and the planned dates of such Quality Audits.
- B. The LRV Supplier shall include the following information in the Quality Audit Plan:

1. the name and qualifications of the independent third-party auditor the LRV Supplier intends to retain for third-party Quality Audits;
 2. the auditing process, which must be capable of identifying Deficiencies, Corrective Actions, and Preventive Actions and facilitating continuous improvement; and
 3. details of the Quality Audits the LRV Supplier intends to conduct on its own processes and those of Subcontractors, the planned dates of such Quality Audits, and the conditions or circumstances that could give rise to an unscheduled Quality Audit.
- C. The LRV Supplier shall update the Quality Audit Plan at three-month intervals following the initial submission of the Quality Audit Plan until all Quality Audits have been completed.
- D. The LRV Supplier shall conduct Quality Audits in accordance with ISO 19011.

2.4.2 LRV SUPPLIER QUALITY AUDITS

- A. The LRV Supplier shall conduct Quality Audits at least quarterly, or as agreed upon with the City in writing, to do the following:
1. confirm that all activities of the Work comply with the QMS;
 2. identify all Deficiencies of the QMS, Corrective Actions, and Preventive Actions;
 3. confirm that the QMS Team is familiar with the Quality Manual, DQMP, MQMP, Inspection Plan, and the QMS; and
 4. facilitate continuous improvement.
- B. The LRV Supplier shall schedule Quality Audits to meet the following requirements:
1. such that each Subcontractor is subject to at least one Quality Audit until the Fleet Acceptance Certificate as been issued; and
 2. to ensure all key processes are reviewed at least annually until the Fleet Acceptance Certificate as been issued.
- C. In addition to the quarterly Quality Audits, the LRV Supplier shall conduct at least one Quality Audit on the Software development process of each Custom Software, including Custom Software provided by Subcontractors, to verify adherence to the following:
1. Software Development Process, described in Section 5.1.2 [*Software Development Process*];
 2. Software Project Management Plan, described in Section 5.4.1 [*Custom Software*];
 3. documentation of clear and concise requirements in the relevant Software Requirements Specification for each application, described in Section 5.4.1 [*Custom Software*];
 4. traceable verification of requirements and implementation in the relevant Software Validation and Verification Plan, described in Section 5.4.1 [*Custom Software*];
 5. configuration control and versioning defined in the relevant Software Configuration Management Plan, described in Section 5.4.1 [*Custom Software*]; and
 6. Quality Assurance oversight as defined in the relevant Software Quality Assurance Plan, described in Section 5.4.1 [*Custom Software*].
- D. If problem areas are identified in a Software Quality Audit, the LRV Supplier shall submit a Software Process Audit Improvement Action Plan (CDRL 03-22) describing process improvements for the

problem areas and specifying the specific procedures, reviews, reports, or other activities, both reactive and proactive, implemented to compensate for the noted problem areas.

- E. The LRV Supplier shall conduct the Quality Audits independently for all elements of the Work.
- F. The LRV Supplier shall provide notice to the City at least 15 Business Days in advance of all Quality Audits and allow the City to witness any audit upon request.
- G. The LRV Supplier shall perform the following actions for each Quality Audit:
 - 1. document the results of all Quality Audits in individual audit reports,
 - 2. complete all audit reports within 10 Business Days of performing Quality Audits; and
 - 3. make audit reports available to the City upon request.
- H. The LRV Supplier shall schedule follow-up Quality Audits within 30 days of a Quality Audit, notifying the City five Business Days in advance, to ensure identified Corrective Actions and Preventive Actions have been carried out.

2.4.3 THIRD-PARTY AUDITS

- A. The LRV Supplier shall schedule annual third-party Quality Audits to be performed by the independent third-party auditor identified in the Quality Audit Plan, as required by ISO 9001.
- B. The LRV Supplier shall include the resulting audit reports in the Quality Records and make them available to the City upon request.
- C. The LRV Supplier shall provide written notice to the City within two Business Days after receiving any third-party Quality Audit report.
- D. The LRV Supplier shall address all Deficiencies identified by the independent third-party auditor and implement all Corrective Actions and Preventive Actions within 30 days of completion of the independent third-party Quality Audit.

2.4.4 THE CITY'S QUALITY AUDITS

- A. The City may conduct scheduled and unscheduled Quality Audits as follows:
 - 1. at a frequency determined by the City, and
 - 2. to verify that the Corrective Action Plan, in accordance with Section 2.5 [*Deficiencies*], has been implemented.
- B. The City will notify the LRV Supplier at least five Business Day in advance of any follow-up Quality Audit.
- C. The City may carry out increased levels of Quality Audits, whether in number, duration, or detail, of all or any aspect of the QMS until such time as the City is reasonably satisfied that the LRV Supplier and Subcontractors are in full compliance with the QMS.
- D. The LRV Supplier shall provide the City with adequate access to all documentation, records, facilities, and assistance required for the safety and convenience of the City's Quality Audits.
- E. The LRV Supplier shall ensure that the City is provided an opportunity to witness inspection and testing to verify conformance and compliance with the QMS.

2.4.5 COST OF THE CITY'S QUALITY AUDITS

- A. If the City carries out any Quality Audit pursuant to Section 2.4.4 [*The City's Quality Audits*], and the results of such audit shows any material Deficiency in respect of the Work that was not in the

Deficiency Tracking System before the Quality Audit, then, without limiting any of the City's other rights and remedies, the LRV Supplier shall compensate the City for all costs reasonably incurred in carrying out such Quality Audit, including all relevant administrative expenses of the City and including an appropriate sum in respect of general staff costs and overheads.

2.4.6 QUALITY RECORDS

- A. The LRV Supplier shall maintain complete and accurate Quality Records that provide objective evidence of the following:
 - 1. conformance with all requirements of the Supply Agreement;
 - 2. compliance with ISO 9001; and
 - 3. the effective implementation of the QMS.
- B. The LRV Supplier shall include the following documentation in the Quality Records:
 - 1. all Inspection Reports;
 - 2. test data and Test Reports;
 - 3. material certification;
 - 4. qualification records;
 - 5. calibration records;
 - 6. all Deficiency Reports; and
 - 7. all Quality Audit reports.
- C. The LRV Supplier shall include in Quality Records all documentation used as the basis for material and product acceptance by the LRV Supplier and Subcontractors.

2.5 DEFICIENCIES

2.5.1 DEFICIENCY RECTIFICATION PROCESS

- A. The LRV Supplier shall develop, implement, and maintain a Deficiency rectification process for the handling of Deficiencies that addresses the matters described in Section 2 [*Quality Assurance*].

2.5.2 ADDRESSING DEFICIENCIES

2.5.2.1 LRV Supplier Deficiency Reports

- A. The LRV Supplier shall do the following for each Deficiency:
 - 1. within two Business Days of the discovery of a Deficiency, enter a Deficiency Report into the Deficiency Tracking System that includes at least the information described in Section 2.5.2.5 [*Deficiency Report Requirements*];
 - 2. within two Business Days of the Deficiency Report being entered into the Deficiency Tracking System, assign each Deficiency Report with the status "Open"; and
 - 3. review any plans or processes that relate to the Deficiency, including, if applicable, any quality management plans, and any amendments or changes that need to be made to such plans or processes.
 - a. Enter a separate Deficiency Report with respect to such amendments or changes in accordance with the requirements of Section 2.5.2 [*Addressing Deficiencies*].

2.5.2.2 City Deficiency Reports

- A. If at any time the City becomes aware of a Deficiency, the City may create a City Deficiency Report in the Deficiency Tracking System, without prejudice to any of the City's other rights and remedies.
- B. The LRV Supplier shall provide notice to the City within two Business Days after the City enters a City Deficiency Report into the Deficiency Tracking System that the LRV Supplier intends to do the following:
 - 1. accept the City Deficiency Report, and designates it as a Deficiency Report; or
 - 2. reject the City Deficiency Report and provide the reasons for rejection at the same time as providing the rejection notice to the City.
- C. If the LRV Supplier fails to provide notice to the City within two Business Days or fails to provide reasons with its notice, then the City Deficiency Report shall be deemed to be a Deficiency Report, and the LRV Supplier shall include the Deficiency Report in the Deficiency Tracking System.

2.5.2.3 Procedure

- A. The LRV Supplier shall update the Deficiency Report with a proposed Corrective Action Plan to rectify the Deficiency, including the timing and scope of the Corrective Action, and any Preventive Actions to prevent such Deficiency of reoccurring, within 10 Business Days of the "Open" date of the Deficiency Report, or another date if such other date is as follows:
 - 1. appropriate based on the nature of the Deficiency; and
 - 2. acceptable to the City, acting reasonably.
- B. The LRV Supplier shall finalize the Corrective Action Plan within 20 Business Days of the "Open" date or within another time period accepted by the City, and obtain the consent or agreement to the Corrective Action Plan from individuals who will be responsible for certifying completion of the relevant Work, including the City if applicable.
- C. The LRV Supplier shall include in the finalized Corrective Action Plan the scope of the Corrective Action Plan and the timing for completion of such scope, which shall be no longer than 40 Business Days following finalization of the Corrective Action Plan, unless otherwise agreed by the City or another date if such other date is as follows:
 - 1. appropriate based on the nature of the Deficiency; and
 - 2. acceptable to the City, acting reasonably.
- D. The LRV Supplier shall do the following for each Deficiency:
 - 1. document and verify the implementation of the Corrective Action Plan and final rectification of the Deficiency;
 - 2. implement Preventive Actions to prevent such Deficiency from occurring again, if applicable; and
 - 3. once a particular Deficiency has been fully rectified, assign the associated Deficiency Report with the status "Closed" and record the "Closed" date in the Deficiency Tracking System.

2.5.2.4 General Considerations

- A. The LRV Supplier is responsible for all scope, cost, and schedule impacts associated with implementing a Corrective Action Plan and rectifying Deficiencies.
- B. If a document that is subject to a Design Review is to be changed in any way by the implementation of a Corrective Action, the LRV Supplier shall submit to the City such other changed document.

- C. If the City issues a City Deficiency Report under Section 2.5.2.2 [*City Deficiency Reports*], and the Deficiency or Deficiencies identified in the City Deficiency Report impact the safety of the LRV or LRVs, or the ability of the Operator to meet service requirements, then the City may require that the LRV Supplier develop, implement, and finalize a Corrective Action Plan in a shorter time period than is set out in Section 2.5.2.3 [*Procedure*].

2.5.2.5 Deficiency Report Requirements

- A. The LRV Supplier shall include the following information in each Deficiency Report when entering it into the Deficiency Tracking System:

- 1. designation of the associated Deficiency as either a Minor Deficiency or a Major Deficiency;
- 2. the Deficiency Report reference number;
- 3. the date the Deficiency was identified or discovered;
- 4. a description of the Deficiency, traceable to processes, systems, subsystems, components, drawings, and data sheets as appropriate;
- 5. the date and time the Deficiency Report was entered into the Deficiency Tracking System;
- 6. the due date for the proposed Corrective Action Plan; and
- 7. the estimated date of rectification.

- B. The LRV Supplier shall include the following information for each Deficiency Report when changing the status to “Closed” in the Deficiency Tracking System:

- 1. all information listed in Section 2.5.2.5 [*Deficiency Report Requirements*];
- 2. the finalized Corrective Action Plan;
- 3. the date the Deficiency was rectified;
- 4. the name of the QMS Team member who verified the rectification; and
- 5. the date and time the Deficiency Report status was changed to “Closed” in the Deficiency Tracking System.

2.5.3 DEFICIENCY TRACKING SYSTEM

- A. The LRV Supplier shall implement and maintain a Deficiency Tracking System that is fully operational within 90 days after NTP to monitor the status of all Deficiency Reports and City Deficiency Reports.

- B. The LRV Supplier shall ensure the following functionality in the Deficiency Tracking System:

- 1. acts as a single repository for all Deficiency Reports;
- 2. allows attachment of supporting material, such as photos and documents, to a Deficiency Report;
- 3. provides remote access for up to eight City users, using a secure browser-based method, that allows the City to perform the following functions:
 - a. input, update, and view the current status, dates, data, and support material for all City Deficiency Reports; and
 - b. view the current status, dates, data, and support material for all Deficiency Reports;

4. provides automatic, user-configurable notifications whenever a Deficiency Report or City Deficiency Report is inputted, updated, and closed;
 5. includes links to the Corrective Action Plans related to the Deficiency Reports; and
 6. has a built-in query functionality that can be used to produce ad hoc summary reports.
- C. The LRV Supplier shall include a monthly Deficiency Status Report in the Quality Management System Report that includes the following:
1. the number of Deficiency Reports and City Deficiency Reports entering the “Open” and “Closed” status within the last month;
 - a. include cumulative statistics and trends for the number of Deficiency Reports and City Deficiency Reports for the “Open” and “Closed” statuses;
 2. the total number of Deficiency Reports and City Deficiency Reports; and
 3. the number of Deficiency Reports and City Deficiency Reports in each Minor Deficiency or Major Deficiency category.

2.5.4 UNRECTIFIED DEFICIENCIES

- A. The City may issue a City Deficiency Report if a Deficiency identified in a Deficiency Report continues without rectification beyond the time provided in the Corrective Action Plan or as otherwise required pursuant to Section 2.5.2.4 [*General Considerations*].
- B. All Deficiency Reports and City Deficiency Reports classified as Major Deficiencies must be closed in order to achieve Conditional Acceptance, in accordance with Section 9.4.1 [*Conditions Precedent to Conditional Acceptance*].
- C. All Deficiency Reports and City Deficiency Reports classified as Minor Deficiencies must be closed in order to achieve Final Acceptance, in accordance with Section 9.4.3 [*Conditions Precedent for Final Acceptance*].

2.6 QUALITY INSPECTIONS

2.6.1 GENERAL

- A. The LRV Supplier shall conduct inspections to verify conformance of the work to the specifications and to the Supply Agreement.
- B. Any inspection by the City, or City presence at an LRV Supplier facility or Subcontractor facility, shall not relieve the LRV Supplier of meeting all of the requirements of the Supply Agreement.
- C. The LRV Supplier shall provide the City with access to assign a City Person to the LRV Supplier’s and Subcontractor’s manufacturing facilities to witness all phases of production, including witnessing any inspection when requested.
 1. The City shall give the LRV Supplier 20 Business Days notice if the assigned City Person is to be a full-time resident inspector and requires office accommodations in the LRV Supplier’s facility.
- D. The LRV Supplier shall schedule any inspections that the City is attending on Business Days.
- E. If the LRV Supplier completes an inspection without the participation of the City, or without notice that the City is waiving its right to attend such inspection, the LRV Supplier shall repeat such inspection with the City at the LRV Supplier’s cost.

2.6.2 INSPECTION IDENTIFICATION

- A. The LRV Supplier shall establish and maintain a system for identifying the inspection status of the Work throughout all stages of receiving, production, and installation. The system shall include the following:
 - 1. identification and traceability control; and
 - 2. a method of status identification that indicates the conformance or Deficiency result of the inspections performed.
 - a. Where identification markings may be obfuscated by surface treatment or by use of a portion of a material lot, provide an alternative means of status identification.
- B. The LRV Supplier shall maintain an ongoing record of the status of inspected components, subsystems, and systems in the form of Inspection Reports (CDRL 03-23).
- C. The LRV Supplier shall include the Inspection Reports in the Quality Records, and the LRV Supplier shall submit the Inspection Reports to the City when requested to do so by the City.
 - 1. The LRV Supplier will submit Inspection Reports to the City, for any inspection that the City waived its right to attend, within 20 business days of the completion of the inspection that the City waived its right to attend.
- D. The LRV Supplier shall include the following in each Inspection Report:
 - 1. assigned a unique document number;
 - 2. contains a reference to the corresponding inspection type;
 - 3. records the date of the inspection;
 - 4. records the equipment used in the inspection and applicable calibration results;
 - 5. describes the pass/fail criteria of the inspection;
 - 6. includes a summary and conclusion of the test; and
 - 7. identifies any Deficiencies.

2.6.3 INSPECTION AND TEST EQUIPMENT

- A. The LRV Supplier shall ensure all inspection and test equipment are as follows:
 - 1. meet the standards of accuracy for the measurements required; and
 - 2. are rated for the environmental conditions in which they will be used.
- B. The LRV Supplier shall provide certification documents of the inspection and test equipment upon request by the City.
- C. The LRV Supplier shall calibrate inspection and test equipment at intervals prescribed by the OEM and Good Industry Practice, and do the following for each inspection and test equipment:
 - 1. label all inspection and test equipment that requires calibration with the date when the recalibration is next required; and
 - 2. when inspection and test equipment is out of calibration, promptly remove the equipment from service and recalibrate, repair, or replace it as required.

- D. All inspections and tests performed with out-of-calibration inspection and test equipment are considered invalid, and the LRV Supplier shall repeat all such inspections and tests with calibrated inspection and test equipment.

2.6.4 INSPECTION PLAN

- A. The LRV Supplier shall develop and submit an overarching Inspection Plan (CDRL 03-24) that contains the details of all the inspection activities for the Work performed by the LRV Supplier and Subcontractors.
- B. The LRV Supplier shall include the following information in the Inspection Plan:
 - 1. a description of the inspection activities;
 - 2. the frequency of inspections;
 - 3. the standards, codes, specifications, and acceptance criteria referenced for the inspections;
 - 4. the reports and checklists required;
 - 5. the personnel resource requirements for inspection activities;
 - 6. the procedures for documenting Deficiencies found during inspections;
 - 7. the procedures and records for equipment used to determine quality or acceptability, including how the equipment will be controlled, calibrated, and maintained; and
 - 8. the procedures for the FAI, Subcontractor, receiving, in-process, hold point, pre-shipment, shipping, post-shipment, pre-acceptance, and modification and retrofit program inspections.

2.6.5 FIRST ARTICLE INSPECTIONS

- A. The LRV Supplier shall facilitate and conduct FAIs with the City at the point of manufacture on the first piece, component, assembly, system, and LRV constructed using production processes and tooling.
- B. The LRV Supplier shall develop and submit a First Article Inspection List (CDRL 03-25) that indicates all items to be subject to an FAI. The list shall include the proposed inspection date of each FAI.
- C. The LRV Supplier shall schedule no more than one FAI on the same date and no more than two FAIs within five consecutive Business Days unless otherwise approved by the City.
- D. The LRV Supplier shall provide written notice to the City as follows:
 - 1. at least 30 Business Days in advance of each FAI conducted in Canada; and
 - 2. at least 45 Business Days in advance of each FAI conducted outside of Canada.
- E. The LRV Supplier shall submit a Pre-FAI Report (CDRL 03-26) that includes the following information:
 - 1. the FAI procedure specific to the entire LRV, system, assembly, subassembly, or components inspected;
 - 2. manufacturer information, including the following:
 - a. manufacturer's name;
 - b. manufacturing facility address and phone number;
 - c. contact person at the manufacturing facility; and

- d. manufacturer's certifications, as required;
 3. a detailed FAI agenda;
 4. the complete set of drawings Accepted by The City;
 5. the material certifications;
 6. the completed and dispositioned inspection forms that control in-process work, including the following:
 - a. manufacturing processing documents, including a process flow chart, a process control plan, and work instructions;
 - b. qualifying laboratory certificates; and
 - c. welding and painting information, if applicable;
 7. test results indicating that all required testing has been performed on the FAI article in accordance with the Accepted Inspection Plan; and
 8. verification that the test results satisfy the specification requirements.
- F. Prior to an FAI, the LRV Supplier shall ensure the following:
1. all procedures, equipment, and personnel required to perform inspections and tests will be available and fit for purpose;
 2. all required personnel are available; and
 3. the item or system to be inspected will be located in an accessible, well-lit space.
- G. The LRV Supplier shall ensure adequate samples required to satisfy the inspection of subjective characteristics are available for the City review as follows:
1. the City, the LRV Supplier, and any required Subcontractors are to be provided copies of the sample with the subjective characteristics; and
 2. samples shall originate from a single common piece that is representative of the intended characteristics.
- H. Throughout the manufacturing phase, the LRV Supplier shall store Accepted FAI items, except for the carbody and the completed LRV, in a secure area of the LRV Supplier's or a Subcontractor's facility, and retain these items for the duration of the manufacturing phase.
1. The LRV Supplier shall upgrade the stored Accepted FAI items to the latest Accepted design configuration, unless otherwise agreed by the City. Retained FAI items may be used for production of the last LRV after the FAI items have been re-inspected and Accepted by the City.
- I. Any change to product design, production process, manufacturer, or manufacturing location after the initial FAI shall require an additional FAI to verify compliance.
- J. The LRV Supplier shall not ship equipment from the point of manufacture until after an FAI has been Accepted by the City.
- K. The City shall issue an FAI Completion Certificate to the LRV Supplier, certifying the date on which the LRV Supplier has completed the LRV FAI, once the following items have been completed:
1. an FAI has been completed on all items on the First Article Inspection List; and

2. an FAI has been completed on the entire LRV as a single unit.

2.6.6 SUBCONTRACTOR INSPECTION

- A. The LRV Supplier shall ensure drawings, submittals, FAIs, and Type Tests for Subcontractor products are approved by the LRV Supplier and Accepted by the City prior to release of product for shipment to the LRV Supplier's facility.
- B. The LRV Supplier shall inspect Subcontractor products and materials in accordance with the details, frequency, and procedures detailed in the Inspection Plan.
 1. Where, in accordance with the Inspection Plan, a product or material is being inspected in the Subcontractor's facility, the LRV Supplier shall provide written notice to the City at least 15 Business Days in advance of the Subcontractor pre-shipment inspection date.

2.6.7 RECEIVING INSPECTION

- A. The LRV Supplier shall conduct receiving inspections, in accordance with the procedures detailed in the Inspection Plan, of incoming materials and products from either the LRV Supplier or Subcontractors.
- B. The LRV Supplier shall not use incoming product until a receiving inspection has been conducted and the product is verified as conforming to the specified requirements.
- C. The LRV Supplier shall conduct the receiving inspections to determine whether the product meets the requirements of the following:
 1. the Supply Agreement;
 2. purchase order documents;
 3. applicable and Accepted drawings; and
 4. samples.

2.6.8 IN-PROCESS INSPECTION

- A. The LRV Supplier shall perform all production, processing, and fabrication operations with documented Work instructions, specified production equipment, and specified environmental controls.
- B. The LRV Supplier shall inspect the products in accordance with the Inspection Plan. The LRV Supplier shall hold products until the required inspections have been completed and all required reports have been verified by the QMS Team.
- C. The LRV Supplier shall document Deficiencies immediately during the inspection and notify responsible departments and personnel of the need for correction.
 1. The LRV Supplier shall not release defective products until all Deficiencies in those products have been corrected, re-inspected, and accepted by the QMS Team.
 2. The LRV Supplier shall conduct re-inspections in accordance with the Inspection Plan.
- D. Prior to Work being concealed by succeeding assembly operations, the LRV Supplier shall perform a Hold Point Inspection in accordance with Section 2.6.9 [*Hold Point Inspection*].
 1. If Work is concealed without inspection, the City reserves the right to perform an inspection of any concealed Work. The LRV Supplier shall expose the Work and verify that inspection requirements have been met to the City's satisfaction.

2.6.9 HOLD POINT INSPECTION

- A. In collaboration with the City, the LRV Supplier shall establish Hold Point Inspections in the manufacturing process to allow inspection at all critical stages of manufacturing.
 - 1. At each Hold Point Inspection, the LRV Supplier shall carry out the inspection of the LRVs with the City at the factory. The City may decide not to participate in any of these Hold Point Inspections.
- B. The LRV Supplier shall submit a Hold Point Inspections List (CDRL 03-27) that lists all the Hold Point Inspections to be performed, with Hold Point Inspections carried out, at minimum, as follows:
 - 1. on items that are about to be concealed by succeeding assembly operations, in accordance with Section 2.6.8 [*In-Process Inspection*];
 - 2. at each carbody completion;
 - 3. prior to factory testing; and
 - 4. prior to the LRV shipment from the manufacturing facility to the Gerry Wright OMF.
- C. The LRV Supplier shall update and re-submit the Hold Point Inspections List with the planned date for each Hold Point Inspection.
 - 1. If more than one LRV is affected by a Hold Point Inspection date change, the LRV Supplier shall submit a revised Hold Point Inspection List with the updated dates.
- D. The LRV Supplier shall provide written notice to the City at least 15 Business Days in advance of any date change to a Hold Point Inspection.
- E. The LRV Supplier shall adjust the Hold Point Inspection List as a result of improved or diminished product quality and submit to the City.

2.6.10 PRE-SHIPMENT INSPECTION

- A. Prior to shipment from the manufacturing facility, the LRV Supplier shall conduct a pre-shipment inspection of each LRV with the City as follows:
 - 1. all open items shall be documented prior to performing the pre-shipment inspection;
 - 2. written notice shall be provided to the City at least 15 Business Days in advance of the pre-shipment inspection date; and
 - 3. all inspection reports and documentation of corrected Deficiencies shall be made available to the City upon request.
- B. The LRV Supplier shall ensure all production and pre-shipment functional testing and pre-shipment Commissioning activities have been completed and documented before the pre-shipment inspection begins.
- C. The LRV Supplier shall appoint a quality staff member to accompany the City during the pre-shipment inspection.
- D. During the pre-shipment inspection, the LRV Supplier shall provide the following:
 - 1. a draft of the relevant Vehicle History Book;
 - 2. safe access to the LRV, the LRV underside, and the LRV roof;
 - 3. adequate interior and exterior lighting;

4. a power source to energize the LRV systems; and
 5. all necessary personnel and tools required to remove or open and replace, secure, and lock access covers and doors.
- E. The LRV Supplier shall correct, document, and re-inspect any Deficiencies found during the pre-shipment inspection. The LRV Supplier shall, after correction and verification, re-inspect the discrepant items with the City, and repeat this cycle until all items are satisfactory.

2.6.11 POST-SHIPMENT INSPECTION

- A. The LRV Supplier shall do the following:
1. conduct a post-shipment inspection with the City of each LRV after its arrival at the Gerry Wright OMF;
 2. include the impact recorder data during transport on the associated Inspection Report;
 3. correct all Deficiencies found between the pre-shipment and post-shipment inspections prior to the Conditional Acceptance Inspection; and
 4. conduct a post-shipment inspection with the City on each Spare Part after its arrival at the Gerry Wright OMF Part B.

2.6.12 CONDITIONAL ACCEPTANCE INSPECTION

- A. The LRV Supplier shall provide written notice to the City at least 10 Business Days prior to each Conditional Acceptance Inspection.
- B. The LRV Supplier shall conduct a Conditional Acceptance Inspection with the City on each LRV at the Gerry Wright OMF Part B to ensure there are no Major Deficiencies and no components are missing. The Subcontractor's representatives, if any, may also be present for the Conditional Acceptance Inspection.
- C. The LRV Supplier shall do the following:
1. correct all Major Deficiencies prior to Conditional Acceptance Inspection of an LRV;
 2. correct all discrepancies between any previous inspections and the Conditional Acceptance Inspection prior to release for operational service testing;
 3. submit a list of all open Minor Deficiencies to be corrected prior to the Final Acceptance Inspection;
 4. use the Conditional Acceptance Inspection to verify the functionality of the LRV and review the Conditional Acceptance test documentation and the Vehicle History Book; and
 5. perform the Conditional Acceptance Inspection after all Conditional Acceptance requirements described in Section 9.4.1 [*Conditions Precedent to Conditional Acceptance*] have been completed.

2.6.13 FINAL ACCEPTANCE INSPECTION

- A. The LRV Supplier shall provide written notice to the City at least 10 Business Days prior to each Final Acceptance Inspection.
- B. The LRV Supplier shall conduct a Final Acceptance Inspection with the City on each LRV once all Minor Deficiencies documented in previous LRV inspections have been corrected.
- C. The LRV Supplier shall do the following:

1. perform additional Final Acceptance Inspection(s) if additional Minor Deficiencies are found or have not been corrected properly until all Minor Deficiencies have been corrected;
2. use Final Acceptance Inspections to verify the functionality and safety of the LRV and review any test Project Records and additions to the Vehicle History Book that occurred after Conditional Acceptance; and
3. perform Final Acceptance Inspections after all Final Acceptance requirements described in Section 9.4.3 [*Conditions Precedent for Final Acceptance*] have been completed.

2.6.14 MODIFICATION PROGRAM INSPECTION

- A. After a Conditional Acceptance Certificate has been issued, the LRV Supplier shall perform all subsequent modifications to the LRV in accordance with the Change Management Subplan.
- B. The LRV Supplier shall do the following:
 1. obtain the City's Acceptance of the design documents and modification procedures prior to commencing the modification;
 2. provide documented proof of completion of all modification and modification inspections to the City upon request; and
 3. allow the City to inspect and audit modification Work.

2.6.15 SPECIAL TOOL ACCEPTANCE INSPECTION

- A. The LRV Supplier shall provide written notice to the City at least 10 Business Days prior to a Special Tool Acceptance Inspection.
 1. The LRV Supplier shall conduct a Special Tool Acceptance Inspection with the City on each Special Tool after the Special Tool's validation tests have been performed in accordance with the Commissioning Plan. During the Special Tool Acceptance Inspection, the LRV Supplier shall review the Special Tool's validation test documentation.
- B. The LRV Supplier shall perform the Special Tool Acceptance Inspection after requirements described in Section 9.4.6 [*Conditions Precedent to Special Tools Acceptance*] have been completed.

2.6.16 SPARE PARTS ACCEPTANCE INSPECTION

- A. The LRV Supplier shall provide written notice to the City at least 10 Business Days prior to a Spare Parts Acceptance Inspection.
 1. The LRV Supplier shall conduct a Spare Parts Acceptance Inspection with the City on each Spare Part after the Spare Part's validation tests have been performed in accordance with the Commissioning Plan. During the Spare Parts Acceptance Inspection, the LRV Supplier shall review the Spare Part's validation test documentation.
- B. The LRV Supplier shall perform the Spare Parts Acceptance Inspection after requirements described in Section 9.4.8 [*Conditions Precedent to Spare Parts Acceptance*] have been completed.

SECTION 3: RELIABILITY, AVAILABILITY, MAINTENANCE, AND SAFETY

3.1 RAMS PROGRAM

3.1.1 GENERAL

- A. The LRV Supplier shall implement and maintain a Reliability, Availability, Maintainability, and Safety Program throughout the Work to ensure the delivered LRVs fulfill the reliability, availability, maintainability, and safety requirements.
1. The RAMS Program shall apply to all Subcontractors.
- B. The LRV Supplier shall develop and submit a Reliability, Availability, Maintainability, and Safety (RAMS) Program Plan (CDRL 03-28) that describes the organization and processes used to integrate RAMS activities. The RAMS Program Plan shall be as follows:
1. be developed in accordance with EN 50126-1; and
 2. set management's responsibility for the RAMS function in organization chart is independent of the production function.
- C. The LRV Supplier shall ensure all RAMS activities are performed throughout the design, manufacturing, installation, testing, Commissioning, and Primary LRV Warranty phases of the Work.

3.1.2 RAMS PROGRESS REPORT

- A. The LRV Supplier shall submit a RAMS Progress Report (CDRL 03-29) that includes the following:
1. RAMS activities within the reporting period;
 2. RAMS progress and issues;
 3. RAMS performance for all defined requirements, including the following:
 - a. changes to the Hazard Log Matrix; and
 - b. RAMS parameters, including MDBF, MDBTD, availability, and MTTR;
 4. expected RAMS activities in the next reporting period; and
 5. a reliability prediction performed in accordance with MIL-HDBK-217F, parts stress method, supplemented by NPRD-2016 – Quanterion.
- B. The LRV Supplier shall have the RAMS Progress Report authenticated by the Lead Engineer.

3.1.3 RAM PLAN

- A. The LRV Supplier shall develop and submit a RAM Plan (CDRL 03-30) that does the following:
1. include data from the operation requirements set out in the VLW Operations & Maintenance Concept when calculating the availability and reliability targets;
 2. describe the RAM objectives, including the provisions of a design that is as follows:
 - a. achieves close to failure-free operation under all operating conditions;
 - b. minimizes maintenance interventions;
 - c. achieves high levels of availability;

- d. describes the process by which inspection and component service intervals will be minimized; and
 - e. ensures ease of maintenance;
3. describe the process to employ a consistent approach to RAM analysis across all equipment, components, systems, and subsystems that influence the RAM targets;
 4. establish quantified and measurable RAM targets for all systems, subsystems, LRUs, and LLRUs to assure LRV reliability, availability, and maintainability levels are sufficient to satisfy all the requirements outlined in the RAM Plan;
 5. provide a description of how RAM targets will be met, including methods of measurement, allocated by subsystem;
 6. define the MDBF, MTTR, and MDBTD requirements for the LRVs and all its systems;
 - a. specify MDBF, and MDBTD in kilometers;
 7. include the methodology to be used in reliability analyses to predict compliance with the reliability requirements specified in this Section;
 8. identify the software tools that will be used as part of the RAM Plan to model the system and conduct the analyses;
 9. define controls for activities of Subcontractors to ensure their compliance with the RAM Plan methods and objectives;
 10. include details of the organization, roles, and responsibilities for all RAM Plan activities;
 11. identify the personnel responsible for managing the RAM Plan;
 12. include the proposed format of the Failure Analysis Reports to be provided for the reports specified in Section 3.2.3 [*Failure Analysis Reports*]; and
 13. be based on the preliminary RAM Plan included in the Bid Extracts.
- B. The LRV Supplier shall perform all necessary modifications to the LRV, LRV system, subsystem, or component design, modification of maintenance manuals, additional training, or other action, to ensure they achieve the RAM requirements.

3.2 RELIABILITY AND AVAILABILITY

3.2.1 GENERAL

- A. The LRV Supplier shall base LRV system reliability calculations on a single LRV operation with an average speed of 40 km/h and an average of 100,000 km travelled per LRV per year and shall consider any incident or failure causing a Train Delay in the calculation of MDBTD.

3.2.2 RELIABILITY ANALYSIS

- A. The LRV Supplier shall prepare and submit a Reliability Analysis (CDRL 03-31) as follows:
1. demonstrate how each component, assembly, subsystem, and system element is designed to perform its function under the specified design operating conditions without failure for the durations specified;
 2. include a reliability model based on established reliability prediction techniques using MIL-HDBK-217 or certified field failure data. The reliability model shall do the following:

- a. demonstrate how the LRVs comply with the target MDBF and MDBTD requirements specified in the RAM Plan; and
 - b. provide the predicted MDBF and MDBTD for the subsystems and the whole LRV;
3. include verification that the specified MDBF and MDBTD requirements are achievable. Base product history and experience, where possible, on actual Revenue Service results for identical equipment operating under service conditions and duty cycles equivalent to, or more severe than, those specified in this Section, and if required, perform the following:
 - a. make reasonable extrapolations if equipment is non-identical but similar; and
 - b. submit supporting documentation for any extrapolations to the City for Acceptance;
 4. include analyses to identify weaknesses in system hardware and Software design whenever these details are not established by historical records of equipment operation;
 5. provide input to system designs for theoretical circuit behaviour; and
 6. provide input to system design to protect against and minimize the impact of random component failures, electrical interference, systematic component failures, and Software errors in Software-based logic.

3.2.3 FAILURE ANALYSIS REPORTS

- A. The LRV Supplier shall submit Failure Analysis Reports (CDRL 03-32) for all failure incidents that occur from the commencement of equipment production testing through to the completion of the Primary LRV Warranty. Each Failure Analysis Report shall be as follows:
 1. be in the form specified in the Accepted RAM Plan;
 2. include routine information, such as date, description, and physical location of incident, part number, and spaces for signatures;
 3. describe impact(s) on LRV availability or cause of Train Delay;
 4. identify the individual within the LRV Supplier organization best qualified to explain the cause of the failure incident;
 5. include an explanation of the cause of the failure incident;
 6. include physical location of the failed part(s) at the time of writing of the report;
 7. include a notation if the failed part(s) are subject to be recalled for further investigation of the failure incident; and
 8. include the implemented Corrective Actions and Preventive Actions to prevent repetition of similar failure incidents.
- B. The LRV Supplier shall submit Failure Analysis Reports prepared by Subcontractors for failure incidents in their original format.

3.3 MAINTAINABILITY

3.3.1 GENERAL

- A. The LRV Supplier shall minimize LRV downtime by applying a maintenance approach where failed equipment is removed from the LRV for repair in the workshop, and the failed equipment is replaced by equipment known to be operational.

- B. The LRV Supplier shall ensure the design of the maintenance manuals described in Section 10.1 [*Technical Manuals*] and the design of the training programs described in Section 10.4 [*Training Programs*] are based on the City's maintenance philosophy, which is as follows:
1. The City performs Maintenance Level 1 and Maintenance Level 2, and outsources Maintenance Level 3, as follows:
 - a. Maintenance Level 1 are practices and activities that occur directly on the LRV itself. This includes vehicle cleaning and servicing, mechanical adjustments, or replacement of LRUs. The intent of this level of maintenance is to return the LRV to Revenue Service in the shortest time possible;
 - b. Maintenance Level 2 are practices and activities that involve repair of a subsystem offline, often on a workbench, using BTE or other Special Tools, or in an area with equipment specific to the repair being carried out. The intent of this level of maintenance is to repair an LRU so that it may be placed back into the inventory stock pool to be used during Maintenance Level 1 activities. Maintenance Level 2 activities would include work such as the following:
 - i. corrective maintenance of an LRU through the fault-finding and eventual replacement of an LLRU such as a circuit board; and
 - ii. depot level overhaul of LRV systems such as couplers, gearboxes, bogies, pantographs, doors, traction control units, and auxiliary power systems; and
 - c. Maintenance Level 3 are practices and activities that are not practical for the local maintenance area, such as LRV refurbishment, are impractical, such as repair of relays or PCBs, or involve major overhaul of a subsystem, such as motor rewinding.
- C. The LRV Supplier shall design the LRVs to achieve an overall MTTR value, calculated as the weighted average of the MTTR of the key system elements, as shown in *Table 1: MTTR Values for Key System Elements*.

Table 1: MTTR Values for Key System Elements

Key System Element	Weighted Average MTTR
Train control	1.0 h
HVAC	2.0 h
traction equipment and controls	1.8 h
friction braking equipment	2.0 h
communications equipment	1.0 h
side door and control equipment	0.8 h
lighting equipment	0.5 h
auxiliary electrical equipment	1.5 h
coupler and draft gear equipment	2.25 h
bogie and suspension equipment	4.0 h

Key System Element	Weighted Average MTTR
Train-to-wayside communications equipment	1.0 h
carbody and appointments	2.1 h

3.3.2 MAINTAINABILITY PROGRAM PLAN

A. The LRV Supplier shall submit a Maintainability Program Plan (CDRL 03-33) as follows:

1. provides the basis for development of maintenance tasks, maintenance procedures, methods, and techniques;
2. establishes the maintenance concepts to be incorporated in the design, taking into consideration safety, reliability requirements, accessibility of apparatus for maintenance, and the skills available for performing maintenance tasks;
3. develops predictions, in accordance with MIL-HDBK-472, to assess the adequacy of the LRVs and LRV systems design to meet maintainability and MTTR requirements identified in this Section;
4. identifies the maintenance actions required for preventive maintenance and corrective maintenance, including the following:
 - a. for preventive maintenance, the performance of scheduled maintenance tasks, and time required for those tasks, to postpone or prevent anticipated occurrence of failures and deterioration; and
 - b. for corrective maintenance, the time to identify the failure and fault isolate LRU and LLRU failures, repair or replace the failed LRU or LLRU, and test and confirm the restored function;
5. includes estimated intervals and work hours for at least the following maintenance tasks:
 - a. replacement of the LRV tires;
 - b. replacement of the friction surfaces on the LRV's brake discs;
6. incorporates the VLW Operations & Maintenance Concept information; and
7. conforms to MIL-HDBK-470A.

B. The LRV Supplier shall ensure the Maintainability Program Plan confirms that the total preventive maintenance tasks are no more frequent or take no more time than the following schedule for each LRV, with tasks performed by persons having been qualified and tooled in accordance with the Maintainability Program Plan:

1. preventive maintenance tasks to be performed every 8,000 kilometres or 30 days shall require no more than a total of 10 work hours;
2. preventive maintenance tasks to be performed every 25,000 kilometres or 90 days shall require no more than a total of 20 work hours;
3. preventive maintenance tasks to be performed every 50,000 kilometres or 180 days shall require no more than a total of 30 work hours; and

4. preventive maintenance tasks to be performed every 100,000 kilometres or one year shall require no more than a total of 40 work hours.

3.3.3 MAINTAINABILITY DEMONSTRATION

- A. The LRV Supplier shall conduct a Maintainability Demonstration during the FAI of the First LRV to confirm the maintenance procedures stated in the technical manuals and validate the stated MTTR of the LRV and LRV systems.
 1. The Maintainability Demonstration shall be conducted at the Gerry Wright OMF.
 2. The systems that will be subjected to a Maintainability Demonstration shall be selected by the City.
- B. The LRV Supplier shall submit a Maintainability Demonstration Plan (CDRL 03-34) that does the following:
 1. identifies all systems, and their LRUs, of the LRVs;
 - a. groups the LRUs by system;
 - b. includes the MTTR and MTBF for each LRU; and
 - c. includes the pass/fail Maintainability Demonstration criteria for each system;
 2. identifies the processes and the time required to do the following:
 - a. prepare LRVs under all disabling conditions for removal from Revenue Service, including towing, dead towing, movement under emergency power such as limp mode, towing a Stage 1 LRV, and being towed by a Stage 1 LRV; and
 - b. implement Driver interventions to keep LRVs affected by non-critical or redundant system failures in Revenue Service; and
 3. includes the personnel required from the City, the Operator, and the LRV Supplier to conduct the Maintainability Demonstration.
- C. No later than 60 days prior to the expected start date of the Maintainability Demonstration scheduled in the CWS, the City will inform LRV Supplier of the selected systems and processes for the maintainability demonstration. The City expect at least 30% of the systems listed in the Maintainability Demonstration Plan to be selected.
- D. The LRV Supplier shall submit a Maintainability Demonstration Report (CDRL 03-35) no later than 15 Business Days after the conclusion of the Maintainability Demonstration that includes the following:
 1. a narrative of the maintainability demonstration describing the outcome of the maintainability demonstration and any unexpected results;
 2. a list of the systems and LRUs subjected to the maintainability demonstration, with a comparison of the expected MTTR to the demonstrated repair times;
 3. a comparison of the expected times to the demonstrated times for preparing a disabled LRV for removal from Revenue Service; and
 4. a comparison of the expected times to the demonstrated times for implementing Driver interventions on an LRV affected by non-critical or redundant system failures.
- E. Where the demonstrated times to repair, remove from Revenue Service, and return to Revenue Service are not successfully demonstrated, the LRV Supplier shall implement Corrective Actions until

compliance can be achieved. The LRV Supplier shall repeat the associated Maintainability Demonstration to show compliance and update the Maintainability Demonstration Report with the new comparison for the associated demonstration.

- F. All demonstrations for the Maintainability Demonstration shall be conducted in accordance with the relevant technical manuals. If, during the Maintainability Demonstration, a demonstration is not performed in accordance with the relevant technical manual, one of the following shall occur:
1. the demonstration shall be repeated in accordance with the relevant technical manual; or
 2. the technical manuals shall be updated within 15 Business Days of the Maintainability Demonstration Report being Accepted by the City to match the demonstration if the demonstration was the correct procedure.

3.3.4 SPARE PARTS

- A. The LRV Supplier shall provide all Spare Parts listed in *Table 2: Base Order Spare Parts* in accordance with Section 1.1 A [*LRV Supplier Obligations*] of the Supply Agreement.

Table 2: Base Order Spare Parts

Item	Spare Part	Amount
1	Motor bogie	1 full LRV ¹
2	Trailer bogie	1 full LRV ¹
3	Complete traction power unit	1
4	Gearbox	1
5	Driver's cab HVAC unit	1
6	Passenger area HVAC unit	1
7	Auxiliary converter	2
8	Complete pantograph assembly	2
9	Master controller	1
10	Fully assembled Driver's cab console	1
11	Sets of each type of door panels	2
12	LRV skirts	1 full LRV ¹
13	Set of each type of passenger seat	1
14	Driver's seat	1
15	Coupler	2
16	Battery	3
17	Event recorder	2
18	Complete articulation assembly	3
19	Driver's cab TOD	2
20	Cab front shell moulding	2
21	Internal LRV VMS	2
22	External LRV VMS	2

Note 1: "1 full LRV" means the quantity required to complete one LRV.

- B. The LRV Supplier shall submit a Recommended Spare Parts List (CDRL 03-36) that shall include all Spare Parts, including those listed in *Table 2: Base Order Spare Parts*, and replacement components that have been identified through the RAM Plan.

1. The preliminary Recommended Spare Parts List included in the Bid Extracts will form the basis for the Recommended Spare Parts List.
- C. The LRV Supplier shall include the following for each Spare Part in the Recommended Spare Parts List:
1. name and description of part;
 2. recommended quantity that will allow the City to support operations and maintenance activities for three years following the date that the first LRV achieves Conditional Acceptance;
 3. recommended quantity that will allow the City to support the first overhaul activities after the first LRV achieves Conditional Acceptance;
 4. calculations in support of the recommended quantity based on the RAM Plan;
 5. recommendation for the minimum number of Spare Parts, at which point the Spare Parts should be reordered;
 6. design drawing reference number;
 7. subassembly or larger assembly in which part is used and indication if used in different assemblies;
 8. suggested Spare Part strategy, such as replace individual components or the larger assembly;
 9. recommended re-order quantity;
 10. procurement lead time;
 11. shelf life;
 12. commercial supplier of each Spare Part, including name and address, and appropriate contact information;
 - a. identify if the commercial supplier is the manufacturer, distributor, agent, or other. Local and Canadian distributors are preferred by the City for logistical reasons;
 13. The LRV Supplier's part number, if applicable;
 14. Subcontractor's part number(s), if applicable; and
 15. unit price, price break quantities, and minimum order quantity.
- D. The City may order additional Spare Parts, at various stages of the Work, in accordance with Schedule 9 [*Pricing and Payment*].
- E. The LRV Supplier shall not include Warranty Spares and those Spare Parts required for Commissioning in the Recommended Spare Parts List.
- F. The LRV Supplier shall segregate Spare Parts required for Commissioning and Warranty Spares from the Spare Parts defined in the Spare Parts List and store such parts in a dedicated storage area Accepted by the City.
1. The LRV Supplier shall coordinate with the City for space and access if such dedicated storage area is to be located on the Gerry Wright OMF Part B.
 - a. The City will provide the LRV Supplier with access to land on the Gerry Wright OMF site sufficient for the LRV Supplier to set up a temporary secure storage facility.

- b. The LRV Supplier will be responsible for all costs to provide, set-up, maintain and operate such a temporary secure storage facility.
- G. The LRV Supplier shall replace or update any Spare Part that has been issued a Spare Parts Acceptance Certificate, if such Spare Part has been affected by any modification in accordance with the Change Management Subplan.

3.4 SAFETY

3.4.1 GENERAL

- A. The LRV Supplier shall design and manufacture the LRVs to be safe for Passengers, persons nearby, the City and Operator employees, and the environment under normal operating and failure mode conditions.
- B. The LRV Supplier shall identify, document, evaluate, and mitigate all risks according to Good Industry Practice.

3.4.2 SAFETY AND SECURITY CERTIFICATION PROGRAM

- A. The LRV Supplier shall implement a Safety and Security Certification Program for the verification, validation, and certification of the safety and security of the LRVs.
- B. The LRV Supplier shall develop and submit a Safety and Security Certification Plan (CDRL 03-37) that describes the Safety and Security Certification Program and includes the following:
 - 1. a description of the processes implemented to collectively verify, validate, and certify the safety and security of the LRVs;
 - 2. details of the organization, roles, and responsibilities for all safety and security activities;
 - 3. a Software safety section, in accordance with Section 3.4.8 [*Software Safety*];
 - 4. a description of the approach, methodology, and schedule for all of the Hazard Analyses that will be performed, including the PHA, Failure Modes, Effects, and Criticality Analysis, Operations and Maintenance Hazard Analysis, Threat and Vulnerability Analysis, and any additional system hazard or safety analysis required to demonstrate the safety and security of the LRVs;
 - 5. a description of the processes, inspections, tests, and validation activities each LRV shall undergo to be considered safe for Revenue Service and be issued a Safety and Security Verification Certificate;
 - 6. identification of the standards, consistent with Good Industry Practice, to be used to establish integrity levels and to be used in the development and validation of Software for all LRV systems in which Software is performing a safety function; and
 - 7. coordination with the other system and safety assurance activities described in this Section.
- C. The LRV Supplier shall include the safety and security requirements, identified by the Safety and Security Certification Program, and the inspection, test, and validation activities required to validate these safety and security requirements in the requirement tracking system detailed in the Accepted Requirements Traceability Plan.
- D. The LRV Supplier shall submit a completed Safety Compliance Assessment (CDRL 03-38) that incorporates all components of the PHA that is as follows:
 - 1. is organized in the same format as the PHA;
 - 2. demonstrates that all requirements identified in the PHA have been fulfilled; and

3. includes all items and documents identified as requirements for the safety verification of individual events, preferably as appendices.
- E. For each LRV, the LRV Supplier shall submit a Safety and Security Verification Certificate (CDRL 03-39) that has been authenticated by the Lead Engineer.

3.4.3 FAILURE-INDUCED HAZARDS

- A. The LRV Supplier shall design and construct the LRVs, LRV systems, and equipment to revert to safe modes under failure conditions.
1. The LRV Supplier shall consider failures in equipment that result in an indication of danger, whether or not actual danger exists, to have occurred in a safe manner.
 2. The LRV Supplier shall not consider a failure that results in an indication of safety, when a dangerous condition may exist, to be safe.
- B. The LRV Supplier shall design the LRVs to apply restrictive responses to hazardous failure modes, such as the following:
1. forcing the LRVs to stop versus allowing it to proceed;
 2. enforcing a lower speed versus allowing a higher speed;
 3. forcing doors closed versus allowing doors to open;
 4. enforcing deceleration versus allowing acceleration;
 5. applying brakes versus releasing brakes; and
 6. actuating alarms.
- C. The LRV Supplier shall design LRV systems whose failure could result in hazards of Category I or II severity in accordance with DOT-FTA-MA-26-5005-00-01 to conform to the following:
1. design principles and validation by Type Tests:
 - a. the failure of a single device shall not result in a permissive condition; and
 - b. an undetected failure of any device shall not permit a subsequent device failure to result in a permissive condition; and
 2. safety design principles by one, or all, of the following methods:
 - a. use fail-safe devices such as signal grade relays, combined in circuits in such a way that the failure modes are mitigated to an acceptable level of safety;
 - b. use independent channels with independent checking of each channel where all channels must indicate a permissive state for the controlled system to achieve a permissive state, and where the following shall be enforced:
 - i. failure in any channel shall not affect any other channel, or cause the system to achieve a permissive state; and
 - c. upon detection of any differences in state between channels monitoring the same variable, an alarm shall be activated, and the system shall be forced to a restrictive state.

3.4.4 SAFETY UNDER NORMAL OPERATING AND MAINTENANCE CONDITIONS

- A. The LRV Supplier shall ensure the LRVs present a safe, hazard-free environment to Passengers, and the City's and Operator's personnel.
- B. The LRV Supplier shall design the LRVs such that Passengers and Drivers are not exposed to tripping hazards, sharp points and edges, lethal and injurious voltages, toxic materials, and similar hazards.
 - 1. All equipment containing hazardous materials, lethal and injurious voltages, and other risks shall be labelled on both the outside and inside of the equipment.
- C. The LRV Supplier shall do the following:
 - 1. identify normal and emergency equipment and controls that the Passengers may operate, and where required, present operating procedures in both printed English and graphic formats;
 - 2. identify normal and emergency equipment and controls that the Drivers may operate, and where required, present operating procedures in both printed English and graphic formats;
 - 3. ensure maintenance manuals, procedures, and training indicate the proper handling, storage, and disposal of hazardous materials in accordance with Section 10.1 [*Technical Manuals*]; and
 - 4. reduce the exposure of maintainers to lethal and high voltages through compartmentalization, interlocks, and other similar measures.

3.4.5 HUMAN ERROR AND OTHER EXTERNAL INFLUENCES

- A. The LRV Supplier shall ensure all LRV systems minimize unsafe conditions resulting from human error. This includes the following:
 - 1. no sequence of operations, or the simultaneous activation of any controls, will result in unsafe conditions; and
 - 2. where conflicting commands, such as simultaneous power and brake, are requested, the more restrictive will apply.
- B. The LRV Supplier shall design safety-related equipment to minimize the hazardous effects resulting from erroneous maintenance by employing methods such as limitation of adjustment ranges, use of unalterable Software, use of non-interchangeable parts, and application of visible wear indicators.

3.4.6 HAZARD LOG MATRIX

- A. The LRV Supplier shall submit the Hazard Log Matrix (CDRL 03-40) that records all hazards identified throughout the Work.
- B. The LRV Supplier shall update the Hazard Log Matrix when a new hazard is discovered and append the updated Hazard Log Matrix in accordance with Section 1.4 B.3.d.vi [*Progress Reports*].

3.4.7 SAFETY ANALYSES

- A. The LRV Supplier shall submit a Failure Modes, Effects, and Criticality Analyses Package (CDRL 03-41) in accordance with MIL-STD-1629A that provides a systematic, comprehensive, and bottom-up evaluation of the design data to analyze the effects on systems of potential component failures.
- B. The LRV Supplier shall submit a Sneak Circuit Analysis (CDRL 03-42) of all trainline control circuits where undetected wiring and signal path errors can lead directly to hazardous effects. Include a description of mitigations used to reduce the risk of these effects.
- C. The LRV Supplier shall submit a Threats and Vulnerability Analysis (CDRL 03-43) that identifies, analyzes, and prioritizes the vulnerabilities in the LRV systems to physical, electrical, and cyber

attacks and lists possible effects of these attacks on the LRVs, the Valley Line LRT, Passengers, and the public. Include a description of mitigations used to reduce the risk of these effects.

- D. The LRV Supplier shall submit an Operations and Maintenance Hazard Analysis (CDRL 03-44) that evaluates the operating and maintenance procedures to ensure that, when followed, the procedures do not result in hazards. The Operations and Maintenance Hazard Analysis shall do the following:
1. include recommendations regarding the Occupational Health and Safety programs to mitigate hazards related to the operation and maintenance of the LRVs;
 2. list all materials recommended for use on the LRVs that are subject to WHMIS, include their WHMIS safety data sheets, and identify hazards associated with each material; and
 3. incorporate maintenance and operational procedures that comply with the City's Occupational Health and Safety programs, and recommend mitigations to prevent or address hazards.
- E. The LRV Supplier shall submit a Preliminary Hazard Analysis (CDRL 03-45) in accordance with DOT-FTA-MA-26-5005-00-01 that provides a systematic, high-level examination of all proposed system elements and identifies and classifies potential hazards. The Preliminary Hazard Analysis shall be as follows:
1. classify the following hazards in the PHA to be severity Category I or II, in accordance with DOT-FTA-MA-26-5005-00-01:
 - a. maximum brake fails to apply when requested;
 - b. service brakes fail to apply when requested;
 - c. propulsion is not removed when requested;
 - d. No Motion detection system indicates No Motion when the LRV is moving;
 - e. LRV displays motion when LRV is at confirmed rest and preventing LRV doors from being opened with emergency egress device;
 - f. door opens spontaneously when not commanded;
 - g. door opens on the wrong side of the LRV;
 - h. door closes on person's limb and indicates door closed and locked to control system;
 - i. door interlocks erroneously indicate door is closed and locked;
 - j. LRV system responds in a permissive manner to a restrictive command;
 - k. indication of uncoupled when not uncoupled;
 - l. indication of being coupled when not coupled;
 - m. excessive currents or overheated equipment cause fire;
 - n. LRV moves in wrong direction;
 - o. LRV speed and track curvature combine in such a manner as to cause an LRV to derail or an LRV to overturn;
 - p. onboard equipment causing electromagnetic interference that affects other onboard systems or wayside systems;

- q. onboard systems affected by the electromagnetic interference from wayside systems;
 - r. TCS onboard equipment fails to detect overspeed;
 - s. TCS onboard equipment component failure;
 - t. TCS onboard equipment fails to enforce brake assurance;
 - u. safety grounds are lost, or other failure occurs that exposes persons to injurious voltages;
 - v. use of material that is hazardous to Passengers, Drivers, maintainers, and the environment;
and
 - w. misconfiguration of post-delivery adjustable system parameters; and
2. include constraints for PTUs to override normal controls of systems under test to troubleshoot issues, in accordance with Section 10.3.2 [*Portable Test Units*].
- F. The LRV Supplier shall submit a Fire Hazard Analysis (CDRL 03-46) that shall document all design and test efforts taken to comply with the requirements of Section 1.3.16 [*Fire and Life Safety*] of Schedule 4 [*Technical Requirements*].

3.4.8 SOFTWARE SAFETY

3.4.8.1 General

- A. The LRV Supplier shall include a Software safety section in the Safety and Security Certification Plan for any safety-related Software and Software item that control or monitor safety-related functions.
1. The LRV Supplier shall execute safety-related functions accomplished through the use of Software as Vital unless an independent hardware means to mitigate a Software failure is also provided. The LRV Supplier shall document the mitigation means in the relevant safety analyses described in Section 3.4.7 [*Safety Analyses*].
- B. The LRV Supplier shall provide Software that meets or exceeds the recommended requirements for software safety of EN 50128.
- C. The LRV Supplier shall include all post-delivery adjustable system parameters as part of the Preliminary Hazard Analysis described in Section 3.4.7 [*Safety Analyses*].

3.4.8.2 Software Safety Integrity Level

- A. The LRV Supplier shall base the Software Safety Integrity Level of safety-related Software systems on the requirements of EN 50128.

3.4.8.3 Commercially Available Software

- A. The LRV Supplier shall do the following:
1. for Software Safety Integrity Level 0, accept the use of commercially available Software with no further precautions;
 2. for Software Safety Integrity Levels of 1 or 2, include commercially available Software in the Software validation process;
 3. for Software Safety Integrity Levels of 3 or 4, implement the following mitigations:
 - a. include the commercially available Software in the validation testing;
 - b. submit an analysis of possible failures;

- c. submit and implement a strategy to detect failures of the commercially available Software and to protect the system from these failures;
- d. subject the protection strategy to validation testing;
- e. submit an analysis of error logs; and
- f. use only the simplest functions of the commercially available Software.

SECTION 4: SYSTEMS ENGINEERING

- A. The LRV Supplier shall submit a System Design Description (CDRL 03-47) that does the following:
1. defines and graphically depicts the overall system architecture;
 2. defines, describes, and breaks down the subsystems that make up the overall LRV systems;
 3. describes and graphically depicts the internal and external interfaces between all systems and subsystems;
 - a. identify all network description documents and all ICDs by title and document number where each respective interface is further detailed;
 4. describes how the functional requirements are allocated to the subsystems, including the possible decomposition of single requirements into multiple requirements that are allocated to multiple subsystems; and
 5. includes functional descriptions of each subsystem being provided. Ensure each subsystem functional description includes the following:
 - a. context diagrams showing the specific subsystem in relation to other systems and identifying and describing all external interfaces;
 - b. a decomposition diagram showing the components of the subsystem including hardware, Software, and networks, using terminology consistent with other documentation and showing all internal interfaces between components and external interfaces to other systems; and
 - c. a definition of the overall LRUs and LLRUs for acceptance by the City.
- B. The LRV Supplier shall submit a Systems Integration Matrix and Testing Plan (CDRL 03-48) that is as follows:
1. includes a matrix graphically depicting the interfaces between each system, and between the systems and the LRV, with references to all ICDs;
 2. includes a matrix graphically depicting the interfaces between the LRVs and the Valley Line LRT, with references to all ICDs; and
 3. clearly identifies and describes all of the testing required to thoroughly test each interface described in Section 4.B.1 [*Systems Engineering*] and Section 4.B.2 [*Systems Engineering*].
 - a. where integration testing of the LRV and LRV systems requires testing beyond that indicated in Section 8, Table 4 [*Minimum Required Qualification and Routine Tests*], the LRV Supplier shall also include that testing in the Systems Integration Matrix and Testing Plan.
- C. The LRV Supplier shall include all testing identified in the Systems Integration Matrix and Testing Plan in the Master Test Plan.
- D. The LRV Supplier shall submit an Interface Control Document Package (CDRL 03-49) that includes the ICDs for all internal, intra-LRV, and external interfaces that define the physical, electrical, and functional characteristics of the interface. At minimum, the LRV Supplier shall produce an ICD for each interface identified in the Systems Integration Matrix and Testing Plan and the following:
1. wheel-rail interface;
 2. Software interfaces;

3. TRPS interface;
4. LRV-Maintenance Facilities interfaces; and
5. LRV-City interfaces for the following:
 - a. APC;
 - b. MDS;
 - c. CCTV; and
 - d. passenger information system.

SECTION 5: SOFTWARE SYSTEMS

5.1 GENERAL

5.1.1 GENERAL

- A. The LRV Supplier shall submit a Software Design Plan (CDRL 03-50) that identifies all Software required for the project and all Submittals necessary to demonstrate compliance with the requirements of this Section, and includes the following:
1. a list of all commercially available Software intended for use for the Work;
 2. a list of all Custom Software intended for use on this project;
 3. a list of operating systems that describes the operating systems used and the applications they support;
 4. the quantity of licenses required for each piece of Software; and
 5. the submittal numbers and delivery dates associated with all related Software documentation required in Section 5.4 [*Documentation*] for each piece of Software.
- B. The LRV Supplier shall submit Software and Licenses of the LRV Systems (CDRL 03-51) including all the licenses for all Software installed on each system and installed on any Special Tools and DTE needed to support the LRVs.
- C. The LRV Supplier shall provide Software that performs the following basic functions:
1. implements the desired control scheme to achieve the required performance as specified in the Software Requirements Specifications and Software Design Descriptions specified in Section 5.4.1 [*Custom Software*];
 2. monitors all inputs for unsafe, erroneous, or unknown conditions;
 3. takes appropriate actions to preserve proper functioning;
 4. retains all information necessary for the City to perform root cause analysis and repair when necessary;
 5. performs with sampling rates and program execution times such that the Software detection, execution, and output is not a material factor in response to unsafe or damaging conditions;
 6. meets the timing requirements for safety-related tasks in all circumstances;
 7. responds safely and predictably when powering up or recovering from power interruptions or unexpected shutdowns;
 8. reinitializes all affected routines and temporary data in the event of any power interruption or shutdown that is likely to have corrupted temporary storage; and
 9. limits all output commands to maintain safe, effective output levels and states regardless of any combination of input conditions.
- D. The LRV Supplier shall provide current, operable, and licensed versions of all Software required to operate and maintain the LRVs on physical media.

5.1.2 SOFTWARE DEVELOPMENT PROCESS

- A. For Custom Software, the LRV Supplier shall submit a Software Development Process (CDRL 03-52) that describes the Software development process used by the LRV Supplier, acting as the systems

and Software integrator, and the Software development process of Subcontractors providing Software.

5.1.3 DIAGNOSTIC FEATURES

A. For Custom Software, the LRV Supplier shall design microprocessor-based Software systems to meet the following diagnostic requirements:

1. perform self-diagnostic routines to detect program corruption and validate the integrity of memories and subsystems controlled by the Software, and respond promptly, safely, and predictably to detected faults;
2. permit complete interrogation of all input and output conditions by external DTE; and
3. provide access to diagnostic information and tools via a web browser interface or other user-friendly software installed on the PTU that allows a maintainer with the PTU to access the system under test through an ethernet connection.

5.2 OPERATING SYSTEMS

A. The LRV Supplier shall do the following:

1. use operating systems that are commercially available Software;
2. identify the required operating system for each Software item in the relevant Software Requirements Specification in accordance with Section 5.4.1 [*Custom Software*]; and
3. verify that all Software provided as part of test or interface equipment provided for the purpose of post-download data analysis and processing, or incorporated within training technology uses the designated Microsoft Windows operating system specified by the City at NTP.

5.3 PROGRAMMING LANGUAGES

5.3.1 GENERAL

A. The LRV Supplier shall code Custom Software in English using commercially available, high-level programming languages with a suitably large installation base, subject to Acceptance by the City.

B. The LRV Supplier shall submit a List of Programming Languages (CDRL 03-53) that includes the following:

1. a description of all programming languages used for Custom Software;
2. which Custom Software the programming languages are used to code; and
3. information regarding the installation and deployment base of Custom Software coded using each programming language.

C. The LRV Supplier shall submit a List of Non-English Code (CDRL 03-54) identifying all source code and comments that are not in English.

D. The LRV Supplier shall write source code with the following requirements:

1. well structured;
2. modular; and
3. clearly documented for ease of comprehension.

- E. The LRV Supplier shall define and follow a standard and documented internal coding convention for all Custom Software produced.

5.3.2 PERSONAL COMPUTER BASED SOFTWARE

- A. All personal computer based Software, including DTEs, shall adhere to Microsoft Windows User Experience: Official Guidelines for User Interface Developers and Designers.
- B. The LRV Supplier shall provide a Microsoft Windows format help file for all personal computer based Software, including DTEs, that provides context-sensitive help to the Software user.

5.4 DOCUMENTATION

5.4.1 CUSTOM SOFTWARE

- A. The LRV Supplier shall submit the following Software documentation for each Custom Software in accordance with standard IEEE 1558 for a Type 5 procurement or EN 50567 with the equivalent level of documentation:
 - 1. Software Project Management Plan (CDRL 03-55);
 - 2. Software Quality Assurance Plan (CDRL 03-56);
 - 3. Software Configuration Management Plan (CDRL 03-57);
 - 4. Software Validation and Verification Plan (CDRL 03-58);
 - 5. Software Validation and Verification Report (CDRL 03-59);
 - 6. Software Requirements Specification (CDRL 03-60);
 - 7. Software Interface Control Document (CDRL 03-61);
 - a. verify that the Software Interface Control Document is not proprietary, under any circumstance, prior to submission;
 - 8. Software Design Description (CDRL 03-62);
 - 9. Database Design Description (CDRL 03-63);
 - 10. Software Requirements Traceability Matrix (CDRL 03-64);
 - 11. Software Test Plan (CDRL 03-65);
 - 12. Software Test Procedure (CDRL 03-66);
 - 13. Software Test Report (CDRL 03-67);
 - 14. Software Version Description (CDRL 03-68), including the following:
 - a. date of release;
 - b. name of person responsible for the change;
 - c. function description being addressed;
 - d. change description;
 - e. reason for change;

- f. expected result; and
 - g. required actions from end user; and
15. Software User Manual (CDRL 03-69).
- B. The LRV Supplier shall document Software Quality Assurance and validation and verification activities for both new and reused Custom Software either completely within the Software Project Management Plan, or in a separate Software Quality Assurance Plan, in accordance with standard IEEE 1558 or EN 50657.
- C. If Software modifications are performed after Conditional Acceptance of an LRV, the LRV Supplier shall submit, in addition to the documentation noted above, In-Service Software Modification Documentation (CDRL 03-70) that includes the following:
- 1. risks if Software is not placed in service;
 - 2. expected impact of the implementation, such as the following:
 - a. downtime;
 - b. data changes;
 - c. Software compatibility; and
 - d. fleet compatibility;
 - 3. expected impact on the Driver and maintainer;
 - 4. expected impact on Passengers;
 - 5. hazard assessment;
 - 6. reverse migration strategy, should it be necessary to revert to a previous version;
 - 7. necessary preparations and subsequent Work;
 - 8. system monitoring plan to validate that the modified Software is functioning as intended; and
 - 9. implementation checklist.

5.4.2 COMMERCIALY AVAILABLE SOFTWARE

- A. The LRV Supplier shall submit a Commercially Available Software Package (CDRL 03-71) for each commercially available Software that includes the following:
- 1. the original data storage/transfer media;
 - 2. functional and usage details;
 - 3. all provider manuals; and
 - 4. perpetual licenses required for the City's use.
- B. The LRV Supplier shall document commercially available Software requirements and interfaces in a specific section of the relevant ICD and System Requirements Specification, specified in Section 4 [*Systems Engineering*], for that component of the system.
- 1. The LRV Supplier shall include references to specific sections of any Subcontractor's Project Records for all requirements.

5.5 SOFTWARE VALIDATION AND VERIFICATION

- A. The LRV Supplier shall execute a fully auditable Software validation and verification process that is compliant with IEEE 1012 or EN 50657 and is in accordance with the requirements of Section 7 [*Requirements Management*] and the applicable Software Requirements Specification.
- B. The LRV Supplier shall perform documented unit and module testing, integration testing, and system testing, including full code coverage and branch testing.
- C. The LRV Supplier shall submit an Interface Control Document Verification Demonstration Report (CDRL 03-72) for each piece of Software demonstrating that each Interface Control Document has no errors or omissions for all seven levels of the Open System Interconnection model as defined in ISO/IEC 7498-1.

5.6 TRACEABILITY

5.6.1 BACKWARD TRACEABILITY

- A. The LRV Supplier shall trace all Software requirements back to the applicable design requirement in the requirement tracking system detailed in the Accepted Requirements Traceability Plan.
- B. The LRV Supplier shall document these traces in the relevant Software Requirements Traceability Matrix and specify section references for all documentation.

5.6.2 FORWARD TRACEABILITY

- A. The LRV Supplier shall trace all Software requirements forward to the design and associated Software validation and verification activities through the documented internal design process.
- B. The LRV Supplier shall evaluate forward traceability in the relevant Software Requirements Traceability Matrix.

5.7 VERSIONING

- A. The LRV Supplier shall use verifiable version control for all Software items based on a calculated cyclic redundancy check polynomial published in the system documentation or other alternative method of reliable and efficient version control.
- B. The LRV Supplier shall incorporate version naming information of Software systems within the code and report this information through a direct or indirect user interface or DTE.
- C. The LRV Supplier shall design verifiable version control such that it is dynamically calculated and reported through the interface.
- D. The LRV Supplier shall design all configuration parameters or other selectable features made to configure the system, either through site-specific adaptation or subsequent parameter tuning, such that they are identifiable and traceable through versioning differences visible on the system display, MDS, DTE, and remote diagnostics.

5.8 PROCESS DEVIATIONS

- A. The LRV Supplier shall develop all Software items using the Accepted Software development processes as documented in the relevant Software Project Management Plan.
- B. The LRV Supplier shall submit a Software Process Deviation Request (CDRL 03-73) that clearly identifies any Software items resulting from process deviations and limits the deviation to a specific application, instance, and duration.

- C. The LRV Supplier shall bring Software items resulting from process deviations into process compliance at the earliest possible date or remove them from service prior to the specified duration expiration.
- D. The LRV Supplier shall revert Software to the version prior to the deviation and proceed in accordance with the Accepted Software development processes as documented in the relevant Software Project Management Plan.

5.9 SOFTWARE DELIVERY

5.9.1 GENERAL

- A. The LRV Supplier shall deliver all necessary Software for this project to the City on DVD ROM, USB device, or portable hard disk drive, as Accepted by the City.

5.9.2 DEMONSTRATION

- A. The LRV Supplier shall install the deliverable Software and associated documentation and instructions on the City's computer equipment with delivery of the first LRV and update accordingly thereafter.
- B. The LRV Supplier shall demonstrate and prove that the Software items created on the City's computer equipment match the delivered Software items.

5.10 SOFTWARE TOOLS

- A. The LRV Supplier shall do the following:
 - 1. use the latest version available at NTP for all Software tools, including compilers, non-Microsoft Windows operating systems, and editors;
 - 2. provide only tools that are commercially available Software;
 - 3. not use proprietary or Custom Software tools; and
 - 4. provide only tools that are capable of being hosted or run on a computer using the City's specified Microsoft Windows operating system at NTP.

SECTION 6: ELECTROMAGNETIC COMPATIBILITY

6.1 EMISSIONS AND IMMUNITY

- A. The LRV Supplier shall do the following:
1. control the LRVs', and the LRV systems' emissions and immunity to EMI to achieve EMC;
 2. work with Project Co to ensure LRVs and system immunity to EMI will allow continuous and reliable operation throughout the Valley Line LRT;
 3. ensure the LRVs and LRV systems are adequately protected against radio frequency emissions from nearby mobile and handheld radios or cellular telephones;
 4. ensure emissions and immunity of LRV-mounted equipment conform with EN 50121-3-2, unless otherwise Accepted by the City; and
 5. ensure the LRVs are compatible with the wayside TRPS equipment in accordance with EN 50238-1, EN 50238-2, and EN 50238-3.
- B. The LRV Supplier shall submit an Electromagnetic Compatibility Plan (CDRL 03-74) that describes the following:
1. the plan to achieve EMC;
 2. the activities required to achieve EMC;
 3. the schedule required to achieve EMC;
 4. the qualifications of the LRV Supplier's personnel;
 5. the procedures and methods required to achieve and document EMC compliance;
 6. the immunity qualification test plans and testing procedures;
 7. the EMC-related testing to be carried out during production;
 8. the EMC-related testing to be carried out during preventive maintenance; and
 9. the approach and plan to meet all requirements of this Section 6 [*Electromagnetic Compatibility*].
- C. The LRV Supplier shall perform an RSQT as detailed in Section 6.3.2 [*Radio Susceptibility Qualification Test and Evaluation Criteria*].
- D. The LRV Supplier shall submit a completed LRV Emissions and Immunity Report (CDRL 03-75) that demonstrates that the LRVs meets the requirements of EN 50121 and includes the following information:
1. the electromagnetic footprint of the LRVs showing all radiated and conducted LRV emissions; and
 2. testing of LRV systems that demonstrates they meet the specified EMC performance criteria, as determined by the safety analysis, specified by the LRV Supplier, and defined in EN 50121-1-4.

6.2 ELECTROMAGNETIC INTERFERENCE SAFETY PROVISIONS

6.2.1 SAFETY ANALYSIS

- A. The LRV Supplier shall submit an EMI/EMC Safety Analysis (CDRL 03-76) that documents that the LRVs' and the LRV systems' immunity characteristics and expected emissions meet the following requirements:
1. are safe under normal conditions;
 2. will provide adequate detection, indication, and response to failures that could cause the LRVs' immunity to decrease, or emissions to increase, beyond tested levels; and
 3. will allow Vital systems and equipment to perform their safe function under conditions of excessive EMI or decreased immunity levels.
- B. The LRV Supplier shall design the safety analysis to achieve the following:
1. align with the safety analyses specified in Section 3.4.7 [*Safety Analyses*] for all appropriate Vital systems and equipment;
 - a. demonstrate that the design of the LRVs and LRV systems, and any actions they may take, are adequate to prevent an EMI hazard; and
 2. distinguish between EMI-affecting failures of the following types:
 - a. automatically protected;
 - b. annunciated for Driver or maintainer action; and
 - c. non-mission critical non-annunciated failures.
- C. The LRV Supplier shall ensure the failure rates used are traceable to the safety analyses specified in Section 3.4.7 [*Safety Analyses*].
- D. The LRV Supplier shall demonstrate that the LRVs and LRV systems are immune to expected internal and external emissions, within the margins proposed by the LRV Supplier and Accepted by the City with the EMI/EMC Safety Analysis and LRV Emissions and Immunity Report.
- E. The LRV Supplier shall design the EN 50121 lab and the field RSQT testing to validate the safety analysis and quantify the effects of annunciated and non-annunciated EMI-affecting failures.

6.2.2 PRODUCTION TESTS

- A. The LRV Supplier shall identify, detail, and perform EMC-related Routine Tests on each set of Vital equipment to assure protection against EMI hazards.

6.2.3 MAINTENANCE TESTS OR PROCEDURES

- A. The LRV Supplier shall identify and detail in the maintenance manuals the maintenance tests and procedures that will be performed on equipment and Vital systems by maintainers to assure EMC and protection against EMI hazards.

6.3 IMMUNITY AND EMISSION QUALIFICATION TESTING

6.3.1 LRV AND SUBSYSTEM TESTING

- A. The LRV Supplier shall demonstrate through immunity and emission qualification tests that the LRVs and LRV systems meet the following requirements:
1. are compatible with the worst case conducted and radiated emissions in the Valley Line LRT;

2. meet the performance standards described in the LRV Emissions and Immunity Report;
 3. demonstrate that the designed susceptibility thresholds are adequate to permit operation with worst case conducted and radiated emissions expected within the LRVs, LRV systems, and the Valley Line LRT; and
 4. meet the designed susceptibility thresholds under normal and failure conditions.
- B. The LRV Supplier shall conduct immunity and emission Type Tests in lab tests that are compliant with EN 50121 and the RSQT for all LRV systems.
1. For each lab test, develop a Test Procedure that complies with EN 50121 and submit it to the City for Acceptance.
 - a. The LRV Supplier shall conduct lab testing as part of the LRV system Type Test.
 - b. The LRV Supplier may submit results of previous tests of substantially identical systems for the City's Acceptance.
 2. Demonstrate in the RSQT that the as-installed performance of the LRV systems conforms with the LRV Supplier's Failure Modes, Effects, and Criticality Analysis and the lab test results.
 3. Perform the immunity and emission Type Tests to the satisfaction of the City.
- C. The LRV Supplier shall submit all EMI Test Procedures and Test Reports in accordance with Section 8.2.2 [*Test Procedures*] and Section 8.2.3 [*Test Reports*], respectively.

6.3.2 RADIO SUSCEPTIBILITY QUALIFICATION TEST AND EVALUATION CRITERIA

- A. The LRV Supplier shall do the following:
1. perform an RSQT on the LRV systems installed in the completed LRVs;
 2. expose the LRV systems during the RSQT to radiated emissions from an Accepted list of radios in use throughout the Edmonton area; and
 3. during the RSQT, monitor the integrity of the following:
 - a. the equipment functionality with the LRVs and LRV systems in all applicable operating modes; and
 - b. the equipment functionality in maintenance modes, when normally closed equipment enclosures are opened for inspection; and
 4. provide a pass to systems if their responses conform to the specified equipment's performance criteria chosen from EN 50121-1-4 in both operational and maintenance modes. If required, the LRV Supplier shall define a reduced performance criteria for a system in maintenance mode and submit a hazard analysis of that operating mode to the City for Acceptance.
- B. The LRV Supplier shall prepare and submit the Radio Susceptibility Qualification Test Procedure (CDRL 03-77), in accordance with Section 8.2.2 [*Test Procedures*], that specifies the following:
1. the LRV and system operating modes to be tested;
 2. the detailed list of radios to be used in the RSQT, including the following:
 - a. each radio manufacturer;
 - b. model number;

- c. serial number, to be recorded during the RSQT;
 - d. frequency or channel used;
 - e. nominal transmit power rating; and
 - f. measured field strength at a distance of 30 cm in volts/meter (v/m), to be recorded during the RSQT;
3. the LRV systems to be tested and the indications on the LRV system and LRVs that will be monitored to assess that the equipment function is conforming to performance criteria defined by the LRV Supplier; and
 4. enclosures containing electrical or electronic items that can be opened for maintenance when the LRVs are operating. The LRV Supplier shall test such enclosures while opened in maintenance mode unless warning labels printed on the equipment enclosure specifically caution against this.
- C. The LRV Supplier shall perform the RSQT as follows:
1. with the LRV in the operating or maintenance mode specified by the RSQT procedure, test each system item by placing the portable radio in the transmit mode and moving the radio past the equipment at a rate of 30 cm per second along the path shown in *Figure 1: RSQT Testing Path*, or held in place for a minimum of 10 seconds for small equipment;
 2. position the radio 30 cm from the equipment surface whether moving along the path or holding it stationary;
 3. if the placement and function of the equipment makes it possible that a radio will normally be operated closer than 30 cm from the surface, position the radio next to the equipment surface during the test;
 4. rotate the radio to ensure the transmit antenna alternates between the horizontal and vertical polarity at about a 1 Hz rate;
 5. propose modifications to the radio path and placement as necessary to fit physical constraints of the LRV equipment layout; and
 6. use the evaluation criteria described in *Table 3: RSQT Evaluation Criteria*.

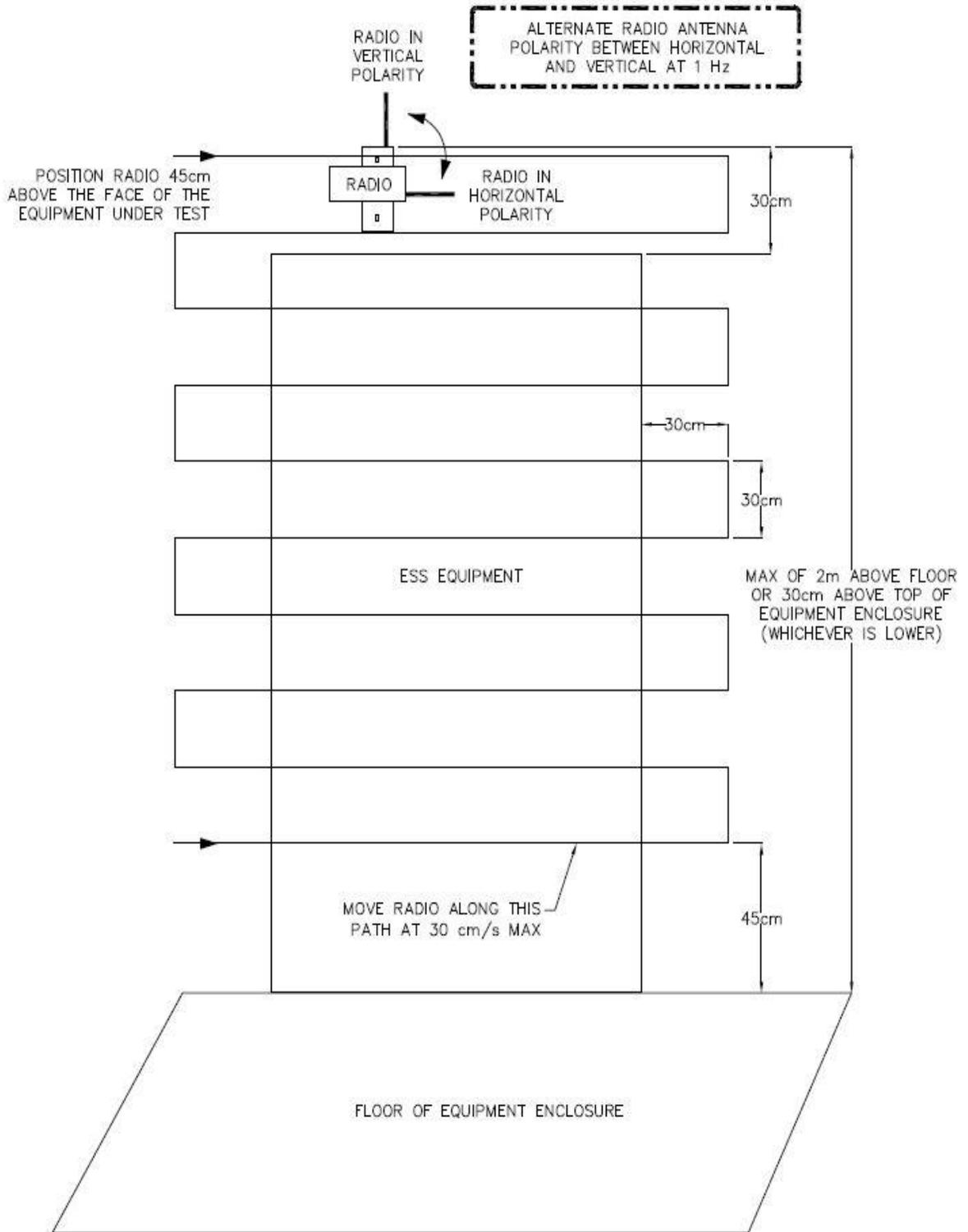


Figure 1: RSQT Testing Path

Table 3: RSQT Evaluation Criteria

Category	Effect on Function or Performance of CBTC System Equipment
A	No effect on function or performance of the LRVs or LRV systems.
B	Minor effect during exposure to radiated emission. Effect ends when exposure to radiated emission ends.
C	Major effect, such as LRV unacceptable action or response. Major or minor effect requires Driver action to reset or restore after exposure to radiated emission ends.
D	Effect requires maintainer action to repair or restore after exposure to radiated emission ends.

- D. The LRV Supplier shall prepare and submit the Radio Susceptibility Qualification Test Report (CDRL 03-78), in accordance with Section 8.2.3 [*Test Reports*], that documents the results of the RSQT testing.
- E. The LRV Supplier shall document in the Radio Susceptibility Qualification Test Report the equipment under test, the radios used, and the category of the resulting response for each radio.
 - 1. Provide full details of the equipment response in the Radio Susceptibility Qualification Test Report for any system where equipment performance is degraded in some way during or after the RSQT.

6.3.3 EXTREMELY LOW FREQUENCY EMISSION REQUIREMENTS

- A. The LRV Supplier shall submit an Extremely Low Frequency Emission Demonstration Procedure (CDRL 03-79), in accordance with Section 8.2.2 [*Test Procedures*], that identifies the following:
 - 1. all LRV areas subject to extremely low frequency emission testing. At minimum, this procedure shall include all areas of the LRV accessible to Passengers, Drivers, and maintainers; and
 - 2. measurement techniques, instrumentation, and applicable limits to validate extremely low frequency compliance.
- B. The LRV Supplier shall submit an Extremely Low Frequency Compliance Report (CDRL 03-80), in accordance with Section 8.2.3 [*Test Reports*], that demonstrates and documents that the ELF emission of the LRVs are in compliance with Section 6.3.3 [*Extremely Low Frequency Emission Requirements*] and the following:
 - 1. for magnetic media protection, comply with the limits of LUL 1-222 for static magnetic flux density of 1.0 mT up to 600 mm above the floor;
 - 2. for public exposure limits, comply with the guideline developed by the International Committee on Non-Ionizing Radiation Protection; and
 - 3. for cardiac pacemakers and medical devices, comply with the limits of EN 50061 A1.

SECTION 7: REQUIREMENTS MANAGEMENT

7.1 REQUIREMENTS TRACEABILITY

7.1.1 REQUIREMENTS TRACEABILITY PLAN

- A. The LRV Supplier shall submit a comprehensive Requirements Traceability Plan (CDRL 03-81) that details the requirement tracking system that the LRV Supplier will implement to manage the requirement traceability for the Work.
- B. The requirement tracking system identified by the LRV Supplier in the Requirements Traceability Plan will meet the following requirements:
1. is implemented using an industry-recognized requirements management software that can export its requirements management database to DOORS Next Generation;
 2. provides traceable verification evidence of the implementation of all requirements, including derived requirements, of Schedule 4 [*Technical Requirements*];
 3. provides the following information for each requirement, including derived requirements, of Schedule 4 [*Technical Requirements*]:
 - a. requirement text and cross reference to Schedule 4 [*Technical Requirements*];
 - b. verification level, as defined in Section 7.2.2 [*Verification Levels*];
 - c. verification method, such as analysis or testing;
 - d. requirement verification procedure identification number, once available;
 - e. date the verification is performed, once available;
 - f. requirement verification report number, once available; and
 - g. requirement verification status;
 4. tracks the following categories, and subcategories, of requirement verifications for the LRV:
 - a. design verifications at the following levels;
 - i. subsystem level;
 - ii. system level; and
 - iii. LRV level;
 - b. manufacturing verifications;
 - c. functional verifications at the following levels;
 - i. subsystem level;
 - ii. system level; and
 - iii. LRV level;
 - d. Software requirements verifications;
 - e. Valley Line LRT integration compatibility verifications; and

- f. interface verifications; and
 - 5. tracks the verification of all deliverable equipment, including Special Tools and DTE.
- C. The LRV Supplier shall issue the City two read-only licenses that provide viewing access at any time to the requirements tracking system, identified by the LRV Supplier in the Accepted Requirements Traceability Plan.
- 1. The read-only licenses provided shall have sufficient viewing rights that any requirement and its verification status can be viewed by the City.
- D. The LRV Supplier shall submit the complete requirements tracking system database to the City in a format that is importable into DOORS Next Generation when the last Primary LRV Warranty expires.

7.1.2 REQUIREMENTS VERIFICATION PROTOCOLS

- A. The LRV Supplier shall prepare and submit a Requirement Verification Procedure (CDRL 03-82), in accordance with Section 8.2.2 [*Test Procedures*], that includes the following:
- 1. a reference to the requirement entry in the requirement tracking system detailed in the Accepted Requirements Traceability Plan;
 - 2. a description of the instrumentation, calibrations, measurements, tests, and inspections to be performed, and acceptance criteria to verify the requirement; and
 - 3. a description of the verification methods to be used, consisting of the methods described in Section 7.2.3 [*Verification Methods*].
- B. The LRV Supplier shall do the following:
- 1. using the Accepted procedures, verify each requirement in the requirement tracking system detailed in the Accepted Requirements Traceability Plan;
 - 2. allow the City to witness all requirement verifications;
 - 3. perform Corrective Actions as needed and repeat the verification of the requirement if the Acceptance criteria are not achieved; and
 - 4. repeat the Requirements Verification Procedure until the Acceptance criteria are achieved.
- C. The LRV Supplier shall submit a Requirement Verification Report (CDRL 03-83), in accordance with Section 8.2.3 [*Test Reports*], that clearly states the following:
- 1. a reference to the requirement entry in the requirement tracking system detailed in the Accepted Requirements Traceability Plan;
 - 2. a clear conclusion as to the status of the verification;
 - 3. procedures used;
 - 4. the results of measurements;
 - 5. tests or observations conducted; and
 - 6. a comparison of the results to the acceptance criteria for that requirement.
- D. The LRV Supplier shall append a Requirement Metrics Report (CDRL 03-84) to the Progress Report in accordance with Section 1.4 [*Progress Reports*]. The Requirement Metrics Report shall include the following:

1. total number of requirements;
2. total number of orphaned requirements;
3. total number of requirements in each state of each attribute;
4. total number of verified requirements;
5. total number of new requirements added; and
6. change in each metric during the reporting period.

7.2 VERIFICATION

7.2.1 GENERAL

- A. For the purpose of this Section, successful completion of a verification activity shall mean that the LRV, or portion thereof, as applicable to the verification activity, has demonstrated compliance with the applicable Supply Agreement requirements.
- B. The LRV Supplier shall submit a Validation and Verification Plan (CDRL 03-85) that includes a description of the validation and verification organization, including details of independence, validation, and verification activities for each system through to the entire LRV, and for the LRVs through to the Valley Line LRT, as embodied by the v-model systems development life cycle methodology.
- C. The LRV Supplier shall allow the City to witness all testing and verification activities. The LRV Supplier shall provide written notice to the City of the date, time, and location for each test at least 15 Business Days, or as otherwise agreed with the City on a test-by-test basis, prior to the start date of the test.

7.2.2 VERIFICATION LEVELS

- A. The LRV Supplier shall conduct LRV-level verification to verify conformance to the Supply Agreement, design parameters, operational-level requirements, and Valley Line LRT compatibility.
- B. The LRV Supplier shall conduct system-level verification to satisfy the LRV level requirements to the Supply Agreement and design parameters.
- C. The LRV Supplier shall carry out subsystem-level verification to satisfy the subsystem level requirements to the Supply Agreement, design parameters, system-level requirements, and equipment functionality.

7.2.3 VERIFICATION METHODS

7.2.3.1 Similarity

- A. The LRV Supplier shall prepare and submit verification of design on the basis of similarity to other projects the LRV Supplier has completed, along with the justification for re-use, for Acceptance by the City.

7.2.3.2 Inspection and Measurement

- A. Where applicable, the LRV Supplier shall verify through inspection and measurement.
- B. The LRV Supplier shall perform FAIs in accordance with Section 2 [*Quality Assurance*] to verify that the first item manufactured under the regular production processes and procedures meets the specification and design requirements.

7.2.3.3 Testing

- A. The LRV Supplier shall verify by test that the equipment, in its final Accepted design, conforms to all applicable requirements detailed in the requirement tracking system identified in the Accepted Requirements Traceability Plan.

7.2.3.4 Analysis

- A. The LRV Supplier shall submit Verification (By Analysis) of Design Performance Requirements (CDRL 03-86) as documented verification evidence for requirements that cannot be verified by one of the other methods.

SECTION 8: TESTING

8.1 REQUIREMENTS

- A. The LRV Supplier shall submit a Testing Standards List (CDRL 03-87), based on *Table 4: Minimum Required Qualification and Routine Tests*, that details the standards that will be used to test the LRVs, the LRV systems, the LRV subsystems, and any component build-up to an LRV subsystem throughout the design and manufacturing process.
1. Where a standard currently is not identified in *Table 4: Minimum Required Qualification and Routine Tests*, the LRV Supplier shall provide such standard.
 2. Where the LRV Supplier requests to use an alternative standard to a standard listed in *Table 4: Minimum Required Qualification and Routine Tests*, the LRV Supplier shall indicate this in the Substitution of Standards List in accordance with Schedule 4 [*Technical Requirements*], Section 1.3.1 [*Standards Used*], Clause 1.3.1.C.
- B. The LRV Supplier shall provide access to the City to all testing activities of all parts of the LRVs, including individual pieces of the system and subsystem. The LRV Supplier shall provide written notice to the City of the date, time, and location for each test at least 15 Business Days, or as otherwise agreed with the City on a test-by-test basis, prior to the start date of the test.
1. The LRV Supplier shall provide the City with full access to all testing activities.
- C. The LRV Supplier shall verify that the prerequisite conditions listed in the Test Procedure are satisfied prior to beginning any testing or verification and validation activities.
1. Where prerequisites are not satisfied, the LRV Supplier shall not perform the testing and shall rectify or mitigate conditions found that are within its control and inform the City through the Document Management System of conditions that are beyond its ability to rectify or mitigate.
- D. The LRV Supplier shall ensure when a Deficiency is discovered, it is promptly rectified, and all affected systems are re-tested until they meet the applicable Supply Agreement requirements.
- E. The LRV Supplier shall ensure testing of the LRV systems encompasses the following:
1. device and operational testing of the individual systems and subsystems, including their components; and
 2. end-to-end testing, confirming all integrated systems and subsystems operate in accordance with the applicable Supply Agreement requirements.
- F. The LRV Supplier shall perform requirement testing that consist of the following:
1. Type Tests that demonstrate that the equipment at subsystem, system, and LRV level meets performance requirements;
 - a. Routine Tests, as a subsection of the Type Tests, performed on each completed LRV, and on all systems, subsystems, and components that demonstrate that the equipment under test meets the selected functional and performance requirements. These tests shall ensure each unit is produced to at least the same quality level as the unit presented for the FAI and in accordance with the Accepted Master Test Plan and Test Procedures for the equipment;
 2. pre- and post-installation testing where applicable; and

3. post-shipment tests, in Edmonton, to confirm that each LRV is fully functional, safe, and suitable for service on Valley Line LRT in accordance with item 104 in *Table 4: Minimum Required Qualification and Routine Tests*.
- G. The LRV Supplier may submit Previous Type Test Documentation (CDRL 03-88) for components of the exact same make and model used on previous projects instead repeating such test identified in the Previous Type Test Documentation. Each Previous Type Test Document shall include the following information:
1. all related test documentation and results; and
 2. a narrative justifying why the test results are still valid and the test doesn't need to be repeated.
- H. The LRV Supplier shall submit a Previous Type Test Documentation for each Type Test and each component the LRV Supplier requests a waiver on.
- I. If the City does not Accept a Previous Type Test Documentation, the LRV Supplier shall perform the requisite Type Test in accordance with this Section.
- J. The LRV Supplier shall include results of all testing in each Vehicle History Book, in accordance with Section 10 [*Systems Support*].
- K. The LRV Supplier shall perform additional tests if the tests presented in *Table 4: Minimum Required Qualification and Routine Tests* are insufficient to verify the requirements listed in the Supply Agreement.

Table 4: Minimum Required Qualification and Routine Tests

Test Identifier	Test Category	Applicable Standard
1.	AC Auxiliary Motors	IEEE 112; IEEE 114; NEMA MG1
2.	AC Traction Motors	IEC 349-2/03.93
3.	Aluminium Side Skin Tests	
4.	Axle Journal Bearings	
5.	Battery	IEC 62660-1
6.	Carbody Compression Load Test at the Coupler	EN 12663-1
7.	Carbody Compression Load Test at the End Sill	EN 12663-1
8.	Carbody Diagonal Jacking Test	EN 12663-1
9.	Carbody Dimensions	EN 12663-1
10.	Carbody Dimensions	EN 12663-1
11.	Carbody Vertical Load Test	EN 12663-1
12.	Coupler and Draft Test	
13.	Current Collection Devices	EN 50367 and EN 50153
14.	DC Auxiliary motors	NEMA MG1
15.	Door Mechanical Strength Testing	EN 14752
16.	Fiberglass reinforced plastic (FRP) tests	
17.	Flammability & Smoke Emission	NFPA 130, Section 8, and BSS 7239 or EN 45545

Test Identifier	Test Category	Applicable Standard
18.	Floor and Roof Fire Endurance Tests	EN 45545-3
19.	Light Control Unit	EN 13272
20.	Pantograph	EN 50367; IEC 60494-2
21.	Propulsion Gear Unit	UIC 515-3
22.	Seat	APTA PR-CS-S-011-99
23.	Train Digital Sound Generator and Devices	
24.	Bogie Equalization Test	EN 13103; EN 13104
25.	Bogie Fatigue Test	EN 13749; VDV 152; UIC 515-4; UIC 615-4
26.	Bogie Frame Air Pressure Test	
27.	Bogie Primary Suspension Tests	EN 13298
28.	Bogie Static Load Test	EN 13749
29.	Windshield and Passenger Windows	FRA Type I impact and ballistics requirements of 49 CFR 223 – windshield FRA Type II impact and ballistics requirements per 49 CFR 223 – passenger windows
30.	APC (Automatic Passenger Counting System)	
31.	Auxiliary Power Supply	IEC 61287-1; IEEE 16; IEEE 1478; EN 61287-1; EN 50121-3-2
32.	Cab HVAC Unit	EN 14750-1
33.	Communication System (including PIS)	IEEE 802.1p; IEEE 802.1q: VLAN; IEEE 802.3af Class 1; IEEE 802.11g; AREMA Communications Manual, Section 12-10; EIA SE-101; EIA SE-103; EIA SE-105
34.	Door System Endurance Test	EN 14752; EN 14813-1
35.	Friction Brake Linearity	EN 13452
36.	Friction Brake Pressure	EN 13452
37.	Friction Brake Response	EN 13452
38.	Friction Brake System Capacity	EN 13452
39.	Friction Brake System Endurance Test	EN 14535-1; EN 13452-2
40.	Friction Brake System Environmental test	EN 13452-2
41.	Monitoring and Diagnostic System	
42.	Passenger HVAC Unit	EN 14750-2; EN 14813-1
43.	Propulsion Inverter System	EN 61287-1, EN 50121-3-2
44.	Secondary Suspension	EN 13802
45.	Accessibility	
46.	ATP/TRPS	
47.	Automatic Passenger Counting Validation	
48.	Battery Capacity	
49.	Braking Performance Tests	EN 13452-1; IEEE 1698
50.	Coupled Vehicle Clearance	Demonstration

Test Identifier	Test Category	Applicable Standard
51.	Door 1,000 Cycle Test	EN 14752
52.	Dynamic Envelope and Clearance	Analysis and demonstration
53.	Electromagnetic Compatibility	EN 50121-3-1 and -2; APTA PR-E-S-010-98
54.	Horn, Bell, and Train Digital Sound Generator	
55.	HVAC System Performance	ASHRAE 34; EN 14750-1; EN 14750-2; EN 14813-1
56.	Lighting Performance Tests	EN 50155, 50121-3-2, IEEE 1478, IEEE16; EN 13272; APTA RT-VIM-S-020-10 Rev 1
57.	LRV Dynamic, Car Wash Mode	
58.	LRV Dynamic, Dead-In Tow	
59.	LRV Dynamic, Thermal Capacity Tests	
60.	Monitoring and Diagnostic System	
61.	Noise and Vibration (including Wayside Noise)	IEC 61373, Class 1A; EN 61373; ISO 3095; ISO 3381
62.	Parking Brake	
63.	Passenger Capacity	
64.	Ride Quality	EN 12299
65.	Roll Angle	
66.	Simulated Revenue service	
67.	Traction Performance Tests	
68.	Trainline	
69.	Weight and Balance Distribution	
70.	Wheel Spin and Slide	UIC 541-05
71.	LRV to Wayside Communication Protocol	
72.	Automatic Passenger Counting System	
73.	Auxiliary Power Supply	IEC 61287-1; IEEE 16; IEEE 1478; EN 61287-1; EN 50121-3-2
74.	Battery	50 minutes of vehicle operation and a further 60 minutes of emergency lighting
75.	Closed Circuit TV	IEEE 802.1p; IEEE 802.1q: VLAN; IEEE 802.3af Class 1; IEEE 802.11g
76.	Communication System	AREMA Communications Manual, Section 12-10, SE-101 ; SE-103 ; SE-105
77.	Coupler	
78.	Door	EN 14752
79.	Electrical Apparatus	EN 50155
80.	Event Recorder	IEEE 1482.1
81.	Friction Brake Equipment	EN 14535-1
82.	Gear Units	
83.	Horn, Bell, and Train Digital Sound Generator	

Test Identifier	Test Category	Applicable Standard
84.	HVAC System	EN 14813-1
85.	Lighting Control	EN 50155 ; EN 50121-3-2 ; IEEE 1478 ; IEEE 16 ; EN 13272 ; PT ART-VIM-S-020-10
86.	Monitoring and Diagnostic System	
87.	Motors	IEEE 112; IEEE 114; NEMA MG1
88.	Pantograph	IEC 60494-2
89.	Propulsion Power Control	EN 61287-1
90.	Bogies	EN 10025-1 ; EN 10025-5 ; EN 10025 ; EN 10027 ; DIN 6700 ; EN 15085 ; EN 13104 ; EN 13103
91.	Wire Integrity	IEEE 16; APTA-PR-E-S-001-98
92.	Coupled Car Clearance Test	
93.	Hydraulic System Leakage Test	
94.	Mechanical Adjustments	
95.	Safety Certification	EN 50126-2
96.	Static System Functional Verification	
97.	Vehicle Performance Test	IEEE 1698
98.	Vehicle Wiring	APTA-PR-E-S-001-98
99.	Water tightness	EN 50125
100.	Weighing	
101.	Quality Inspection	
102.	Post-Shipment Mechanical Set-up	
103.	CTS/M Functional Tests	
104.	Post-shipment Test for Passenger and Multiple Unit columns as defined in Annex A in EN 50215	EN 50215
105.	High Speed Performance Verification	IEEE 1698
106.	Reliability	MIL-HDBK-217F; EN 50126-1
107.	Maintainability	EN 50126-3
108.	Burn-in Testing	

8.2 TEST PLANS, PROCEDURES, AND REPORTS

8.2.1 GENERAL

A. The LRV Supplier shall prepare and submit a Master Test Plan (CDRL 03-89), covering all tests required by standards listed in the Testing Standards List, the Systems Integration Matrix and Testing Plan, and the Commissioning Plan, and required to verify the requirements in the requirement tracking system detailed in the Requirements Traceability Plan. The Master Test Plan shall be as follows:

1. include in the Master Test Plan identification of any waivers of Federal, Provincial, or local safety regulations required for the testing of the equipment for Revenue Service operation; and

2. update the Master Test Plan monthly until all testing has been completed.
- B. The LRV Supplier shall ensure the latest revision of all Test Procedures and Test Report are submitted within 10 days of LRV Supplier's internal release date and in accordance with the CWS and the Master Test Plan.
- C. The Master Test Plan shall include the following:
1. a Master Test Schedule, consistent with and in the CWS format, depicting the planned sequence of testing;
 2. all Subcontractors' tests to be completed at the Subcontractors' facilities, all LRV Supplier tests to be completed at its facility prior to shipment, and all testing to be conducted by the LRV Supplier on the City property prior to delivery and Acceptance;
 3. the time, date, and location of each test to be performed;
 4. the objective of each test to be performed;
 5. the Test Procedures associated with each test; and
 6. identification of each test as a Type Test, Routine Test, or acceptance test.

8.2.2 TEST PROCEDURES

- A. The LRV Supplier shall prepare and submit a detailed Test Procedure (CDRL 03-90) for each test described in the Master Test Plan and for any other tests conducted in connection with the Commissioning Plan and the Quality Assurance program. Test Procedures must be Accepted prior to performing the associated test.
- B. The LRV Supplier shall design each Test Procedure to include the following items:
1. forms to be used to record data accumulated in that test, containing a step-by-step format for data reduction, formulae used in deriving the format, criteria for acceptability, and justification for the criteria set forth;
 2. system description and system drawings, schematics, and diagrams showing the main system functions and parameters, and location and connections of the measuring points;
 3. a clear correlation between the text and the drawings;
 4. the test objective, including a requirement to demonstrate that the equipment meets the safety requirements relevant to the equipment when operated in the environment in which it is to be used;
 5. prerequisite conditions that must be satisfied before the testing can be performed;
 6. test set-up description, drawings, schematics, diagrams, loading of the system or test specimen, and the loading increments that provide a clear understanding of the test set-up with system or specimen under the tests and a clear correlation between the text and the drawings;
 7. typical logging sheets, print outs, plotting forms, and examples of any other data sheets that will be used during the test;
 8. tables showing the measuring points, their expected nominal, minimum, and maximum values, and conditions that cause the readings;

9. tables of predicted values at selected sensor or gauge locations. These tables shall list the sensor number, predicted value, a space to enter the actual value (check marks are not allowed), and a space to enter a pass or fail of the measurement;
10. detailed description of the test instrumentation, sensors, and gauges, including data acquisition system, the instrumentation accuracy, and the manufacturer description of the instrumentation; and
11. assignment of a unique document number that matches the reference or document number identified for the corresponding test in the Master Test Plan.

8.2.3 TEST REPORTS

- A. The LRV Supplier shall prepare and submit a Test Report (CDRL 03-91) of each test, including copies of all test data.
- B. The LRV Supplier shall include the reports of those tests in the appropriate Vehicle History Book for tests performed.
- C. The LRV Supplier shall design each Test Report to include the following:
 1. a description of the test, including a reference to the corresponding Test Procedure;
 2. a reference to the tested LRV;
 3. all raw data collected in the test;
 4. all data reduction forms;
 5. a summary of the results in a manner that can be directly compared to the relevant requirement within the Supply Agreement without further calculations;
 6. test narrative with the dates, timing (start, finish, interruptions), location of the test set-up elements, list of attending test personnel, and lead tester;
 7. record of each instrument used during the tests and record of applicable calibration certificate;
 8. record of all equipment used during the test, including the applicable Software, firmware, and hardware versions;
 9. tester initials indicating that each step identified in the Test Procedure was successfully completed;
 10. final signature of the Lead Engineer indicating that the test has been successfully completed;
 11. filled tables as required in the procedure;
 12. graphs, charts, and other records required in the Test Procedure;
 13. images taken during the testing with relevant notations on pages the same size as the report pages;
 14. description and explanation of every discrepancy between the procedure and actual testing;
 15. description and explanation of every value that does not comply with the test criteria, and a recommended disposition of the same;
 16. assignment of a unique document number that matches the reference or document number identified for the corresponding test in the Master Test Plan; and

17. the current calibration certificates of the test instrumentation, sensors, and gauges described in the relevant Test Procedure.
- D. The LRV Supplier is not required to submit reports for tests classified as Quality Assurance tests but the LRV Supplier shall make Quality Assurance Tests Reports available to the City upon request.

SECTION 9: COMMISSIONING

9.1 GENERAL

- A. The LRV Supplier shall do the following:
 - 1. provide all required resources and work processes to plan, schedule, coordinate, and execute the Commissioning of the Work; and
 - 2. ensure Commissioning activities comply with the procedures and requirements established in Section 2 [*Quality Assurance*].
- B. The LRV Supplier shall provide written notice to the City with the following notification periods:
 - 1. at least 15 Business Days in advance of each Commissioning activity performed outside of Edmonton, for all parts of the LRVs including individual pieces of the systems and subsystems; and
 - 2. at least 3 Business Days in advance of each Commissioning activity performed in Edmonton, for all parts of the LRVs including individual pieces of the systems and subsystems.
- C. The LRV Supplier shall facilitate City attendance at all Commissioning activities.
- D. When requested by the City, the LRV Supplier shall provide copies of all Commissioning procedures, reports, technical documentation, and other data and photographs.
- E. The LRV Supplier shall commence Commissioning at the start of manufacturing of the first LRV and end after the issuance of the Fleet Acceptance Certificate.

9.2 COMMISSIONING PLAN

- A. The LRV Supplier shall prepare and submit a Commissioning Plan (CDRL 03-92) that details Commissioning activities, requirements, and applicable acceptance criteria, training for operational and maintenance staff, and other activities required to fully commission the LRV fleet and to satisfy the requirements of the Supply Agreement.
- B. The LRV Supplier shall design the Commissioning Plan to do the following:
 - 1. describe the process for demonstrating compliance with the RAM Program, the Safety and Security Certification Program, and the other Supply Agreement requirements;
 - 2. describe the 2,000 km burn-in process in accordance with Section 9.4.1B.3 [*Conditions Precedent to Conditional Acceptance*] and how the LRV and LRV systems will be operated to simulate Revenue Service;
 - 3. provide a description of the processes and procedures to Commission each individual Special Tool to be provided under the Supply Agreement;
 - 4. provide a description of the processes and procedures to Commission each individual Spare Part to be provided under the Supply Agreement;
 - 5. provide a description of the LRV-specific procedures and Commissioning rules to be implemented to manage hazards during Commissioning that arise from Train movements to adjacent and crossing vehicular traffic, pedestrians, cyclists, and other members of the public;

6. include a description of the process for managing Commissioning documentation and records of tests, inspections, Quality Assurance, and training to demonstrate how the requirements of Section 9.3 [*LRV Commissioning Requirements*] will be satisfied;
7. include a detailed list of the Commissioning deliverables to be submitted;
8. include a description of the timing and location of all Commissioning activities, including all testing, inspection, training activities, required access to Valley Line infrastructure, and all Driver and maintainer resourcing required from the Operator;
9. include a short description of all systems, subsystems, assemblies, and processes to be inspected, tested, and demonstrated as part of the Commissioning;
10. include a description and diagram illustrating the structure and sequence of Commissioning activities; and
11. describe the post-installation audits, SAT, and SIT requirements, including the pass/fail criteria for each test, and procedures required to fully Commission each LRV and fully integrate it into the Valley Line LRT;
 - a. SIT shall include the following:
 - i. LRV and infrastructure integration tests;
 - ii. dynamic system verification tests;
 - iii. LRV and TCS integration tests;
 - iv. LRV and communications systems integration tests;
 - v. radio tests;
 - vi. trainline tests;
 - vii. systems functional verification tests; and
 - viii. general integration tests.

9.3 LRV COMMISSIONING REQUIREMENTS

9.3.1 GENERAL

- A. The LRV Supplier shall include all Test Reports from Commissioning in the Vehicle History Book, in accordance with Section 10.2 [*Vehicle History Book*].
- B. The LRV Supplier shall perform SITs in accordance with the Commissioning Plan.

9.3.2 FIRST LRV COMMISSIONING REQUIREMENTS

- A. Prior to shipping the First LRV, the LRV Supplier shall perform the following QA inspections, FAI, and pre-shipment Type Tests:
 1. QA inspections on all components manufactured by the LRV Supplier and Subcontractors in accordance with Section 2.6.1 [*General*];
 2. FAIs in accordance with Section 2.6.5 [*First Article Inspections*];
 3. audits and inspections on all systems, subsystems, assemblies, and components once they have been installed to verify compliance with the technical requirements and installation

drawings, to ensure correct installation, routing, connectivity, and to confirm that no damage has been sustained in the installation process, as defined in the Commissioning Plan; and

4. perform pre-shipment Type Tests in accordance with the Accepted Master Test Plan.
- B. After delivery of the First LRV to the Gerry Wright OMF, the LRV Supplier shall perform all remaining Type Tests, acceptance tests, and post-delivery tests to validate the integrity of the LRV and its systems in accordance with the Accepted Master Test Plan.
- C. The LRV Supplier shall perform routine static functional verification tests, static and dynamic routine trainline tests, and other SAT procedures defined in the Commissioning Plan on the components, systems, and entire LRV following successful completion of the pre-shipments tests and delivery to the Gerry Wright OMF.

9.3.3 SUBSEQUENT LRV COMMISSIONING REQUIREMENTS

- A. Prior to shipping subsequent LRV, the LRV Supplier shall perform the following QA inspections and Routine Tests:
1. QA inspections on all components manufactured by the LRV Supplier and Subcontractors in accordance with Section 2.6.1 [*General*];
 2. audits and inspections on all systems, subsystems, assemblies, and components once they have been installed to verify compliance with the technical requirements and installation drawings, to ensure correct installation, routing, connectivity, and to confirm that no damage has been sustained in the installation process, as defined in the Commissioning Plan; and
 3. pre-shipment Routine Tests in accordance with the Accepted Master Test Plan.
- B. After delivery of the LRV, the LRV Supplier shall perform all remaining Routine Tests, acceptance tests, and post-delivery tests to validate the integrity of the LRV and its systems in accordance with the Accepted Master Test Plan.
- C. The LRV Supplier shall perform routine static functional verification tests, static and dynamic routine trainline tests, and other SAT procedures defined in the Commissioning Plan on the components, systems and entire LRV following successful completion of the pre-shipments tests and delivery to the Gerry Wright OMF.

9.3.4 SPECIAL TOOLS COMMISSIONING REQUIREMENTS

- A. The LRV Supplier shall perform all testing required to validate the proper function of each Special Tool in accordance with the Commissioning Plan.

9.3.5 SPARE PARTS COMMISSIONING REQUIREMENTS

- A. The LRV Supplier shall perform all testing required to validate the proper function of each Spare Part in accordance with the Commissioning Plan.

9.4 ACCEPTANCE REQUIREMENTS AND PROTOCOLS

9.4.1 CONDITIONS PRECEDENT TO CONDITIONAL ACCEPTANCE

- A. To satisfy Conditional Acceptance of the first LRV, in addition to all other requirements listed in this Section, the second draft of all technical manuals must have been Accepted.
- B. Each LRV shall satisfy the following conditions prior to achieving Conditional Acceptance of that LRV:
1. the LRV has been designed and manufactured in accordance with Schedule 4 [*Technical Requirements*];
 2. all assembly operations have been completed and any Major Deficiencies have been corrected;

3. the LRV has completed a 2,000 km burn-in on either the Valley Line LRT or the LRV Supplier's test track without Major Deficiencies;
 - a. if a Deficiency causing a delay greater than five minutes to a Train or a Major Deficiency occurs during the burn-in distance, the burn-in distance shall be reset to zero and require completion of 2,000 km burn-in from the rectification of the Deficiency or Major Deficiency noted; and
 - b. the burn-in period shall simulate Revenue Service operation, including propulsion, braking, regular cycling of doors, HVAC operation, passenger information system, passenger emergency systems, radio communications, and other system functions;
4. the LRV has successfully completed all tests described in the Master Test Plan and Section 9.3 [*LRV Commissioning Requirements*];
5. the LRV is fit to enter Revenue Service, evidenced by issuance of a Safety and Security Verification Certificate meeting the requirements defined in Section 3.4.2 [*Safety and Security Certification Program*];
6. all Minor Deficiencies, open items, engineering changes, and other required Work items, if any, have been clearly documented, along with the Corrective Action Plans and associated schedule to rectify these known Minor Deficiencies, open items, engineering changes, and other required Work items, and have been Accepted by the City; and
7. a complete Vehicle History Book, for that LRV, has been delivered to and Accepted by the City.

9.4.2 CONDITIONAL ACCEPTANCE CERTIFICATION PROCESS

- A. The LRV Supplier shall schedule a Conditional Acceptance Inspection once the requirements described in Section 9.4.1 [*Conditions Precedent to Conditional Acceptance*] have been met. The Conditional Acceptance Inspection shall be conducted in accordance with Section 2.6.12 [*Conditional Acceptance Inspection*].
- B. The City shall within 10 Business Days following the Conditional Acceptance Inspection do one of the following:
 1. issue the LRV Conditional Acceptance Certificate, verifying the date on which the Conditional Acceptance Inspection of the LRV was Accepted by the City; or
 2. provide written notice to the LRV Supplier of its decision to not issue the LRV Conditional Acceptance Certificate and include reasons for such decision.
- C. Any dispute in connection with or arising out of failure of the City to issue the LRV Conditional Acceptance Certificate shall, unless otherwise agreed by the Parties, be resolved in accordance with Schedule 14 [*Dispute Resolution Procedure*].

9.4.3 CONDITIONS PRECEDENT FOR FINAL ACCEPTANCE

- A. LRV Final Acceptance in respect of each LRV shall only be achieved if, at the time of certification, all Deficiencies, open items, engineering changes, and other required Work items identified in respect of that LRV on the applicable LRV Conditional Acceptance Certificate have been corrected.

9.4.4 FINAL ACCEPTANCE CERTIFICATION PROCESS

- A. The LRV Supplier shall schedule a Final Acceptance Inspection once the requirements described in Section 9.4.3 [*Conditions Precedent for Final Acceptance*] have been met.
 1. The Final Acceptance Inspection shall be conducted in accordance with Section 2.6.13 [*Final Acceptance Inspection*].

- B. The City shall within 10 Business Days following the Final Acceptance Inspection do one of the following:
 - 1. issue the LRV Final Acceptance Certificate, verifying the date on which the LRV has been so certified; or
 - 2. provide written notice to the LRV Supplier of its decision to not issue the LRV Final Acceptance Certificate and include reasons for such decision.
- C. Any dispute in connection with or arising out of failure of the City to issue the LRV Final Acceptance Certificate shall, unless otherwise agreed by the Parties, be resolved in accordance with Schedule 14 [*Dispute Resolution Procedure*].

9.4.5 FLEET ACCEPTANCE

- A. The Fleet Acceptance Certificate shall only be issued, if, at the time of certification, the following has been achieved:
 - 1. all technical manuals listed in the Technical Manuals Program Plan have been updated to match the As-Built Information Package and been Accepted by the City; and
 - 2. the As-Built Information Package has been Accepted; and
 - 3. all LRVs included in the Base Order have achieved Final Acceptance.
- B. The City shall, within 10 Business Days following the date on which the LRV Supplier has notified the City that all conditions presented in Section 9.4.5A [*Fleet Acceptance*] have been completed do one of the following:
 - 1. issue a Fleet Acceptance Certificate to the LRV Supplier, verifying the date on which the Commissioning all of the LRVs included in the Base Order has been completed; or
 - 2. provide written notice to the LRV Supplier of its decision to not issue the Fleet Acceptance Certificate and include reasons for such decision.

9.4.6 CONDITIONS PRECEDENT TO SPECIAL TOOLS ACCEPTANCE

- A. Special Tool Acceptance shall only be achieved if all testing has been completed on such Special Tool in accordance with the Commissioning Plan.

9.4.7 SPECIAL TOOLS ACCEPTANCE CERTIFICATION PROCESS

- A. The LRV Supplier shall schedule a Special Tool Acceptance Inspection once the requirements described in Section 9.4.6 [*Conditions Precedent to Special Tools Acceptance*] have been met. The Special Tool Acceptance Inspection shall be conducted in accordance with Section 2.6.15 [*Special Tool Acceptance Inspection*].
- B. The City shall within 10 Business Days following the Special Tool Acceptance Inspection do one of the following:
 - 1. issue the Special Tool Acceptance Certificate, stating the date on which such Special Tool has been certified; or
 - 2. provide written notice to the LRV Supplier of its decision to not issue the Special Tool Acceptance Certificate and include reasons for such decision.
- C. Any dispute in connection with or arising out of failure of the City to issue the Special Tool Acceptance Certificate shall, unless otherwise agreed by the Parties, be resolved in accordance with Schedule 14 [*Dispute Resolution Procedure*].

9.4.8 CONDITIONS PRECEDENT TO SPARE PARTS ACCEPTANCE

- A. Spare Parts Acceptance shall only be achieved if all testing has been completed on such Spare Part in accordance with the Commissioning Plan.

9.4.9 SPARE PARTS ACCEPTANCE PROCESS

- A. The LRV Supplier shall schedule a Spare Parts Acceptance Inspection once the requirements described in Section 9.4.8 [*Conditions Precedent to Spare Parts Acceptance*] have been met. The Spare Parts Acceptance Inspection shall be conducted in accordance with Section 2.6.16 [*Spare Parts Acceptance Inspection*].
- B. The City shall within 10 Business Days following the Spare Parts Acceptance Inspection do one of the following:
 - 1. issue the Spare Parts Acceptance Certificate, stating the date on which such Spare Part has been certified; or
 - 2. provide written notice to the LRV Supplier of its decision to not issue the Spare Parts Acceptance Certificate and include reasons for such decision.
- C. Any dispute in connection with or arising out of failure of the City to issue the Spare Parts Acceptance Certificate shall, unless otherwise agreed by the Parties, be resolved in accordance with Schedule 14 [*Dispute Resolution Procedure*].

SECTION 10: SYSTEMS SUPPORT

10.1 TECHNICAL MANUALS

10.1.1 GENERAL

- A. The LRV Supplier shall prepare and submit technical manuals that will provide the City and the Operator the necessary and appropriate knowledge of how to operate, test, maintain, overhaul, repair, and restore the LRVs to the performance requirements of Schedule 4 [*Technical Requirements*] for the Design Service Life of the LRVs.
- B. The LRV Supplier shall provide technical manuals that meet the following requirements:
1. treat the LRVs as an integrated system;
 2. highlight special procedures, safety-related cautions and warnings, and other information required for safe operation and maintenance of the LRVs;
 3. use block diagrams, illustrated parts breakdowns, and schematic drawings to describe the following:
 - a. LRUs and LLRUs, and their relationship to the system they are part of;
 - b. the relationship between LRV systems; and
 - c. the relationship of the LRVs to the Valley Line LRT;
 4. integrate sections into a functional technical manual through the use of indexes, cross-references, descriptions of system interrelationships, and consistent terminology;
 5. provide all measurements in SI and SI-derived units;
 6. include any mitigation activities identified in safety analyses performed in Section 3.4 [*Safety*]; and
 7. maintain consistency with the Maintainability Program Plan in Section 3.3.2 [*Maintainability Program Plan*].
- C. The LRV Supplier shall ensure all warnings required to mitigate all hazards identified in the Operations and Maintenance Hazard Analysis described in Section 3.4.7 [*Safety Analyses*], including those associated with the WHMIS safety data sheets, are included in the operations and maintenance manuals and training manuals.
- D. The technical manuals shall include operations and maintenance information gathered during the manufacturing process, Commissioning, training, and Primary LRV Warranty.

10.1.2 TECHNICAL MANUALS PROGRAM

- A. The LRV Supplier shall prepare and submit a Technical Manuals Program Plan (CDRL 03-93) that includes the following:
1. a list of all the technical manuals the LRV Supplier will be providing in accordance with Section 10.1 [*Technical Manuals*] and Section 10.5.3 [*Maintenance Management Information System*];
 2. an outline of the methodology, schedule, and deliverables for all technical manuals required by the Supply Agreement;

3. a description of the process by which technical manuals will be reviewed by the LRV Supplier and its Subcontractors;
 4. a description of the process that indicates how service bulletins and revisions will be identified and distributed; and
 5. a narrative and schedule that specifies applicable strategies for repair and replacement, running repair, heavy repair, preventive maintenance, and corrective maintenance.
- B. The City shall issue a Technical Manual Completion Certificate after the final draft, submitted in accordance with Section 10.1.5.2 [*Submission Timing*], of all technical manuals described in the Technical Manuals Program Plan have been Accepted, certifying the date on which the LRV Supplier has successfully delivered the final draft of all technical manuals.

10.1.3 GENERAL STRUCTURE OF MANUALS

- A. The LRV Supplier shall divide technical manuals into the following topics, as applicable:
1. table of contents;
 2. list of figures;
 3. revision list;
 4. general information and specifications, including operational characteristics, performance specifications, and general non-technical system descriptions;
 5. theory of operation, including interface descriptions supported by figures;
 6. preventive maintenance schedules, including testing and limits, settings, and tolerances;
 7. lubrication and cleaning, including frequency, methods, identification of recommended materials, and location and description of components;
 8. corrective maintenance to the LRU and LLRU level, including step-by-step test procedures, techniques, and use of Special Tools and DTE;
 9. troubleshooting, including flow sheets, tables, and symptom-cause-remedy charts; and
 10. lists of replacement parts.
- B. The LRV Supplier may submit alternative technical manual structures based on existing LRV Supplier manuals to the City.
- C. Without modifying the information provided by Subcontractors in any manner that would diminish the quality or quantity of the information provided, the LRV Supplier shall integrate LRV Supplier and Subcontractor information within the technical manuals such that it is not apparent to a reader that information has been supplied by different parties.

10.1.4 SOFTWARE FOR PRODUCTION AND REVISION OF TECHNICAL MANUALS

- A. The LRV Supplier shall develop all technical manuals using suitable text editing software and a commercially available vector format editing software for illustrations.
1. Raster illustrations and artwork shall not be used in the technical manuals.
 2. Where images are appropriate, the LRV Supplier shall submit a request to the City to use high resolution photographs in lieu of illustrations.

10.1.5 SUBMISSION OF TECHNICAL MANUALS

10.1.5.1 General

- A. The LRV Supplier shall submit, for each submission, electronic copies of the final version of each technical manual to the City as follows:
1. an electronic copy of the original source files in editable Microsoft Office 365 format for each technical manual; and
 2. an electronic copy in a fully searchable PDF format with appropriate cross-referencing and hyperlinking for each technical manual.
- B. The LRV Supplier shall format the original source file and the PDF electronic versions of the technical manuals to be printable onto paper that is 8.5 inches x 11 inches for text or 11 inches x 17 inches unfolded format for schematics, drawings, and images.
- C. The LRV Supplier shall provide an electronic copy of the first draft; a single hard copy of the second draft, four hard copies of the final draft, and four hard copies of the final version of each technical manual listed in the Technical Manuals Program Plan.
1. During the submission of the final version of a technical manual, if Accepted by the City in writing, the LRV Supplier may choose to only replace specific sections affected by changes in the hard copies of the technical manuals.
- D. Except for the Owner's Operating Manual (Pocket-Sized), the LRV Supplier shall provide hard copy technical manuals that are suitable for use in a maintenance shop environment as follows:
1. printed on paper that is 8.5 inches x 11 inches for text or 11 inches x 17 inches for schematics, drawings, and images using ink that resists smearing, fading, and deterioration with age;
 2. provided with 11 inches x 17 inches pages, "Z" folded to fit in the 8.5 inch x 11 inch manuals, where the information to be conveyed cannot be presented clearly on an 8.5 inches x 11 inches page;
 3. provided with a protective cover, sized for 8.5 inches x 11 inches paper, that is resistant to oil, moisture, and wear, to a degree commensurate with its use in an operations and maintenance environment;
 4. bound, with tabbed fly leaf separators for each section of each technical manual, such that the complete technical manual is not greater than 75 mm thick, lays flat when opened, and permits the addition and replacement of pages; and
 5. divided into multiple volumes, with a table of contents and cross-references in each volume, if the required material cannot be accommodated within the maximum binder thickness.
- E. The LRV Supplier shall submit a Web-Based LRV Manual Library (CDRL 03-94) that is a web-browser based compilation of all the technical manuals and includes the following content and features:
1. includes a sidebar menu with a hierarchical representation of all technical manuals;
 2. contains a diagrammatic representation of the LRVs and LRV systems with call outs and hyperlinks to the maintenance manuals;
 3. has features that provide the user the ability to read, scroll through, and copy the text and images on the screen;

4. provides features that allow the user to search a single index of all technical manuals and find any alphanumeric text string found within the manuals' text, figures, and drawings;
 5. includes hyperlinks to the referenced location wherever schematics, drawings, and text descriptions link to another drawing, sheet, or page; and
 6. is programmed such that a maintainer can scan the QR code mounted on equipment in accordance with Section 1.5.4.5.A.6 [*Nameplates*], or in the Illustrated Parts Catalogue, and be redirected to the appropriate section in the relevant technical manual.
- F. The City will provide the server hardware to host the Web-Based LRV Manual Library.

10.1.5.2 Submission Timing

- A. The LRV Supplier shall submit an electronic first draft of each technical manual at least six months, but no earlier than nine months, prior to the scheduled delivery of the first LRV. The LRV Supplier shall stagger the submission of the technical manuals to meeting the following requirements:
1. no more than 20% of the total number of technical manuals listed in the Technical Manuals Program Plan are submitted in a two-week period; and
 2. all technical manuals have been submitted six months prior to the scheduled delivery of the first LRV.
- B. Based on information gathered during delivery, testing, and Commissioning activities, the LRV Supplier shall submit the second, redlined draft of each technical manual no later than one month prior the Conditional Acceptance of the first LRV, and no earlier than two months prior to the Conditional Acceptance of the first LRV.
1. The second draft of each technical manual shall be sufficiently complete to be used during the training activities outlined in Section 10.4 [*Training Programs*] and be used by the Operator to maintain the first 10 LRVs that have achieved Conditional Acceptance.
- C. The LRV Supplier shall submit the final, redlined draft of each technical manual no later than one month prior to the Conditional Acceptance of the tenth LRV, and no earlier than three months prior to the Conditional Acceptance of the tenth LRV.
- D. The LRV Supplier shall submit final versions of each technical manual one month prior to the Conditional Acceptance Inspection of the fortieth LRV.

10.1.6 UPDATES FOR FINAL VERSIONS OF TECHNICAL MANUALS

- A. The LRV Supplier shall update every technical manual, in every format, at least quarterly during the first 24 months after the final versions of the technical manuals have been Accepted.
- B. The LRV Supplier shall provide service bulletins between updates to cover safety-related issues and corrections and changes to the technical manuals and operations and maintenance processes.

10.1.7 OWNER'S OPERATING MANUAL

- A. The LRV Supplier shall prepare and submit an Owner's Operating Manual (CDRL 03-95) that contains all information required for the safe and efficient operation of the LRVs, including the following:
1. a general description of all LRV systems and features;
 2. instructions to perform the daily preparation for service check;
 3. the location, function, and operation of the following:
 - a. controls;

- b. gauges;
 - c. indicators; and
 - d. switches;
4. procedures for normal operating conditions, including the following:
 - a. preparing the LRVs for operation;
 - b. operating the LRVs; and
 - c. leaving the LRVs unattended;
 5. emergency procedures;
 6. safety-related dangers, warnings, cautions, and notes;
 7. failure symptoms, indications, and troubleshooting methods that allow the Driver to recover the LRV during a failure; and
 8. other features of the LRV that the Driver may not be in a position to control or adjust but requires knowledge of.
- B. The LRV Supplier shall provide an Owner's Operating Manual (Pocket-Sized) (CDRL 03-96) that will be a full version of the Owner's Operating Manual printed on 4 inches x 6 inches pages and electronic versions of the Owner's Operating Manual formatted to be printed on 4 inches x 6 inches sized pages.

10.1.8 LRV SYSTEMS MANUALS

- A. The LRV Supplier shall provide LRV system manuals for all systems on the LRVs including the following:
1. the overall LRV describing the LRV as a unit and the interrelationships between its systems;
 2. carbody;
 3. coupler;
 4. driver's cab;
 5. doors;
 6. HVAC;
 7. lighting;
 8. electrical systems, including HSCB, lighting arrestor, and battery;
 9. APS;
 10. pantograph;
 11. propulsion;
 12. bogies, broken down further to specific parts;
 13. friction brakes;

14. PIS and CCTV;
 15. TCS, Train-to-wayside communications, event recorder;
 16. MDS; and
 17. APC.
- B. The LRV Supplier shall include the following sections for each LRV system manual listed in Section 10.1.8 [*LRV Systems Manuals*]:
1. Illustrated Parts Catalogue, described in Section 10.1.9 [*Illustrated Parts Catalogue*];
 2. Running Maintenance and Service Manual, described in Section 10.1.10 [*Running Maintenance and Service Manual*]; and
 3. Heavy Repair and Overhaul Manual, described in Section 10.1.11 [*Heavy Repair and Overhaul Manual*].
- C. The LRV Supplier shall provide the following manuals for electrical, hydraulic, and pneumatic systems as applicable and described in Section 10.1.12 [*Electrical, Hydraulic, and Pneumatic System Manuals*]:
1. wire, hose, and cable numbering systems;
 2. schematics;
 3. narratives for electrical, pneumatic, and hydraulic schematics; and
 4. consolidated electrical, pneumatic, and hydraulic parts lists.

10.1.9 ILLUSTRATED PARTS CATALOGUE

- A. The LRV Supplier shall prepare and submit an Illustrated Parts Catalogue (CDRL 03-97) that compiles all parts lists and illustrations covering all equipment on the LRVs, starting from the top of the equipment hierarchy down to the smallest removable and replaceable component and identifies and describes every component with its related parts, including the following:
1. OEM name and part number;
 2. LRV Supplier's part number;
 3. quantities per assembly; and
 4. a QR code that identifies the OEM name and part number, LRV Supplier's part number, the equipment name, and any other information that is required to completely identify the part.
- B. The LRV Supplier shall design the Illustrated Parts Catalogue as follows:
1. integrate information supplied by the LRV Supplier and its Subcontractors into a unified presentation for each system addressed;
 2. use diagrams, cutaways, and exploded view drawings to identify and index every removable and replaceable part;
 3. accompany each illustration with a corresponding page listing every item in the associated illustration and providing complete ordering data for every item;
 4. ensure a part common to different components has the same OEM part number and, except for common hardware, provide cross-references to other components in which the part is found;

5. associate each part or component with the next larger assembly by using an indented format;
6. organize the Illustrated Parts Catalogue by the same chapter and numbering system as the Running Maintenance and Service Manual and the Heavy Repair and Overhaul Manual, described respectively in Section 10.1.10 [*Running Maintenance and Service Manual*] and Section 10.1.11 [*Heavy Repair and Overhaul Manual*];
7. include separate sections for Special Tools and DTE supplied under the Supply Agreement;
8. ensure descriptions of parts, including size, material, and grade are adequate to procure the parts independently; and
9. include an appendix listing each system's OEM name, website, address, and telephone number for parts ordering.

10.1.10 RUNNING MAINTENANCE AND SERVICE MANUAL

- A. The LRV Supplier shall submit a Running Maintenance and Service Manual (CDRL 03-98) that provides maintainers with the following information:
 1. an overview of the LRV's operation;
 2. general and detailed descriptions of each system and major component of the LRVs;
 3. recommended condition-based, distance-based, and time-based schedules for performing all preventive maintenance procedures, including the frequency, tools, and materials required for each procedure;
 4. corrective maintenance procedures, including step-by-step removal, replacement, and adjustment procedures of LRUs;
 5. online and offline troubleshooting procedures in fault tree analysis format; and
 6. inspection procedures, intervals, and pass/fail criteria.
- B. The LRV Supplier shall include a preventive maintenance schedule in the Running Maintenance and Service Manual that does the following:
 1. identifies the scheduled maintenance tasks to be performed and the intervals at which they need to be scheduled;
 2. outlines all maintenance tasks required to keep the LRVs in service during the operating period between scheduled maintenances;
 3. includes the number of hours required to perform each task; and
 4. includes all service intervals up to LRV overhaul.
- C. The LRV Supplier shall design the Running Maintenance and Service Manual to do the following:
 1. minimize redundant and related maintenance activities to optimize the maintenance effort and out-of-service time;
 2. combine the service intervals of systems, subsystems, and assemblies that require the disassembly and removal of other components or subcomponents that recently required similar maintenance or would otherwise imminently require such maintenance; and
 3. integrate the use of DTE into the maintenance procedures.

10.1.11 HEAVY REPAIR AND OVERHAUL MANUAL

- A. The LRV Supplier shall submit a Heavy Repair and Overhaul Manual (CDRL 03-99) that contains a detailed description and analysis of each LRU and LLRU on the LRVs to enable maintainers to effectively service, inspect, maintain, adjust, troubleshoot, repair, replace, refurbish, and overhaul the LRVs.
- B. The LRV Supplier shall include the following in the Heavy Repair and Overhaul Manual:
 - 1. detailed test, troubleshooting, and adjustment procedures for the LRVs, LRV systems, LRUs, and their LLRUs with step-by-step removal, overhaul, replacement, and adjustment procedures describing the tools and materials required;
 - 2. details for rebuilding, reclaiming, and replacing all wearing and moving parts with comprehensive condemning limit criteria sufficient to enable maintainers to determine if the part should be rebuilt, reclaimed, or replaced;
 - 3. recommended condition-based criteria, and distance- and time-based schedules for all maintenance procedures;
 - 4. complete instructions and procedures for the use of the Special Tools and DTE specific to heavy repair and overhaul procedures; and
 - 5. a detailed description of the design and maintenance of all electronic and microprocessor-based equipment including all configuration data and documentation required to maintain the electronic and microprocessor-based equipment.

10.1.12 ELECTRICAL, HYDRAULIC, AND PNEUMATIC SYSTEM MANUALS

- A. The LRV Supplier shall submit the Wire, Hose, and Cable Numbering System (CDRL 03-100) that describes the numbering and identification systems used for LRV wiring, hosing, and cabling and includes cross-references between the drawings, schematics, and part numbers to enable locating any device, wire, hose, cable, and terminal point within the drawings, schematics, and part lists.
- B. The LRV Supplier shall submit an Integrated Schematic (CDRL 03-101) that covers the electrical, hydraulic, and pneumatic systems on the LRVs and provides the necessary information to troubleshoot and repair faults down to the LRU level on a single diagram in a format that can be readily followed by anyone with basic electrical, hydraulic, or pneumatic knowledge.
- C. The LRV Supplier shall include the following information on the Integrated Schematic:
 - 1. wire, hose, and cable numbers as applicable;
 - 2. terminal and connector numbers as applicable;
 - 3. component identification using graphic symbols for components, devices, and circuits that conform to the following standards:
 - a. IEEE 315;
 - b. IEEE 315A;
 - c. IEEE 91/91A;
 - d. ASME Y14.38; and
 - e. ASME Y14.2;
 - 4. electronic LRUs identified as empty boxes with the LRU schematic drawing number shown and, to the extent possible, LRU inputs and outputs represented as relay contacts and relay coils;

5. the page and alphanumeric grid location to provide easy diagram-to-diagram reference for any signal leaving, or coming onto, a diagram; and
 6. other standard identification information.
- D. The LRV Supplier shall include the following tables, diagrams, drawings, and sections on the Integrated Schematic:
1. device symbols table;
 2. table that identifies each acronym used in the Integrated Schematic and cross-references it with the full name of the equipment and its location by zone on the LRVs;
 3. equipment arrangement drawing of the LRVs identifying all physical locations within the LRVs;
 4. electric coupler pin arrangement drawing with a table identifying the pin number and its corresponding trainline name and the LRVs-to-coupler connector pin number;
 5. trainline wiring diagrams with connector and wire designations;
 6. pin-to-pin connector terminal designations and wire designations at both sides of each connection for connectors and terminal blocks;
 7. power distribution diagrams for the primary, auxiliary, and low voltage power systems;
 8. wire, hose, and cable diagrams for each system as applicable;
 9. printed circuit board connections and pin-outs for each system;
 10. test points and point-to-point signal data for troubleshooting;
 11. refrigerant diagram; and
 12. subsections that are divided and organized around the major LRV systems.
- E. The LRV Supplier shall submit Wire, Hose, and Cable Connection Diagrams (CDRL 03-102) to accompany the Integrated Schematic. The Wire, Hose, and Cable Connection Diagrams shall include the following information:
1. wire, hose, and cable code schematic designation as applicable;
 2. origin, "From" device and terminal;
 3. destination, "To" device and terminal;
 4. wire, hose, and cable size as applicable;
 5. voltage and pressure rating as applicable;
 6. jacket colour; and
 7. harness designation.
- F. The LRV Supplier shall submit an Electrical Schematics Narrative (CDRL 03-103) that is written to accompany the Integrated Schematic and describes the operations, characteristics, and troubleshooting of each electrical system and circuit shown in the Integrated Schematic.
- G. The LRV Supplier shall submit a Consolidated Electrical Parts List (CDRL 03-104) that provides details for all electrical parts shown in the Integrated Schematic as follows:

1. describes standard items such as resistors, capacitors, inductors, and common electronic components as such and includes all necessary identification data and ordering parameters such as BS, DIN, or ISO standards, voltage, rating, grade, and dimensions in the descriptions for standard items; and
 2. provides part numbers only for components that are non-standard or custom-made.
- H. The LRV Supplier shall submit a Hydraulic Schematics Narrative (CDRL 03-105) that is written to accompany the Integrated Schematic and describes the operations, characteristics, and troubleshooting of each hydraulic system and hydraulic circuit shown in the Integrated Schematic.
- I. The LRV Supplier shall submit a Consolidated Hydraulic Parts List (CDRL 03-106) that provides details for all hydraulic parts shown in the Integrated Schematic as follows:
1. includes all necessary identification data and ordering parameters such as BS, DIN, or ISO standards, pressure, rating, grade, and dimensions in the descriptions for standard items; and
 2. provides part numbers only for components that are non-standard or custom-made.
- J. The LRV Supplier shall submit a Pneumatic Schematics Narrative (CDRL 03-107) that is written to accompany the Integrated Schematic and describes the operations, characteristics, and troubleshooting of each pneumatic system and pneumatic circuit shown in the Integrated Schematic.
- K. The LRV Supplier shall submit a Consolidated Pneumatic Parts List (CDRL 03-108) that provides details for all pneumatic parts shown in the Integrated Schematic as follows:
1. includes all necessary identification data and ordering parameters such as BS, DIN, or ISO standards, pressure, rating, grade, and dimensions in the descriptions for standard items; and
 2. provides part numbers only for components that are non-standard or custom-made.

10.1.13 TECHNICAL INSTRUCTION MANUAL

- A. The LRV Supplier shall submit a Technical Instruction Manual (CDRL 03-109) that describes the fault finding and diagnostic approach to resolve complex technical problems with the LRVs.
- B. The Technical Instruction Manual shall include a detailed fault finding section that describes the approach to diagnosing technical problems and functional descriptions of all systems, with cross-references to their specific maintenance manuals and drawings.

10.1.14 SPECIAL TOOLS AND DIAGNOSTIC TEST EQUIPMENT MANUAL

- A. The LRV Supplier shall submit a Special Tools and Diagnostic Test Equipment Manual (CDRL 03-110) that describes the application, operation, usage, adjustment, calibration, inspection, maintenance, troubleshooting, and repair and storage instructions for each of the Special Tools and DTE identified in the Recommended Special Tools and Diagnostic Test Equipment List.
- B. The Special Tools and Diagnostic Test Equipment Manual shall provide the following operation and maintenance documentation for each Special Tool and DTE provided as part of the Work:
1. complete drawings showing all dimensions of, and materials used in, the Special Tool or DTE along with electrical schematics, as appropriate;
 2. general usage instructions for the Special Tool or DTE cross-referenced to the appropriate sections of the Running Maintenance and Service Manual and Heavy Repair and Overhaul Manual that describe the use of the Special Tool or DTE in specific tasks;
 3. maintenance, calibration, troubleshooting, and repair instructions and replacement parts lists in the same format as the Illustrated Parts Catalogue;

4. infrastructure requirements as applicable to the Special Tool or DTE including physical space, heating, cooling, exhaust, and power requirements;
5. user manuals for all Software programs used to perform LRV systems diagnosis, troubleshooting, and maintenance activities; and
6. OEM documentation, including manuals, data sheets, and application notes.

10.2 VEHICLE HISTORY BOOK

10.2.1 GENERAL

- A. The LRV Supplier shall provide a Vehicle History Book (CDRL 03-111) for each LRV that contains the information pertaining to project milestones specific to each LRV from the start of production to Final Acceptance of each LRV.
- B. The LRV Supplier shall update each Vehicle History Book while an LRV is being manufactured, shipped, and Commissioned such that at no time will the information in the Vehicle History Book be more than three Business Days out of date.
- C. The LRV Supplier shall include the following content in the Vehicle History Book:
 1. title page, clearly marked to indicate the LRV number in accordance with Section 1.6.3 [*Identification*] of Schedule 4 [*Technical Requirements*];
 2. all events, including the following, where the LRV Supplier requires the City's Acceptance to proceed:
 - a. manufacturing hold points for each LRV as defined in Section 2.6.9 [*Hold Point Inspection*];
 - b. pre-shipment inspection of each LRV as defined in Section 2.6.10 [*Pre-Shipment Inspection*];
 - c. Conditional Acceptance of each LRV as defined in Section 9.3.5 [*Spare Parts Commissioning Requirements*]; and
 - d. Final Acceptance of each LRV as defined in Section 9.3.5 [*Spare Parts Commissioning Requirements*];
 3. mass certificate;
 4. serial numbers of all serialized items on the Component Serialization List on the LRV at shipment from the manufacturing facility;
 - a. update the serial number of serialized components that are replaced under Warranty or are replaced prior to the Final Acceptance of each LRV due to a Deficiency;
 5. configuration control records including the following:
 - a. status of engineering and design changes, defined in Schedule 13 [*Changes*], including an itemized lists of all changes that identifies the status of each change and clearly identifies which changes have been completed and which are outstanding;
 - b. applicable Deficiency Reports; and
 - c. configuration verification list, showing the status of each item;
 6. bogie history records including the following:

- a. problem reports for bogies assigned to this LRV;
 - b. bogie QA inspection checklists that were generated during the fabrication process; and
 - c. non-destructive testing documents specific to the bogies;
7. LRV carbody history records, including the following:
- a. problem reports for the LRV carbody through to finishing;
 - b. LRV carbody QA inspection checklists that were generated during the fabrication process; and
 - c. non-destructive testing documents specific to the LRV carbody;
8. factory inspection and test records including the following:
- a. problem reports generated during final assembly and testing;
 - b. QA inspection checklists generated during final assembly and testing; and
 - c. in accordance with Section 5 [*Software Systems*], reports from all tests completed at the factory, including the following:
 - i. qualification test reports;
 - ii. water test reports;
 - iii. high pot test reports;
 - iv. wiring continuity test reports;
 - v. static system functional verification test reports; and
 - vi. dynamic system verification test reports;
9. Commissioning tests and records including the following:
- a. problem reports generated during Commissioning;
 - b. receiving inspection report;
 - c. impact recorder data from LRV shipping;
 - d. on-site routine static functional verification test reports;
 - e. static and dynamic routine trainline test reports; and
 - f. on-site routine systems functional verification test reports; and
10. work orders raised against this LRV from the start of production through to the Final Acceptance of each LRV.

10.2.2 AS-BUILT INFORMATION

A. The LRV Supplier shall submit an As-Built Information Package (CDRL 03-112) that includes the following:

- 1. all as-built drawings, schematics, and bills of materials;

2. all the LRV Supplier's and Subcontractor's drawings, details, and bills of materials that are required for future installation, maintenance, repair, and overhaul purposes;
3. all systems and system arrangement drawings of the LRVs as finally furnished, modified, and Accepted;
4. all electrical schematics, electronic circuits, and wiring diagrams;
5. the current configuration of hardware, firmware, and Software;
6. all ICDs; and
7. carbody drawings and documents required for wreck repair and procurement of replacement parts.

10.3 SPECIAL TOOLS AND DIAGNOSTIC TEST EQUIPMENT

10.3.1 GENERAL

- A. The LRV Supplier shall submit a Recommended Special Tools and Diagnostic Test Equipment List (CDRL 03-113) at each Design Review that is grouped by LRV system and provides the following information:
 1. the quantity of each Special Tool and DTE to be supplied, commensurate with use, system reliability, LRV fleet size, the VLW Operations & Maintenance Concept, and the RAM Plan;
 2. calculations in support of the recommended quantity of each Special Tool and DTE;
 3. commercial supplier of each Special Tool and DTE, if applicable, including name and address, and appropriate information;
 4. unit price, price break quantities, and minimum order quantity;
 5. a description of each Special Tool and DTE and categorize each DTE as either a PTU or a BTE;
 6. the infrastructure requirements of each Special Tool and DTE including physical space, heating, cooling, exhaust, and power requirements; and
 7. cross-reference of each Special Tool and DTE to their call out in the technical manuals.
- B. The preliminary Recommended Special Tools and Diagnostic Test Equipment List included in the Bid Extracts will form the basis for the Recommended Special Tools and Diagnostic Test Equipment List.
- C. The Recommended Special Tools and Diagnostic Test Equipment List must include an adequate quantity of Special Tools and DTE to enable operation and maintenance of LRVs in accordance with LRV fleet size, the VLW Operations & Maintenance Concept, and the RAM Plan;
- D. The LRV Supplier shall provide all required and recommended Special Tools and DTE described in the Accepted Recommended Special Tools and Diagnostic Test Equipment List in accordance with Section 1.1.A [*LRV Supplier's Obligations*] of the Supply Agreement.
 1. The City may order additional Special Tools and DTE, that are in excesses of the Accepted Specials Tools and DTE List, at various stages of the Work, in accordance with Schedule 9 [*Pricing and Payment*].
- E. Prior to commissioning any Special Tool, DTE, or BTE that will be fixed in place the LRV Supplier shall do the following:

1. coordinate with the City and the Operator, in accordance with Schedule 6 [*Interface Agreement*], to verify the placement location of the fixed in place Special Tool, DTE, or BTE within the Gerry Wright OMF Part B;
 2. coordinate with the City and the Operator, in accordance with Schedule 6 [*Interface Agreement*], for suitable time for installation of the Special Tool, DTE, or BTE in the Gerry Wright OMF Part B;
 3. physically install the fixed in place Special Tool, DTE, or BTE in the accepted location in the Gerry Wright OMF Part B; and
 4. make all connections to the Gerry Wright OMF Part B infrastructure required for the proper function of the Special Tool, DTE, or BTE being installed, including but not limited to, power, ventilation, and pressurized air connections.
- F. The LRV Supplier shall replace or update any Special Tool that has been issued a Special Tool Acceptance Certificate, if such Special Tool has been affected by any modification in accordance with the Change Management Subplan.
- G. The LRV Supplier shall design all Special Tools and DTE provided as part of the Work to operate on a North American power grid.
- H. The LRV Supplier shall do the following:
1. integrate the functions of the DTE with the LRV's systems to form a cohesive maintenance system;
 2. provide Special Tools and DTE, including computers, that are of rugged design suitable for operation within the Valley Line LRT and are certified for operation in Canada;
 3. provide all relevant certifications with the delivery of the Special Tools and DTE;
 4. provide each Special Tool and DTE with a self-test feature or simple procedure to verify its proper operation;
 5. provide training on all Special Tools and DTE in accordance with the requirements of Section 10.4 [*Training Programs*];
 6. ensure all Special Tools and DTE will perform their specified functions on the final configuration of the LRV systems;
 7. make modifications to Special Tools and DTE and to Special Tools and DTE documentation as required to reflect all revisions made to the LRV systems during the Primary LRV Warranty;
 8. design the LRV systems, Special Tools, and DTE to work in concert such that a trained maintainer will be able to identify a failed system down to the LLRU level; and
 9. provide BTE that will aid maintainers in identifying failed systems, subsystems, LRUs, and LLRUs and verifying that repaired equipment is ready for service.
- I. When the DTE is a computer, the LRV Supplier shall submit a Requirement Specification for Portable Test Unit Laptop (CDRL 03-114) that provides the minimum hardware, firmware, and operating system requirements for the computer.
1. The LRV Supplier shall design DTEs for maintenance such that all DTE Software runs on a single operating system and a single minimum specified hardware platform whenever possible.

10.3.2 PORTABLE TEST UNITS

- A. The LRV Supplier shall provide PTUs that will allow a maintainer to quickly verify proper operation of the system under test and troubleshoot failures to the LLRU level.
- B. The LRV Supplier shall do the following:
 - 1. design the PTU to interface with the LRV systems as follows:
 - a. through the LRV's ethernet network using a client-server web application with the server-side application residing within the firmware of the LRV system; and
 - b. through a COTS web browser and the IP address assigned to the specific LRV system;
 - 2. design the PTU such that, once interfaced in accordance with Section 10.3.2 [*Portable Test Units*], it will allow a maintainer to directly operate the system under test to perform the following operations:
 - a. within the constraints of the PHA described in Section 3.4.7 [*Safety Analyses*], override the normal controls of the system under test to directly control any possible functional block in the system under test; and
 - b. run diagnostic routines that are embedded in the system under test to detect and diagnose system failures;
 - 3. provide PTUs that meet the following requirements:
 - a. are designed to be carried by a person and are not larger than 51 cm x 41 cm x 15 cm and not heavier than 13.5 kg;
 - b. are constructed to provide reliable operation in a maintenance environment of the Valley Line LRT;
 - c. beyond a standard web browser will not require any additional software or web browser extensions, to fully access the LRVs, run diagnostics, perform testing and carry out maintenance functions;
 - d. display all commands in English, all measurements in SI and SI-derived units relevant to the type of signal being recorded, and all dates and times in year/month/day and 24-hour clock hh:mm:ss formats;
 - e. make connections to the system under test through a single multiple-pin connector, common to all LRV systems, or through a WLAN connection;
 - f. wherever practicable, use of the PTU will not require breaking any mechanical or electrical connection to, or within, the system under test;
 - i. where troubleshooting and testing can be accomplished more quickly and accurately by breaking a connection, design the PTU to test the integrity of those connections when they are reconnected; and
 - g. where power is required to run the PTU, supply power from the LRVs' voltage sources and ensure the PTU is self-protected in the event of an overload or short-circuit condition.

10.3.3 BENCH TEST EQUIPMENT

- A. The LRV Supplier shall provide BTE that are powered from shop-supplied power in the Gerry Wright OMF Part B and are suitable for the testing, troubleshooting, repair, and calibration of all electrical, electronic, mechanical, and electromechanical components down to the LLRU level for each system where the LRU is not the LLRU.

- B. The LRV Supplier shall design the BTE to allow for the rapid connection of meters, oscilloscopes, signal generators, and any other standard equipment required to perform tests.

10.4 TRAINING PROGRAMS

10.4.1 GENERAL

- A. The LRV Supplier shall provide the following types of training courses:
 - 1. operational training that shall include training for Drivers using a “train-the-trainer” approach to familiarize the City and the Operator’s trainers with the operation of the LRVs and the training materials and integrate them into their training formats;
 - 2. maintainer training that shall include direct training of the following maintainers:
 - a. service personnel;
 - b. tradespeople; and
 - c. mechanics; and
 - 3. operational control and wayside support training that shall include direct training of all personnel who connect to the LRV systems or LRV wayside systems remotely.
- B. The City expects to provide the following numbers as a guide to the magnitude of training required. These numbers shall be finalized by the City at FDR:
 - 1. trainers: 3;
 - 2. supervisors: 15 field supervisors and 12 OCC personnel;
 - 3. maintainers: 30; and
 - 4. Drivers: 50, to be trained by the City’s or Operator’s trainers who have completed the train-the-trainer program described in Section 10.4.4 [*Driver Training: Train-the-Trainer Approach*].
- C. The LRV Supplier shall submit all Training Records (CDRL 03-115) describing training requirements and training completed for each trainee.
- D. The LRV Supplier shall design the training program to use training aids appropriate to the subject, including the following:
 - 1. electronic presentations created with the Microsoft Office 365 software suite;
 - 2. mock-ups;
 - 3. parts catalogues;
 - 4. videos;
 - 5. manuals; and
 - 6. diagrams.
- E. The LRV Supplier shall not use transparencies as visual training aids.
- F. The LRV Supplier shall include written examinations and hands-on skill testing, as appropriate, in the training program to validate the training program and certify that each trainee has acquired the knowledge and skills necessary to competently and safely perform the trained tasks.

- G. The LRV Supplier shall submit a Training Schedule (CDRL 03-116) that meets the following requirements:
1. align with the CWS; and
 2. split into two categories: Commissioning Training and Service Training, as follows:
 - a. design Commissioning Training to meet the following requirements:
 - i. start no earlier than three months prior to the delivery of the first LRV;
 - ii. be completed prior to the delivery of the first LRV;
 - iii. be structured to train four Drivers and two maintainers to support moving LRVs during Commissioning and to maintain Conditionally Accepted LRVs until the remainder of staff are training through the Service Training; and
 - iv. be held in Edmonton, at a location agreed to by the City; and
 - b. design Service Training to meet the following requirements:
 - i. start after the delivery of the first LRV;
 - ii. be completed prior to the Conditional Acceptance of the tenth LRV;
 - iii. be structured to train the remaining personnel listed in Section 10.4.1B [*General*] to support the operation of the Conditionally Accepted LRVs on the Valley Line;
 - iv. be held at the Gerry Wright OMF Part B, or as otherwise agreed by the City; and
 - v. for training that requires an LRV, only use an LRV that has achieved Conditional Acceptance.
- H. The LRV Supplier shall prepare and submit a Training Course Plan (CDRL 03-117) that identifies the following for each training course:
1. overview of course content;
 2. course objectives;
 3. a list of any prerequisites;
 4. duration of each course;
 5. instructional techniques to be used;
 6. instructional aids that will be used;
 7. the evaluation method and criteria used to certify that each trainee has attained the knowledge and skills necessarily to perform the task competently and safely;
 8. the proposed pilot course and final course presentation schedules; and
 9. training facilities and equipment to be used.
- I. The LRV Supplier shall provide all test equipment, diagnostic equipment, components, and tools used during the training.

- J. The LRV Supplier shall provide physical and electronic copies of the following material for trainers and trainees for each training course:
 - 1. Operational Training Material (CDRL 03-118);
 - 2. Maintenance Training Material – Service Personnel (CDRL 03-119);
 - 3. Maintenance Training Material – Tradespeople/Mechanics (CDRL 03-120);
 - 4. training instructor manuals with training aids and lessons plans referenced;
 - 5. student manuals and hand outs; and
 - 6. drawings, schematics, and troubleshooting guides.
- K. In addition to the initial training classes, the LRV Supplier shall provide one class per year throughout the length of the Primary LRV Warranty, as well as classes that cover any changes to the LRVs due to modifications and field retrofits.
- L. The LRV Supplier shall ensure the instructors attend one safety orientation and location orientation at the Gerry Wright OMF at least 20 Business Days prior to the beginning of classroom instruction.
- M. All training materials, including training aids and lesson plans, become the property of the City at the completion of the training program.
- N. The LRV Supplier shall maintain responsibility for the condition of all training materials for the duration of the training program. The LRV Supplier shall replace all damaged materials unless the damage resulted from neglect by the City or the Operator.

10.4.2 STUDENT WORKBOOKS

- A. For each course, the LRV Supplier shall provide hard copies of the following information to each student:
 - 1. a student workbook, which will include course agenda, course objectives, and a schedule of sessions; and
 - 2. printed copies of presentations, lecture outlines, lesson summaries, and any other information that will facilitate the learning process.

10.4.3 AUDIO-VISUAL RECORDINGS

- A. The LRV Supplier shall provide one Training Audio-Visual Recording (CDRL 03-121) of each LRV Supplier-led training session in the training program in 4K resolution on a USB device or portable hard disk drive.
 - 1. Each audio-visual recording shall include a constant view of the presenter and presentation, and if possible, any ad hoc diagrams and materials.

10.4.4 DRIVER TRAINING: TRAIN-THE-TRAINER APPROACH

- A. The LRV Supplier shall provide the Driver training as follows:
 - 1. in the first session, trainers from the City and from the Operator are members of the class;
 - 2. in the second session, the City and the Operator’s trainers will assist the instructor; and
 - 3. in the third and any subsequent sessions, the Operator’s trainer will deliver the training, assisted by the instructor.

- B. The LRV Supplier shall provide time, appropriate to the material being taught, between training sessions to allow the Operator's trainer to study the reference material in preparation for the next session.
- C. The LRV Supplier shall design the Driver training program to teach trainees to operate the LRVs safely and reliably under the assumption that the Driver trainees have no knowledge of the new LRVs but have the skills required for their level of employment classification.
- D. The LRV Supplier shall break the program down into roughly 75% classroom training and 25% hands-on training.

10.4.5 MAINTAINER TRAINING

- A. Maintainer trainees will include supervisory, operating, and maintenance personnel who have no knowledge of the new LRVs but have the skills required for their level of employment classification.
- B. The LRV Supplier shall design the maintainer training program to ensure each maintainer trainee acquires sufficient skills in order to do the following:
 - 1. safely maintain the LRVs in a condition to operate safely;
 - 2. safely perform preventive and corrective maintenance;
 - 3. safely maintain the LRVs in a condition that will be attractive to riders in both appearance and function; and
 - 4. safely maintain the reliability of the LRVs.
- C. The LRV Supplier shall design the maintainer training program to cover scheduled and periodic maintenance, corrective maintenance, troubleshooting, and heavy maintenance of the LRVs as appropriate to the course being taught.
 - 1. Break the maintainer training program down into roughly 75% classroom training and 25% hands-on training.
 - 2. Design the classroom instruction to include the design and function of the systems, components, and parts under discussion.
 - 3. Include the following topics the maintainer training program:
 - a. scheduled maintenance, including lubrication schedules;
 - b. consumable replacement and frequencies;
 - c. inspection and test frequencies;
 - d. corrective maintenance including system, subsystem, LRU, and LLRU troubleshooting, removal, and replacement;
 - e. Software functionality and Software structure, including description of firmware, executive Software, and application Software;
 - f. Software update process and the process to upload Software to the LRVs; and
 - g. the use and maintenance of Special Tools and DTE.

10.4.6 TRAINING FACILITIES

- A. The LRV Supplier shall conduct the formal classroom instruction in a suitable classroom located in the Gerry Wright OMF Part B, or location otherwise agreed with the City.

- B. The LRV Supplier may also carry out informal field instruction in and around the LRVs at the Gerry Wright OMF.
- C. The LRV Supplier shall ensure hands-on training is only permitted on LRVs that have received Conditional Acceptance, unless otherwise agreed to by the City for specific City and Operator personnel.

10.4.7 COMPLETION OF THE TRAINING PROGRAMS

- A. The training program will only be completed once all the following requirements have been met:
 - 1. the finalized number of personnel listed in Section 10.4.1 [*General*], except Drivers, have completed the training specific to their position, as evidenced by the submission of the Training Records;
 - 2. all training aids specified in each Training Program Plan have been delivered;
 - 3. all Submittals listed in Section 10.4 [*Training Programs*] have been Accepted by the City;
 - 4. all events listed in the Training Schedule have been completed; and
 - 5. the Maintainability Demonstration has been completed, with the Maintainability Demonstration Report Accepted by the City.
- B. The City shall issue a Training Program Completion Certificate to the LRV Supplier after all training programs described in Section 10.4.7A [*Completion of the Training Programs*] have been completed to certify the date on which the LRV Supplier has completed its training obligations.

10.5 TECHNICAL SUPPORT SERVICES

10.5.1 ON-SITE PERSONNEL

- A. The LRV Supplier shall provide, at minimum, the following fully qualified full-time support personnel on-site at the Gerry Wright OMF during the following periods:
 - 1. from the delivery of the First LRV to the Conditional Acceptance of the last LRV:
 - a. two Commissioning engineers; and
 - b. two technical support personnel;
 - 2. from the Conditional Acceptance of the last LRV to the Final Acceptance of the last LRV:
 - a. one Commissioning engineer; and
 - b. two technical support personnel; and
 - 3. from the Final Acceptance of the last LRV to the end of the Primary LRV Warranty of the last LRV:
 - a. one Commissioning engineer; and
 - b. one technical support person.
- B. The LRV Supplier shall do the following:
 - 1. ensure the on-site technical support personnel complete the following work:
 - a. product introduction, inspections, testing, and Commissioning;

- i. coordination and execution of required site testing activities; and
 - ii. management of site open items;
 - b. Warranty administration;
 - i. provide support during the Primary LRV Warranty by isolating failures;
 - ii. provide replacement parts and respond to any Warranty Deficiencies, including initiation and follow-up of remedial actions; and
 - iii. provide technical support to the City and the Operator's personnel;
 - c. control of field modifications;
 - i. procurement and management of materials required for modifications done at the Gerry Wright OMF;
 - d. daily meetings with the City and the Operator to review any outstanding issues on the LRVs; and
 - e. weekly open item meetings to resolve technical issues;
 - 2. provide on-site technical support personnel who are fluent in English; and
 - 3. provide the on-site technical support personnel who are qualified to maintain the LRVs, assist with testing, and assist with resolving operational and maintenance issues with the LRVs.
- C. The LRV Supplier shall submit Resumes of Proposed On-Site Technical Support Personnel (CDRL 03-122).
- 1. The LRV Supplier shall perform all Work under Warranty, and record all work orders generated during the Warranty Period using the maintenance management information system used by the City and the Operator. If a parallel maintenance management system to manage Work under Warranty is being used, the LRV Supplier shall provide the City and the Operator with full access to the parallel maintenance management information system.
- D. The LRV Supplier shall provide additional technical assistance and support as required for any systems or components that are not of service-proven design.

10.5.2 ON-CALL PERSONNEL

- A. During LRV testing from Conditional Acceptance of the first LRV through Final Acceptance of all LRVs, the LRV Supplier shall provide additional on-call personnel within two Business Days of a request for additional technical assistance, for resolution of Warranty Deficiency related repairs, and for investigation of repetitive failures and design defects.

10.5.3 MAINTENANCE MANAGEMENT INFORMATION SYSTEM

- A. The LRV Supplier shall provide the Maintenance Management Information (CDRL 03-123) that includes, at minimum, the following information in a format compatible with the Valley Line Stage 1 LRT maintenance management information system:
 - 1. the buildup of each LRV;
 - 2. the serial numbers of components on each LRV;
 - 3. full bill of materials;
 - 4. inventory on site;

5. modifications and details of any repair or maintenance carried out during testing and Commissioning;
6. Warranty items;
7. asset structure;
8. asset and sub-asset specification;
9. asset codes maintaining traceability of the sub-asset to asset relationships described in the asset structure;
10. for each system, subsystem, LRU, and LLRU:
 - a. asset group;
 - b. asset subgroup;
 - c. name or reference;
 - d. location;
 - e. model number;
 - f. manufacturer;
 - g. serial number, if available;
 - h. installation date;
 - i. configuration information;
 - j. link to Spare Parts useable on that asset;
 - k. Software version and revision, if applicable;
 - l. corrective maintenance record;
 - m. routine work orders; and
 - n. maintainer training requirements;
11. for all Spare Parts:
 - a. name or reference;
 - b. asset group;
 - c. asset subgroup;
 - d. Spare Part item type;
 - e. reference to asset which it is used for;
 - f. storage location;
 - g. model number;
 - h. manufacturer;

- i. supplier;
- j. delivery lead time;
- k. order quantity;
- l. unit price;
- m. minimum stock quantity for reorder;
- n. expected life of Spare Part, if applicable;
- o. serial number, if applicable;
- p. usage to date;
- q. Software version and revision, if applicable;
- r. Spare Part corrective maintenance records; and
- s. Spare Part routine maintenance records.

SECTION 11: PERFORMANCE DEMONSTRATION SUPPORT REQUIREMENTS

11.1 RESPONSIBILITIES OF THE PARTIES

- A. The LRV Supplier shall acknowledge that the Performance Demonstration Committee shall be established pursuant to and in accordance with Schedule 6 [*Interface Agreement*].
- B. During the Infrastructure Performance Demonstration Period, the LRV Supplier shall do the following:
 - 1. appoint a representative to the Performance Demonstration Committee in accordance with Schedule 6 [*Interface Agreement*];
 - 2. provide all personnel and equipment necessary or required to support Project Co and the Operator in identifying the root cause of any failure or incident that may be attributed to the LRVs as determined by the Performance Demonstration Committee; and
 - 3. if applicable, rectify any and all Warranty Deficiencies attributable to the LRVs.
- C. Pursuant to the Independent Performance Demonstration Certifier Agreement, the Independent Performance Demonstration Certifier will be responsible for the following:
 - 1. chair the Performance Demonstration Committee; and
 - 2. assign the underlying root causes of failures to the appropriate Performance Demonstration Committee Party based on the information provided by all Performance Demonstration Committee Party to the Performance Demonstration Committee.
- D. As between the City and the LRV Supplier, during the Infrastructure Performance Demonstration Period, the City shall, or shall cause the Operator, to do the following:
 - 1. operate the Valley Line LRT in Revenue Service and perform preventive maintenance on the LRVs;
 - 2. record on-time performance;
 - 3. identify all Train Delays and make an initial identification of the cause;
 - 4. provide information from the ICS that is relevant to any failure or incident and is necessary to determine the underlying root cause; and
 - 5. identify and report to the members of the Performance Demonstration Committee any failures and incidents.
- E. As between the City and the LRV Supplier, during the Infrastructure Performance Demonstration Period, the City shall, or shall cause Project Co or the Operator as the City may designate, in its discretion, to identify and report to the members of the Performance Demonstration Committee any failures and incidents.

APPENDIX 3A: FORMS

FORM 1: CONDITIONAL ACCEPTANCE CERTIFICATE

[The City]

[Contract Number]

LRV #: _____

LRV Supplier hereby makes the following representations and warranties regarding the above-referenced vehicle: (i) that all phases of production, testing, inspection, and burn-in testing have been completed for such LRV in accordance with the requirements of the Supply Agreement between **the City** and the LRV Supplier for the manufacture of said LRV, (ii) that such LRV substantially conforms to all requirements set out in said Supply Agreement (iii) that such LRV meets or exceeds all of the technical requirements of the Supply Agreement except with respect to those items set out in attached Exhibit [#], which is incorporated herein by this reference; and (iv) that those items set out in attached Exhibit [] are not considered Major Deficiencies. The LRV Supplier warrants and represents that the above-referenced LRV is free and clear of any and all liens, mortgages, encumbrances, financing statements, security agreements claims, and demand of any character and that title to said LRV is vested in the City.

The persons signing below on behalf of LRV Supplier represent, respectively, that they are authorized to make the foregoing representations and warranties on behalf of LRV Supplier.

For [LRV Supplier] _____
Date

For [LRV Supplier] _____
Date

[The City] has inspected the above-referenced LRV and finds that it is in condition for acceptance under a reservation of rights as to burn-in testing and the incomplete or unresolved items listed in attached Exhibit [#].

For [the City] _____
Date

For [the City] _____
Date

EXHIBIT [#]: CONDITIONAL ACCEPTANCE CERTIFICATE

[The City]

[Contract Number]

LRV #: _____

Date: _____

The following are incomplete or unresolved items at the time of LRV inspection. Resolution of these items is the LRV Supplier's responsibility.

Item #	Resolved Mfg.	Approved [City's Representative]	Description of Exception

FORM 2: FINAL ACCEPTANCE CERTIFICATE

[The City]

[Contract Number]

LRV #: _____

The LRV Supplier hereby makes the following representations and warranties regarding the above-referenced LRV: (i) that all phases of design, manufacture, static testing, dynamic testing, calibration, acceptance testing have been properly completed for such LRV pursuant to the terms of the Supply Agreement between the City and the LRV Supplier for the manufacture of said LRV, (ii) that satisfactory documentation of the foregoing is set out in the completed Vehicle History Book for said LRV, and (iii) that all of the items listed in the Conditional Acceptance and Inspection Form for said LRV have been satisfactorily completed or resolved.

For [LRV Supplier] _____
Date

For [LRV Supplier] _____
Date

The LRV Supplier has inspected the LRV during manufacture and testing, and has reviewed the Vehicle History Book for completeness and finds that the above-referenced LRV is acceptable and that all exceptions noted on the Conditional Acceptance and Inspection Form have been completed or resolved in accordance with the Supply Agreement requirements.

For [LRV Supplier] _____
Date

For [the City] _____
Date

**THE CITY OF EDMONTON
VALLEY LINE WEST LRT**

LRV SUPPLY AGREEMENT

Schedule 4 – Technical Requirements

VALLEY LINE WEST LRT
SCHEDULE 4 – TECHNICAL REQUIREMENTS

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SECTION 1: DESIGN AND PERFORMANCE CRITERIA

1.1 OPERATING ENVIRONMENT

1.1.1 OPERATIONAL REQUIREMENTS

A. Design the LRVs to meet the following requirements:

1. operate throughout the Valley Line LRT, Lewis Farms Storage Facility, and Gerry Wright OMF;
2. operate at grade on segregated ROW and in-street running segments, above grade on elevated guideways and bridges, and below grade in tunnel sections;
3. operate on, and through transitions between, ballasted, direct fixation, and embedded track, and any special trackwork located within or between the track types;
4. operate on an overhead contact wire system rated at a nominal 750 VDC; and
5. load and unload Passengers at elevated and at-grade Stops and Stations located on the Valley Line LRT.

1.1.2 DESCRIPTION OF THE ULTIMATE VALLEY LINE LRT RIGHT OF WAY

A. The ultimate build out of the Valley Line LRT, shown in *Figure 1: Valley Line LRT* below, will consist of the Valley Line LRT Stage 1, indicated as Valley Line Southeast and shown with a solid dark blue line in *Figure 1: Valley Line LRT*, and the Valley Line LRT Stage 2, indicated as Valley Line West and shown with a dashed dark blue line in *Figure 1: Valley Line LRT*. When completed, the Valley Line LRT will be a 27 km low-floor LRT alignment with 28 Stops and Stations. End-to-end, it will connect communities between Mill Woods and Lewis Farms to downtown and various other destinations along the right of way.

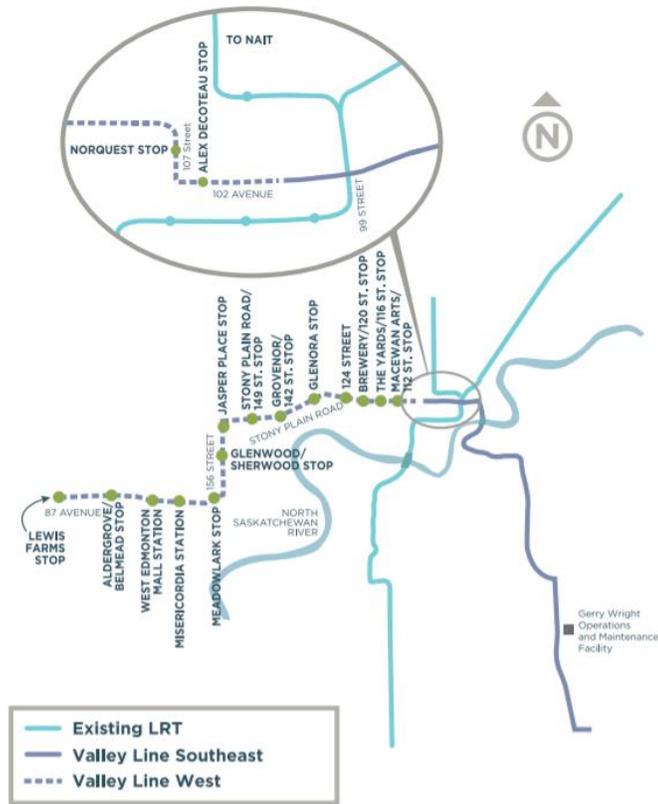


Figure 1: Valley Line LRT

1.1.3 DESCRIPTION OF THE VALLEY LINE LRT STAGE 1

- A. Valley Line LRT Stage 1 is the 13 km long portion of the Valley Line LRT currently under construction. When completed the Valley Line LRT Stage 1 will extend from Mill Woods to downtown, terminating at the “102 Street Stop”. Valley Line LRT Stage 1 will not connect to the “existing LRT” high floor Capital Line and Metro Line but will provide a transfer point at “Churchill Stop” to allow Passengers to transfer on foot to the “existing LRT” high floor Capital Line and Metro Line, shown in light blue in *Figure 1: Valley Line LRT*.
- B. Valley Line LRT Stage 1 will include 13 km of LRT double track with 12 Stops and Stations of which one is elevated and 11 are at-grade, two bridges, 1.2 km of elevated track in two separate segments, one tunnel, and two tunnel approaches.
 1. The bridges are located at, and cross over, Whitemud Drive at 66/75 Street and the North Saskatchewan River at 95 Street.
 2. One segment of elevated track is located between the “Muttart Stop” and the bridge over the North Saskatchewan River. The other segment of elevated track is located above Argyll Road, the Canadian Pacific Railway tracks, Mill Creek Ravine, 75 Street, and the Canadian National Railway tracks and includes “Davies Station”.
 3. The tunnel runs from the east side of 96 Street, under Jasper Avenue and 95 Street, to the north bank of the North Saskatchewan River. The two tunnel approaches are located at 102 Avenue and the north riverbank of the North Saskatchewan River.

- C. Valley Line LRT Stage 1 will connect with a new transit centre in Mill Woods and transit centre and park and ride at “Davies Station”.

1.1.4 DESCRIPTION OF THE VALLEY LINE LRT STAGE 2

- A. Valley Line LRT Stage 2 is the 14 km long portion of the Valley Line LRT with green Stop and Station markers on *Figure 1: Valley Line LRT*. It will be constructed as one segment and will extend from downtown west to Lewis Farms.
- B. Valley Line LRT Stage 2 will include 14 km of LRT double track with 16 Stops and Stations, of which two are elevated and 14 are at grade, two bridges, and 1.5 km of elevated track.
 - 1. The bridges are located over Anthony Henday Drive at 87 Avenue and over Groat Road at Stony Plain Road.
 - 2. The 1.5 km of elevated track is located between 163 Street and 182 Street and includes “West Edmonton Mall Station” and “Misericordia Station”.
- C. Valley Line LRT Stage 2 will connect with three transit centres at Jasper Place, West Edmonton Mall, and Lewis Farms. Valley Line LRT Stage 2 will include the expansion of the existing park and ride at Lewis Farms.

1.1.5 DESCRIPTION OF THE GERRY WRIGHT OMF

- A. Valley Line LRT will include an operations and maintenance campus at the Gerry Wright OMF located in the lands east of 75 Street, north of Whitemud Drive and south of 51 Avenue. The Gerry Wright OMF Part A will be constructed as part of Valley Line LRT Stage 1, and the Gerry Wright OMF Part B will be constructed as part of the Valley Line LRT Stage 2 on the Gerry Wright OMF site.
- B. The Gerry Wright OMF Part A and the Gerry Wright OMF Part B will include facilities required for the performance of operations, maintenance, and LRV storage, and will include an OCC within the Gerry Wright OMF Part A.

1.1.6 LEWIS FARMS STORAGE FACILITY

The Lewis Farms Storage Facility will be constructed south of the Lewis Farms park and ride as part of the Valley Line LRT Stage 2 and will contain the back-up OCC for the Valley Line LRT and the facilities required for the cleaning, light maintenance, and storage of both Stage 1 LRVs and LRVs.

1.2 RIGHT OF WAY INTERFACE DESIGN CONSTRAINTS

1.2.1 TRACK

- A. Design the LRVs to operate in Revenue Service, under all Passenger loadings, on the TCRP 155 compliant Valley Line LRT alignment as follows:
 - 1. on 1,435 mm gauge track constructed of AREMA 115 RE rail;
 - 2. on ballasted, direct fixation, and embedded sections, and all special trackwork of the Valley Line LRT system that has been designed to the reference concept design drawings;
 - 3. on a maximum grade of $\pm 6\%$;
 - 4. on vertical hog and sag curves down to 285 m radius; and

5. on horizontal curves down to 25 m radius that occur on main line and within the Gerry Wright OMF.

1.2.2 STOPS AND STATIONS

- A. Provide LRVs that provide level boarding, as defined in Section 1.6 [*Accessibility Requirements*], at all Stops and Stations throughout the Valley Line LRT. All Stops and Stations have Platforms that have been designed with a Platform edge that is located 1,400 mm from the centerline of the track and 300 mm above TOR with the construction, wear, and maintenance tolerances that have been considered in the Valley Line Stage 1 Platform Gap Interface Control Document.

1.2.3 SYSTEMS

1.2.3.1 Traction Electrification System

- A. Design the LRVs to operate on an IEC 60850 compliant, 750 VDC nominal, single overhead contact wire and floating negative return traction electrification system.

1.2.3.2 Signalling Systems

- A. Provide the LRVs with the components described in Section 12 [*Signalling*] and make the LRVs compatible with the TRPS, TCS, and YCS systems described in Section 12 [*Signalling*].

1.2.3.3 Communications

- A. Install the Voice Radio System, Wi-Fi O&M Data Radio System, CCTV System, and TCN Systems described in Section 9 [*Communications*] to provide voice communications, data communications, and transfer of CCTV data, between the driver's cab, passenger area, and the OCC as required by the Supply Agreement, and between LRV systems and the wayside as required by the Supply Agreement.

1.3 GENERAL REQUIREMENTS

1.3.1 STANDARDS USED

- A. Identify all local, provincial, national, and international codes, standards, rules, and regulations applicable to the LRVs at NTP.
- B. Deviate from, or substitute for, the standards specified in Appendix 1B [*Standards, Specifications, Guidelines, and Manuals*] of Schedule 1 [*Definitions and Interpretations*] only if Accepted by the City.
- C. If LRV Supplier proposes to use a standard other than those specified in Appendix 1B [*Standards, Specifications, Guidelines, and Manuals*] of Schedule 1 [*Definitions and Interpretations*], submit a Substitution of Standards List (CDRL 04-03) indicating the following:
 1. the standards the specification requires cross-referenced with the standards LRV Supplier is proposing to substitute;
 - a. provide copies of the proposed standard in the original language of their publishing and in English; and
 2. a detailed comparison of the alternative criteria in the proposed standard, the rationale for the alternative, and whether the proposed standard meets or exceeds the existing standard.

1.3.2 INTEGRATION REQUIREMENTS

- A. Coordinate with the City and Project Co to integrate the LRVs and Valley Line LRT wayside infrastructure and systems elements and to verify that the LRVs will remain compatible with the wayside infrastructure and systems elements at all Valley Line LRT locations in accordance with Schedule 5 [*Integration Requirements*] and Schedule 6 [*Interface Agreement*].

1.3.3 LANGUAGE USED

- A. Use English language for all information, instructions, decals, screens, controls, and user interfaces throughout the LRVs that are used or read, or could be used or read, by Passengers, Drivers, and maintainers.

1.3.4 SUI

- A. The Valley Line LRT project is founded on the principles of SUI, an approach that encourages the seamless integration of the LRT system into the existing surrounding urban fabric while promoting high quality and sustainable user experiences. Without limiting the requirements, the design of the LRVs shall be consistent with the themes, colours, guidance, imagery, and aesthetics illustrated in the Design Guide.

1.3.5 HUMAN EFFORT

- A. Comply with CCOHS guidelines for the effort and body position required to manually actuate, reposition, remove, or replace any component of the LRVs.
 - 1. Take into account all relevant lift, push, and pull factors for the movement of the specific component including the weight of the object being positioned, the lifting points, the lifting positions, dynamic movements, and the body position and changes in body position required to move the object.
 - a. Where the CCOHS guidelines for the movement of the component are exceeded, provide mechanical means of assistance that bring the movement of the component within CCOHS guidelines.
 - i. Document the mechanical means of moving the object within the relevant operations and maintenance manuals.
 - ii. Design roof-mounted equipment that exceeds the CCOHS lifting guidelines to be mechanically liftable from the centerline of the LRVs without the use of specialized rigs and jiggling.
- B. Submit a Manual Operations and Mitigations Report (CDRL 04-04) that documents the following:
 - 1. all components of the LRVs that exceed the CCOHS guidelines for lifting, pulling, and pushing, including calculations demonstrating the unaugmented movement is outside of CCOHS guidelines; and
 - 2. the mechanical means used to bring the component movement within CCOHS guidelines, and calculations demonstrating that the augmented lift is within CCOHS guidelines.
- C. Have the Manual Operations and Mitigations Report approved by a human factors engineering specialist prior to being submitted to the City.

1.3.6 HUMAN FACTORS ENGINEERING

- A. Wherever the Supply Agreement indicates an action is being performed by, or equipment is being used by, a Driver, Passenger, maintainer or person, or approval by a human factors engineering specialist is required by the Supply Agreement, have a human factors engineering specialist validate the requirement using the ergonomic dataset from the current version of “The Measure of Man and Woman: Human Factors in Design” to establish that the requirement stated by the Supply Agreement is performable by a person within the 5 percentile female to 95 percentile male range.
- B. The human factors engineering specialist providing validation of the person-to-LRV interfaces in the Human Factors Engineering Report shall have at least a degree in human factors engineering or ergonomics along with relevant experience in designing for, or evaluating the designs of, passenger transit vehicles and rail driving environments.
 - 1. The LRV Supplier shall provide a resume and curriculum vitae of the person it is proposing as the human factors engineering specialist at CDR for Acceptance by the City.
- C. Submit a Human Factors Engineering Report (CDRL 04-05) that compiles all evidence provided by the human factors engineering specialist and validates that all aspects of the Supply Agreement requiring approval by a human factors engineering specialist meet the requirements of the Supply Agreement.

1.3.7 DURABILITY

- A. Use materials and equipment in the LRVs and LRV systems that are durable and will require minimal maintenance and repairs throughout the LRVs and LRV systems Design Service Life.
- B. Design and construct the LRVs and LRV systems to address potential for deterioration of materials and equipment, including deterioration specific to exposure to the installation environment, and account for the following aspects of durability during the design and manufacture of the LRVs and LRV systems:
 - 1. control of moisture;
 - 2. control of corrosion, including material compatibility;
 - 3. control of ultraviolet light exposure;
 - 4. control of exposure to industrial and vehicular pollution;
 - 5. control of thermal expansion due to exposure to a range of ambient temperatures;
 - 6. minimization of damage from wear and tear; and
 - 7. ease of repair.

1.3.8 UNIFORMITY

- A. Design and construct systems that do not differ in their operational, functional, and performance characteristics such that all components are positioned within the system in the same location and internal wiring is routed between components in a similar manner.
- B. Adhere to the following requirements wherever identical installations exist on the same LRV and wherever identical installations exist on all the LRVs manufactured under this Supply Agreement:

1. equipment enclosures shall be mounted and installed in a like manner;
 2. equipment serving similar functions shall be in the same relative location in equipment cabinets to the maximum extent practicable;
 3. penetrations for conduit, grounding, and access panels shall be located in the same place;
 4. location of equipment relative to adjacent equipment shall not differ;
 5. routing of conduit, cable tray, and cables between equipment enclosures shall not differ;
 6. termination hardware shall be located in a like manner;
 7. cables and wire terminations shall be located in a like manner; and
 8. mounting hardware of like equipment shall not differ.
- C. Standardize configurations of equipment and system parameters to align with Good Industry Practice for new LRV builds.
- D. Design and construct for uniformity and standardization to facilitate the supply and availability of components and maintainability during Revenue Service.

1.3.9 INTERCHANGEABILITY

- A. Use LRV systems, LRUs, and LLRUs of a like design that are interchangeable, without modification except for the installation and removal of components specific to that installation location, both on the LRV, and between the LRVs supplied under this Supply Agreement.
- B. Design the LRVs and LRV systems such that a component can be removed from one LRV and installed directly onto another LRV with only minor firmware modifications being required.
- C. Use COTS equipment, that can be readily sourced from North America, to the maximum extent practicable throughout the LRVs and LRV systems.

1.3.10 OBSOLESCENCE

- A. Use OEM-supported versions of all hardware, Software, and firmware that are available at the time of FDR for the LRVs and LRV systems.
- B. Provide the LRVs with LRV systems that have known dates of obsolescence, which is end of support by the LRV system's OEM, that do not fall within two overhaul cycle intervals of the LRV system in question from the time the last LRV receives Conditional Acceptance.
1. Where an LRV system has no specific overhaul interval, provide the LRVs with LRV systems with a known date of obsolescence that is greater than 10 years from the date the last LRV receives Conditional Acceptance.
- C. In the event that an LRV system or any hardware, Software, or firmware associated with an LRV system becomes obsolete within the LRV system's Warranty Period, replace the LRV system, or the affected hardware, Software, or firmware, and any other LRV system hardware, Software, and firmware affected by the change with a current version.
- D. In the event that an LRV system or any hardware, Software, or firmware associated with an LRV system becomes obsolete within the time specified in Section 1.3.10B [*Obsolescence*] or

Section 1.3.10B.1 [*Obsolescence*], as applicable, provide the City with a migration plan that details the following:

1. the process to update the affected hardware, Software, or firmware to a currently supported version; and
 2. the consequences to any other LRV system, hardware, Software, and firmware affected by the update of the affected hardware, Software, or firmware.
- E. Submit an Obsolescence Management Plan (CDRL 04-06) that includes the following:
1. all planned processes and coordinated activities to monitor, report, and assess the impact of impending or occurred obsolescence of LRV hardware, Software, and firmware provided on the LRVs;
 2. known and expected dates of obsolescence of all LRV systems and, where applicable, portions of LRV systems; and
 3. expected mitigation strategies and estimated cost of the mitigation strategy.

1.3.11 EQUIPMENT ARRANGEMENT AND MAINTENANCE ACCESSIBILITY

- A. Design the LRVs and LRV systems with consideration of maintenance, troubleshooting, component removal, repair, and inspection requirements to minimize maintenance labour and materials costs, LRV downtime, and the need for specially trained service personnel.
- B. Provide adequate working clearances on the LRVs for equipment removal, replacement, and maintenance without impacting other equipment.
- C. Design LRV systems such that routine preventive maintenance of LRV systems shall not require major disassembly of the equipment and any other equipment.
- D. Align the preventive maintenance intervals of components and LRUs that are collocated or located such that one component needs to be removed to access the other, to the maximum extent practicable.
- E. Secure LRV system enclosure doors with square maintenance keys where Drivers require access and triangular maintenance keys where maintainers require access.
1. Do not locate equipment from LRV systems that is to be used exclusively by maintainers within enclosures that Drivers have access to.
- F. Unless otherwise stated, design the LRVs and LRV systems such that all exterior surfaces and enclosures, entranceways, and equipment on the LRVs are IP55 and IK10 rated, and the LRVs and LRV systems will be unaffected by operation and storage within the Edmonton climatic conditions in accordance with Section 1.3.14 [*Climatic Conditions*].
1. Where water, dust, dirt, and snow penetrate LRV systems through air ingresses and egresses intended for ventilation, the operation of the equipment will not be impaired by such penetration, nor will filter media require changing outside of normal preventive maintenance cycles.

1.3.12 NETWORK, SOFTWARE, AND FIRMWARE SECURITY

- A. Provide secure and encrypted network communications through the Wi-Fi O&M Data Radio System between systems on the LRVs and the wayside.
- B. Design the Wi-Fi O&M Data Radio System, TCN, HMIs, and LRV Software and firmware to be in accordance with SP 800-82 Rev. 2, APTA-SS-CCS-RP-001-10, APTA-SS-CCS-RP-0C-13, and APTA-SS-ECS-RP-001-14.
- C. Design the Wi-Fi O&M Data Radio System, TCN, HMIs, and LRV Software and firmware such that unauthorized people, systems, and connections are unable to connect to the Wi-Fi O&M Data Radio System and TCN, or access or modify LRV systems, LRV systems parameters, and LRV system data on any system on the LRVs.

1.3.13 SERVICE-PROVEN DESIGN

- A. Provide service-proven LRVs that meet all the following criteria:
 - 1. for the LRV design, has been in passenger service operation for at least three years where it has accumulated at least 65,000 km per light rail vehicle per year;
 - a. only consider passenger service operation for LRV designs that have operated as part of a homogenous fleet of a minimum of 12 light rail vehicles with a minimum achieved light rail vehicle fleet availability of 93%, where an individual light rail vehicle is considered to be available if there are no known safety issues on the light rail vehicle and no known issues that would impact passenger service operation on the light rail vehicle prior to it entering passenger service operation; and
 - 2. has achieved RAMS requirements consistent with the requirements of Section 3 [*Reliability, Availability, Maintenance, and Safety*] of Schedule 3 [*Design and Manufacturing Protocols*].
- B. Design and construct service-proven LRVs using products, equipment, hardware, Software, materials, and design concepts from established manufacturers with a documented operating history of previous and current usage in a rail transit environment.
- C. Design and construct service-proven LRVs using standardized materials and common off the shelf equipment to reduce life cycle costs for materials, equipment, and components, ease inventory management, minimize staff training, and optimize maintenance.
- D. Design the LRVs and LRV systems using equipment, materials, cables and appurtenances compliant with relevant CSA, ULC, ANSI, IEEE, IEC, EN, ASTM, and local standards as applicable.

1.3.14 CLIMATIC CONDITIONS

- A. Provide LRVs that will meet the requirements of the Supply Agreement and have a 30 year design life when operated, maintained, and stored on the Valley Line LRT.
- B. Provide LRVs that are fully functional after, and not damaged by, storage when not in Revenue Service inside the facilities at the Gerry Wright OMF and Lewis Farms Storage Facility, where the ambient temperature will be no less than 5°C, and outdoors at any ambient temperature from 40°C to -40°C for periods up to 72 hours.
- C. Provide LRVs that are fully functional in, and not damaged by, operation in ambient temperatures from +40°C to -40°C with an expected thermal shock step change in temperature of up to ±60°C

occurring when the LRV transitions in either direction between the exterior ambient temperatures and the temperatures within the facilities at the Gerry Wright OMF and Lewis Farms Storage Facility, and the exterior ambient temperature and the temperature within the tunnels on the Valley Line LRT.

1. Validate the functionality of the LRVs and LRV systems through the complete +40°C to -40°C temperature range through climate chamber testing which shall include power up of equipment that has been cold soaked for a period of time long enough that the temperature of the equipment's internal and external components will have stabilized at -40C.
- D. Provide LRVs that have full functionality during, and is not damaged by, operation and storage in relative humidity from 100% to 0%.
- E. Provide LRVs that, when in motion at any speed up to rated track speed, shall remain stable in sustained winds of up to 90 km/h from any direction, and when stationary will not roll over in sustained winds of up to 150 km/h from any direction.
- F. Provide LRVs that have full functionality during, and are not damaged by, operation and storage in rainfall of up to 70 mm/hr and 115 mm/24 hr.
1. Provide the LRVs with shallow fording functionality as follows:
 - a. with maximum wheel wear, the LRVs shall operate without damage or equipment malfunction in water up to 75 mm above TOR, at speeds up to 15 km/h;
 - b. when stationary with the pantograph down, the LRVs shall not be damaged by water levels up to 130 mm above TOR; and
 - i. provide preventive maintenance procedures in the technical manuals to be carried out by maintainers in the event that the LRV is exposed to water levels greater than 130 mm above TOR.
- G. Assuming that the pantograph carbon and OCS contact point are maintained clear provide LRVs that will not be damaged by operation and storage during freezing rain and ice accumulations of up to 5 mm on the track and LRVs.
- H. Provide LRVs that have full functionality during, and are not damaged by, operation and storage during snowfalls of up to 55 mm/hr and 500 mm/24 hr.
1. Provide LRVs that have full functionality during, and are not damaged by, wet snow during transitions into and out of the winter season, with predominantly dry powder in the winter season taking into consideration at least the following:
 - a. The LRVs' ventilation systems shall reject ingress of wet and dry powdered snow;
 - b. The LRVs shall mitigate wet and dry snow from packing into voids and on equipment within the LRVs' undercarriage;
 - c. The LRVs' roof and carbody structure shall support the anticipated snow loadings from the snowfalls described in this Section; and
 - d. The LRV's propulsion and braking systems shall provide the specified performance under the snow conditions described in this Section.

2. Provide LRVs that operates with maximum wheel wear, and without damage or equipment malfunction, through wet and dry snow up to 200 mm above TOR.
 3. Validate the LRVs for snow and cold operation in accordance with EN 16251.
- I. Provide LRVs that have full functionality during, and are not damaged by, operation and storage at an altitude 700 m above sea level and in any of the weather Edmonton receives including hail and lightning.
 - J. Submit a Climate Plan Package (CDRL 04-07) that details how the LRV Supplier will manufacture the LRVs to meet the requirements of Section 1.3.14 [*Climatic Conditions*] and validate that the LRVs meet the requirements of Section 1.3.14 [*Climatic Conditions*].

1.3.15 EMC/EMI

- A. Use LRVs, LRV-mounted equipment, and LRV systems in all configurations and operating modes, that conform to the applicable requirements of the following:
 1. EN 50121;
 2. EN 50238;
 3. ICNIRP Guidelines; and
 4. Section 6 [*Electromagnetic Compatibility*] of Schedule 3 [*Design and Manufacturing Protocols*].
- B. Design the LRVs and LRV systems such that in any operating state, and when exposed to electromagnetic interference, the LRVs and LRV systems are not capable of any condition that permits or causes unsafe conditions.
- C. Design the LRVs to be electromagnetically compatible within themselves, with the Valley Line LRT TRPS, yard control system, and traction power equipment, with the City's communications systems and other electronic equipment, and with any equipment called out at the sites in the Edmonton SE to W LRT – Electromagnetic Compatibility (EMC) Preliminary Investigation Report.

1.3.16 FIRE AND LIFE SAFETY

- A. The LRV Supplier shall design the LRVs to do the following:
 1. prevent fire, and to protect the public, employees, and emergency response personnel from injury due to fire, smoke, and explosion due to these occurrences;
 2. protect system elements from damage by fire or explosion; and
 3. provide a fire load of less than 24 MW.
- B. The LRV Supplier shall design the LRVs, LRV systems, subsystems, components, and materials in accordance with NFPA 130 and BSS 7239, or EN 45545, using the OC2/N/HL2 vehicle category. The maximum gas release limits shall comply with the following:
 1. Carbon Monoxide (CO) shall be less than 3,500 ppm;
 2. Carbon Dioxide (CO₂) shall be less than 90,000 ppm;

3. Hydrogen Fluoride (HF) shall be less than 200 ppm;
 4. Nitrogen Dioxide (NO₂) shall be less than 100 ppm;
 5. Hydrogen Chloride (HCl) shall be less than 500 ppm;
 6. Hydrogen Cyanide (HCN) shall be less than 150 ppm;
 7. Sulfur Dioxide (SO₂) shall be less than 100 ppm; and
 8. Hydrogen Bromide (HBR) shall be less than 100 ppm.
- C. The LRV Supplier shall locate equipment outside of the passenger compartment, whenever practical, unless specified otherwise, to isolate potential ignition sources from combustible materials.
- D. The LRV Supplier shall apply the following design treatments to protect the LRV interiors from fire:
1. designing the articulation, floor, sides, and roof to retard propagation of an underfloor and roof fire to the LRV interiors; and
 2. providing fire stops at floor and roof penetrations.
- E. The LRV Supplier shall submit a Fire and Smoke Load Analysis (CDRL 04-08) that analyses the fire, smoke, and heat load of the LRV, and provides the maximum spread of fire, smoke, and heat. The analysis shall also include, at minimum, the following information:
1. the simulation models and codes used for analyzing fire spread, and the production and spreading of smoke and heat; and
 2. fire, smoke, and heat modeling parameters.

1.3.17 REFERENCE SIGNALS

1.3.17.1 No Motion Signal

- A. Provide LRV systems that the PHA has determined must not operate when the LRV is in motion with a vitally generated No Motion signal.

1.3.17.2 LRV Speed

- A. Design the LRV with a single system that provides the LRV speed, LRV accumulated kilometrage, and distance signalling information used by other LRV subsystems.

1.3.18 PASSENGER EXPERIENCE

- A. Passenger Experience includes all elements that affect the Passengers perception of their experience or their time on the LRV including Passenger flow, seating, ventilation, temperature, cleanliness, noise, vibration, human factor engineering, aesthetics, and availability and access to safety devices and passenger information systems.

1.4 LRV GENERAL ARRANGEMENT

1.4.1 LRV TYPE

- A. Provide bidirectional, articulated, low-floor LRVs suitable for operation from a nominal 300 mm Platform on a ROW with both segregated and in-street running segments, and operable from a

750 VDC nominal, IEC 60850 compliant, traction electrification system with an OCS that will range in height from 4,100 mm to 6,400 mm above TOR.

- B. Provide LRVs that shall operate in multiple-unit Trains of up to two LRVs in length, and when operating in tow mode, Trains of up to twice that length. While there are 26 Stage 1 LRVs, the Stage 2 LRVs will operate as a separate fleet in Revenue Service and will only be coupled to the Stage 1 LRVs during towing operations where the two different vehicles will be mechanically but not electrically coupled.

1.4.2 LRV GENERAL DESIGN

- A. Provide LRVs that are in accordance with the LRV characteristics indicated in the LRV Design Information Package included in Bid Extracts.
- B. Provide articulated LRVs where at least 80% of the area in the passenger area is low floor such that it is accessible through level boarding in accordance with Section 2.1 [*Carbody*].
 - 1. Design the LRV carbody using crash energy management principles in accordance with Section 2.1 [*Carbody*].
- C. Subject to the maintenance intervals specified in Section 3.3.1 [*General*] of Schedule 3 [*Design and Manufacturing Protocols*] and LRV Supplier's recommended maintenance practices and operating procedures, design the LRVs to provide the following on the Valley Line LRT:
 - 1. a minimum Design Service Life of 30 years with an annual average kilometrage of 100,000 km per LRV;
 - 2. a maximum Revenue Service speed of 80 km/h, capable of a maximum design speed of 90 km/h, and stable at speeds of up to 100 km/h; and
 - 3. Revenue Service operation for 24 hours per day for a continuous period of 10 days with 20 second Dwell Time at each Stop and Station on the Valley Line LRT system.
- D. Equip the LRVs with a communications system that passes one-way and two-way audio and visual messaging and infotainment between the Driver, the LRV interior, the LRV exterior, the wayside, and the OCC as appropriate and in accordance with Section 9 [*Communications*] and Section 11 [*Passenger Information System*].
- E. Equip the LRVs with an APC system, in accordance with Section 10 [*Monitoring and Diagnostic System*], that shall accurately count Passengers on the LRVs and pass those counts to the Driver through the TCN and to the City's wayside systems through the Wi-Fi O&M Data Radio System.
- F. Equip the LRVs with an HVAC system that provides independent and separated climate control of the driver's cabs and passenger area in accordance with Section 2.4 [*Heating, Ventilation, and Air Conditioning*].
 - 1. Design the driver's cabs and passenger area to be heated via separate radiant heating elements and heated, cooled, and ventilated via separate air conditioning units or by a single air conditioning unit that provides zoned climate control for the passenger area and driver's cab.
- G. Design the LRVs to be compatible with the Valley Line LRT Stage 1 system.

1.4.3 LRV CRITICAL DIMENSIONS

1.4.3.1 Carbody

- A. Design the LRVs such that the maximum width of the carbody at the widest point is 2.65 m, not including sacrificial door threshold nosings, and the maximum height of any point on the carbody with the pantograph in a lowered and locked down position is 4.0 m.
- B. Provide LRVs that are between 40 m and 44 m in length, and are such that a two-LRV Train with end couplers retracted is not more than 90.0 m in length.
- C. Design the minimum finished floor to finished ceiling height clearance in the LRVs to be as follows:
 - 1. throughout the LRV passenger area to be at least 2,040 mm with a minimum unrestricted vertical clearway height of 1,900 mm across the width of the passenger area and along the length of the passenger area of the LRV; and
 - 2. in the driver's cabs, the vertical clearway height across the width and length of the cab ceiling is at least 1,980 mm.

1.4.3.2 Pantograph

- A. Pantograph dimensions are provided in Section 8 [*Electrical*].

1.4.3.3 Bogies

- A. Provide bogies that are compatible with all curves and special trackwork on the Valley Line LRT and meet the requirements of Section 5 [*Bogies*].

1.4.3.4 Clearance

- A. Design the LRVs such that at any Passenger loading all parts of the LRVs are maintained during Revenue Service as follows:
 - 1. such that there is no conflict with the Platform edge or other equipment and structures in the Stop or Station when the LRV is in operation within Stop and Station boundaries;
 - 2. such that at any loading and failure condition, with the exception of the LRV's wheels, all parts of the LRV are maintained above 50 mm above TOR;
 - 3. within the confines of the Future LRV Dynamic Envelope shown in Appendix 4C [*Future LRV Dynamic Envelope*] of this Schedule for all normal operating conditions and failure-mode conditions that could include reasonable combinations of failed suspension elements;
 - 4. within the Vehicle Lateral Clearance Table shown in Appendix 4B [*VLW – Vehicle Lateral Clearance Table*] of this Schedule; and
 - 5. within the confines of the Accepted LRV Swept Path Analysis for all points on the Valley Line LRT alignment.
- B. include the following effects in the development of the LRV's VDE:
 - 1. dynamic motion of springs, suspension, and bolsters of LRV bogies;
 - 2. LRV suspension side play and wear;
 - 3. LRV wheel flange and radial tread under minimum and maximum wear;

4. maximum bogie yaw;
 5. Passenger loadings from AW0 to AW3;
 6. lateral wind loadings of up to 60 km/h;
 7. wheel and track gauge difference;
 8. wheel back-to-back mounting and maintenance tolerances; and
 9. suspension system failure of one secondary suspension component.
- C. Submit an LRV Track Clearance Report (CDRL 04-01) that provides the following:
1. drawings showing the LRV's VSE, and VDE within the Valley Line LRT Future LRV Dynamic Envelope provided in Appendix 4C [*Future LRV Dynamic Envelope*] of this Schedule;
 2. a table comparing the LRV's inswing and outswing to the inswing and outswing limits shown in the Vehicle Lateral Clearance Table provided in Appendix 4B [*VLW – Vehicle Lateral Clearance Table*]; and
 3. static and dynamic inswing and outswing for the LRVs, and dimensioned overhead drawings of the TCEs showing the static and dynamic inswing and outswing, for the LRVs on curves of radius from 25 m to 200 m in 5 m increments and 210 m to 1,000 m in 10 m increments.
 - a. Provide the static inswing and outswing when the LRV is at No Motion and the dynamic inswing and outswing when the LRV is at the maximum speed for that curve as defined in the VLW Operations & Maintenance Concept.
- D. Submit an LRV Swept Path Analysis (CDRL 04-02) that includes drawings of the complete Valley Line LRT ROW, including tangent, horizontally and vertically curved track, and special trackwork with the outer edges of the space the LRVs will sweep through shown on the alignment drawings both with the LRVs operating optimally at all loadings and with the LRVs having common suspension failures at all loadings.
1. Use the LRV Swept Path Analysis to demonstrate that there are no conflicts between any part of the LRV and the Valley Line LRT infrastructure.
 - a. Notwithstanding Clause 1.4.3.4.D.1 of this Schedule, identify in the Swept Path Analysis all locations of potential conflict between any part of the LRV and the Valley Line LRT Stage 1 emergency walkways and for all identified potential conflict locations indicate the modification to the infrastructure required to resolve the potential conflict.

1.4.4 SEATING ARRANGEMENT

- A. Provide LRVs with a minimum capacity of 270 Passengers at AW2, with a no more than 2.5:1 stand:sit ratio, based on the Passenger loadings in accordance with EN 15663, Section 5 with additional constraints as follows:
1. all wheelchair spaces used as standing areas;
 2. no additional seated capacity allowance made for oversized seats; and
 3. perch seating is counted as standing.

B. Arrange passenger seating in the LRVs as follows:

1. in accordance with the Design Guide;
2. to maximize the aisle width and accessibility for Passengers with mobility assistance devices between passenger doors and wheelchair spaces on the LRV;
3. such that there is a minimum 300 mm clear horizontal distance between the front edge of any seat and any obstacle in front of it; and
4. such that there is a minimum 550 mm clear horizontal distance between the front edges of any adjacent seats that face one another unless the seats are facing one another over a bogie, in which case the minimum clearance between the front edges of the seats is relaxed to 520 mm.

1.4.5 LRV PASSENGER DOOR ARRANGEMENT

A. Provide each side of the LRVs with a minimum of five passenger doors along the LRVs' length.

B. Submit an LRV Passenger Ingress and Egress Flow Study (CDRL 04-09) that demonstrates the following:

1. the maximum number of Passengers that can be exchanged between the LRV interior and the space that is on the Platform behind a line running parallel with, and 300 mm onto, the Platform from the Platform edge during 20 second and 45 second Platform Dwell Times;
 - a. assume, for the purposes of the flow study, that the Platform space past the 300 mm point allows free flow of Passengers for ingress to and egress from the LRV;
 - b. provide multiple flow modeling scenarios within the flow study to validate different door arrangements and different seating and aisle width arrangements; and
 - c. provide the 20 percentile, median, and 80 percentile times for the following:
 - i. flow scenarios that evaluate egress from the LRV, ingress to the LRV, and mixed ingress and egress with varying internal Passenger loads;
 - ii. flow scenarios that evaluate emergency egress from the LRV with the LRV under AW1, AW2, and AW3 loadings; and
 - iii. flow scenarios that evaluate loading the LRV from a near empty to an AW3 crush load state; and
2. the time for a Driver to move from a line 300 mm on the Platform side of the crew access door to being seated in the driver's cab and vice versa with the LRV under AW0, AW1, AW2, and AW3 loadings.

1.4.6 AVIS INTEGRATION

A. Work with the AVIS Supplier, and provide the requisite information about the LRV exterior and exterior mounted systems to the AVIS Supplier, such that the AVIS Supplier can build a description of the LRV for the AVIS equipment to accurately scan the LRV as it passes through the AVIS building at the Gerry Wright OMF Part B.

- B. Provide an RFID tag on the LRV, in a location determined by Project Co and the AVIS Supplier, such that the RFID tag is readable by the AVIS equipment as the LRV passes through the AVIS building at the Gerry Wright OMF Part B.

1.5 PROPULSION AND BRAKING PERFORMANCE

1.5.1 GENERAL

- A. Design the LRVs' propulsion system to respond correctly, smoothly, predictably, and safely to all trainline commands under all conditions.
- B. Design the propulsion system of the LRVs to meet the acceleration, braking, load compensation, and wheel spin and slide requirement defined in Section 4 [*Propulsion*].
 - 1. Design the LRVs' propulsion system to automatically determine the wheel diameter of each wheel on the LRV.
- C. Design the LRVs to coordinate its propulsion and braking effort to eliminate LRV rollback in excess of that specified at the PHA.
- D. Design the LRVs' driving command to be inhibited by at least the following:
 - 1. emergency brake and emergency stop applications;
 - 2. mandatory brake;
 - 3. service brake and parking brake applications;
 - 4. open or unlocked passenger doors;
 - 5. operation of the pantograph lowering device;
 - 6. deployment, stowage, electrical isolation, and uncoupling of the coupler until the action is complete;
 - 7. failure of disc brakes to release within an LRV Supplier-defined timeframe after the application of propulsion;
 - 8. failure and error states of the LRV's propulsion and braking systems that would inhibit continued safe operation of the LRV. Include all such states in the PHA;
 - 9. the absence of a "Cab Active" driver's cab; and
 - 10. direction out-of-correspondence on an LRV-by-LRV basis, in accordance with Section 4.5.7.9 [*Direction Change and Motor Correspondence*].
- E. Submit an LRV Safe Braking Distance (CDRL 04-10) document that includes the following:
 - 1. the LRV's guaranteed emergency brake rate; and
 - 2. an analysis of stopping distance on dry tangential track based on IEEE 1698 or EN 13452 at speeds from 5 km/h to 80 km/h in 5 km/h steps at AW2 and AW3 for the following:
 - a. minimum brake rate;

- b. half maximum service brake rate;
- c. full-service brake rate;
- d. mandatory brake rate;
- e. emergency brake rate;
- f. emergency stop brake rate; and
- g. track brake only braking.

1.5.2 LRV WASH SPEED

- A. Design the LRVs to have a restricted speed mode to be used when an LRV is operated through the LRV wash.
- B. Design the LRVs to enter LRV wash restricted speed mode when the LRV is at No Motion and the “LRV Wash” button is pressed on the driver’s console of the active driver’s cab.
- C. Determine the maximum LRV wash speed during the PHA.
 - 1. Provide a means for the LRV wash restricted speed to be adjusted through a PTU to any value from 0.5 km/h to the maximum speed determined by the PHA.

1.5.3 DUTY CYCLES

- A. Design the LRVs to sustain continuous operation within the Valley Line LRT without exceeding the continuous rating of any of its onboard equipment or systems.
 - 1. Continuous operation is defined as the LRV sustaining the following operational loadings:
 - a. a base AW2 load increasing to AW3 loads for two hours during morning and evening peaks and special events.
 - b. a Dwell Time of 20 seconds at each stop;
 - c. a 30 second layover at each end of the line;
 - d. acceleration and braking at maximum service rates; and
 - e. operation at any speed up to maximum track speed in accordance with the VLW Operations & Maintenance Concept.
- B. Submit a Duty Cycle Report (CDRL 04-11) that includes the results of and a narrative describing the results of computer simulations of the following duty cycles:
 - 1. Duty Cycle 1 – Round Trip Performance:
 - a. this duty cycle simulation shall demonstrate the round-trip performance for a one-LRV and two-LRV Train over the Valley Line LRT;
 - b. simulate the Trains running a round-trip of the Valley Line LRT with the following:
 - i. new wheels;

- ii. AW3 loading;
 - iii. a 20 second Dwell Time at each intermediate Stop and Station;
 - iv. a 90 second layover at each terminus;
 - v. the Train requesting maximum acceleration and full-service braking rates; and
 - vi. the Train running at maximum allowable speeds for the alignment in accordance with the VLW Operations & Maintenance Concept;
2. Duty Cycle 2 – Towing:
- a. this duty cycle simulation shall demonstrate the round-trip performance of one AW0 LRV towing another AW0 LRV through the Valley Line LRT and stopping at all Stops and Stations throughout the Valley Line LRT with speed limited to that at which the LRV Train can safely stop without overshooting the Platform;
3. provide the following information in the simulation results and narratives for each of the duty cycles in Section 1.5.3 [*Duty Cycles*]:
- a. LRV travel distance;
 - b. end-to-end round trip time;
 - c. total Dwell Time;
 - d. average speed with and without Dwell Time;
 - e. total energy consumption;
 - i. assume for the purpose of total energy consumption that there is no regenerated energy available for acceleration and all braking energy is rheostatically dissipated;
 - f. current at the pantograph and traction motors;
 - g. thermal analysis for the following:
 - i. inverter and brake chopper;
 - ii. traction motors;
 - iii. braking discs;
 - iv. braking resistors; and
 - v. pantograph carbons; and
 - h. minimum adhesion demand to meet the requirements of Section 1.5.3B.1 [*Duty Cycle 1 – Round Trip Performance*] and Section 1.5.3B.2 [*Duty Cycle 2 – Towing*]; and
4. provide the following information in tables and figures as appropriate:
- a. tractive effort curves for all applicable voltages in accordance with IEC 62313;

- b. LRV speed as a function of time in braking and acceleration;
- c. LRV speed as a function of distance in braking and acceleration; and
- d. the overall propulsion system efficiency as a function of speed from 20% to 100% of tractive effort. The inverter, motor, and gear drive unit shall be included in the propulsion system efficiency calculation.

1.5.4 TOWING AND RECOVERY

- A. Given an assumed point of failure such that the worst-case load is imposed, design the LRV such that an AW3 loaded Train shall perform the following, without damage to equipment or reduction in equipment life:
 - 1. push or tow another AW3 loaded Train of equal or shorter length from the point of equipment failure to the Stop and Station past the next Stop and Station unloading Passengers at this Stop and Station then continuing to the end the Valley Line LRT with both Trains loaded at AW0.

1.5.5 WHEEL-RAIL INTERFACE, STABILITY, AND CURVING PERFORMANCE

- A. Complete all studies required to validate that the LRVs using the Valley Line LRT wheel profile and running on the Valley Line LRT rail head profile shall maintain wheel-rail interface compatibility across all running rails, check rails, guard rails, and special trackwork such that wheel and rail wear, rolling contact fatigue, and derailment risk are minimized.
- B. Confirm, through analysis of the proposed plans and profiles of the mainline, Gerry Wright OMF and Lewis Farms Storage Facility tracks, that the LRV shall negotiate all proposed horizontal and vertical curves, vertical grades, and all special trackwork.
 - 1. If IRWs are used on the LRVs, validate gains that may be achieved by using a different wheel profile on IRWs than on the LRV's conventional axle wheels.
- C. Assess the wheel-rail profile for wheels of different wear levels using wheel-rail contact analysis and vehicle dynamic simulations with rail-industry recognized software such as NUCARS, ADAMS/Rail, or VAMPIRE.
 - 1. Submit a Validated LRV Dynamic Simulation Model (CDRL 04-12) that shall be used to analyze the LRV during the derailment, curving, and lateral stability studies in Section 1.5.5 [*Wheel-Rail Interface, Stability, and Curving Performance*].
- D. Submit a Wheel Rail Interface (CDRL 04-13) document that includes the following:
 - 1. commentary on the profiles' ability to steer the LRV and resist derailment;
 - 2. if the LRVs includes IRWs, the specific concerns and performance parameters for IRWs and their unique behaviour and wear characteristics; and
 - 3. results of the contact analysis required in Section 1.5.5E [*Wheel-Rail Interface, Stability, and Curving Performance*] and the dynamic simulations required in Section 1.5.5F [*Wheel-Rail Interface, Stability, and Curving Performance*].
- E. Perform a contact analysis of the wheel-rail interface that includes the following:

1. identification of the points that are in contact between the wheel and rail for a given lateral displacement of the wheelset;
2. analysis, using applicable tools and software, of the contact position, rolling radius difference, contact angle, and wheel lateral-vertical loading ratio;
3. analysis of wheel lateral-vertical loading ratio is to be used as a guide for the protection against derailment offered by the proposed wheel profile when running in the proposed alignment and special trackwork.

F. Dynamic Simulations

1. Conduct dynamic simulations of the wheel-rail interface using industry-recognized software such as NUCARS, ADAMS/Rail, or VAMPIRE that include derailment, curving, and lateral stability.
2. Wear Study
 - a. Assess the likely wear of both the wheel and rail on tangential track in their new, medium worn, and maximum wear conditions and combinations thereof.
3. Derailment Study
 - a. Develop dynamic simulation case studies to assess the LRVs' derailment risk throughout the Valley Line LRT at speeds up to 120% of the operational track speed.
 - b. Simulate wheel and rail profiles in their new and worn conditions with the LRV model in tare and AW3 loading conditions at speeds up to 120% of the LRV's rated maximum speed.
 - c. Provide the amount of flange climb experienced and the L/V ratios in all cases.
4. Curving Study
 - a. Perform the following for all curves on the Valley Line LRT:
 - i. assess the likely wear of both the wheel and rail in their new, medium worn, and maximum wear conditions and combinations thereof;
 - ii. evaluate contact stress, angle of attack and creepage and creep force in the lateral and longitudinal directions; and
 - iii. confirm the wheel-rail profile will be stable in terms of wear rate and provide good derailment protection in all conditions from new to maximum wear.
5. Lateral Stability Study
 - a. Demonstrate lateral stability of the LRVs at all line speeds up to 120% of operational track speed.
 - b. Complete a lateral stability study to demonstrate the ride comfort due to lateral acceleration throughout the Valley Line LRT.

- G. Submit the Wheel Rail Interface – Wheel Maintenance Guidelines (CDRL 04-14) that, as a minimum, specify the following:

1. the limits of wheel flange height, angle, and thickness;
2. the wheel back-to-back measurement and tolerances;
3. the maximum size of all defect types including wheel flats, rolling contact fatigue, tread rollover, toe-radius build up, and hollow wear;
4. the minimum actions to be taken, and the timeframes in which they are to be taken, when a given level of wheel wear or wheel defect is identified;
5. the minimum acceptable surface finish on newly turned wheels that is achievable by the Danobat DLR-80091; and
6. the inspection frequencies for wheel geometry and defects.

1.6 ACCESSIBILITY REQUIREMENTS

1.6.1 DOORWAYS AND AISLEWAYS

- A. Design all passenger doorways that can access a wheelchair space through a wheelchair-accessible path on the LRVs to be wheelchair accessible with minimum clear openings as specified in Section 2.3.3 [*Wheelchair-Compatible Access Doors*].
 1. Provide wheelchair-accessible passenger doorways with decals that indicates that a wheelchair space is accessible from that door.
 2. Place the decals in such a way that they are visible to a person sitting in a wheelchair on the Platform with the LRV's passenger doors in the opened and closed positions.
- B. Design the LRVs such that every designated wheelchair-accessible passenger door on the LRVs provides unimpeded access for a Reference Wheelchair to a designated wheelchair space, as specified in Section 1.6.6 [*Wheelchair Spaces*].
 1. Design the aiseways and spaces between seats along the path that connects passenger doorways to wheelchair spaces be at least 813 mm wide at any point, and to not have any step or slope exceeding the requirements described in Section 2.1.1.5 [*Floor Structure*].
- C. Design the LRVs' door thresholds to provide level boarding at the Platforms such that when the LRVs are stopped at a Platform, the horizontal gap between the LRVs and the Platform edge is no greater than 75 mm and the door threshold is within ± 38 mm vertically of the Platform edge on the Valley Line LRT Platforms at AW2 and within +38/-50 mm of the Platform edge at AW3.
 1. Submit a Platform Interface Study (CDRL 04-15) that includes drawings and analysis demonstrating that the LRVs meets the level boarding requirements of Section 1.6.1 [*Doorways and Aisleways*] under all loadings and the construction, wear, and maintenance tolerances that have been considered in the Valley Line Stage 1 Platform Gap Interface Control Document.

1.6.2 PRIORITY SEATING SIGNS

- A. Provide the LRVs with signage that indicates that certain seats are priority seats for persons with mobility issues, and that other Passengers should make such seats available to those who wish to use them.

- B. Provide signage for designated wheelchair spaces and mobility aid seating locations that indicate the location and advise other Passengers of the need to permit wheelchair and mobility aid users to occupy them.
- C. Use signage that matches the signage currently used by the City within its fleets for designating priority seating.

1.6.3 HANDHOLDS, STANCHIONS, AND STRAP HANGERS

- A. Provide handholds, stanchions, and strap hangers that are in accordance with the Design Guide.
- B. Provide handholds, stanchions, and strap hangers throughout the LRVs such that a point to hold onto is accessible to a Passenger standing anywhere in the LRVs passenger areas.
- C. Provide vertical handholds on both sides of each passenger doorway.
- D. Provide strap hangers on all horizontal stanchions such that the strap and horizontal stanchion grab point is accessible to all Passengers.
- E. Provide handholds, stanchions, and strap hangers that are a contrasting colour to the surrounding environment and have a durable slip-resistant surface that is easily sanitized.
- F. Extend vertical handholds from a point not more than 700 mm above the floor to a point not less than 1,400 mm above the floor.
- G. Place stanchions such that they do not obstruct Passenger flow within the LRV or obscure the view of the CCTV cameras.
- H. Provide handholds on the LRV seats that are as follows:
 - 1. fitted to the top of the seat backrest;
 - 2. colored to match the stanchions and strap hangers;
 - 3. have rounded edges and corners, including those in its mountings with the seat;
 - 4. provide a minimum of 45 mm clearance on all sides, including any gap between the handhold and the seat to which it is attached; and
 - 5. have a cross section, excluding any mountings, between 20 mm and 40 mm in thickness.
- I. Do not provide handholds on any LRV seat that is as follows:
 - 1. where the back of the seat touches a partition;
 - 2. where the back of the seat touches the back of another seat fitted with a handhold and facing the opposite direction; or
 - 3. that is situated within 50 mm from a handhold or partition measured from the top of the back of that seat.
- J. Ensure horizontal, non-seat handholds are as follows:
 - 1. have a circular cross section with a diameter of between 30 mm and 40 mm; and

2. have a minimum 45 mm clearance between any part of the handhold and any other part, excluding the mountings of the handhold to the LRV.

1.6.4 FLOORS, STEPS, AND THRESHOLDS

- A. Use slip-resistant surface on all floors throughout the LRVs.
- B. Provide a band of yellow colour not less than 50 mm and not more than 100 mm wide, in the same colour as that in the Stage 1 LRV, that runs the full width of the edge of any vertical step change in floor height that contrasts with the adjacent floor.

1.6.5 REFERENCE WHEELCHAIR SPACE AND MOVEMENT REQUIREMENTS

- A. Refer to the space requirements for a Reference Wheelchair shown in *Figure 2: Wheelchair Movement Requirements*. Note that the 1220, 760, 725, and 50 dimensions are given in millimetres.

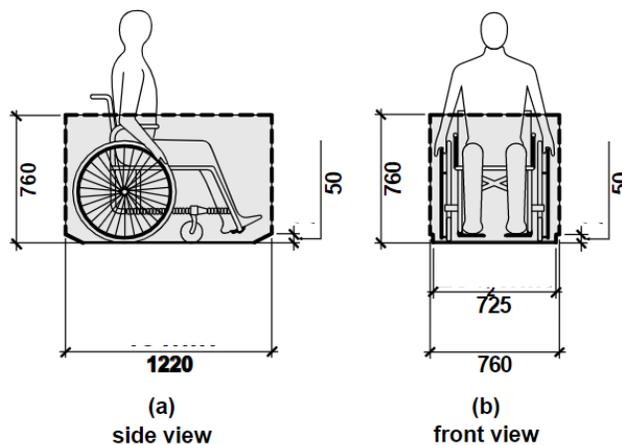


Figure 2: Wheelchair Movement Requirements

1. The minimum diameter of the turning circle of a Reference Wheelchair within the LRVs shall be 1,500 mm.

1.6.6 WHEELCHAIR SPACES

- A. Provide at least two designated wheelchair spaces on the LRVs such that every wheelchair space has access to at least one designated wheelchair-accessible passenger door per side of the LRV.
- B. Design wheelchair spaces in accordance with the Design Guide.
- C. At each wheelchair space, provide the following:
 1. a minimum clear level floor space of 1,300 mm by 760 mm, with the wheelchair facing in the longitudinal direction of the LRV. These spaces shall not protrude into any Passenger movement corridors, including those for entering, exiting, or movements within the LRVs;
 2. transverse panels behind wheelchair spaces in accordance with the Design Guide;
 3. space adjacent to, or partly adjacent to and partly within, the wheelchair space to allow a Reference Wheelchair to make a 180° turn uninterrupted;

4. a control device consistent with Section 2.3.5 [*Passenger Door Controls*] to allow Passengers to request the door operation mechanism to extend the door closing time;
 - a. the door closing time extension shall be determined by a human factors engineering specialist;
 5. a push button-activated emergency intercom device, in accordance with Section 11.2 [*Passenger Emergency Devices*], that is placed to be within reach of a person using a Reference Wheelchair, and is operable by the palm of the hand, with a force of no more than 30 N being necessary to activate the device;
 6. perch seating for use by standing Passengers when the wheelchair space is not occupied by a wheelchair; and
 7. signage, consistent with the Stage 1 LRV, that identifies the wheelchair space.
- D. If the wheelchair space includes a horizontal handhold, ensure the handhold is as follows:
1. fitted onto and parallel with the side of the LRV;
 2. mounted at a height of not less than 650 mm and not more than 1,000 mm, as measured vertically from the floor; and
 3. does not protrude into the minimum clear floor space requirements specified in Section 1.6.6 [*Wheelchair Spaces*].
- E. Design wheelchair spaces for storage of walking aids, strollers, and bicycles when not in use by a wheelchair user.

1.6.7 PUBLIC INFORMATION SYSTEM

- A. Equip the LRVs with an interior passenger information system, further described in Section 11 [*Passenger Information Systems*], that shall permit Drivers and recorded or digitized human speech messages to announce Stops and Stations and provide Passengers with information.

1.6.8 EMERGENCY EQUIPMENT SIGNAGE

- A. In addition to words and images, provide American Grade 2 Braille on all emergency system signage that is designed for the use of Passengers.

1.6.9 ACCESSIBILITY DESIGN REPORT

- A. Submit an Accessibility Design Report (CDRL 04-16) that has drawings demonstrating, and approval from a human factors engineering specialist, of the following:
1. that sufficient handholds and stanchions will exist within the LRVs to permit safe boarding, onboard circulation, seating and standing assistance, and alighting by mobility impaired Passengers;
 2. that a Passenger can reach a handhold or stanchion from any standing location within the passenger area of the LRVs;
 3. that handhold and stanchion placement does not interfere with wheelchair and mobility aid access and circulation;

4. that wheelchair spaces are suitably configured for wheelchair users and there is a wheelchair-accessible path between every wheelchair space and at least one designated accessible passenger door per side of the LRVs; and
 5. the accessibility of passenger information systems and passenger emergency system to all passengers; and
 6. Platform interface drawings demonstrating the accessibility at the door threshold for mobility devices.
- B. Include in the Accessibility Design Report the mitigations and processes to be implemented to allow all Passengers to enter and alight the LRVs in the event a single designated accessible door is out-of-order.

1.7 LRV MASS

1.7.1 PASSENGER OCCUPANCY AND MASS CALCULATION

- A. Complete all calculations of the combined LRV and Passenger mass and Passenger occupancy in accordance with EN 15663.

1.7.2 LRV MASS CONTROL

- A. Implement and enforce a mass management program for the LRVs, and LRV systems, throughout the LRV design and manufacturing processes that seeks to limit LRV mass.
1. Structural margins and performance margins including safety performance shall not be degraded if the as-built weight exceeds the estimated weights used in design.
- B. Provide LRVs that have a maximum mass of less than 64,577 kg at AW0 and less than 92,771 kg at AW3 with a centre of gravity that is located no more than 1.8 m above TOR for any loading from AW0 to AW3.
1. Confirm the AW0 mass by measurement at the point of shipment for each LRV.
- C. Provide LRVs where the AW0 mass of the as-built LRV divided by the number of Passengers the as-built LRV will hold at AW2 is less than 240 kg/Passenger.
- D. Design the maximum axle load of the LRVs at AW3, including sand and fluids, to not exceed 12,000 kg.
1. Design bogies of a similar type to support the same portion of the total LRV mass for all loading conditions from AW0 to AW3.
- E. Arrange all LRV systems on the LRVs so that their mass is distributed to maximize adhesion and minimize the propensity to derail.
- F. Provide the City with at least two weeks of advance notice of all LRV weighing activities.

1.7.3 LRV MASS CONTROL DOCUMENTATION

- A. Submit the Mass Management Program (CDRL 04-17) that describes the following:
1. how the LRV Supplier's mass management program actively minimizes the LRV mass throughout the design and manufacturing process;

2. the points in time, throughout the design and manufacturing process, that the LRVs, and LRV systems, are weighed; and
 3. all weight documentation that records the mass of the LRVs and LRV systems.
- B. Beginning 90 days after NTP and every 90 days thereafter until the weighing of the first LRV, include a Total LRV Mass Report in the Progress Report, defined in Section 1.4 [*Progress Reports*] of Schedule 3 [*Design and Manufacturing Protocols*], that includes the following:
1. estimations of the total LRV mass, LRV AW0 mass divided by number of Passengers at AW2, and axle loading of the individual axles;
 2. the most recent masses for the LRV without bogies, each bogie, and the complete LRV;
 3. calculation of the center of gravity of the LRV;
 4. a list of masses for every system on the LRV and an indication of percentage of the estimated mass that the system contributes to the total estimated mass and as actual scale masses become available, replace the estimated masses in the LRV Total Mass Report with the measured masses.
- C. Submit an LRV Mass Ticket (CDRL 04-18) for each LRV that states the as measured mass of that entire LRV and the as measured mass being carried by each axle.
1. Include the LRV Mass Ticket for each LRV in the LRV's Vehicle History Book.
 2. Record masses of components added by the LRV Supplier after shipment, but before Conditional Acceptance of the LRVs, on the LRV's acceptance form, and inserted in the LRV's Vehicle History Book to establish and state the final mass of that LRV.

1.8 LRV OPERATING MODES AND START-UP TIMES

1.8.1 LRV OPERATING MODES

- A. Design the LRVs to have the following modes and functionality:
1. "Battery Isolation" – in this mode, the LRVs is completely dead with no low voltage or high voltage power to any equipment;
 2. "Auxiliary Off" – in this mode, only data communication is enabled through the Wi-Fi O&M Data Radio System, allowing two-way information transfer between all LRV systems and the wayside, transfer of MDS information and databases, and remote diagnostics between the vehicle and wayside systems;
 3. "Auxiliary On" – when there is no active cab in the Train, all LRVs in the Train enter "Auxiliary On" mode;
 - a. design the LRVs to remain in this mode until either a driver's cab in the Train becomes active again or a set time period, configurable by a maintainer using a PTU to anything between instantly expires and never expires, has elapsed since a driver's cab was last active;

- b. design the Train to transition to “Auxiliary Off” mode should a driver’s cab in the Train not become active before the time period in Section 1.8.1A.3.a has elapsed;
 - c. design the LRVs such that if OCS voltage is present, and the LRV is in “Auxiliary On” mode, and the exterior temperature is less than 5°C, every system with an electronic controller on the LRV shall be enabled;
 - d. design the LRVs such that propulsion functionality is disabled while the Train is in “Auxiliary On” mode;
4. “Cab Active” – this mode designates this driver’s cab as the active cab and at the same time prevents other driver’s cabs in the train from being put into “Cab Active” mode. All systems on the LRVs, including propulsion, are enabled; this is the normal operating mode for the LRVs but the following modes shall also trigger an active cab condition:
- a. “Emergency Drive” – this mode shall allow a Driver to move an LRV short distances under its own power under fault conditions that would preclude normal LRV operation; and
 - b. “Tractive Effort Boost” – this mode shall provide additional tractive effort for towing disabled LRVs and Trains;
 - c. “Coupling” – this mode speed limits the LRVs during coupling operations in accordance with Section 6 [*Couplers*];
 - d. “Wash Rack” – this mode speed limits the LRVs, to a PHA determined speed, during cleaning operations in the Gerry Wright OMF wash rack facility;
5. “Update” – remote diagnostic of, and Software and firmware updates to, LRVs and Train systems is allowed in “Update” mode;
- a. design the LRVs such that “Update” mode is entered through activation of a sealed switch or other cut out that shall put the entire Train into the “Update” mode;
 - i. design the LRVs such that all LRV systems are ready to receive Software updates but propulsion functionality is disabled;
 - ii. design the LRVs such that Software updates to LRV systems and changes to LRV system settings are prohibited while a driver’s cab is “Cab Active” in a Train; and
 - iii. provided that data gathering shall not affect system safety, design the LRVs to allow data gathering from LRV systems of LRVs with “Active Cab” driver’s cabs; and
6. “Trailing” – this mode places the LRVs in an “Auxiliary On” state, with the LRV’s propulsion system cut out.

1.8.2 STATE TRANSITIONS

A. Design the LRVs to be moveable within the following times from the following states:

- 1. If the Train was completely powered down, design the LRVs to be moveable from a powered down state within two minutes from the time when an LRV is commanded to “Auxiliary On”.

2. If the Train was already in an “Auxiliary On” state, design the LRV to be moveable from “Auxiliary On” mode within 20 seconds from the time the cab transitions to active.

1.9 NOISE, VIBRATION, AND RIDE QUALITY

1.9.1 NOISE

1.9.1.1 General

- A. Design the LRVs such that the average noise produced during testing to ISO 3081 and ISO 3095 does not exceed the specified interior and wayside noise limits specified in Section 1.9.1.2 [*Interior Noise Limits*] and Section 1.9.1.3 [*Wayside Noise Limits*], respectively.
- B. Incorporate enclosures, baffles, seals, acoustical absorption, body panels with adequate sound damping characteristics, vibration isolators, and other appropriate methods into the LRVs to adequately attenuate the physical noise, electrical noise, electrodynamic noise, air movement noise, and vibrations generated by the wheel-rail interface, motors, HVAC systems, and other LRV-mounted equipment such that the limitations on vibration and interior and wayside noise are not exceeded.
- C. Install LRV-mounted equipment so it does not rattle or resonate when the LRVs are travelling anywhere within the Valley Line LRT at any speed up to 10% above the maximum operating speed in that location.
- D. Design the LRVs so that the noise within the LRVs shall not increase over the life of the LRVs based on LRV Supplier-recommended maintenance processes that have been accepted by the City.

1.9.1.2 Interior Noise Limits

- A. Use a method of measurement for internal noise levels within the driver’s cab and passenger area that complies with the procedure described within ISO 3381.
- B. Design the LRVs such that internal noise levels within the driver’s cab do not exceed the values given for “Tramcar (low floor)” in Table 4.3 of VDV Recommendation 154 “Noise Caused by Urban Rail Vehicles 10/2011” and as stated in *Table 1: Requirements for Noise Levels within the Driver’s Cab*.

Table 1: Requirements for Noise Levels within the Driver’s Cab

Operating Condition of Vehicle and HVAC System	$L_{pAeq,T}$ where $T \geq 10$ seconds
LRV at standstill, ready for operation and HVAC in ventilation or air conditioning mode at: <ul style="list-style-type: none"> • full-load operation • partial-load operation 	63 dBA 56 dBA
LRV operating at 60 km/h and HVAC in cooling mode at part-load operation	65 dBA

- C. Design the LRVs such that internal noise levels within the passenger area does not exceed the values given for “Tramcar (low floor)” in Table 4.2 of VDV Recommendation 154 “Noise Caused by Urban Rail Vehicles 10/2011” and as stated in *Table 2: Requirements for Noise Levels within the Passenger Area*.
 1. Provide the methodology for measurement of the interior noise in the noise test procedures in accordance with Schedule 3, Section 8.2 [*Test Plans, Procedures, and Reports*].

Table 2: Requirements for Noise Levels within the Passenger Area

Operating Condition of Vehicle and HVAC System	$L_{pAeq,T}$ where $T \geq 10$ seconds
LRV at standstill, ready for operation, and HVAC at maximum heating, as the mean value of all measurement points equally spaced along the LRV	62 dBA
LRV at standstill, ready for operation, and HVAC in cooling mode at the following operation: <ul style="list-style-type: none"> • full-load operation • partial-load operation 	65 dBA 57 dBA
LRV operating at 60 km/h, HVAC in cooling mode at part-load operation: <ul style="list-style-type: none"> (i) at transition, door and running gear areas (ii) at areas other than (i) for areas directly adjacent to (i), that are sufficiently far away and minimally influence the acoustic results, such as the area between two doors or between a door and a transition 	(i) 75 dBA (ii) 68 dBA

- D. Design the LRVs such that noise generated by the interior LRV PA system, measured 305 mm from any speaker with the PA system energized and operating in a standby condition, and with any electrical system energized, does not exceed 40 dBA.

1.9.1.3 Wayside Noise Limits

- A. Measure exterior noise levels of one- and two-car Trains in compliance with ISO 3095 at a location on the Valley Line LRT suitable for carrying out the noise testing of one- and two-car Trains as prescribed by ISO 3095.
1. Where there are small deviations in rail roughness the method described in ISO 3095, Annex C can be used to compensate for the small deviations.
- B. Design the LRVs so that average noise levels emanating from the LRVs does not exceed the maximum noise levels in Table 4.1 of the VDV Recommendation 154 "Noise Caused by Urban Rail Vehicles 10/2011", using the value for Tramcars.
- C. Measure at constant speeds and accelerating over the point at which the LRVs draws maximum power and the worst level obtained under maximum electrodynamic braking and maximum friction braking from maximum speed.

1.9.2 VIBRATION AND IMPACT LOADS

- A. Design all LRV equipment to operate without damage or degradation of performance when subjected to vibration and impacts encountered during normal service.
- B. Subject all LRV-mounted equipment to shock and vibration testing described in IEC 61373.
1. Perform this testing on the equipment and its associated mounting hardware assembled into its mounting configuration for the LRVs.

1.9.3 RIDE QUALITY

- A. Evaluate ride quality according to EN 12299 with a continuous comfort index no greater than 0.30 m/s² in all directions when tested with new wheels on representative track.
 - 1. The chosen representative track shall include curves and sections where the LRVs are run at the maximum operational speed.
- B. Evaluate ride quality for one and two-car Trains at all load conditions from AW0 to AW3, and all normal acceleration, deceleration, and speed conditions in accordance with the VLW Operations & Maintenance Concept.

1.10 VISUAL IDENTITY, BRANDING, DECALS, AND IDENTIFICATION

1.10.1 VISUAL IDENTITY AND BRANDING

- A. Design the LRVs' livery to meet the City's branding and visual identity requirements, and be reasonably consistent with the livery of the Stage 1 LRVs, as presented in the Design Guide, such that they are clearly identifiable as part of the Valley Line brand identity.
- B. Submit the Exterior Design and Finishing Scheme (CDRL 04-19) document that includes the following:
 - 1. detailed drawings and renderings showing the complete exterior of the LRVs from all angles;
 - 2. data sheets for the materials and products being used and the methods of their application; and
 - 3. tinting level and colour on the cab front, side, and passenger area windows:
 - a. design the driver's cab side and passenger area windows with the same tint level and colour to maintain visual consistency along the length of the vehicle.
- C. Apply the LRV livery design as per the Accepted Exterior Design and Finishing Scheme to the LRVs using the paint system and anti-graffiti coating system in the Accepted Exterior Design and Finishing Scheme.
- D. Apply the complete LRV livery design and all decals that relate to equipment safety to the LRVs prior to shipping it to Edmonton.
 - 1. Apply all remaining LRV decals prior to Conditional Acceptance of the LRVs.

1.10.2 DECALS

- A. Provide decals throughout the LRVs to provide Passengers, Drivers, and maintainers with pertinent information regarding LRV operation and safety.
 - 1. Where the system or equipment is the same, and space permits, base the decal design on the City's current design for the Stage 1 LRVs.
 - 2. Where space doesn't permit, or a new decal is required for the LRVs, use decals with a similar look and feel to the City's current decals for the Stage 1 LRVs by matching their size, shape, font, colour, proportion, and image style.

1.10.3 IDENTIFICATION

- A. Sequentially number LRVs using four-digit numbers, starting from 2027 from the first production LRV to the last.
- B. Provide LRV numbers on the exterior of the LRVs as follows:
 - 1. viewable from the side of the LRVs:
 - a. provide and install LRV identification numbering near the roofline as follows:
 - i. on each end of the LRVs; and
 - ii. at the midpoint of the LRVs; and
 - b. size LRV identification numbering such that it is clearly legible from the side of the LRVs by a person at track level within 10 m of the decal; and
 - 2. viewable from the ends of the LRVs:
 - a. provide and install LRV identification numbering centered under the LRV's windshield that is clearly legible from the front of the LRVs by a person at track level within 10 m of the decal.
- C. Provide and install LRV numbers and body articulation section identification letters (e.g., A, B) in the interior of the LRVs as follows:
 - 1. above the left-side driver's cab window in each driver's cab end, design the LRV identification designator in the driver's cab such that it is clearly legible by a Driver looking at it while seated in the driver's seat; and
 - 2. in the passenger area on the upper part of each driver's cab bulkhead and on the upper part of each articulation bulkhead:
 - a. design LRV identification designators within the passenger area to be clearly legible from within the passenger area at the midpoint between any two adjacent LRV identification numbering placement locations; and
 - b. design and place the LRV identification designator within the passenger area such that every interior camera has a clear view of at least one LRV identification designator regardless of the LRV's loading.

SECTION 2: CAR STRUCTURE

2.1 CARBODY

2.1.1 STRUCTURAL DESIGN

2.1.1.1 General

A. Design the structure of the carbody of the LRVs to be as follows:

1. fully compliant with EN 12663-1, Category P-V;
2. withstand operation on the Valley Line LRT without fatigue failure over the Design Service Life of the LRVs;
3. based on supporting an AW4 loading over the Design Service Life of the LRVs; and
4. have sufficient jacking points, with their positions clearly identified on the outside of the LRVs, accessible for use by maintenance and emergency services in accordance with Section 2.1.7 [*Lifting and Jacking Provisions*].

2.1.1.2 Equipment Enclosures

A. Provide enclosures with a positive locking mechanism that prevents enclosure covers from unlatching and opening when the LRVs are exposed to the shock and vibration occurring in Revenue Service.

1. Equip exterior equipment enclosures with a secondary, passive locking mechanism that shall restrain the covers to within the VDE and higher than 90 mm above TOR if the primary mechanism is left unlocked.

B. Electrically bond all roof-mounted equipment enclosures and all roof-mounted ducting to the carbody using grounding straps or direct bonding.

C. Design all roof-mounted equipment, enclosures, ducting, and wireways to support the weight maintainer walking on them without incurring inelastic deformation or other damage.

D. Design all ducting, wireways, and cable runs, to allow access for inspection and maintenance up to and including their entire length wherever possible.

E. Secure all under-floor equipment mounting bolts with self-locking nuts and design equipment mounts in the underframe to retain equipment within the VDE and 90 mm above TOR after loss of any single point of mounting support.

2.1.1.3 Articulations

A. Design the LRV's articulations to be in accordance with EN 16286-1 and the Design Guide.

2.1.1.4 Underframe

A. Design the underframe assembly to transfer the loads generated at the anti-climber, coupler, and bogie interface to the carbody frame and incorporate the crash energy management principles described in Section 2.1.3 [*Crash Energy Management*].

B. Apply a corrosion-resistant coating to the entire exposed underframe area including the LRVs' skirts.

- C. At each end of the LRVs provide points on the underframe for attaching two separate tow chains that are designed to withstand, without damage, the shock loading that occurs when the slack in the tow chains is taken up after coupler failure during the towing of the connected Trains.

2.1.1.5 Floor Structure

- A. Design the floor structure to not have any slope, as measured when the LRVs are on a straight and level track, that exceeds the following:
 - 1. 5%; or
 - 2. 8%, provided the slope does not exceed 2,000 mm in length on any wheelchair-accessible path.
- B. Provide a subfloor that is highly resistant to water damage, and water-based deterioration, caused by water ingress.

2.1.1.6 Roof

- A. Design the roof skin and roof structure such that the heaviest roof mountable equipment, loaded on a single equipment loading pad, can sit anywhere on the roof, with a safety factor in accordance with Section 2.1.1.6A.1, without permanent deformation of the roof skin or roof structure.
 - 1. The safety factor applied to the roof structure shall be 1.5 in accordance with EN 12663-1, which can be relaxed to 1.3 provided the LRV Supplier will be verifying the design load cases by test and correlation between the test and calculation is established.
- B. Provide a slip-resistant, electrically insulated surface for the roof.
- C. Provide a shroud on the roofline of the LRVs that meets the following requirements:
 - 1. is integrated into the carbody design in accordance with the Design Guide;
 - 2. hides all roof-mounted equipment, with the exception of the LRV's pantograph, from the view of a person standing on a Platform; and
 - 3. provides access to roof mounted equipment for maintenance activities.
- D. Provide a suitable number of engineered fall arrest rated tie-in points on the LRV's roof to allow maintainers with fall protection equipment to tie into, and safely access any location, on the LRV's roof.

2.1.1.7 Under-Run Protection

- A. Design the under-run protection to be compliant with the SUI requirements described in the Design Guide.
- B. Provide continuous skirting around the perimeter of the LRVs that is designed to deflect persons, animals, and objects that may come into contact with the LRVs and stop them from passing beneath.

2.1.1.8 Anti-Climber

- A. Mount anti-climbers on each end of the LRVs that provide the following functionality:
 - 1. prevent over riding and telescoping in LRV-on-LRV collisions between two LRVs and between one LRV and one Stage 1 LRV;

2. have a cover that makes the anti-climbers not visible to the public and prevents injury to pedestrians in LRV-to-pedestrian collisions but shall not interfere with the locking action of the anti-climbers in LRV-to-LRV collisions; and
 3. interlock with end-of-track devices to bring the LRV to a controlled stop.
- B. Submit an Anti-Climber Collision Analysis (CDRL 04-20) that summarizes the parameters, processes, and results of the analysis used to demonstrate compliance with this Section 2.1.1.8 [*Anti-Climber*] and includes analyses of the following anti-climber interactions at different combinations of weight loadings, wheel wear, and the worst-case relative positions on horizontal and vertical curves:
1. LRV to LRV;
 2. LRV and end-of-track devices; and
 3. LRV to Stage 1 LRV.

2.1.2 BODY EXTERIOR

2.1.2.1 General

- A. Design the LRVs exterior bodywork to meet the following requirements:
1. to be in accordance with the Design Guide;
 2. to have a consistent and flowing cross-section that does not provide any accessible hand and footholds that a person could use to ride or “surf” on the exterior bodywork; and
 3. to have no gaps, sharp corners, sharp edges, or finger traps, side protrusions and visible fixings or fastenings that could pose a danger to pedestrians, cyclists, or motor vehicles.
- B. Where exterior cameras are mounted on the LRV body design their mounts and shrouding such that the cameras are integrated into the LRVs to be compliant with the SUI requirements described in the Design Guide.

2.1.2.2 Livery

- A. Paint the exterior surface of the LRVs with a livery design that is compliant with Section 1.10 [*Visual Identity, Branding, Decals, and Identification*] and meets the following requirements:
1. has a graffiti resistant topcoat that is not affected by the cleaning or removal of graffiti;
 2. is suitable for the frequent application and removal of decals, including full body wraps, without damage or deterioration of the exterior finish and other decals; and
 3. uses finishes that have a minimum Design Service Life of 15 years.

2.1.3 CRASH ENERGY MANAGEMENT

2.1.3.1 General

- A. Design the LRVs to fully comply with EN 15227 Category C-IV.

2.1.3.2 Crash Energy Management Validation Report

- A. Submit a Crash Energy Management Validation Report (CDRL 04-21) that identifies the crash energy management validation process and includes the following:

1. a narrative of the analysis, including the following:
 - a. the collision modes analyzed, including the following:
 - i. LRV-to-LRV collisions;
 - ii. LRV-to-Stage 1 LRV collisions;
 - iii. LRV to end of track buffer collisions; and
 - b. the maximum speed at which the entire crush energy will be absorbed by the energy absorbing components;
 - c. the numerical simulation parameters;
 - d. the crash data source and crash data test parameters;
 - e. finite element analysis principles and other principles applied;
 - f. the name of the simulation software and simulation parameters; and
 - g. any other relevant information;
2. a narrative demonstrating how the design of the LRV protects pedestrians and cyclists in the event of LRV-to-pedestrian and LRV-to-cyclist collisions;
3. numerical simulations;
4. empirical crash data, if available;
5. a narrative of the validation process; and
6. final results of the validated numerical simulations with the empirical crash data, if available.

2.1.4 WATER TIGHTNESS AND DRAINAGE

- A. Provide a finished interior floor that prevents water from ponding in the passenger area and promotes drainage through the door thresholds.
- B. Protect areas where water cannot be drained away with anti-corrosion measures.
- C. Design the roof to meet the following drainage requirements:
 1. slope the roof such that water drains to the sidewalls and roof drains, and does not accumulate on the roof structure;
 2. prevent cascading of water due to movement of the LRVs; and
 3. divert water run-off away from doorways and driver's cab side windows.
- D. Provide the LRV roof with a drainage system that has the following design features:
 1. discharges water run-off to ground level without splashing;
 2. is protected from blockage by foreign materials or icing;

3. is accessible for cleaning and maintenance; and
 4. if water is drained from the roof through drain tubes, has drain tubes that are insulated and will not have joints inside equipment lockers wherever the tubes are required to be routed through the interior of the LRVs.
- E. Drain condensation away from the sidewalls and side windows to prevent condensation from accumulating.
 - F. Design the floor structure and covering to prevent water and moisture ingress from the interior floor covering surface to the under-frame structure.
 - G. Submit a Water Accumulation Analysis (CDRL 04-22) that includes a narrative, calculations, and drawings that demonstrate compliance with Section 2.1.4 [*Water Tightness and Drainage*].
 - H. Verify the water tightness of the following LRV components, and any other exterior mounted component, in accordance with EN 50215:
 1. roof structure;
 2. body structure, including windows;
 3. Passenger and crew access doors;
 4. articulations;
 5. under-frame structure;
 6. bogies; and
 7. electrical and electronic equipment including wiring and connectors.

2.1.5 CORROSION PREVENTION

- A. Design and construct the LRVs using corrosion-proof and corrosion-resistant materials wherever possible and treat all materials subject to corrosion with a coating system with demonstrated use in industries where mitigation against corrosion has been implemented.
- B. Paint and finish painted surfaces on the LRVs with a paint system, fillers, and other finish coatings that are as follows:
 - a. compatible with each other, sourced from a single manufacturer, supplied by a single supplier, and readily available within Canada; and
 - b. the most robust of protective coatings in industry and offer the best abrasion, graffiti, UV, and chemical resistance;
- C. Where joining two or more dissimilar metals is unavoidable, protect the joint against electrolytic corrosion in accordance with Good Industry Practice.

2.1.6 PASSENGER WINDOWS

- A. Integrate passenger windows into the LRVs such that the LRVs are in accordance with the Design Guide.

- B. Provide passenger windows and passenger door windows with an R value of at least 1 and that are manufactured using low-e coated, laminated safety glass, tinted grey to provide 40-50% VLT.
- C. Provide all transparent surfaces within the passenger area with an optically clear, distortion-free, multi-layer, anti-vandalism film on the interior facing surfaces.
 - 1. Install the anti-vandalism film such that it can be removed and replaced without removing the transparent surface from its frame.
- D. Seal the windows in the passenger area such that drafts and water ingress is prevented.
- E. Windows in the passenger area will be non-openable

2.1.7 LIFTING AND JACKING PROVISIONS

2.1.7.1 Maintenance Provisions

- A. Include provision for lifting and jacking the body modules, articulation assemblies, bogies, and the LRV as a unit for both maintenance and emergency recovery purposes in accordance with EN 12663-1 in the design.
 - 1. Provide the LRVs with body lifting and jacking points that shall allow it to be lifted from the in-ground body jacks that will be installed in the Gerry Wright OMF Part B to match the LRV's body lifting and jacking points.
 - 2. Design the jacking pads such that it is not necessary to remove any parts or components to use the jacking pads.
- B. Include the necessary lifting points, body support points, and jacking points on all LRVs for use in all track form areas within the Gerry Wright OMF Part B.
- C. Mark the location of all lifting points on the LRVs on the lower skirting such that the markings are visible to a maintainer standing at TOR level within 5m of the marking.
- D. Identify all jacking locations, including lifting air bag locations, in the manuals and training materials described in Section 10 [*Systems Support*] of Schedule 3 [*Design and Manufacturing Protocols*].

2.1.7.2 Rerailing and Emergency Lift Provisions

- A. Design the LRV to allow rerailing using the rerailing equipment already in use at the Gerry Wright OMF, in accordance with the Stage 1 LRV – Rerailing equipment document.
- B. Design the carbody to provide enough horizontal and vertical deflection at its articulation sections to allow LRVs to be rerailed when a carbody section is jacked separately during rerailing and emergency lift operations.
- C. Provide the LRVs with provisions in the interior of the articulation areas for bayonet-style jacking devices that lock into position and enable jacking and rerailing from inside the LRV.
- D. Provide emergency jacking points where emergency lift air bag devices shall be placed and mark their location on the lower skirting and undersides of the LRVs such that the lower skirt markings are visible to a maintainer standing at TOR level.

2.2 PASSENGER AREA DESIGN

2.2.1 GENERAL INTERIOR REQUIREMENTS

- A. Design the interior of the LRVs to be compliant with the Design Guide.
- B. Design the interior of the LRVs as follows:
 - 1. using highly durable, low maintenance, vandal-resistant, anti-bacterial materials with non-porous surfaces and non-porous finishes, that shall not be damaged by cleaning solutions and disinfectants;
 - 2. to be free of sharp corners and edges that could cause injury to Passengers, Drivers, and maintainers;
 - 3. such that all equipment installed throughout the interior is both vandal-resistant and installed in a vandal-resistant manner;
 - 4. such that all equipment within the passenger area is enclosed in such a way that the functionality and maintainability of the equipment is unaffected;
 - 5. without pockets and areas that will accumulate trash and dirt; and
 - 6. such that maintenance and cleaning activities are not made more difficult by the interior layout.
- C. Submit an Interior Design Layout Report (CDRL 04-23) that include the following:
 - 1. a narrative describing how the design of the interior of the LRVs contributes to Passenger experience, safety, and accessibility, and meets the requirements of the Design Guide.
 - 2. a complete interior layout design drawing package that includes the following information:
 - a. passenger area layout;
 - b. floor slopes and steps throughout the LRVs;
 - c. articulation location between modules and width of the walkway through the articulation;
 - d. floor to ceiling height;
 - e. aisle widths seating layout, including priority seating;
 - f. seating capacity;
 - g. standing capacity at AW2 and AW3;
 - h. stanchion, strap hanger, and handhold arrangement;
 - i. wheelchair spaces;
 - j. wheelchair access to passenger doors;
 - k. locations of all passenger information system equipment and passenger emergency devices; and

- l. weather screen arrangement.
- 3. Include renderings or 3D models of the following spaces, demonstrating compliance with the Design Guide:
 - a. wheelchair spaces and their door access, with the spaces occupied by a wheelchair users;
 - b. general passenger seating, with Passengers sitting; and
 - c. general passenger standing spaces, with Passengers standing and interacting with stanchions and handholds.

2.2.2 PASSENGER AREA LAYOUT AND AESTHETIC REQUIREMENTS

2.2.2.1 General

- A. Provide the passenger area of the LRVs with a layout that provides good visibility between all areas throughout the length of the LRVs, as well as ease of access to, and egress from, all areas of the LRVs under all loading conditions.
- B. Provide a weather screen to shield the Passengers adjacent to each side of a doorway against the elements while the doors are open that meets the following requirements:
 - 1. mounted in such a way as to not obstruct the view of CCTV cameras;
 - 2. constructed from transparent laminated safety glass designed to resist the load resulting from a 95 percentile male being thrown against the weather screen with a force of 5 kN without shattering or material breaking off; and
 - 3. is the same width as the seats adjacent to the doorway where the weather screen is located.
- C. Integrate all joints and fasteners throughout the passenger area such that no seams or fasteners are visible to the greatest extent possible.

2.2.2.2 Keys and Locks

- A. Provide the LRV with the following three locking systems to separate equipment by user type:
 - 1. a driver's cab door locking system that is configured in accordance with Section 3.2.3 [*Driver's Cab Access*];
 - 2. a Driver accessible enclosure locking system using a square maintenance key compatible with the Stage 1 LRV; and
 - 3. a maintainer accessible enclosure locking system using a triangular maintenance key compatible with the Stage 1 LRV.
- B. Submit a Locking Configuration Design Report (CDRL 04-24) that shows the following:
 - 1. the driver's cab door locking system;
 - 2. the Driver accessible enclosure locking configuration;
 - 3. the maintainer access-only locking configuration; and
 - 4. a drawing of the vehicle indicating equipment and enclosures that are accessible by each key.

and includes sample keys of the three configurations with the Locking Configuration Design Report.

2.2.2.3 Passenger Seating

A. Provide passenger seating as follows:

1. installed throughout the passenger area of the LRVs in a manner that is in accordance with Section 1.4.4 [*Seating Arrangement*];
2. made with a durable, non-absorptive, anti-slip, and stain resistant textured vinyl material that is printable with patterns and colours customized to the Edmonton and has a Design Service Life of a minimum of 10 years and is in accordance with the Design Guide;
3. has a seat structure and cushion material that is resistant to scratches from common carry items such as, but not limited to, keys and coins;
4. contoured and cushioned for Passenger comfort;
5. corrosion and vandalism resistant;
6. cleanable and sanitize-able without removal of the seats;
7. be of a two part design with the seat back or seat base replaceable in less than five minutes by service staff in the event of damage or vandalism;
8. that conforms to Canadian ergonomic standards, is approved by a human factors engineering specialist, and complies with Section 1.3.6 [*Human Factors Engineering*];
9. be provided with handholds as detailed in Section 1.6.3 [*Handholds, Stanchions, and Strap Hangers*];
10. have no pockets or voids behind or between seat backs in which baggage, litter, or other items can be left behind by Passengers; and
11. have a drain hole located in the back of the bottom of the seat to prevent pooling of liquids.

B. Provide passenger seating that is installed such that each seat shall withstand, without permanent deformation, the loads expected in operation on the Valley Line LRT, but no less than the following:

1. a force of 1,335 N applied uniformly along the top edge of the back rest and perpendicular to the seat back rest, per sitting position, without permanent local deflection or failure and no more than 3 mm of deflection over repeatable application of such load; and
2. a downward vertical load applied uniformly along the front edge of each sitting position of 1,780 N without permanent local deflection or failure and no more than 3 mm of deflection over repeatable application of such load.

C. Where passenger seating is not mounted on a bogie well mount the passenger seating using a cantilever, or otherwise suspended, design such that it is not mounted to the floor.

1. Design the wall structure to be of sufficient strength to withstand the seating loads experienced in service without deflection, under the loads provided in Section 2.2.2.3 [*Passenger Seating*].

- D. Designate a minimum of 20% of the total number of passenger seats in each LRV as priority seating for mobility-challenged Passengers. Each seat so designated shall be identified by signs in accordance with Section 1.6.2 [*Priority Seating Signs*] and shall meet the following requirements:
 - 1. not be of a fold-up/fold-down type;
 - 2. be the seats positioned with the most convenient access to passenger doors; and
 - 3. appear nominally consistent with the colour and pattern of the priority seats on the Stage 1 LRVs, in accordance with the Design Guide.
- E. Use priority seat signage and colouring that is the same as the Stage 1 LRV priority seat signage and colouring.

2.2.2.4 Flooring

- A. Design the flooring surface to be in accordance with the Design Guide.
- B. Provide flooring surfaces in the LRVs that are as follows:
 - 1. slip-resistant with a static coefficient of friction not less than 0.6 for horizontal flooring and not less than 0.8 for ramps when measured in accordance with ASTM D2047;
 - 2. comply with the hardness requirements in ASTM D2240 with a Shore A80 wheel;
 - 3. abrasion resistant, in accordance with ASTM D3389, with 1 gram loss or less; and
 - 4. chemically resistant, in accordance with ASTM F925.
- C. At each passenger doorway inside the LRVs, provide the floor with a band of colour, that complies with Section 1.6.4 [*Floors, Steps, and Thresholds*].
- D. Finish the transition point between the flooring and side walls, end walls, equipment boxes, floor heaters, and all other vertical surfaces at which, or behind which, the floor covering terminates, including those in the driver's cab in a way that will not promote the collection of dirt and grime and will be easy to clean.
- E. Provide a flooring surface with a minimum Design Service Life of 15 years.

2.2.2.5 Walls and Ceilings

- A. Provide walls, ceilings, and cornice lockers that are in accordance with the Design Guide.
- B. Fasten side and end wall panels to the carbody using a method that provides panel security, ease of replacement, and is vandal resistant.
- C. Design ceiling panels such that they can be removed individually with a mounting system that maintains panel alignment and support.
- D. Where equipment is required to be stored in the passenger area provide suitably sized cornice lockers within the area connecting the ceiling to the wall that shall permit these areas to be used as equipment lockers, subject to the following restrictions:
 - 1. ensure cornice locker front door panels have a continuous smooth, flat surface at least 889 mm wide and 280 mm high where advertising decals can be placed and removed;

2. ensure equipment installed on the door panels, such as speakers, does not infringe on the advertising space; and
3. hinge and secure the door panels with maintenance key operated latches appropriate to the equipment access required.
 - a. If door panels are hinged at the top, provide “hold open” devices.

2.2.2.6 Power Receptacles

- A. Provide electrical power receptacles throughout the interior of the LRVs such that the following requirements are met:
 1. each module is equipped with a minimum of one 20 ampere GFCI type receptacle that complies with CSA C22.1 26-700 and is individually fed from an appropriately protected circuit rated at 20 A;
 2. receptacles and power are accessible by Drivers and maintainers but not by Passengers; and
 3. receptacles are equipped with spring-loaded, IP65 rated covers.

2.2.3 PASSENGER AREA MOCK-UP

- A. No later than 15 Business Days prior to the PDR, deliver a full scale dimensionally accurate mock-up of no less than a quarter of the LRV’s passenger area to a location in Edmonton that will be agreed upon prior to the passenger area mock-up’s shipping date. The passenger area mock-up must be of a high enough quality to support evaluation by the City as well as being transportable such that it can be used as an interactive display for members of the public at public events at locations within Edmonton. The passenger area mock-up shall be updated to show all design changes and refinements 15 Business Days prior to FDR and again 60 Business Days after FDR.
- B. Design the passenger area mock-up to allow validation of the following activities in the passenger area:
 1. moving in, out, and within the passenger area using the following
 - a. on foot and with bicycles and strollers;
 - b. wheelchairs and other mobility aids;
 2. sitting on the various seats within the passenger area;
 3. standing in the passenger area and validating that handholds and stanchions are usable and within easy reach; and
 4. verifying sightlines and text sizes of visual displays and interacting with switches, controls and panels in the passenger area.
- C. Design the wheelchair space in the passenger area mock-up to include the following:
 1. the actual placements of the following:
 - a. wheelchair space decals;
 - b. control devices and push buttons; and

- c. perch seats, adjacent seats, handholds, and other elements the wheelchair user may interact with in the wheelchair space and between the wheelchair space and the nearest wheelchair compatible access doors; and
 - 2. the complete pathways from the wheelchair-accessible doors to the wheelchair space.
- D. In addition to the wheelchair spaces, include the following in the passenger area mock-up:
 - 1. the Platform-to-LRV interface at the door threshold adjustable between the best-case and worst-case offsets;
 - 2. stanchions, handholds and strap hangers;
 - 3. passenger area emergency equipment;
 - 4. flooring;
 - 5. an articulation joint;
 - 6. any steps within the passenger area
 - 7. passenger destination signs displaying mock messaging in a text and size consistent with Section 11 [*Passenger Information System*];
 - 8. passenger information signs displaying mock messaging in a text font and size consistent with what will be displayed on the passenger information signs;
 - 9. weather screens;
 - 10. CCTV camera placement; and
 - 11. passenger seating.
- E. Use equipment and materials and finish the surfaces in the passenger area mock-up in colours and finishes intended for use in the actual passenger area.
- F. Provide a passenger area mock-up that is a separate and independent of the driver's cab mock-up but is connectable to the driver's cab mock-up when the two mock-ups are displayed together at public events.
- G. Provide a passenger area mock-up that meets the following transportability requirements:
 - 1. is separable into two sections within two hours, with the sections suitable for transport on a 20-foot tandem axle deckover trailer;
 - 2. has each section that is able to be lifted onto and off of a 20-foot tandem axle deckover trailer using a forklift;
 - 3. has each section that has exterior tie downs suitable for securing it to a 20-foot tandem axle deckover trailer;
 - 4. will not be damaged by transport on a 20-foot tandem axle deckover trailer, once secured and tarped for protection from the elements; and

5. has two sections that can be aligned, reconnected, and made ready for the public within two hours of being removed from the trailer.

2.3 PASSENGER DOORS

2.3.1 GENERAL

- A. Design and construct the passenger doors to comply with EN 14752.
- B. Provide passenger doors that meet the accessibility requirements of Section 1.6.1 [*Doorways and Aisleways*] when the LRVs are at a Platform.
- C. Provide a sufficient number of passenger doors on the LRVs to meet the boarding and alighting performance requirements of Section 1.4.5 [*LRV Passenger Door Arrangement*].
- D. Finish the passenger doors using colours that contrast with the LRVs' interior and exterior walls in accordance with the Design Guide.
- E. Identify passenger doors, at the door, on the TOD, throughout the LRVs' manuals, and in drawings and schematics using the same notation and numbering system as the Stage 1 LRV.
- F. Illuminate the door threshold when doors are opened with a light placed within, or immediately adjacent, to the door threshold.
- G. Design and construct passenger doors as follows:
 1. as single panel doors, or two single panels in the case of bi-parting doors;
 - a. bifold doors will not be used for single passenger width or dual passenger width doors;
 2. to eliminate the possibility of water accumulation within the door panels;
 3. to be vibration-, rattle-, and noise-free in the closed position under all operating conditions; and
 4. installed such that no part of the passenger door or its operating mechanism intrudes into the passenger area when the passenger door is open, closed, or moving between the open and closed positions.

2.3.2 OPERATION

- A. Provide controls for the passenger door functions in the driver's cab in accordance with Section 3.3.3.2 [*Cab Console*].
- B. When the passenger doors have been enabled by the Driver using the "Doors Enabled" control, ensure the doors operate as follows:
 1. remain closed until such time that a Passenger operates the applicable passenger-activated control device;
 2. once opened via the passenger-activated control device, automatically attempt to close once there has been no traffic through the doorway for a maintainer-configurable time interval of not less than five seconds;

3. remain available for Passenger operation until such time as the Driver activates the “Door Cancel” or “All Doors Close” function, which shall remove the door open function from the passenger-activated control devices and continue as follows based on the function selected by the Driver:
 - a. upon operation of the “Door Cancel” function by the Driver, all open doors shall initiate their closing sequence after their next time interval, and automatically lock once closed, until the Driver reinitiates the “Doors Enabled” function; and
 - b. upon operation of the “All Doors Close” function by the Driver, all open doors shall automatically close after providing door movement visual and audible warnings in accordance with EN 14752, and automatically lock once closed, until the Driver reinitiates the “Doors Enabled” function.
- C. Design the passenger door system to automatically detect obstacles on the leading and trailing edges of the passenger doors and impediments to door motion anywhere around the entire perimeter of the passenger doors and to automatically re-open and attempt re-close of the obstructed doors, until all the passenger doors successfully close and lock or the Driver overrides the system.
1. Design the passenger doors to enter a faulted state after the doors have attempted to re-close and been subsequently blocked by the obstacle detection system prior to reaching its closed position a number of times that is maintainer-modifiable through a Software interface in accordance with Section 10.3.2 [*Portable Test Units*] of Schedule 3 [*Design and Manufacturing Protocols*] between PHA defined minimum and maximum values.
 2. Design the passenger door system so that in such a faulted state, it performs the following actions:
 - a. automatically informs the Driver by both audible and visual means that a passenger door has entered a faulted state; and
 - b. returns the obstructed passenger doors to, and maintains them in, the fully open position until responded to by the Driver.
 3. Provide the passenger door system with functionality that shall allow a maintainer to modify the number of times the passenger doors shall attempt to reclose through a Software interface between PHA-defined minimum and maximum values.
 4. Design the passenger door system such that it pushes a notification to the MDS of the passenger doors that have entered a faulted state due to re-close attempts by the obstacle detection system.
- D. Provide an automatic Platform side detection function in the passenger door system to prevent the doors from opening when there is no Platform, even if the Driver has enabled the passenger doors.
1. Ensure that the design and application of this function is based on, and is traceable to, the PHA conclusions and recommendations.
 2. Design the automatic Platform side detection function to be switchable between “automatic” and “manual” modes through a switch in the active driver’s cab the activation of which is logged by the MDS.

3. Design the “automatic” and “manual” modes of the automatic Platform side detection to operate as follows:
 - a. in “manual” mode, the automatic Platform side detection function is disabled and the passenger door system controls on the driver’s console function identically to the passenger door controls on the driver’s console in the Stage 1 LRV; and
 - b. in “automatic” mode, the automatic Platform side detection function is enabled and the passenger door system functions as follows when the LRVs are at No Motion at a Platform:
 - i. enables the passenger door system controls on the driver’s console such that the Driver can only release the passenger doors on the side the Platform has been detected on;
 - ii. provides a visual indication to the Driver of the door bank controls that have been enabled;
 - iii. releases and cancels the doors only on the Platform side door bank when commanded by the Driver; and
 - iv. provides a visual and audible indication to the Driver and logs a fault occurrence if the Driver attempts to release the doors on the non-Platform side door bank.

- E. Provide a tamper-proof door isolation device in accordance with EN 14752 that meets the following requirements to lock individual defective passenger doors out of service:
 1. is only operable by Drivers and maintainers;
 2. allows Drivers and maintainers to take passenger doors out of service from within the passenger area without opening compartments and panels;
 3. automatically pushes a notification to the MDS indicating which passenger door has been taken out of service;
 4. when active, physically locks the door and takes the door out of the door safety loop allowing the Train to be moved;
 5. when active, causes a visual message to be displayed to the Driver indicating which door has been taken out of service; and
 6. when active, automatically activates a local display on the door that indicates to Passengers that the door is out of service.

- F. Equip each passenger door with audible and visual warning devices that function the same as the Stage 1 LRV.
 1. Design the sound level of the door audible warning devices to be maintainer-adjustable within a reasonable range, and automatically adjusted based on the surrounding noise level in accordance with EN 14752.

2.3.3 WHEELCHAIR-COMPATIBLE ACCESS DOORS

- A. Design a minimum of two passenger doors on each side of the LRVs for wheelchair-compatible access and as follows:

1. have a clear usable width of not less than 1,220 mm;
 2. are positioned near the wheelchair spaces within the LRVs with wheelchair-accessible access between the wheelchair-compatible access door and the wheelchair space in accordance with Section 1.6 [*Accessibility Requirements*];
 3. are located on the LRVs such that the wheelchair-compatible access doors are always physically located in the same location on the Train as viewed by a Passenger standing on the Platform, regardless of LRV orientation within the Train; and
 4. are provided with decals as follows:
 - a. that identify the passenger door as a wheelchair-compatible access door;
 - b. that are consistent with the design of the decals on the Stage 1 LRV; and
 - c. that are visible from the Platform to a person seated in a Reference Wheelchair both before and after the doors have opened.
- B. For doors that do not comply with the requirements of Section 2.3.3 [*Wheelchair-Compatible Access Doors*], and any other doors that do not allow direct access to at least one wheelchair space within the LRVs, provide signage that indicates no through access for wheelchairs.

2.3.4 CREW ACCESS DOORS

- A. Provide one crew access door at each end of the LRV, and on opposite sides of the LRV, that meets the following requirements:
1. be a passenger door or a separate door, operable from the driver's cab and independent of all other doors;
 2. be electrically operable from outside the LRV by a square maintenance key switch that is accessible from the Platform and TOR level;
 3. be manually operable using external and internal release devices when no power is available and the LRVs are at No Motion; and
 4. be protected from unauthorized operation.
- B. Provide the controls in the driver's cab and functionality in the door system for the Driver to select, release, and cancel the door on either side of the LRV and immediately behind the "Active Cab" to allow crew in the LRV to exit to the Driver-selected side of the LRV.

2.3.5 PASSENGER DOOR CONTROLS

- A. Provide passenger doors that are operable by Passengers with a passenger-activated control device as follows:
1. only operate the doors when the LRVs are at No Motion, and the Driver has enabled the doors;
 2. only operate the doors on the Platform side of the LRVs; and
 3. only operate the door to which it is attached.
- B. Provide passenger-activated control devices that meet the following requirements:

1. contrast in colour with the surface on which they are mounted and are in accordance with the Design Guide;
 2. have a raised tactile surface; and
 3. are piezo switches with integrated haptic feedback and integrated lighting elements that provide Passengers with both visual and tactile feedback when activated.
- C. Provide mobility-impaired passenger-activated control devices on the LRV that meet the following requirements:
1. are located in the following locations on the LRV at a height that is accessible to mobility-impaired passengers:
 - a. adjacent to all designated wheelchair spaces on-board the LRV;
 - b. on the outside of the LRV either on, or adjacent to, all wheelchair-accessible doors; and
 2. are designed to be in accordance with the Design Guide, have the physical characteristics of the passenger activated control devices outlined in Section 2.3.5B [*Passenger Door Controls*], and provide the following functionality:
 - a. when activated, extend the door open time of the associated door for a maintainer configurable interval; and
 - b. design the extended door open time to not be truncated by the Driver initiating the “All Doors Close” function or the “Door Cancel” function prior to the extended door open time ending.

2.3.6 PASSENGER EMERGENCY DOOR RELEASE

- A. Provide a passenger emergency door release device at each passenger door that is located on the LRV interior and operates in accordance with EN 14752 to permit the manual release of the passenger door lock in the event of an emergency.
- B. Design the passenger emergency door release device such that it is as follows:
1. it is accessible to people in wheelchairs;
 2. it does not allow the door to be released or opened when the LRVs are not at No Motion;
 3. its activation does not result in an automatic brake application when the LRVs are not in a No Motion state;
 4. it is designed such that no failure mode and no latent defect shall prevent the passenger door from being opened once the passenger emergency door release device has been activated;
 5. it includes a tamper resistant cover that prevents accidental activation of the passenger emergency door release device, but still allows maintainers to access the passenger emergency door release device without having to replace the tamper resistant cover after accessing the passenger emergency door release device;
 6. it overrides any prior isolation or lockout of the applicable passenger door when the LRVs are at No Motion; and

7. it is only resettable by a Driver or other authorized person.
- C. Design the MDS such that, on operation of the passenger emergency door release device, an audible and visual alarm is indicated to the Driver and remains active until the affected passenger doors have been closed and locked and the passenger emergency door release device has been reset by the Driver.
1. Provide a method in the driver's cab that allows the audible alarm to be mutable by the Driver.
 2. Interlock the passenger emergency door release device such that following activation of the passenger emergency door release device and the LRV achieving a No Motion state, the door interlock system shall prevent LRV movement until the Driver has reset the passenger emergency door release device.

2.4 HEATING, VENTILATION, AND AIR CONDITIONING

2.4.1 GENERAL

- A. Provide an automatic passenger area temperature and climate control system that is in accordance with EN 14750-1 and EN 14750-2 and the following requirements:
1. category B for urban type applications;
 2. normal occupation as per EN 14750-1 Clause 4 is considered to be AW2;
 3. winter zone III; and
 4. summer zone I.
- B. Design the temperature and climate control system to clear and prevent the build-up of moisture, condensation, frost, and ice on the interior surfaces of the windows, and on any surfaces within the driver's cabs and passenger area.
- C. Design the HVAC system to push HVAC statuses to the MDS, in accordance with Section 10.3 [*Monitoring*].
- D. Submit an HVAC System Analysis Package (CDRL 04-25) that, at minimum, includes the following:
1. an air cooling and heating loads analysis; and
 2. an analysis of recirculated airflow requirements and the resulting value for total air flow.

2.4.2 COOLING

- A. As an exception to EN 14750-1 Figure A.2 design the cooling system to maintain the interior temperature below +25°C for any air temperature warmer than +25°C up to +40°C.

2.4.3 HEATING

- A. Provide a heating system that provides overhead heat from the HVAC system and heat through an electric radiant heating system.
1. Protect electrical connections to heater elements such that electrically live points are only accessible by maintainers.

- B. Design the heating system to maintain the interior temperature between +5°C and +10°C while the LRVs are in Auxiliary On mode.

2.4.4 VENTILATION

- A. Design the HVAC system to achieve the following:
 - 1. maintain a positive static air pressure within the LRV at all speeds with the doors closed;
 - 2. maintain ventilation of the LRV at 12 m³/h/Passenger with a reduction to 8 m³/h/Passenger in partial loading conditions at all loads up to and including AW3;
 - 3. maintain ventilation throughout the passenger area on loss of primary power or failure of the APS equipment directly supplying the HVAC; and
 - 4. include water eliminators within the fresh air intake that prevent rain and snow from entering the LRVs without the need to use filters for this purpose.
- B. In addition to meeting the requirements in EN 14750-1, provide air filters on both the fresh air and return ducts that are located to provide ease of access to maintainers for inspection and replacement and are inaccessible to Passengers.

2.4.5 REFRIGERANT

- A. Provide refrigerant that is compliant with the following:
 - 1. has an assigned ASHRAE “R” number;
 - 2. is in an “A1” safety group as defined by ASHRAE 34;
 - 3. is not on the list of refrigerants affected by the Montreal Protocol; and
 - 4. is not to be phased out within the expected life of the HVAC unit as provided by the HVAC OEM.

SECTION 3: DRIVER'S CAB

3.1 GENERAL

- A. Provide a driver's cab on each end of the LRVs that contains all necessary controls and equipment required to safely and efficiently operate the LRVs in each direction.
- B. Use materials in the driver's cab that minimize noise, vibration, rattling, reflections, and glare, and maximize comfort, cleanliness, and durability.
- C. Design the layout and colours of the driver's cab in accordance with the Design Guide.

3.2 DESIGN REQUIREMENTS

3.2.1 ARRANGEMENT

- A. Provide a full height partition wall that divides the driver's cab from the passenger area that is as follows:
 - 1. is a colour that is in accordance with the Design Guide; and
 - 2. has at least 50% of the partition wall's surface area as follows:
 - a. is transparent;
 - b. is provided with anti-glare treatment; and
 - c. has a visible light transmission index suitable to both allow Passengers to see through and prevent light from the passenger area from interfering with the Driver's vision.
- B. Provide a transparent door in the partition wall, of the same material as the partition wall, that is lockable and securable such that access to the driver's cab by unauthorized persons is prevented.
- C. Provide sun visors or similar devices, operable by one hand, for the windshield and each side facing window in the driver's cabs that are as follows:
 - 1. cover the entire width of the windshield;
 - 2. have a minimum VLT of 20%;
 - 3. do not impair sighting of wayside signals; and
 - 4. are adjustable by the Driver to any position from fully up to fully down and will remain in any position without loosening or vibrating during normal LRV motion; and
- D. Provide at least two means of exit from each driver's cab, that shall include one emergency escape route that does not require the occupants of the driver's cab to enter the passenger area and one exit route that meets the rapid egress requirements of ASME RT-1.

3.2.2 VISIBILITY

- A. Size the windshield to provide the maximum possible amount of view for a seated Driver.
 - 1. Provide the Driver in all possible driver seat adjustment positions with the following:

- a. a minimum vertical upward view to allow visibility of the traffic signals and signals along the Valley Line LRT described in the Sightlines Document;
 - b. a downward view sufficient to see a 1.0 m tall person standing at TOR 0.5 m from the front-most surface of the LRVs;
 - c. minimum blind spots, such as might be caused by the A-pillars or other obstacles that may block sections of viewable area from the Driver to provide a minimum unobstructed viewing angle totalling 180° about the horizontal line of sight in the forward direction, with a total of 90° to each side of centre;
 - d. distortion-free windshield in the required field of view;
 - e. sufficient visibility of a deployed coupler from within the driver's cab such that the Driver shall be able to visually confirm the deployment and alignment of the coupler prior to coupling;
 - f. sufficient visibility such that a seated 5 percent female to 95 percent male Driver has a clear view of cross-traffic lanes at mixed traffic intersections;
 - g. a means of viewing the passenger area behind the driver's cab; and
 - h. views of the of the adjacent Platform through high-resolution full-colour video display screens that are integrated into the cab console and allow a seated Driver to monitor camera views of Passengers boarding and alighting along the length of the Train. Exterior mirrors shall not be used to provide, or supplement, the Platform visibility.
- B. Design the driver's cab such that the glare on the windshield within the forward view of the Driver under any driver's cab lighting, passenger area lighting, and exterior lighting conditions has a UGR of 13 or less as measured by ISO 8995-1.
- 1. Glare on the driver's cab side windows under any driver's cab lighting shall have a UGR of 16 or less as measured by ISO 8995-1.
- C. Design the driver's controls, displays, and instruments to be unaffected by glare under any ambient lighting condition that would occur in operational service.

3.2.3 DRIVER'S CAB ACCESS

█ [REDACTED]
 [REDACTED]
 [REDACTED].

3.2.4 WINDSHIELD AND SIDE WINDOWS

3.2.4.1 General

- A. Integrate the windshield and side windows into the LRVs such that the LRVs are compliant with the SUI requirements described in the Design Guide.
- B. Seal windows in the driver's cab to prevent drafts and water ingress and to maintain the environment conditions set out in Section 2.1.4 [*Water Tightness and Drainage*].

3.2.4.2 Windshield

- A. Provide driver's cab windshields that comply with the following:
 - 1. the FRA Type I impact and ballistics requirements per 49 CFR 223; and
 - 2. ECE R43 or ANSI Z26.1 for light or colour distortion.
- B. Design the windshield with embedded electrical heating elements to defrost and defog the windshield and to cover the parking location of the windshield wiper.

3.2.4.3 Cab Side Windows

- A. Provide driver's cab side window that comply with the following:
 - 1. the FRA Type II impact and ballistics requirements per 49 CFR 223; and
 - 2. ECE R43 or ANSI Z26.1 for light or colour distortion.
- B. Construct the cab side windows from laminated safety glass with a maximum tinting of 44% VLT, coloured in accordance with the Design Guide, and treated with an IR reflective film.
- C. Design the cab side windows, or a section of the cab side window, to be opened to allow passage of a clipboard that will hold legal sized paper.
 - 1. Provide a latch, operable from the inside of the driver's cab only, on the side windows to hold the window closed.
 - 2. Design the cab side window to be positioned over their range from fully closed to fully open.
 - a. Ensure the cab side window, once positioned, shall not change position under normal driving conditions.
- D. Ensure the cab side windows do not rattle while the Train is in motion, whether open or closed.

3.2.5 DRIVER'S CAB SEATING

3.2.5.1 Driver's Seat

- A. Provide a driver's seat in accordance with APTA PR-CS-S-011-99 that includes adjustments for height, position, lean, and lumbar support.
- B. Design the driver's seat such that no combination of seat adjustment and seat suspension travel shall allow any part of the seat to contact any other fixed object within the driver's cab.
- C. Provide a driver's seat that is upholstered with a material that is cleanable by wiping with cleaning agents.
- D. Include in the Human Factors Engineering Report, described in Section 1.3.6 [*Human Factors Engineering*], confirmation that a Driver can perform the following:
 - 1. can access and easily use the seat adjustment controls when seated in the driver's seat;
 - 2. can access all controls and equipment on the cab console when seated in the driver's seat; and
 - 3. meet the visibility requirements stated in Section 3.2.2 [*Visibility*] when seated in the driver's seat.

3.2.5.2 Instructor's Seat

- A. Include with each driver's cab a fixed or stowable instructor's seat upholstered in the same material as the driver's seat, located as follows:
 - 1. such that the door to the driver's cab can be securely closed with the driver's seat and the instructor's seat both occupied;
 - 2. to allow access and emergency egress to and from the driver's cab; and
 - 3. such that a seated instructor can activate the instructor brake to stop the LRVs.

3.2.6 TERTIARY EQUIPMENT

- A. Install the following safety equipment in each driver's cab:
 - 1. break glass hammer, including wall fixing;
 - 2. garbage container;
 - 3. warning triangle;
 - 4. a portable fire extinguisher, rated to be at least 10 lb., meeting the requirements of the NFC(AE), 14-FCB-002, and suitable for Class C Hazards defined in NFPA 10, including dedicated mounting bracket;
 - 5. LED flashlight that meets the following requirements:
 - a. has a rechargeable battery, with a charging station installed in the driver's cab;
 - b. a single battery charge shall last a minimum of two hours; and
 - c. a minimum light output of 350 lumens;
 - 6. a Number 2 First Aid Kit in accordance with the Alberta Occupational Health and Safety Code, Section 178; and
 - 7. all other equipment determined to be necessary pursuant to the Section 3.4 [*Safety*] of Schedule 3 [*Design and Manufacturing Protocols*].
- B. Provide space on the cab console, accessible to the Driver from the driver's seat to accommodate a clipboard suitable for 8.5 inch x 14 inch paper.
- C. Provide a coat hook in the driver's cab located such that articles of clothing hanging from it do not impede the following:
 - 1. the Driver in operating the LRVs;
 - 2. an instructor's access to the means of stopping the LRVs; and
 - 3. the visibility of Driver, and the instructor, to the outside or into the passenger area.
- D. Provide a cup holder, of a suitable size to hold a 600 mL travel mug, in a convenient location such that it is easily accessible to the Driver, and spills and condensation in the cup holder or on the driver's console equipment shall not affect the LRV controls or damage other equipment.

- E. Provide a single microphone in the driver's cab to allow Drivers to make announcements to Passengers and speak over the voice radio in accordance with Section 11 [*Passenger Information System*] and Section 9.1 [*Radio System*].
 - 1. Ensure the microphone is in a location such that it does not obstruct the Driver's visibility and is adjustable to be comfortably used by a Driver.

3.2.7 DRIVER'S CAB LAYOUT PACKAGES

- A. Submit a Driver's Cab Layout Package (CDRL 04-26) that includes the following information:
 - 1. cab drawings;
 - 2. driver visibility calculations and drawings;
 - 3. cab console layout;
 - 4. descriptions of each push button, switch, and control function, including the colour scheme;
 - 5. location and function of the CCTV HMI;
 - 6. full colour rendering depicting the arrangement of the driver's cab; and
 - 7. approval from a human factors engineering specialist that the driver's cab conforms to; and
 - 8. approval of the driver's cab design by a human factors engineering specialist with experience in designing driver consoles for driving in rail transit environments.
- B. Submit a Warning Devices Audio Report (CDRL 04-27) that includes the audio outputs of the cab horn, bell, and in-cab audible annunciations. Include example sound files in .mp3 and .wav formats for each audio output.

3.3 PERFORMANCE REQUIREMENTS

3.3.1 ENVIRONMENTAL SETTINGS

- A. Provide an independent driver's cab temperature and climate control system in compliance with EN 14813-1 and EN 14813-2.
 - 1. As an exception to EN 14813-1 Table 2, design the cooling system to maintain the interior temperature below +25°C for any air temperature warmer than +25°C up to +40°C.
 - 2. Design the temperature and climate control system to clear and prevent the build-up of moisture, condensation, frost, and ice on the interior and exterior surfaces of the windshield and side windows, and on any internal surfaces of the driver's cab.
- B. Mirror all driver's cab environmental settings in the active driver's cab to the trailing cab in the Train such that the environments in the two cabs are the same and windshields are kept clear.

3.3.2 WINDSHIELD WIPER AND WASHER SYSTEM

- A. Fit each driver's cab with a windshield wiper system, covering the windshield area required for the Driver to safely operate the LRVs, with five level variable speed system for both continuous and intermittent operation.

1. Design the windshield wipers to remain in continuous contact with the windshield throughout the swept area and not be allowed to over travel their limits at all wiper frequencies and speed.
 2. Design the windshield wipers to automatically return to their park positions when the windshield wiper system is switched off.
- B. Include with the windshield wiper system an automatic wash system that effectively cleans the swept path of the windshield wiper assembly under all operating and environmental conditions.
1. Design the windshield washer system to deliver washer fluid through a wet wiper arm onto the windshield.
 2. Provide the windshield washer system with a washer fluid reservoir that has a 10 L capacity.
 3. Design the washer fluid reservoir to be refillable from empty in one minute from the exterior of the LRVs by a maintainer standing at ground and Platform levels, from either side of the LRVs.
- C. Mirror the windshield wiper system settings in the active driver's cab to the trailing cab of the Train such that activation of a windshield wiper control in the active driver's cab shall cause the same action to be performed by the windshield wiper system in the trailing driver's cab in the Train.
- D. Design the windshield wiper system such that if there is no active cab signal within the Train, then windshield wiper functionality is disabled, and the windshield wipers return to their park position.
- E. Integrate a headlight washer system into the windshield wiper system that cleans both the low and high beam areas of the LRVs' headlights.
- F. Provide the LRVs with a system that monitors the level of washer fluid in the windshield washer fluid reservoir and pushes a fault code to the MDS, in accordance with Section 10 [*Monitoring and Diagnostic System*], when the washer fluid reservoir falls below a maintainer-configurable level.
- G. Submit a Windshield and Headlight Washer Proposal (CDRL 04-28) that describes the following:
1. the monitoring system that monitors the windshield and headlight washer fluid reservoir level; and
 2. the duration and speed of the windshield and headlight wipers activation on the application of the windshield and headlight washer system.

3.3.3 CAB CONTROLS

3.3.3.1 General

- A. Provide controls within each driver's cab to allow the LRVs and Train to be safely driven by one Driver.
- B. Design human machine interfaces in the driver's cab to have a demonstrably logical and user-friendly layout, based on Driver task frequency and priority.
1. Include in the Human Factors Engineering Report, described in Section 1.3.6 [*Human Factors Engineering*], confirmation that the driver's cab controls are suitably arranged.

2. Unless otherwise determined through the collaborative design process and review of the driver's cab mock-up, arrange the cab console and controls in a similar manner to the cab console and controls in the Stage 1 LRV.
 3. Where a cab control exists in the LRVs that already exists in the Stage 1 LRV label the control in the LRVs using the same colours and iconography as is used in the Stage 1 LRV.
- C. Design controls, indicators, alarms, lights, labeling, iconography, and desk panels to be clearly visible and audible to the Driver under all operating conditions.

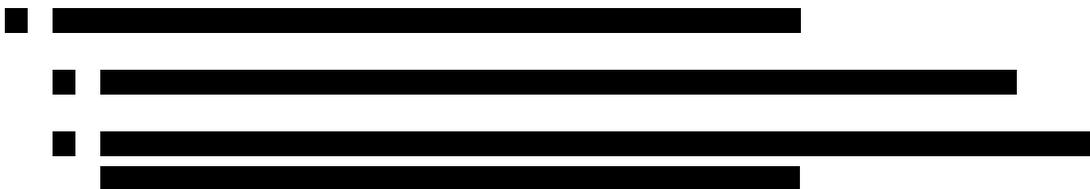
3.3.3.2 Cab Console

A. Design the surfaces of the cab console to be as follows:

1. wear-resistant;
2. of a design that will maintain the temperature of the cab console to less than 34°C when subjected to solar loading experienced in the Edmonton environment;
3. void of sharp edges;
4. easily cleanable and without gaps and spaces that can accumulate dirt and debris; and
5. visually consistent with aesthetic requirements set out in the Design Guide.

B. Include the following key controls in each driver's cab:

1. an emergency stop mushroom push button coloured red that, when pressed, provides an irrevocable emergency brake application in accordance with Section 4.5.7.4 [*Emergency Brake and Emergency Stop Push Button Requirements*];
2. a pantograph "down" mushroom push button, coloured yellow, which when pressed shall lower all the pantographs on the Train into the down position; and
3. "All LRV Doors Open" and "All LRV Doors Close" controls that open and cancel all doors on the selected door bank when the respective function is triggered from within the active driver's cab when the LRVs are at No Motion.



- C. Provide switches, push buttons, and controls that clearly indicate when they are in their activated state by illumination and position.
- D. Provide a TOD in accordance with Section 10.5 [*Train Driver Display*].
- E. Group switches, push buttons, and controls by function, locate them based on criticality and frequency of use, and, wherever possible, in a similar location to the associated switch, push button, and control on the Stage 1 LRV.

- F. Provide a “Doors Enabled” control, separate of the “All Train Doors Open” and “All Train Doors Close” controls, that meets the following requirements:
 - 1. requires a two-stage confirmation process;
 - 2. has a logical layout and operational sequence; and
 - 3. is only operable when the LRVs are at No Motion.
- G. Provide turn indicator controls to trigger the exterior turn indicator lights described in Section 7.3 [*Exterior Lighting*].
- H. Provide Train status indicators for major systems and Train functions that the Driver requires to operate the Train in the event the TOD fails.
- I. Design the cab console such that control systems and switches that Cut-Out and bypass Vital and major systems are only active and enabled in the active driver’s cab.
 - 1. Design the TOD to allow Drivers and maintainers to Cut-Out systems on individual LRVs and the entire Train using a soft-key interface on the LRV’s TOD.
 - 2. Provide mechanically sealable switches for LRV systems that are unable to be Cut-Out using the soft-key interface on the LRV’s active TOD, and meet the following requirements:
 - a. provide sealable switches that do not act as trainline Cut-Outs; and
 - b. limit operation of sealable switches to isolating equipment on the local LRV.
- J. Provide an instructor’s brake that permits the instructor to initiate the LRV’s mandatory brake while seated in the instructor’s seat.
- K. Provide an HMI screen in the driver’s cab that the Driver can use to view any camera in the Train’s CCTV system.

3.3.3.3 In-Cab Audible Annunciations

- A. Provide the following audible annunciations, which must be easily distinguished by a Driver when the LRVs are in operation, in the driver’s cab area:
 - 1. overspeed;
 - 2. Vigilance Device activated;
 - 3. doors closed;
 - 4. track brake on;
 - 5. MDS-generated “Fault Class A”, “Fault Class B”, and “Fault Class C” alarms in accordance with Section 10 [*Monitoring and Diagnostic System*];
 - 6. passenger intercom request; and
 - 7. passenger alarm.

- B. Where an audible annunciation exists on the Stage 1 LRV, use the same audio annunciation on the LRVs.
- C. Provide a dedicated speaker in the driver's cab that plays all passenger information announcements broadcast into the passenger area within the cab environment. This speaker shall play announcements with the same audio quality as in the passenger area.
 - 1. Provide the Driver with the means to control the volume level coming from this cab speaker between a minimum and maximum level to be determined during the collaborative design review process.

3.3.3.4 Master Controller

- A. Provide a single left-hand operable master controller that allows a Driver to make instantaneous adjustments to control Train speed through the adjustment of tractive and braking effort, consisting of a drive-brake lever and a direction controller that issues IEEE 1475 compliant command signals to the propulsion system, in accordance with Section 4 [*Propulsion*].
 - 1. Design the master controller to control other trainlined and local signals as required.
- B. Design the master controller's drive-brake lever to meet the following requirements:
 - 1. follow the convention of demanding Traction Power when the lever handle is pushed forward and away from the Driver, and service braking when pulled toward the Driver;
 - 2. include an emergency brake position that, when engaged, activates a revocable emergency three-brake function in accordance with Section 4.5.7.4 [*Emergency Brake and Emergency Stop Push Button Requirements*]; and
 - 3. be positioned in a similar location with the driver's cab as the drive-brake lever of the Stage 1 LRV.
- C. Provide the master controller's direction controller with the following three positions and operating modes:
 - 1. "Forward" to operate the LRVs in the direction that the "Cab Active" driver's cab is facing;
 - 2. "Off" to prevent primary and auxiliary control circuits from being energized, with the exception of door operator switches and layover heat. Design this mode to automatically apply the service friction brakes and the LRVs to respond to all energized train lines and control commands from the "Cab Active" driver's cab; and
 - 3. "Reverse" to operate single-LRVs to reverse or move in the direction that is opposite of the "Cab Active" driver's cab, at a maximum speed of 5 km/h.

3.3.3.5 Train Operations and Diagnostic Display

- A. Design the display screens in the driver's cab to provide ambient light compensation that ensures displayed information is clearly visible to a Driver under all operating conditions.
 - 1. The term "display screens" refers to any electronic screen in the driver's cab. This includes all driver's displays, video monitors, and diagnostic screens.

2. Match the image qualities of the display screens to each other such that an individual display screen's colour, sharpness, contrast, and hue are indiscernible from the other display screens in the cab environment regardless of the individual display screen's point of origin.
 - a. Provide a method for a maintainer to recalibrate the image settings of the cab display screens.

3.3.3.6 Warning Devices for Wayside Road and Foot Traffic

- A. Equip the driver's cab with a horn and bell suitable for alerting wayside road and foot traffic to the presence of the Train.
 1. The Driver must be able to activate the horn and bell from any driver's cab regardless of whether the driver's cab has been activated and whether the LRV's battery has been turned on or not.
 2. The design of the horn and bell circuitry shall be such that no single point of failure can prevent the function of both the horn and the bell in a driver's cab.
- B. Design the horn and the bell such that the sounds are maintainer-configurable through a process of uploading and selecting either .wav or .mp3 audio files.
 1. The horn and bell sounds shall be identical to the horn and bell sounds of the Stage 1 LRV.

3.3.4 VIGILANCE SYSTEM

- A. In each driver's cab, provide at least two independent tamper-proof Vigilance Devices that require the Driver to apply continuous pressure or activity to remain activated.
 1. Include in the Human Factors Engineering Report, required in accordance with Section 1.3.6 [*Human Factors Engineering*], confirmation that the design of the Vigilance Devices is, with the driver's seat appropriately adjusted, positioned for use by Drivers.
- B. Design the vigilance system to operate as follows:
 1. trigger and activate a warning buzzer with a sound identical to the warning buzzer on the Stage 1 LRV, in the "Cab Active" driver's cab when the direction controller is in a driving position, the Train's door are closed and locked, and there is no Vigilance Device in the active cab activated;
 2. return to an untriggered state if the Driver re-engages a Vigilance Device within two seconds; and
 3. disable Train propulsion and initiate mandatory braking in accordance with Section 4.5.7.3 [*Mandatory Brake*] if the Driver does not re-engage a Vigilance Device within two seconds from the time that the vigilance system is triggered.
 - a. Once the vigilance system is triggered and mandatory brakes have been initiated the vigilance system shall only be resettable by the Driver once the Train is at No Motion.
- C. Design the vigilance system such that if a Vigilance Device has not been re-engaged by the Driver, the time from release of the Vigilance Device to application of the mandatory brake shall be less than 2.5 seconds.

3.4 DRIVER'S CAB MOCK-UP

- A. No later than 15 Business Days prior to PDR, deliver a full scale dimensionally accurate mock-up of the driver's cab to a location in Edmonton that will be agreed upon prior to the driver's cab mock up's shipping date. Ensure the driver's cab mock-up is of a high enough quality to support evaluation by the City as well as being transportable such that it can be used as an interactive display for members of the public at public events at locations within Edmonton. The driver's cab mock-up shall be updated to show all design changes and refinements 15 Business Days prior to FDR and again 60 Business Days after the conclusion of FDR.
- B. Include the following in the driver's cab mock-up:
1. a fully functional version of the proposed driver's seat;
 2. a fully functional version of the proposed instructor's seat;
 3. a master controller with enough functionality to verify the requirements of Section 3.3.3.4 [*Master Controller*];
 4. a mock-up of the cab controls including representation of all vehicle controls and all push buttons, switches, and other controls a Driver may use;
 - a. in the FDR mock-up, all push buttons, switches, and other controls a Driver may use shall be physically installed;
 5. the driver's cab partition wall and door;
 6. driver's cab decals and messaging;
 7. lighting fixtures powered to provide the same level of luminance that shall exist in the driver's cab of the LRVs;
 8. equipment enclosures within the driver's cab; and
 9. the floor, ceiling, and A-pillars.
- C. Submit a Driver's Cab Mock-up Operational Guide that describes the button sequences that Drivers, maintainers, and instructors can run through in the driver's cab mock-up to understand the operational sequences involved with:
1. powering on and off a Train and activating a cab;
 2. door operations;
 3. cab lighting adjustments;
 4. cutting out Train and LRV systems including track brakes, disc brakes, and traction power; and
 5. the activation of a Vigilance Device.
- D. Finish all components and surfaces in the driver's cab mock-up in colours that are the same as those that will be used in the actual driver's cab.

- E. Where components and systems in the driver's cab mock-up require power provide a means of powering these components and systems from a 15 A 120 VAC supply.
- F. Ensure the driver's cab mock-up is of sufficient strength and durability to withstand several months of evaluation by the City's operations and maintenance representatives. These representatives shall do the following:
 - 1. moving in and out of the cab mock-up;
 - 2. sitting in and adjusting the driver's seat; and
 - 3. manipulating the driver's cab adjustments and controls as if they were in the actual vehicle.
- G. Provide a driver's cab mock-up that is a separate and independent of the passenger area mock-up but is connectable to the passenger area mock-up when the two mock-ups are displayed together at public events.
- H. Provide a driver's cab mock-up that meets the following transportability requirements:
 - 1. is suitable for transport on a 20-foot tandem axle deckover trailer;
 - 2. is able to be lifted onto and off of a 20-foot tandem axle deckover trailer using a forklift;
 - 3. has exterior tie downs suitable for securing it to a 20-foot tandem axle deckover trailer;
 - 4. will not be damaged by transport on a 20-foot tandem axle deckover trailer, once secured and tarped for protection from the elements; and
 - 5. can be aligned with the passenger area mock-up, reconnected, and made ready for the public within one hour of being removed from the trailer.

SECTION 4: PROPULSION

4.1 SYSTEM REQUIREMENTS

4.1.1 PROPULSION SYSTEM CONFIGURATION

- A. Provide propulsion and dynamic braking using 3-phase AC traction converter drive units.
- B. Provide one traction motor and gear drive unit for each motor axle of each motor bogie that is interchangeable between motor axles on the same and different motor bogies and mounted to reduce the unsprung weight on the axle.
- C. Provide at least one independent traction converter unit for each motor bogie.
 - 1. Provide traction converter units that are physically and electrically interchangeable between bogies.
 - 2. Mount each traction converter unit's inverter modules in IP66 rated propulsion container enclosures on the roof of the LRVs such that traction motor cable lengths are as short as practical.
 - 3. Mount each traction converter unit's control electronics near their respective bogie in the propulsion container on the roof such that the control electronics are galvanically isolated from power circuitry and high-voltage sources.
 - 4. Design the propulsion system such that failures and isolation of any traction converter unit shall not affect the functions of the other traction converter units.
- D. Design the LRVs such that primary power collection equipment is shared between the individual traction converter units.
- E. Design the propulsion system to limit inrush currents under all conditions to a value that shall not cause failure or deterioration of system components and shall not cause nuisance tripping of wayside substation breakers.
 - 1. Design the inrush current limiting such that the performance of the LRVs is not affected under conditions of intermittent collector contact.
- F. Submit an HVDC Circuit Design and Functional Description (CDRL 04-29) describing HVDC componentry and including functional logic and device timing during the following:
 - 1. pre-charge;
 - 2. overcurrent faults and conditions;
 - 3. overvoltage faults and conditions; and
 - 4. undervoltage faults and conditions.
- G. Submit a Propulsion System Functional Design Description (CDRL 04-30) describing all functions required to operate, protect, and diagnose the propulsion system. Describe each function from the input signal(s) to functional output(s) and include all applicable logic diagrams and associated timing.

4.2 EQUIPMENT THERMAL CAPACITIES

4.2.1 NORMAL DUTY CYCLE

- A. Design the propulsion system such that the propulsion system components shall function without damage or shortening of their Design Service Life when operated on the Valley Line LRT at the expected and worst case possible duty cycles specified in Section 1.5.3 [*Duty Cycles*] and over the allowable range of OCS voltage specified in Section 1.2.3.1 [*Traction Electrification System*].
- B. Provide propulsion power consumed for an AW3 laden LRV for a single round trip of the Valley Line in accordance with the Duty Cycle 1 - Round Trip Performance (B.1) of Section 1.5.3 [*Duty Cycles*]. Consider the following two scenarios:
 - 1. operation with full line receptivity; and
 - 2. operation with no receptivity.
- C. Provide the expected power draw of the proposed LRV when it is in the following mode:
 - 1. storage mode waiting to go into Revenue Service.

4.2.2 EQUIPMENT TEMPERATURE CONTROL

- A. Design the propulsion system such that failures and isolation of any bogie propulsion equipment cooling system shall not affect the functions of other bogie propulsion equipment.
- B. Design the propulsion system such that propulsion equipment, including traction motors and power modulation devices, shall not be damaged by failures of their cooling systems.
- C. Design the propulsion system to push propulsion equipment cooling failures and anomalous increases in temperature to the MDS and automatically reduce the performance of the affected components to a supplier recommended level.
 - 1. Design the propulsion system to shut down the affected propulsion unit when the temperature exceeds a shutdown limit to be specified by the LRV Supplier.
- D. Submit a Propulsion Thermal Protection Design Description (CDRL 04-31) that demonstrates the propulsion system has sufficient thermal protection for normal and recovery operation.

4.3 SWITCHING LINE TRANSIENTS

- A. Design the propulsion system to withstand all LRV- and wayside-generated transients, as well as those specified in EN 50163, without damage, reduction in life, or erratic or improper operation.

4.4 ELECTROMAGNETIC INTERFERENCE

- A. Design the propulsion system to operate in a rail transit environment.
- B. Design the propulsion system to meet the EMI and EMC requirements of Section 6 [*Electromagnetic Compatibility*] of Schedule 3 [*Design and Manufacturing Protocols*].
 - 1. Comply with the requirements of IEC 61000-1-2 for achieving functional safety of the propulsion equipment.

- C. Design the propulsion system such that EMI from the propulsion system shall not inhibit or adversely affect the normal function and safety of other LRVs and off-LRV systems and equipment.
- D. Submit a Propulsion System EMC Report (CDRL 04-32) describing propulsion EMC design, emissions and mitigation provisions to limit excessive EMI effects caused by the propulsion failure modes.

4.5 PERFORMANCE CHARACTERISTICS

4.5.1 GENERAL

- A. Design the propulsion system to use trainlined and network bus signaling in compliance with IEEE 1475.
- B. Design the propulsion system to provide the Train with acceleration and deceleration rates that correspond to the rate commanded by the master controller control signals.
- C. Design the propulsion system to meet the required braking system performance regardless of the OCS voltage or its absence.
 - 1. Design the propulsion system to dynamically brake using regenerative braking into the OCS followed by rheostatic braking into the braking resistors where the OCS is determined to be non-receptive.
 - 2. Design the propulsion system to provide power to the auxiliary systems whenever the LRVs cross section isolators and other discontinuities in the OCS.
- D. Submit a Propulsion Performance Document (CDRL 04-33) presenting in graphical and numerical format the tractive effort versus speed characteristics and associated efficiency characteristics, in braking and motoring, for HVDC line voltage range of 750 VDC \pm 20% with 50 VDC steps.

4.5.2 ACCURACY AND RESPONSE TIMES

- A. Design the propulsion system with a response time fast enough to provide the following:
 - 1. the specified average acceleration and deceleration rates, jerk rate limitation, and mode change dead times in accordance with Section 4.5.3 [*Jerk Limits*] and Section 4.5.6 [*Acceleration Requirements*]; and
 - 2. the specified wheel spin and wheel slide correction efficiencies in accordance with Section 4.5.7.7 [*Wheel Spin and Slide Correction*].
- B. Design the propulsion system such that its specified accuracies and response times are independent of ambient temperatures when operated under the following conditions:
 - 1. variations of the low-voltage supply voltages are within the limits stated by IEC 60571; and
 - 2. variations of the wayside supply voltages are within the limits stated by IEC 60850.

4.5.3 JERK LIMITS

- A. Design the propulsion system such that the release of application of driving effort is not jerk limited but the application of driving and service braking effort is jerk limited to between 1.1 m/s³ to 1.3 m/s³.

- B. Design the propulsion system to follow the command signal rate of change where the command signal is changing at a rate that is less than the jerk rate.
- C. Design the propulsion system such that failure of the jerk limiting function does not cause a reduction in the maximum service braking rate of 1.2 m/s².

4.5.4 SPEED LIMITATION AND SPEED CONTROL REQUIREMENTS

- A. Derive the LRV's speed information from a source that is corrected for, or independent of, wheel wear.
- B. Design the LRVs to operate at the following speeds and conditions without damage to any components and without heating or wear of any components in excess of the values used to calculate the components Design Service Life:
 1. continuously at AW2 weight, on level tangent track at a speed of 80 km/h; and
 2. with a minimum balancing speed of 64 km/h on a 6% grade with a minimum of an AW2 load.
- C. Provide the LRVs with tractive effort reduction function as the LRV speed approaches the overspeed set point and applies mandatory braking when the LRV speed has exceeded the overspeed set point for the time-out period.
 1. Design the service operation overspeed set point of 80 km/h to be maintainer-modifiable through a Software interface in accordance with Section 10.3.2 [*Portable Test Units*] of Schedule 3 [*Design and Manufacturing Protocols*] between PHA defined minimum and maximum values.
 2. Push overspeed conditions to the MDS.
 3. Provide the LRVs with a modified overspeed protection set point when any propulsion or brake equipment has been Cut-Out or when a propulsion or brake system failure has been detected in accordance with Section 4.5.5 [*Braking Effort Distribution*].

4.5.5 BRAKING EFFORT DISTRIBUTION

- A. Design the LRVs so that where there has been a failure of the propulsion system that has required the Driver to Cut-Out some of an LRV's propulsion capability or dynamic or friction braking capacity, the Train shall operate at the following operating speeds:
 1. normal operating speed where the other systems within the Train have the capacity to compensate for the lost propulsive or braking effort; and
 2. a reduced operating speed where the other systems within the Train do not have the capacity to compensate for the lost propulsive or braking effort.
- B. Where the Train speed has been reduced and restricted, design the MDS to notify the Driver of the new maximum speed.

4.5.6 ACCELERATION REQUIREMENTS

- A. Design the LRVs to provide an average acceleration rate from 0 to 30 km/h of at least 1.0 m/s² -0%/+5%, at all LRV weights from AW0 to AW2, with the drive brake lever in the position that commands maximum tractive effort in the forward direction.

- B. Design the propulsion system to hold the commanded AW2 tractive effort at loadings past AW2 such that the LRV's acceleration reduces linearly with increasing mass past AW2.
- C. Allow the LRV's commanded acceleration rate for loadings from AW0 to AW2 to be continuously variable through the master controller between a minimum value of 0.12 m/s² to a maximum value 1.2 m/s².
- D. Design the propulsion system such that during acceleration, with any commanded rate and once the LRV reaches the commanded acceleration rate, the instantaneous acceleration rate shall not vary from the commanded rate by more than 0.09 m/s².

4.5.7 BRAKING REQUIREMENTS

4.5.7.1 Dynamic Brake Control System

- A. Design the propulsion system to supply the OCS with the maximum amount of energy possible and only divert generated energy to the braking resistors in excess of what can be accepted by the OCS.
- B. Design the dynamic brake to maximize the use of electrodynamic braking over the entire speed range by providing the LRVs with electrodynamic braking as a combination of regenerative and rheostatic braking as appropriate for the specific OCS receptivity conditions.
 - 1. Provide the remainder of the required blended braking effort from the LRV's friction brakes in such a way that brake pad wear is equalized and equal wear across the LRV's friction brakes is observed.
 - 2. Design the dynamic braking system to provide a brake rate accuracy of ± 0.09 m/s² at any requested rate during dynamic braking.
 - 3. Design the dynamic braking system to limit pantograph voltage to below 900 V dc, adjustable by a maintainer via PTU.
- C. Design the friction brake system to provide the required braking effort to reach the required braking rate should the dynamic brake system not operate correctly.
 - 1. Size the friction brake system to support a trip of an AW3 loaded LRV from the worst-case point of failure on the Valley Line LRT to the nearest maintenance facility, without limiting the braking performance or restricting the LRV speed, under the condition of a single propulsion failure. If the propulsion failure limits the speed of the LRV, such a failure shall be considered as requiring immediate train removal and must be accounted for in the LRV Supplier's availability calculations under the RAM requirements.
- D. Provide a dynamic brake failure detection function for each motor bogie that pushes a failure notification, including the location of the fault, to the MDS when failures of the dynamic brake on a bogie are detected.

4.5.7.2 Service Brake Requirements

- A. Design the propulsion system such that service braking, defined by EN13452-1 as Service braking, is initiated whenever the Driver positions the drive-brake lever anywhere throughout the braking effort range and braking commands take precedence over any driving signal.
- B. Provide the LRVs with a service braking rate that is continuously variable between 0.12 m/s² and 1.2 m/s².

- C. Provide a blended full-service brake with a jerk-limited average deceleration rate between 1.2 m/s² and 1.3 m/s² at any speed from 80 km/h to 0 km/h on level tangent track.

4.5.7.3 Mandatory Brake

- A. Design the propulsion system so that safety-related actions of Drivers and safety-related failures of LRV systems trigger mandatory braking, defined by EN13452-1 as Emergency 1 braking, resulting in the LRVs being brought to an irrevocable slide-protected jerk-limited stop using electrodynamic braking, friction braking, and deployment of track brakes and sand as required to reach the brake rate of 1.2 m/s².
- B. Design mandatory braking to initiate under any of the following conditions:
 - 1. release of the Vigilance Device and maintainer adjustable time out is complete;
 - a. set the time out value to be the same as the Stage 1 LRV Vigilance Device time out value;
 - 2. overspeed signal and timeout is complete;
 - 3. track brake deployment while the drive-brake lever is in a driving mode; and
 - 4. on a system-by-system basis as determined by the PHA.

4.5.7.4 Emergency Brake and Emergency Stop Push Button Requirements

- A. Design the propulsion system to initiate emergency braking, defined by EN13452-1 as Emergency 3 braking, at a minimum average emergency brake deceleration rate of 2.75 m/s² whenever the Driver moves the drive-brake lever beyond the normal service brake range into the emergency braking position and maintain emergency braking until the drive-brake lever is removed from the emergency braking position.
 - 1. Achieve the emergency brake rate through a combination of dynamic braking, friction brake, track brakes, and sanding according to EN 13452-1 and EN 13452-2.
 - 2. Design emergency braking to be load-compensated and slide-protected such that wheel sliding and wheel lock-up is eliminated and not limited by jerk.
- B. Design the braking system to initiate irrevocable non-slide protected, non-jerk limited, emergency stop braking, defined by EN13452-1 as Security braking, when the Driver presses the emergency stop push button on the driver's console.
 - 1. Design the LRV's minimum average emergency stop deceleration rate to be 1.0 m/s² from 80 km/h with all friction brakes functioning less a single failed friction brake that provides no braking effort.
 - 2. Design the LRV's disc brake system disc to permit at least the following without causing damage to the brake system:
 - a. one stop from 80 km/h at a deceleration rate of 1.0 m/s² with the brake system operating at nominal brake temperature conditions at the beginning of the braking effort followed by one stop from the LRV's restricted operating speed at a deceleration rate of 1.0 m/s².

- C. Design the emergency braking and emergency stop braking such that the instantaneous deceleration does not exceed 4.0 m/s^2 and the maximum braking rate does not exceed the minimum rate by more than 30%.

4.5.7.5 Parking and Holding Brakes

- A. Design the braking system to initiate a holding brake when the LRVs are at No Motion and the last command from the drive-brake lever was a braking command.
 - 1. Should there be no high voltage power, or the high voltage power is lost, when the LRVs are at No Motion, the braking system shall initiate a parking brake.
- B. Design the braking system to initiate a parking brake when there is no active cab in the Train or there has been a loss of LVPS and battery power.
- C. Design the Train's parking brake such that when it is engaged, it shall hold an AW4 loaded Train on a 7% grade indefinitely.

4.5.7.6 Track Brakes

- A. Design the braking system to automatically initiate track brakes on all bogies in accordance with EN 13452-1 and return to their non-active position once the condition that triggered their initiation is removed.
- B. Provide the Driver with a visual and audible indication of track brake deployment in the driver's cab.
- C. Design the track brake system to hold an AW3 loaded LRV on a 7% grade for a minimum of 15 minutes.
- D. Design the track brake system with sufficient braking power to supplement the friction and dynamic brake to achieve the deceleration requirements of all levels of braking as per EN 13452-1.
- E. Provide a method for maintainers to activate the LRV's track brakes to validate operation of the track brake.

4.5.7.7 Wheel Spin and Slide Correction

- A. Provide a wheel spin-slide detection and correction function to detect and correct wheel spin and slide on a bogie-by-bogie basis allowing the LRVs to make use of the maximum available adhesion at the wheel-rail interface.
 - 1. Enable the spin and slide correction system for all acceleration and all dynamic and disc braking modes except for emergency stop applications.
 - 2. Design the wheel spin-slide correction system to prioritize dynamic braking over friction braking.
 - 3. Design the wheel spin-slide correction system to function properly with wheel diameter differences from new to fully worn among the wheels of an LRV.
 - 4. Design the system to automatically apply sanding to affected wheels during the correction of persistent spins and slides only to the bogies experiencing the spins and slides.
- B. Design the wheel spin-slide correction system to prevent slides and spins that would develop martensite and flat spots in the LRV's wheels.

- C. Design the braking system such that no failure mode of the spin and slide correction system shall prevent the application of braking effort at a level less than requested.
- D. Validate the wheel spin-slide correction system using a program based on the WSP testing and validation program outlined in EN 15595.

4.5.7.8 Load Compensation System

- A. Provide the LRVs with a load compensation system such that the LRVs shall maintain the commanded acceleration and braking rates for loadings up to AW2 with a reduction in acceleration rate allowed beyond AW2.
- B. Design the propulsion control to adjust propulsion and braking effort on a per-bogie basis to compensate for the actual loading on the bogie.
- C. Provide functionality to test the load compensation system to verify its correct function when the LRVs are powered on, and periodically thereafter.
 - 1. Design the propulsion system to push failures of the load compensation system to the MDS, identifying the failed load compensation elements on the LRVs and their location whenever a failure of the load compensation system has been detected.
 - 2. Design the braking system such that no failure of the load compensation system results in braking effort less than the braking effort provided for AW0.

4.5.7.9 Direction Change and Motor Correspondence

- A. Allow changes of direction only when the LRVs are at No Motion.
- B. Design the propulsion system to monitor correspondence of the motor phase rotation with the trainline direction control command, push out-of-correspondence conditions to the MDS as a propulsion system fault, and inhibit propulsion mode on the bogie with the fault.

4.5.7.10 Cut-Out Control

- A. Include provisions to allow the tractive effort systems to be Cut-Out on a bogie-by-bogie basis from the high voltage power supply, independent all other systems installed on the bogie, such that with one bogie Cut-Out on a single LRV, or with one or more bogies Cut-Out on one LRV in a Train, the LRV or Train remains bi-directionally operable in accordance with Section 4.5.5 [*Braking Effort Distribution*] without damaging effects.
- B. Design the propulsion system to push notice of activation of a propulsion Cut-Out to the MDS. The propulsion system shall inform the Driver through the TOD of changes from the LRV's normal operating state.

4.5.7.11 MDS Integration

- A. Interface the propulsion system with the MDS to provide an integrated fault management function for the propulsion system, including fault detection and annunciation, system protection, fault data collection, and automatic fault reset capability in accordance with Section 10 [*Monitoring and Diagnostic System*].

4.5.7.12 Adjustability

- A. Submit Maintainer Adjustable Propulsion System Parameters (CDRL 04-34) that identifies all propulsion system parameters that will be adjustable by maintainers using a PTU during maintenance of the LRV.
- B. Make the propulsion system operating characteristics identified in the accepted Maintainer Adjustable Propulsion System Parameters document fully adjustable by the City within the performance range determined by the PHA.
- C. Design the propulsion system performance to self-compensate for component wear, aging, and similar phenomena such that no adjustments shall be required to compensate for system aging and wear.
- D. Design PTUs to be able to bypass the LRV's automated wheel diameter detection, described in Section 1.5 [*Propulsion and Braking Performance*] of this Schedule, and manually set the wheel diameter to a value within wheel diameter limits to a tolerance of 1 mm.
- E. Design the propulsion system to automatically perform all required wheel diameter compensation.

4.6 SYSTEM COMPONENTS

4.6.1 TRACTION MOTORS

- A. Provide totally enclosed, splash-proof, self-ventilated, IEC 60349-2 compliant traction motors with an overhaul interval of not less than 1,200,000 km that are physically and electrically interchangeable on a single motor bogie and between motor bogies.
- B. Resiliently mount the traction motors either directly to the bogie frame or to both the bogie frame and gear unit as follows:
 - 1. design the motor-gear unit mounting arrangement and coupling design that allows the lowest coupling dynamic angular displacement; and
 - 2. provide the motor and gear unit with a retaining mechanism that prevents damage in the event of motor or gear unit mount failure.
- C. Design the traction motor to allow the LRVs to meet the requirements of the Supply Agreement with wheel diameter differences that vary 6 mm between axles on a bogie, and with the wheels on 1 axle being the fully worn wheel diameter.
- D. Provide the traction motors with the following:
 - 1. grease-lubricated antifriction bearings, with an L10 rating life equivalent to at least 1,600,000 km of service, mounted in bearing grease cavities that are large enough to hold a five-year supply of lubricant and are designed to force grease through the bearing when grease is applied under pressure; and
 - 2. traction motor grease fittings that are accessible without requiring the removal of the bogies.
- E. Dynamically balance the traction motor armatures with their cooling fans so that there shall be no need to rebalance the traction motor armature and fan assembly unless the parts are separated at some point in the future.

- F. Design the traction motor to operate without noise or vibration such that the LRVs meet the requirements of Section 1.9 [*Noise, Vibration, and Ride Quality*].
- G. Mark the electrical connections on the traction motors such that the terminals, leads, and motor mounting provisions are positively identified and provide leads between the carbody and the traction motor that are secured to avoid insulation chafing, routed to accommodate all bogie motions without interference or excess strain, and sized to handle 200% of the maximum load current expected under the most severe normal duty conditions.
- H. Insulate the traction motor windings with electrical insulation and insulating process that is suitable for a 30-year Design Service Life.

4.6.2 GEAR DRIVE

- A. Design the gear drives to require inspection of their gears no more frequently than once in every 1,000,000 km, with a Design Service Life of at least 1,200,000 km.
- B. Provide gear drives that are equipped with anti-friction bearings that have an ABMA L10 rating life equivalent to at least 2,500,000 km of service with a bearing inspection interval is at least 800,000 km.
- C. Design the gear drives to be oil-lubricated and provided with baffles, dams, and passages to provide an adequate flow of lubricant to all bearings and gears under all combinations of acceleration, speed, direction, load, and environment, and that meet the following:
 - 1. each gear drive shall be provided with a readily accessible sight gauge window protected by a captive cover and designed to clearly show the current oil level along with markings for the minimum and maximum oil levels;
 - 2. each gear drive shall be provided with easily accessible removable plugs for filling and draining that meet the following:
 - a. plugs shall be located such that they shall not be damaged by obstacles on the track;
 - b. plugs shall be secured with lock wires to prevent loosening in service;
 - c. the filler plug opening shall be arranged to prevent overfilling and provide an indication of oil level; and
 - d. plugs and drains shall be provided with magnetic particle collectors;
 - 3. gear drives shall not allow moisture to infiltrate to the lubricant and not require oil replenishment between oil change intervals; and
 - 4. each gear drive shall be provided with removable and accessible oil and air-tight inspection covers for visual inspection of the gears.
- D. Perform qualification testing on two gear units: one from the initial five gear units and another from the middle of the production run.

4.6.3 GEAR UNIT MOUNTING

- A. Resiliently mount the gear unit to reduce the unsprung mass at the LRV's wheels.

- B. Provide axle coupling elements that are as follows:
 - 1. are not affected by heat radiated from the friction brake discs; and
 - 2. do not require lubrication at intervals less than 600,000 km or 8 years.
- C. Design all gear unit inspection points, filler and drain ports, and the gearbox-to-motor coupling to be accessible for inspection without disassembly or removal of any part.

4.6.4 DYNAMIC BRAKE RESISTORS

- A. Design the dynamic brake resistors with sufficient capacity to provide full power dissipation during operation at full-service braking over the Valley Line LRT duty cycle, as defined in Section 1.5.3 [*Duty Cycles*], and AW3 loadings with no regeneration into the overhead line and without damage to itself or other LRV components.
- B. Design dynamic brake resistors such that a single point of failure in the dynamic brake resistors shall not result in braking voltages being applied to the carbody.
 - 1. Design the LRVs such that a single point of failure in the dynamic brake resistors that reduces the insulation resistance between the carbody and brake resistor shall be detected by the ground fault detection system or other methods and reported to the Driver via the MDS.
- C. Control exhaust air and radiated heat from the dynamic brake resistors to prevent damage to closely mounted OCS components.
- D. Enclose the dynamic brake resistors to prevent ingress by small animals, and such that the brake resistors shall not be damaged by, or cause injury to, the City's staff working on the roof.
- E. Design the dynamic brake resistor elements and their mountings so they do not generate audible noise at any frequency.

4.6.5 SOLID STATE POWER DEVICES

- A. Accomplish traction motor input power conditioning, including motoring, braking, and direction reversal, with suitably rated IGBT devices that are grouped, keyed, and mounted in modular form to facilitate maintenance and easy removal.
- B. Use power inverter IGBTs of the last two generations with form, fit, and function that will be still commercially available at the first major power module overhaul requiring IGBT replacement or a minimum of 20 years.
- C. Design all power semiconductor heat sinks to be at vehicle chassis potential.

4.6.6 LINE SWITCH

- A. Provide a high-speed line switch for each traction converter to do the following:
 - 1. make and interrupt power during normal or faulted conditions:
 - a. if a contactor is used as a line switch, during faults, make sure the contactor is not operated above the maximum opening current, and coordinate its opening with the short circuit protection; and
 - 2. isolate the traction converter from primary power when the traction converter is Cut-Out.

- B. Coordinate operation of the line switch with the HSCB and the input protective device capability of the traction converter.

4.6.7 SPEED SENSING

- A. Equip the LRVs with separate speed sensing systems to measure the LRV speed and the wheel speed as follows:
 - 1. a speed measurement system that measures LRV speed independently of the wheels in a manner that provides the speed of the LRV in relation to any stationary point on the ground; and
 - 2. a speed measurement system that uses “Hall Effect” sensors to measure wheel speeds.
 - a. Provide a sufficient number of speed sensors to continue normal operation with one speed sensor failed on each of the LRV’s motor bogies.
- B. Provide speed sensors of the same make and model that are interchangeable between their mounting locations where used for the same function and that shall not indicate speeds other than the actual wheel or LRV speed under all conditions, unless massive drive train damage has been sustained.
- C. Provide a speed sensor mounting method that provides the following:
 - 1. prevents lubricant loss when the speed sensor is removed;
 - 2. allows continued operation of the LRVs without mechanical adjustment of the speed sensor; and
 - 3. makes the speed sensors easily accessible for inspection, adjustment, and replacement, regardless of whether a bogie is separated from an LRV, or an LRV is positioned over a maintenance pit or lifted using jacking systems.
- D. Mount all speed sensing gears, toothed wheels, and similar devices on their shafts using a non-slip interface.
- E. Connect speed sensors to the LRV system electronics through IP66 rated bulkhead connectors mounted on the carbody.

4.6.8 ODOMETER

- A. Design the propulsion system to do the following:
 - 1. generate and store LRV kilometrage and distance signalling information in non-volatile memory;
 - 2. make the LRV kilometrage and distance signalling available on the TCN; and
 - 3. push the LRV kilometrage to the wayside through the onboard-to-ground network.
- B. Provide, in one driver’s cab, an electronic odometer with permanent non-volatile memory or a non-resettable electromechanical odometer that meets the following requirements:
 - 1. displays the same total LRV kilometrage as the value stored by the propulsion system to the nearest kilometer with a minimum of eight digits;
 - 2. is driven by the propulsion system total LRV kilometrage and distance signalling information; and

3. is legible from outside the LRV by a maintainer standing at TOR level with the LRVs in “Auxiliary Off” and “Battery Off” modes.

4.6.9 PROPULSION SYSTEM CONTROL LOGIC

- A. Provide the following features in the propulsion system control units:
 1. control functions;
 2. self-diagnostic routines; and
 3. fault monitoring of internal and external devices.
- B. Design the propulsion system control units to set clock time from the LRV communications network each time the Train is keyed on by the master controller.
- C. Provide a fully independent propulsion system control unit for each bogie such that bogies can continue to safely function if the propulsion equipment for the others has failed.
 1. Design the propulsion system control unit to operate the traction converter to produce positive and negative tractive effort as commanded by the trainlines and vehicle communications buses.
- D. Equip the LRVs with a modern propulsion system control unit that provides stable operation of the LRVs at any possible combination of line speed, gradient, and track configuration on the Valley Line LRT.
- E. Design the propulsion system control unit to continuously monitor critical propulsion system parameters and be sufficiently responsive to detect and remedy all potentially damaging conditions to prevent equipment damage.
 1. Design the fault detection and response time of the propulsion system control unit to be such that the fault is detected, and corrective action taken, before other protective devices, including the HSCB, can react.
- F. Interface the propulsion system control unit with the MDS to provide Drivers and maintainers with testing and fault-isolation capabilities.
- G. Provide each propulsion system control unit with an ethernet network connector for communication with the PTUs.
- H. Allow PTUs connected to the propulsion system to perform the following:
 1. initiate self-tests of the propulsion system and isolate failures to LLRU level;
 2. download propulsion system fault logs;
 3. modify propulsion system parameters within defined and protected safe limits; and
 4. monitor the propulsion system during LRV operations.

4.7 PROPULSION ENCLOSURES

4.7.1 UNDERFLOOR AND ROOF-MOUNTED PROPULSION EQUIPMENT

- A. House propulsion system control units, inductors, capacitors, and power devices in enclosures suitable for their mounting locations and operating environments.

4.7.2 EQUIPMENT LOCATED IN THE LRV INTERIOR

- A. Install propulsion-related equipment located in the LRV interior in electric lockers in the driver's cab.
 - 1. Select the equipment location and enclosure construction to protect the installed equipment from dirt, conductive dust, and spilled liquids, including corrosive cleaning fluids.

4.8 BRAKING EQUIPMENT

4.8.1 GENERAL

- A. Provide a friction braking system that achieves the following:
 - 1. brings the LRVs to a stop under all operating conditions in accordance with EN 13452-1;
 - 2. automatically adjusts the braking effort to compensate for varying loads on a per bogie basis;
 - 3. is capable of a minimum of a single emergency brake application from maximum rated speed followed by continuous friction-only service braking at performance levels described in Section 4.5.7 [*Braking Requirements*];
 - 4. includes disk brakes and track brakes; and
 - 5. provides parking brake functionality capable of holding a Train in accordance with Section 4.5.7.5 [*Parking and Holding Brakes*].
- B. Provide friction braking systems on all axles and wheels of the LRVs that are designed such that a braking system failure on any bogie shall not affect the dynamic and friction braking system functionality of other bogies.
- C. Provide track brakes that achieve the following:
 - 1. work with the friction and dynamic brake systems to provide the maximum required emergency braking rate;
 - 2. are not deployed during service braking, except when roll back is detected; and
 - 3. report status information on their state to the MDS system.

4.8.2 SPECIFIC FRICTION BRAKING

4.8.2.1 General

- A. Design the friction brakes to provide the following:
 - 1. supplemental braking effort to the propulsion system when required with sufficient thermal capacity to meet the requirements of Section 4.5.7.1 [*Dynamic Brake Control System*] and Section 1.5.3 [*Duty Cycles*]; and

2. a mounting system that protects the brakes from damage due to minor collisions, automobile side impacts, derailments, dirt, dust, ballast, and water.
- B. Design the friction brake system such that failures and isolation of any portion of the friction brake system unit shall not affect the functions of the remainder of the friction brake system.
 - C. Design the friction brake system to push fault information to the MDS.
 - D. Equip the friction brake system with an interface for communicating with PTU to permit static testing, diagnosing, and monitoring of the friction brake system during LRV operations.

4.8.2.2 Brake Discs and Caliper Assemblies

- A. Provide disc rotors that meet the following requirements:
 1. have wear limit indicators that will be clearly visible to a maintainer standing in a Gerry Wright OMF Part B maintenance pit; and
 2. are interchangeable with other discs of the same type.
- B. Where disc rotor friction surfaces are not replaceable without removing the axle from the bogie and the bogie from the LRV the LRV Supplier must account for these maintenance actions within the friction brake disc surface preventative maintenance processes included in the Maintainability Program Plan.
- C. Provide disc brake calipers that are as follows:
 1. disc brake calipers, determined by the PHA as required to meet the Parking Brake, Holding Brake, and Emergency Stop requirements of the Supply Agreement, are to be a spring applied, hydraulic pressure-controlled release design;
 - a. all other disc brake calipers can be a hydraulic pressure applied design;
 2. have brake pads as follows:
 - a. are identical and interchangeable for all disc brake actuators on like bogies;
 - b. have either wear indicators that will be visible to a maintainer standing in a Gerry Wright OMF Part B maintenance pit or have no visible wear indicators and the LRV Supplier has accounted for the maintenance actions associated with inspecting brake pad thickness within the preventative maintenance processes included in the Maintainability Program Plan;
 - c. are replaceable without removal of the caliper unit; and
 - d. have no portion that extends past the edge of the disc rotor regardless of Passenger loading;
 3. have an automatic slack adjuster feature that is operational during service and parking brake applications; and
 4. are identical and interchangeable for all disc brake actuators on like bogies.
- D. Provide a friction brake Cut-Out switch in the cab to release the brakes, overridable by Train uncoupling or emergency brake application.

- E. Incorporate two methods to manually release the brakes in the event of a brake system failure with the second using a separate mechanism than the first.

4.8.2.3 Track Brakes

- A. Provide a track brake mounting arrangement as follows:
 - 1. allows track brake assemblies to be replaced on the LRVs without de-trucking the bogie; and
 - 2. has track brake assemblies that are interchangeable amongst themselves without modification to the position mounting arrangement.
- B. Ensure the track brake, all connections to the track brake, and all junction boxes associated with the track brake are waterproof to IP66 and meet the following requirements:
 - 1. all electrical connections shall be quick disconnects; and
 - 2. all magnetic coils shall be hermetically sealed.
- C. Design the track brake system to provide continuous service regardless of the status of the traction power system.
- D. Provide a track brake system that achieves the following:
 - 1. is adjustable to compensate for wheel and track brake wear, where such adjustments can be made by a maintainer with standard hand tools;
 - 2. includes wear indicators on all track brake shoes that will be visible to a maintainer standing in a Gerry Wright OMF Part B maintenance pit or have no visible wear indicators and the LRV Supplier has accounted for the maintenance actions associated with inspecting track brake shoe thickness within the preventive maintenance processes included in the Maintainability Program Plan;
 - 3. allows track brake shoe material to be replaced without requiring removal of the track brake; and
 - 4. does not interfere with the Valley Line LRT's frogs, switches, guardrails, and other trackwork.

4.8.2.4 Hydraulics

- A. Provide a hydraulic distribution network that meets the following requirements:
 - 1. has test ports that are accessible by a maintainer standing under the LRVs without requiring the removal of surrounding equipment and are a twist-to-connect design to allow their use when the system is in operation and under pressure; and
 - 2. limits pressures within the hydraulic system using a method determined through the PHA to be as follows:
 - a. suitable for safe, reliable operation of the hydraulic equipment; and
 - b. safe for trained maintainers working on, or in the vicinity of, the hydraulic system.

4.8.2.5 Friction Brake Design Document

- A. Submit a Friction Brake Design (CDRL 04-35) document that includes narratives and IEEE 1698 compliant calculations for the following:

1. service and emergency stopping distances from all speeds along with calculations that confirm the friction brake system can apply the appropriate braking rates in all operating conditions;
2. calculations confirming that the brake system stays within the appropriate jerk rates during operation in all operating conditions;
3. the maximum guaranteed brake rate for a friction-only brake application initiated by the emergency stop push button;
4. the guaranteed emergency brake rate calculated using the worst-case track conditions; and
5. calculations confirming that the parking brake can hold an unpowered AW4 loaded LRV on the maximum track grade in the Valley Line LRT alignment for an indefinite period.

SECTION 5: BOGIES

5.1 GENERAL

- A. Equip the LRVs with bogie assemblies that are in accordance with EN 13232-3, EN 13260, EN 13261, EN 13262, EN 13749, and EN 15827 and that shall provide the LRVs with a Design Service Life of 30 years on the Valley Line LRT when run with the duty cycle described in Section 1.5.3 [*Duty Cycles*].
- B. Provide bogie assemblies that are compatible and coordinated with the following:
 - 1. all track forms and all combinations of track geometry throughout the Valley Line LRT, including the following:
 - a. switches and crossings;
 - b. guard rails; and
 - c. all track-mounted equipment and systems; and
 - 2. all maintenance equipment in the Maintenance Facilities.
- C. Ensure bogies of a like design are interchangeable on each LRV, and between any other LRV without modification, except for the installation or removal of components specific to that location.
- D. Match the maintenance overhaul frequency of bogie equipment, that would require removal of the wheel to access, to the designed service life of the tire.
- E. Provide lifting points on the bogie that are rated for lifting and moving a fully assembled bogie.

5.2 PERFORMANCE

5.2.1 CLEARANCES

- A. Ensure clearance is maintained between the bogies, the carbody, and all carbody-mounted components and wiring, regardless of the relative dynamic motions that occur between the carbody and bogies during normal operation on the Valley Line LRT.
- B. Provide mechanical stops on the carbody and bogies to limit bogie movement beyond the limits that would damage the LRVs.

5.2.2 SUSPENSION SYSTEM

- A. Provide the bogie with EN 13802, EN 13298, and EN 13913, as applicable to the suspension system design, and with an optional self-leveling system that would provide level boarding at all door thresholds.

5.2.3 PRIMARY SUSPENSION

- A. Equip the bogie with a primary suspension that supports the bogie frame, reduces unsprung mass, isolates bogie components from loads produced at the wheel-rail interface, and minimizes vibrations and noise produced at the wheel-rail interface.
- B. Design the bogie such that the primary springs are exchangeable without removing the bogie frame from the LRV. Ensure the springs are marked with the tolerance group for easy selection.

5.2.4 SECONDARY SUSPENSION

- A. Design the secondary suspension to support the carbody, allow for the lateral, vertical, and roll movement of the LRV carbody relative to the bogie, maintain the LRVs within the established Valley Line LRT TCE, and meet the ride quality requirements of Section 1.9.3 [*Ride Quality*].

5.2.5 SELF-LEVELLING SYSTEM

- A. If the LRVs are equipped with a self-leveling system, it shall be a non-pneumatic self-leveling system that achieves the level entry boarding as defined in Section 1.6 [*Accessibility Requirements*] at all Platforms on the Valley Line LRT within 2 seconds of the LRVs achieving No Motion at the Platform.
- B. If the LRVs are equipped with a self-leveling system, design the self-leveling system to provide the following functionality:
 - 1. compensate for primary and secondary suspension loading deflection, and carbody loading deflection;
 - 2. allow the release of the passenger doors by the Driver during re-leveling of the LRVs but prohibit door opening by Passengers until the door threshold is within the level boarding tolerances defined in Section 1.6 [*Accessibility Requirements*];
 - a. include an override feature that allows a Driver to directly command the passenger doors to open during the re-leveling period; and
 - 3. regardless of loading, or changing loading, between AW0 to AW3, maintain the LRV door thresholds within the level boarding tolerances defined in Section 1.6 [*Accessibility Requirements*] once the passenger doors are open until all passenger doors are closed and locked.

5.3 BOGIE CONNECTION TO CARBODY

- A. Provide a positive mechanical connection between the carbody and bogies such that the bogies shall be raised with the carbody when it is lifted without disengaging any part of the suspension system or bogie to carbody connections, hosing, and wiring.
 - 1. Ensure these connections are detachable by conventional hand tools to permit de-trucking.
- B. Provide all flexible electrical cabling between the LRVs and bogie systems with IP66 quick disconnect cable connectors.
 - 1. Design the cabling and wiring, supports, and dressing such that the complete range of bogie motion is not impeded, and the cabling, wiring, and connectors at termination and support points are not subject to strain, fatigue, and chaffing over the entire range of bogie motion.
 - 2. Select electrical cabling to provide a 30-year Design Service Life under the repeated flexing caused by bogie motions.
- C. Use quick disconnect couplings in all hydraulic connections between the carbody and the bogie.

5.4 WHEELS, AXLES, AND BEARINGS

5.4.1 GENERAL

- A. Provide the LRV with axles that are as follows:
 - 1. solid or hollow axles in accordance with EN 13103 and EN 13104; or
 - 2. stub or portal axles that satisfy the intent of EN 13103 and EN 13104.
 - a. Demonstrate this by submitting a Stub or Portal Axle Design (CDRL 04-36) that provides the following information:
 - i. the forces and moments to be taken into account with reference to masses and braking conditions;
 - ii. the stress calculation method for axles;
 - iii. maximum permissible stresses to be assumed in calculations for the applicable steel grade;
 - iv. method of determining the maximum permissible stresses; and
 - v. determination of the diameters for the various sections of the axle.
- B. Cut the wheel profile to the Valley Line LRT wheel profile analyzed in Section 1.5.5 [*Wheel-Rail Interface, Stability, and Curving Performance*].

5.4.2 WHEELS

- A. Design the bogie and carbody so that truing and reprofiling operations can be carried out on the Danobat DLR-80091 wheel lathe while the wheel is installed on the bogie and the bogie is installed on the LRV with no disassembly of the LRV and bogie assemblies.
- B. Provide wheels that are compatible with the Danobat DLR-80091 wheel lathe.

5.4.3 RESILIENT WHEELS

- A. Use removable, resilient type wheels that allow the tire to be removed from the hub assembly by means of a simple snap ring, hydraulic provisions, and common maintenance tools.
- B. Provide wheels in marked sets of four in accordance with AAR M-107.
 - 1. Serialize and document tire and wheel hubs in the Vehicle History Books.
- C. Provide multiple externally fastened electrical shunts on the field side of the wheel across the resilient portion.
 - 1. Provide a shunt with a service-proven design and attachment mechanism.
 - 2. Size the shunts to accommodate the maximum return current with a 2:1 safety factor.
 - 3. Verify that the shunting resistance in an assembled bogie, measured between any two wheels across the bogie, does not exceed 0.01 ohms.

- a. Where it can not be verified by measurement that the shunting resistance in an assembled bogie, measured between any two wheels across the bogie, does not exceed 0.01 ohms, verify and validate that the bogie will shunt an AREMA style AC track circuit.

5.4.4 AXLES

- A. Paint the axle and wheel hubs such that there is no exposed metal after assembly.
- B. Design the interference fit between the axle and the wheel hub to provide for at least three removals and replacements of the wheel hub.

5.4.5 JOURNAL BOXES

- A. Design the journal boxes such that in-service lubrication is not required at any less than 200,000 km intervals between bogie overhauls.
 1. Where in-service lubrication is required between bogie overhauls provide a journal box that can be lubricated by a maintainer by adding grease to the journal box through grease nipples that are accessible without the removal of any vehicle components.
- B. Provide the journal boxes with bearings that will not require replacement, due to reaching the end of their design service life, more than once throughout the expected 30-year life of the vehicle.
- C. Mount the journal bearings on the LRV such that following requirements are met:
 1. the position and alignment of the journal bearings are maintained regardless of the movement of the LRVs; and
 2. the electrical potential measured across the bearing, for the purpose of protecting the bearings from electrical damage, is effectively 0.
- D. Where any journal boxes on the LRV are mounted inboard of the LRV's wheels, provide an overheated bearing detection system that monitors each of the journal boxes on the LRV to detect overheated bearings.
 1. Design the overheated bearing detection system to alert the Driver through the TOD to the overheated bearing and log the overheated bearing condition in the MDS when it detects that a journal box is operating outside of its normal temperature range.

5.5 OBSTACLE DEFLECTORS, TRACK GUARDS, AND SAFETY HANGERS

- A. Equip the bogies with track guards as follows:
 1. are a continuous piece of material over the full width of the bogie;
 2. are robust enough to deflect debris that could cause derailments from the rail to the wayside but retain the ability to be frangible during any derailments;
 3. are adjustable to maintain a minimum clearance from the wheels and from TOR to lower edge of the guard; and
 4. where side-mounted components need to be shielded from impacts and debris, provide additional track guards to shield these components.

- B. Protect the underside of the carbody from debris thrown by the bogies wheels by providing fenders or other equivalent methods where fenders are not feasible.
- C. Provide traction motors and gear units with safety hangers that shall retain traction motors and gear units in place in the event of a failure of any one of their supports.

5.6 SANDING EQUIPMENT

- A. Provide a sanding system that is automatically activated during wheel spin and slide conditions to achieve the required acceleration and deceleration rates.
 - 1. Provide a means to momentarily activate the sanding system for testing purposes.
- B. Design the sanding system's sand placement and sand flow rate to maximize spin and slide recovery, minimize the usage of sand, and maintain the required flow rate under all operational conditions.
- C. Design the sanding system to provide continuous service regardless of the status of the primary power.
 - 1. Design the sanding system to provide continuous activation for the maximum time required for an LRV to come to a complete stop from maximum speed with a deceleration mode that is degraded to the LRV's guaranteed emergency brake rate.
- D. Provide the sanding system with a method for maintainers to remove power from the sanding system on a bogie-by-bogie basis without directly accessing wiring or pulling fuses.
- E. Equip all sanding nozzles with nozzle heaters that keep the sanding nozzles at a set temperature and that allow the sand to flow regardless of the ambient temperature.
- F. Provide sand boxes with sufficient capacity to support operation of the LRVs on the Valley Line LRT without refilling for three days in the weather conditions described in Section 1.3.14 [*Climatic Conditions*] of this Schedule.
 - 1. Provide evidence of suitability of sandbox sizing at PDR.
- G. Provide each sand box with a sight glass and additional level sensing method to clearly indicate the level of sand in the sand box as follows:
 - 1. provide a sight glass solution that gives a clear view of the sand level in the sand box to a maintainer standing inside of the LRV;
 - a. The LRV Supplier will provide a sufficient number of replacement viewing glasses to ensure continuous clear visibility throughout life of the sand box; and
 - 2. provide a level sensing solution that gives either continuous or discrete sand level detection and incorporates a feature that detects and diagnoses sand level sensor failures;
 - a. if a discrete level sensing solution is provided, a minimum of three sand levels will indicated.
 - b. Communicate the sand level to maintainers through the MDS, displaying current sand levels on TOD maintenance screens, and generating and logging faults of class appropriate to the detected sand level.

- H. Design sand boxes on each side of the LRV to be refillable through sand filler ports, located on the same side of the LRV as the sand box, by a maintainer standing at a TOR level using a portable sanding device through an easily accessible sand filler port.
 - 1. Provide a sand filler port as follows:
 - a. that connects with a sand filler nozzle, usable on a portable sanding system, to create a dust proof seal;
 - b. the sand filler port shall support the sand flow of the sand transferal system in the Gerry Wright OMF Part B; and
 - c. with a cover that is lockable via a triangular maintenance key and that seals the sand filler port to IP66 when closed.
- I. Design the sand box LRUs and LLRUs to be accessible for maintenance when the sand box is completely full.
 - 1. Design the sanding system to have an overhaul interval that matches the bogie overhaul intervals.

5.7 WHEEL FLANGE LUBRICATION

- A. Provide an EN 15427 compliant wheel flange lubrication system that meets the following requirements:
 - 1. is compatible with all track forms on the Valley Line LRT;
 - 2. uses a geolocation system to automatically apply lubricant to only those areas of the Valley Line LRT where rail wear and wheel noise is most likely to occur;
 - a. design the wheel flange lubrication system to allow the geographic locations of lubrication application to be adjustable by a maintainer;
 - 3. will not cause contamination of any of the running rail surface, adjacent roadways, pedestrian crossings, and the environment;
 - 4. will not affect the LRVs' braking or propulsion performance to the point where operation becomes unsafe;
 - 5. will not activate, or attempt to lubricate the LRVs' wheel flanges, at the same time as the LRVs' sanding system.

SECTION 6: COUPLERS

6.1 GENERAL

- A. Equip each end of the LRVs with a heated, self-centering, manually stowable and deployable, fully automatic Scharfenberg type mechanical and electrical coupler and draft gear system that provides the following features:
1. manual deployment from, and stowage to, the stored position, as follows:
 - a. coupler deployment includes manually opening the front hood and the manually extension of the coupler head; and
 - b. coupler stowage includes manually retracting the coupler head and manually closing of the front hood;
 2. automatic coupling;
 3. Driver-activated uncoupling;
 4. Driver-activated electrical isolation;
 5. manual mechanical uncoupling; and
 6. manual isolation and reconnection of the electrical head, which will override the normal automatic electrical functions.
- B. Design the coupler and draft gear such that when stowed the coupler and draft gear is fully enclosed behind a front hood that is visually integrated into the design of the cab ends in accordance with Section 6.4 [*Front Hood*], and in accordance with the Design Guide.
- C. Design the coupler and draft gear system to provide the following functionality:
1. permit operation throughout the Valley Line LRT of Trains of up to two LRVs in length from the Train's active driver's cab under normal operating conditions without damage to, or reduction in service life of, the coupler and draft gear system and the LRVs;
 2. electrically isolate and re-trainline LRVs while maintaining their mechanical coupling using cab-mounted controls;
 3. manually isolate and reconnect trainlines; and
 4. initiate a Vital command that applies a mandatory brake if an uncommanded uncoupling is detected.
- D. Design the coupler and draft gear system to allow and AW3 loaded Train to push or tow an inoperable AW3 loaded Train of equal length over all grades and curves on the Valley Line LRT without damage to the coupler system or LRVs involved.
1. Provide two adaptors that allow dead tow operations between an AW3 loaded LRV equipped with a Scharfenberg mechanical coupler and an AW3 loaded Stage 1 LRV, massing 92,771 kg, equipped with an Albert mechanical coupler.

6.2 MECHANICAL

6.2.1 DESIGN

- A. Equip the LRVs with a Scharfenberg mechanical coupler head mounted on horizontal and vertical self-centering draft gear that meets one of the following requirements:
 - 1. is stored fully under the structure of the carbody such that in a collision, the energy-absorbing elements of the LRVs can engage and the anti-climbers of the LRVs shall interlock with the opposing LRVs' anti-climbers; or
 - 2. is stored partially under the structure of the carbody such that in a collision, the coupler and draft gear move out of the way to reduce the distance the coupler penetrates the impacted object, the LRVs' anti-climbers can engage, and the LRVs' energy-absorbing elements can activate.
- B. Equip each coupler and draft gear system with a non-powered self-centering device that functions as follows:
 - 1. retains a deployed and uncoupled coupler head within the coupler's level tangent track gathering range while still allowing the coupler to be manually positioned for coupling on curved track using human effort that is within the CCOHS guidelines for lifting, pushing, and pulling;
 - 2. does not prevent the movement of coupled couplers necessary for normal operation; and
 - 3. has vertical and horizontal position adjustments to maintain the position of the coupler head within the coupler's level tangent track gathering range over the life of the LRVs.
- C. Provide replaceable stops on the LRVs that limit coupler swing and prevent damage to the LRVs and are designed to fail before the structure to which they are attached fails.
- D. Equip all parts of the coupler and draft gear system that shall require lubrication as part of recommended preventive maintenance with grease fittings.
- E. Provide the coupler and draft gear system with a means of mechanical adjustment to compensate for wear.

6.2.2 ENERGY MANAGEMENT SYSTEM

- A. Equip the coupler and draft gear system with an energy management system that provides the following:
 - 1. regenerative, self-restoring elements that are designed to absorb the energies involved in coupling events up to two times the maximum coupling speed;
 - 2. non-regenerative elements, if equipped, designed to begin absorbing the energy of coupling events at LRV speeds greater than two times the maximum coupling speed;
 - 3. a breakaway system that prevents damage to the LRV carbody coupler anchor and carbody structure for any energy event that could exceed the absorption limits of the coupler and draft gear system's regenerative and non-regenerative elements; and
 - 4. no damage to the LRV structure and LRV crush zones during coupling events at speeds up to and including three times the coupling speed.

- B. Design the energy management system such that the coupler, draft gear, and LRV structure shall not be damaged during coupling events where the non-regenerative elements engage but the coupler doesn't break away.
- C. Design the energy management system such that the non-regenerative elements shall not engage during and shall not require replacement after coupling events at up to two times the maximum coupling speed.
 - 1. Provide non-regenerative elements that have a visual indicator that provides a clear indication if the non-regenerative element has been engaged.
 - 2. Design the energy management system such that removal and replacement of non-regenerative elements requires only standard maintenance shop tools and minimum labour.
- D. Where the buff force is in excess of the energy management capabilities of the regenerative and non-regenerative energy management elements of the coupler and draft gear, design the energy management system to move the coupler head out of the way, such that the LRVs' anti-climbers engage and transfer the buff load to the LRV's crush zones and ultimately the carbody structure.
 - 1. Design this breakaway feature such that the coupler head and draft gear system shall remain positively attached to the LRVs throughout and after all movement.

6.2.3 COUPLER AND DRAFT GEAR SYSTEM MECHANICAL ANALYSIS REPORT

- A. Submit a Coupler and Draft Gear System Mechanical Analysis Report (CDRL 04-37) that demonstrates that the LRV's coupler, draft gear, hood, and anchorage point meets the following requirements:
 - 1. allows LRVs to operate throughout the Valley Line LRT under the worst-case combination of the following conditions:
 - a. any combination of horizontal and vertical curves on the Valley Line LRT;
 - b. any possible LRV length up to and including four LRVs; and
 - c. variations between adjacent LRVs caused by any effect including uneven loading, differences in wheel wear, differences in suspension travel, and suspension failure;
 - 2. provides cushioning in both buff and draft that meets the requirements of Section 1.3.14 [*Climatic Conditions*];
 - 3. permits pushing and towing of both LRVs and Stage 1 LRVs in accordance with Section 1.5.4 [*Towing and Recovery*];
 - 4. provides a description and analysis of the release and engagement forces for the coupler and draft gear's energy management system;
 - a. provide the coupling speed on level grade for all combinations of load and train length, above which the nonregenerative elements will begin engaging and the speed when the nonregenerative elements have exhausted its energy absorption capacity;
 - 5. has no exposed hardware, parts, and components that could be damaged by a person standing on the coupler and draft gear.

6.3 ELECTRICAL

6.3.1 DESIGN

- A. Mount the electrical coupler heads on the top or sides of the mechanical coupler head in such a way that the electrical coupler heads are replaceable without disturbing the mechanical coupler head.
- B. Provide the electrical coupler heads with a cover that automatically opens during coupling to allow the electrical heads to mate and automatically closes as the electrical heads separate during uncoupling and electrical isolation.
- C. Provide electrical coupler heads that are IP66 rated and have an IP55 rated seal protecting the front face of the contact block whenever the electrical heads are coupled, uncoupled, isolated, or manually retracted.

6.3.2 ELECTRICAL COUPLER CONTACTS

- A. Provide silver- or gold-plated contacts, as appropriate for long-term signal integrity, held in a non-conductive insulating block.
 - 1. Ensure each contact has a minimum amperage capacity of 150% of the normal maximum amperage to which it will be subjected, including inrush currents.
 - 2. Provide contacts with the following features:
 - a. a minimum Design Service Life of 50,000 coupling cycles and minimum 12,000 coupling cycles with a forced misalignment; and
 - b. contact tips that are replaceable by removal through the front of the coupler contact block without disassembly of the coupler or its wiring.
 - 3. Provide dedicated gold-plated contact assemblies that shall support trainlined network protocols with gigabit per second data transmission rates.
- B. For each type of contact installed in the electrical head, provide the electrical coupler heads with the greater of 15% or two spare contacts.

6.3.3 CONTACT BLOCK

- A. Mount the electrical coupler contacts in a contact block that shall not be damaged by the application of the designed continuous maximum amperage through the contact block's electrical contacts.
 - 1. Design the contact block to not be damaged even if the current flows through contacts with increased resistance due to corrosion or other conditions that cause inadequate contact surface between two contacts.
- B. Maximize the creepage distance between adjacent contacts and between the contacts and any metal part connected to the carbody.
- C. Assign trainline functions to contacts such that shorts between adjacent pins will not cause unsafe LRV conditions and the hazard presented by creepage between adjacent contacts is minimized.

6.3.4 COUPLER CONTACT CONNECTIONS TO THE LRV CARBODY

- A. Provide flexible multiconductor cables or IP66 rated flexible conduit filled with individual conductors, supported to prevent stress and chafing in all operating and stowed positions, for all wiring between the electrical coupler head and the LRV carbody.
- B. Terminate the individual conductors within the electrical head on ring terminals such that the ring terminals are accessible for maintenance and interference between adjacent connections is prevented.
- C. Terminate the carbody end of the trainline multiconductor cable within an IP66 multiconductor connector that will be connected to an IP66 multiconductor bulkhead connector on the carbody of the LRVs.
- D. Within the LRVs, run trainlines from the multiconductor bulkhead connector and terminate them on a terminal block.
- E. Connect all coupler pins on the electrical coupler head, including spares, through to separate terminals on the terminal block in the carbody.

6.3.5 COUPLER AND DRAFT GEAR SYSTEM ELECTRICAL ANALYSIS REPORT

- A. Submit an Electrical Coupler Design Analysis Report (CDRL 04-38) that includes the following:
 - 1. drawings and schematics of the electrical heads showing the following:
 - a. mounting arrangement of the electrical heads on the mechanical coupler;
 - b. electrical heads in engaged and retracted modes;
 - c. pin assignments within the electrical heads including spare pins and spare conductors; and
 - d. pin current ratings versus nominal and maximum currents; and
 - 2. a safety analysis of the pin assignments.

6.4 FRONT HOOD

- A. Provide the LRVs with manually openable and closable front hoods that are integrated into the LRVs in accordance with the Design Guide, and have the same impact, strength, and finish requirements as the other cab end exterior surfaces to close off the uncoupled ends of the LRVs.
- B. Provide a finish to the backside of the front hood, and front hood mounting components, that will not corrode and will not detract from the LRVs' appearance when the front hood is open.
- C. Design the front hood to be an integrated part of the LRVs' design that will not interfere with the operation of the crash energy management system described in Section 2.1.3 [*Crash Energy Management*] such that damage to all impacted parties during LRV-to-LRV, LRV-to-motor-vehicle, LRV-to-pedestrian, and LRV-to-cyclist collisions is limited.
- D. Design the front hood mechanical system such that the front hood remains attached to the LRVs at all times and relative motion of the front hood to the carbody is prevented in both the coupler stowed and coupler deployed positions.

- E. If the configuration of the hood is such that it obstructs the headlights when in the coupler deployed position, provide additional lighting to allow safe coupling and operation of the LRV when the coupler is deployed.
- F. Submit a Hood Design Report (CDRL 04-39) that includes the following:
 - 1. renderings of the hood in its open and closed positions on the LRV;
 - 2. drawings of the system for opening and closing the hood and a narrative describing its operation;
 - 3. a reliability analysis of the hood indicating failure modes in the extremes of the Edmonton climate, mean time between the failure modes, and the process and estimated time required to recover from the failure mode; and
 - 4. a crash analysis with the hood in the LRV-to-LRV, LRV-to-motor-vehicle, and LRV-to-pedestrian collision industry standard modes.

6.5 COUPLER OPERATION

6.5.1 GENERAL

- A. Interlock the coupler deployment and stowage actions and the electrical isolation and uncouple controls such that activation of these controls is restricted to No Motion speed from an active cab immediately adjacent to the equipment being controlled.
 - 1. Ensure that once a coupler deployment, stowage, electrical isolation, or uncouple action has been initiated, LRV propulsion is inhibited until the action has been completed.
- B. Design the coupler deployment and stowage systems such that the following can be performed by a single maintainer in under 60 seconds:
 - 1. deploy to the coupler extended and hood open state from the coupler retracted and hood closed and locked state; and
 - 2. stow to the coupler retracted and hood closed and locked state from the coupler extended and hood open state.

6.5.2 LRV COUPLING SPEED INTERLOCK AND OBJECT DETECTION

- A. Design the coupler and draft gear system to limit the LRVs' speed to below the restricted coupling speed once the coupler has been deployed until one of the following conditions is satisfied:
 - 1. the deployed coupler is stowed with the front hood closed and locked;
 - 2. the deployed coupler is mechanically coupled with another coupler; or
 - 3. the coupling speed logic is bypassed by a non-trainlined Cut-Out.
- B. Include an audible alarm in the driver's cab that activates in the active driver's cab when all the following conditions are satisfied for an LRV:
 - 1. the drive/brake lever is in a driving mode;

2. the LRV's coupler is stowed; and
 3. there is an LRV less than 3 m directly in front of the moving LRV.
- C. Determine the maximum coupling speed during the PHA in accordance with Section 3.4 [*Safety*] of Schedule 3 [*Design and Manufacturing Protocols*].
1. Ensure mechanical and electric coupling function correctly at any LRV speed from 0.5 km/h to the maximum coupling speed.
 - a. The maximum coupling speed shall be greater than 3 km/h.
 2. Provide a means for the LRVs' restricted coupling speed to be adjusted to any value from 0.5 km/h to the maximum coupling speed based on the PHA.

6.5.3 AUTOMATIC COUPLING

- A. Provide couplers that automatically mechanically and electrically couple when two couplers come into contact within their gathering ranges at a speed between 0.5 km/h and the maximum coupling speed.
- B. Design the electrical coupling system to operate as follows:
1. if an LRV's electrical coupling isolation switch is in the normal position, the coupler's electrical heads move to the electrically coupled position after mechanical coupling has been achieved;
 - a. if the LRV being coupled onto is powered off, it will power on to facilitate the coupling operation and respond to any trainlined commands from the Train's "Cab Active" driver's cab; and
 2. if the LRV's electrical coupling isolation switch is in the isolate position, the coupler's electrical heads will remain in their uncoupled, or isolated, position.

6.5.4 AUTOMATED UNCOUPLING

- A. Design the coupler system such that with the LRV at No Motion, when the Driver presses an uncouple button on the control panel in the "Cab Active" driver's cab adjacent to the coupler where the uncoupling is to occur, the following actions occur:
1. the electrical heads on both coupled LRVs will move to their isolate positions; and
 2. the mechanical heads on both coupled LRVs will uncouple.
- B. Design the uncoupling operation as follows:
1. once the uncouple button is pressed, the uncouple sequence described in Section 6.5.4 [*Automated Uncoupling*] will continue until the couplers have fully transitioned to the mechanically disengaged and electrically uncoupled state even if the uncouple button is released; and
 2. once the uncouple sequence described in Section 6.5.4 [*Automated Uncoupling*] is completed, driving the LRV in reverse will allow the mechanical heads to separate.
- C. Design the LRVs such that isolating and uncoupling LRVs will not affect the availability of LRV systems or cause adverse system effects.

6.5.5 ELECTRICAL ISOLATION

- A. Design the coupler system to have an electrical isolation mode that retains the mechanical couplers in a coupled state while retracting the electrical coupler heads.
- B. Design the coupler system such that with the LRV at No Motion, when the Driver moves the isolation switch to the isolate position, on the control panel in the driver's cab adjacent to the coupler where the isolation is to occur, the electrical heads on that coupler and the coupler on the coupled LRV retract to their isolated, or uncoupled, position.
 - 1. Design the uncouple function on the LRVs such that it will not be necessary to return the isolation switch to the normal position to mechanically uncouple using the uncouple button.
- C. Design the LRVs such that the position of the isolation switch is checked on mechanical coupling, and the LRV's electrical couplers are moved in accordance with Section 6.5.3 [*Automatic Coupling*].

6.6 MANUAL OPERATION

- A. Provide secured manual operation devices that provide Drivers and maintainers with the following functionality in the event of power loss to, or control failure of, the coupler's automated systems:
 - 1. manual operation of the mechanical coupler for uncoupling only; and
 - 2. retraction of the electrical heads for isolation and reconnection.
- B. Design all manual operation functions to operate independently and in any sequence and combination.
- C. Submit a Coupler System Manual Operation Report (CDRL 04-40) that includes the following:
 - 1. drawings of the manual operational controls, including layout drawings of their locations in the LRV;
 - 2. narrative of the manual operation sequences;
 - 3. confirmation that the proposed manual operation of these automated systems presents no safety or other occupational health hazards to Drivers and maintainers; and
 - 4. approval of the manual operational sequences by a human factors engineering specialist.

6.7 PAINTING, FINISHING, AND DECALS

- A. Paint the LRVs' hood, coupler, and draft gear to match the Accepted Exterior Design and Finishing Scheme.
- B. Provide warning decals on the upper surface of the coupler that indicates the risks associated with standing on the coupler.

SECTION 7: LIGHTING

7.1 GENERAL

- A. Provide the LRVs with commercially available LED internal lighting, LED external lighting, and LED emergency lighting in accordance with EN 13272 and EN 50155.
- B. Integrate all LRV lighting into the LRVs in accordance with the Design Guide.
- C. Design the LRVs' lighting systems to provide uninterrupted lighting for the entire LVDC bus voltage range as per IEC 60571.
- D. Construct all lenses of non-yellowing, UV-resistant polycarbonate.
- E. Provide electronic power supplies for the LRV lighting that incorporate reverse polarity protection, temperature protection, and overvoltage and undervoltage protection.

7.2 INTERIOR LIGHTING

7.2.1 GENERAL

- A. Provide interior lighting in accordance with the Design Guide.
- B. Design the interior lighting system to provide an appropriate interior lighting level by automatically adjusting the luminance level of the interior lighting based on the ambient exterior lighting conditions.
- C. Provide internal lighting in accordance with EN 13272 for mass transit vehicles and include the following:
 - 1. general lighting in the passenger area and both driver's cabs;
 - 2. emergency lighting in the passenger area and both driver's cabs; and
 - 3. at least one hour of emergency lighting operating time in the passenger area and both driver's cabs.
- D. Use internal lighting fixtures that are resistant to vandalism.

7.2.2 DRIVER'S CAB LIGHTING CONTROLS

- A. Design lighting controls in the driver's cab to only allow the Driver to switch the headlights between high and low beam, and change the colour and intensity of the driver's cab lighting, digital and analog displays, instruments, interfaces, and controls within the driver's cab.
 - 1. All other lighting and passenger area lighting shall be controlled via system design or function.
- B. Provide a means on the cab consoles in the driver's cabs for the Driver to do the following:
 - 1. turn on and off the internal lights in the driver's cab;
 - 2. select red or white driver's cab interior lighting;
 - 3. dim and brighten the red and white driver's cab lighting with a minimum of 10 levels of light intensity; and

4. dim and brighten the lighting of all digital and analog displays, instruments, interfaces, and controls.
- C. Design all controls, indications, alarms, lights, and console panels in the driver's cab to be clearly visible under all red and white light operating conditions and intensity levels.

7.2.3 PASSENGER AREA

- A. Provide passenger area lighting levels that are suitable to allow the CCTV system to capture clear images of the LRV interior.
- B. Ensure reflection and glare from windows and other reflective surfaces comply with EN 13272.
- C. Provide a maintainer-accessible, but not Driver-accessible, switch to turn on and off the internal lighting within the passenger area.
1. Ensure this switch will not affect any of the LRVs' emergency lighting systems.

7.3 EXTERIOR LIGHTING

7.3.1 GENERAL

- A. Provide the LRVs with external lighting integrated into the LRV body in accordance with the Design Guide and in compliance with the requirements of the *Traffic Safety Act (Alberta)* and the *Vehicle Equipment Regulations (Alberta)*, applicable to operation of the LRVs on the roadway, tunnels, elevated guideways, and segregated alignments of the system. Note: For the purpose of design, the LRVs are considered vehicles that operate on the road. The LRVs' external lighting requirements include the following:
1. headlights, with high and low beam functions;
 2. side lights;
 3. taillights;
 4. brake lights;
 5. hazard lights;
 6. outline marker lights;
 7. destination sign;
 8. individual turn indicator lights at each end of the LRVs and also equally spaced along each side such that they are visible to other road users;
 9. side marker lights equally spaced, at a maximum spacing of 10 m, along each side of the LRVs such that they are visible to other road users. Side marker lights may be combined with direction indicator lights; and
 10. reflectors along each side of the LRVs, mounted 1 m above road level. Reflectors may be combined with direction indicator lights.
- B. Provide external lighting on the LRVs that auto-switches as required for bidirectional operation.

- C. Design all exterior lighting to be replaceable from the exterior of the LRVs.
- D. Design all exterior lights to be weatherproof with an IP68 rating.
- E. Ensure lenses and bezels are retained by captive fasteners.
- F. Provide the headlights, direction indicator lights (not flashing), taillights, and outline marker lights such that they remain on at all times whenever there is an active driver's cab.
- G. Design the direction indicator lights such that when the direction indicator lights on one side on a LRV are activated they will flash to indicate a turning manoeuvre, while the direction indicator lights on the other side of the LRV will remain illuminated but not flashing.
- H. Design the hazard warning lights to be operable by the Driver manually with a single hazard light switch any time the LRV is "Battery On", regardless of the operating mode of the LRV, including with the control key switch in the "off" position and with the control key removed.

7.3.2 HEADLIGHTS

- A. Provide headlight assemblies on the outside of each end of the LRVs.
 - 1. Ensure the headlights colour temperature is within the 5,000-6,500 K temperature range.
- B. Ensure that during driver's cab activation, with the direction controller in the "Forward" position, headlights on the active driver's cab are illuminated.
- C. Ensure that during driver's cab activation, with the direction controller in the "Reverse" position, headlights on the non-active cab are illuminated.
- D. Design headlights so they do not illuminate on coupled ends.
- E. Provide headlights with high beam and low beam modes.
- F. Design the headlight arrangement, pattern, and intensity to provide a Driver with enough visibility to safely operate the LRVs under all ambient lighting conditions.

7.3.3 TAILLIGHTS AND BRAKE LIGHTS

- A. Provide red LED taillight assemblies on the exterior of the driver's cab at each end of the LRVs.
- B. Design the LRV taillights to illuminate as follows:
 - 1. lit red at both ends of the Train whenever the Train is powered on without an active cab;
 - 2. extinguished at the coupled ends of coupled LRVs;
 - 3. extinguished on the active cab of the Train and lit red on the trailing cab of the Train when the direction controller is in "forward" position; and
 - 4. lit red on the active cab of the Train and extinguished on the trailing cab of the Train when the direction controller is in "reverse" position.
- C. Design the taillights to remain on at all times whenever a Train is powered on and at No Motion.

- D. Design taillights on the trailing cab of the Train to provide brake light functionality by increasing their lux level at least 500% over the normal taillight illumination any time braking effort is requested.

7.3.4 MARKER LIGHTS AND REFLECTORS

- A. Arrange and colour reflectors on the exterior of the driver's cab at each end of the LRVs to provide a visual indication of the LRV position when the LRVs are in "Auxiliary Off" mode in accordance with the Design Guide.
- B. Design the LRV marker lights to have a separate designated colour for the leading cab and the trailing cab and to function as follows:
 - 1. lit the designated colour on the trailing cab end of the Train and lit the designated colour on the leading cab end of the Train when the Train is in "Auxiliary On" mode or when there is an active driver's cab;
 - 2. extinguished on coupled ends of coupled LRVs; and
 - 3. illuminated based on the last-known direction of the Train when a Train transitions to "Auxiliary On" mode from "Auxiliary Off" mode.

SECTION 8: ELECTRICAL

8.1 GENERAL CONFIGURATION

8.1.1 GENERAL REQUIREMENTS

- A. Select all electrical equipment, wiring, connections, and other devices to meet the requirements of IEC 60077, EN 50343, EN 50153, and EN 45545.
- B. Physically and functionally segregate all LRV electrical circuits in accordance with EN 50343.
 - 1. Notwithstanding IEC 62995 compliance, should an LRV Supplier-specific segregation and classification system be used, the criteria of the LRV Supplier's specific segregation and classification system shall be submitted to the City.
 - 2. Where a circuit is not covered by EN 50343, or EN 50343 is not clear, the LRV Supplier shall submit the criteria used to segregate and classify those circuits to the City.
- C. Provide automatic regulation of rolling stock currents at reduced line voltages.
 - 1. Design the current limitation function to comply with IEC 62313 criteria for the coordination between power supply (substation) and rolling stock to achieve interoperability.
- D. Ensure all equipment operating directly from the nominal 750 VDC line voltage provides its full performance at the nominal voltage and is rated for operation at the range of line voltages that comply with IEC 60850.
 - 1. Ensure the LRVs' auxiliary power systems will continue to operate below the Umin2 traction power cut out within a range compliant with both IEC 62313 and IEC 60850.
 - 2. Ensure all LRV equipment operates continuously over the range of expected voltages without damage, failure of the equipment to function as specified, or a reduction in service life.
- E. Design electrical equipment to function properly under the worst-case combination of conditions, including ambient conditions, equipment operating tolerances, Train length, and voltage drops across the LRVs' wiring, connections, and couplers.
 - 1. Configure electrical equipment such that no failure mode related to excess or inadequate voltage power will place the LRVs in an unsafe state.
- F. All primary, AC, and LVPS bus, or portions thereof, located within the passenger area shall comply with the requirements of EN 45545 and its normative references; in particular EN 50153.
 - 1. The level of protection of passengers from the primary, AC, and LVPS bus potentials shall be traceable to the PHA.
- G. Wires, electrical conduits, connectors, and electrical equipment shall not be placed where they are visible to Passengers and shall be protected such that they are not subject to vandalism.
- H. Provide warning signage and a visual indicator that is active whenever more than 50 volts RMS are present for any electrical component designed to store or retain a voltage potential of more than 50 volts RMS.

1. Locate warning signage and the visual indicator to be visible on the exterior of the compartment the electrical component is contained in without the need to remove any covers or panels.
2. Design each visual indicator to be activated by the voltage level present at the electrical component to which it applies.
3. No failure mode of the indicator will allow for a no voltage indication when voltage is present.
 - a. Determine the SIL level of the failure indicator through the PHA.

8.1.2 WIRING AND CONNECTIONS

- A. Make all control wiring connections to LRUs through multi-pin connectors mounted on the LRU enclosure.
- B. Route flexible hoses, wiring, and cabling across articulation joints in ducting containing non-conductive inserts.
 1. Ensure cables have sufficient length and support to permit the full motion of the articulation without chafing or strain to the cables but not so much length that unnecessary flexing of the cables occurs.
 2. Provide multi-pin connector or bolted terminal connector disconnects on both sides of each articulation, as appropriate for the voltage and current ratings of the circuits.

8.1.3 RETURN CIRCUITS

- A. Provide separate primary, AC, and LVPS return buses that are electrically isolated from the LRV carbody structure, and ensure no electrical equipment or circuit uses the LRV carbody structure as its normal return path.
- B. Safety bond the carbody structure from a single location to the LRVs' wheels through safety ground brushes on each bogie.

8.2 CIRCUIT PROTECTION

8.2.1 CIRCUIT PROTECTION

- A. Protect AC circuits with AC circuit breakers and DC circuits with DC circuit breakers located in lockers and panels that are both inaccessible to passengers and not subject to inadvertent operation by the Driver.
 1. The level of protection for the electrical lockers and electrical panels installed in the passenger compartment will be traceable to the PHA.
- B. Protect primary power circuits at the pantograph interface level with high-speed DC-rated circuit breakers that are vented through filter elements to prevent gas build-up and shielded to prevent damage to adjacent equipment and to the LRV structure.
 1. Individually protect the primary power distribution circuits for the LRVs' auxiliary systems with fuses rated for primary voltage mounted in insulated self-extracting fuse holders.

- C. Coordinate the circuit protection within the LRVs and between the LRVs and the wayside such that local faults will not cause nuisance trips that remove power from larger sections of the LRVs' electrical systems or from the OCS.
- D. Provide primary voltage fuses and circuit breakers for all Vital and revenue-operation critical circuits with a visual indicator that shows when they are in the tripped state, and have them report their tripped status to the Driver through the MDS.
- E. Ensure equipment that is directly supplied by the OCS is rated for continuous operation over the entire range of OCS voltages defined by IEC 60850.

8.2.2 GROUND FAULT PROTECTION

- A. Provide ground fault protection for all primary power and auxiliary AC power circuits that detects the return of current through paths other than the normal return paths from the devices to their respective return buses, and opens the HSCB for devices fed through it or opens the appropriate line switch or contactor.

8.2.3 SAFETY BONDING

- A. Safety bond the LRV carbody structure to the running rails through the wheels in accordance with IEC 61991.
- B. Provide no fewer than one safety ground brush assembly per axle on every powered and unpowered bogie that is as follows:
 - 1. is electrically connected such that no current flows across the raceway of the axle bearings on the LRV bogies; and
 - 2. is a service-proven design, with an expected life of more than 2,000,000 km, in wide use in the rail transit industry.
- C. Safety bond all equipment on the LRVs, including resiliently mounted equipment, enclosures, the bogie frame, and bogie-mounted equipment, to the LRV carbody structure.
- D. Design the safety bonding system such that given an undetected failure of a single point of the LRV's safety bonding system, no additional failure occurring on either the LRVs or OCS will cause the carbody voltage to protective conductor to exceed the time limits in accordance with EN 50122-1.

8.2.4 LIGHTNING ARRESTOR

- A. Mount a dry-type lightning arrestor rated by its OEM for outdoor DC operation on the LRV's roof adjacent to the base of the pantograph.
- B. Select the lightning arrestor to prevent voltage transients and surges from damaging or degrading LRV equipment, including the arrestor itself.

8.2.5 FAULT ANNUNCIATION

- A. As the primary means of fault annunciation, push fault indications through the MDS to the TOD's fault display.
- B. Provide individual visual indication on the Train status panel in the driver's cab of the HSCB tripped fault, 3-phase APS fault, 120 VAC single-phase fault, LVPS fault, APS fault, and propulsion fault from any LRV in the Train.

8.3 PRIMARY POWER SYSTEM

8.3.1 HIGH SPEED CIRCUIT BREAKER

- A. Provide an IEC 60077 and IEC 60571 compliant roof mounted HSCB to protect the propulsion primary power circuits and is coordinated with the wayside OCS protection.
- B. Design the HSCB to be electrically resettable using and HSCB reset button on the Train status panel in the driver's cab.

8.3.2 LINE FILTERS

- A. Provide an independent IEC 60310 and IEC 61881 compliant line filter for each propulsion system converter and each auxiliary power supply converter that suppresses all LRV-generated high frequency voltage transients caused by converter switching operations, under both normal and abnormal equipment operation, for any allowable line voltage at any location on the Valley Line LRT, with any combination of active and inactive substations.
- B. Design the line filter such that cold start inrush current is limited to the point that nuisance tripping of HSCBs and wayside components is eliminated.
- C. Design the line filters with circuit elements that reduce the voltage levels within the line filters to fewer than 50 volts within three minutes of primary power being removed.
- D. Provide the line filters with the following equipment:
 - 1. a permanently affixed decal adjacent to the line filter capacitors that warns maintainers to lower the pantograph, wait five minutes, check for voltage, manually discharge, and then short-circuit the capacitor bank before commencing service;
 - 2. a switch that will safely and easily discharge the line filter capacitor bank;
 - 3. a set of easily accessible insulated test jacks adjacent to this switch that will accept multimeter leads and are electrically connected to the capacitor bank such that the actual full potential of the capacitor bank will be displayed on a connected multimeter.

8.3.3 TRACTION POWER RETURN BRUSHES

- A. Provide no fewer than one traction power return brush assembly per axle on every powered bogie that is as follows:
 - 1. is electrically connected such that the axle bearings on the LRV bogies are electrically isolated;
 - 2. is a service-proven design, with an expected life of more than 2,000,000 km, in wide use in the rail transit industry;
 - 3. is designed such that with one ground brush removed, the remaining ground brushes will conduct at least two times the normal primary power circuit RMS current, and 1.5 times the primary power circuit peak current without exceeding the ground brushes OEM ratings; and
 - 4. is compatible with the frequencies and power used in the TRPS, Valley Line LRT wayside equipment, and prospective electrical faults occurring within the LRVs operating on the Valley Line LRT.

8.4 PANTOGRAPH

8.4.1 GENERAL

- A. Equip each LRV with a single, bidirectionally-stable, roof-mounted pantograph assembly that has the following features:
1. is compatible with the VDE, for LRV loadings from AW0 to AW3 inclusive and all conditions of wheel wear;
 2. provides continuous, stable, reliable, and optimal wire tracking and wear at all wire staggers and offsets during operation at all LRV operating speeds throughout the Valley Line LRT;
 3. operates without degradation of performance during all of the environmental operating conditions described in Section 1.3.14 [*Climatic Conditions*];
 4. applies a contact force to the OCS that is in accordance with IEC 60494-2 for all pantograph operating heights and is rated to transfer nominal 750 VDC, in accordance with IEC 60850, from the OCS to the LRV, and is coordinated with the OCS in accordance with EN 50367;
 5. allows replacement of the pantograph carbons with ice cutting collector strips as required by weather conditions;
 6. is spring raised and electrically lowered; and
 7. is protected from corrosion and will not collect or trap water.
- B. In addition to providing the carbon collector strips installed in the pantograph head that are being used in normal operation; the LRV Supplier will provide enough ice cutting collector strips, installable by maintainers during inclement weather operations, to outfit one-third of the LRVs in the fleet with two ice cutting collector strips per pantograph head.
- C. Design the pantograph assembly to have the following dimensional characteristics:
1. no part of the pantograph assembly in the lockdown position shall exceed 4,000 mm above TOR;
 2. minimum operating height shall not exceed 4,100 mm above TOR; and
 3. maximum operating height is not less than 6,900 mm above TOR with the pantograph being able to reach a maximum extension of not less than 7,100 mm above TOR.

8.4.2 PANTOGRAPH ASSEMBLY

8.4.2.1 Collector Head

- A. Provide a collector head assembly that contains two contact strips with integrated contact strip suspension that maintains the contact strips in contact with the OCS and decouples the movement of the contact strips from the pantograph arms such that the pantograph arms don't respond to small and rapid wire height variations.
- B. Provide contact strips that are replaceable with common hand tools, are compatible with the Valley Line LRT OCS, have a Design Service Life of no less than 75,000 operating km, and include a wear indicator on the assembled pantograph that is visible to a maintainer standing at roof level.

- C. Provide each collector head assembly with provisions to permit individual adjustment of each contact strip assembly to set the strips in the same plane to provide for continuous contact with the overhead wire.
- D. Design the collector head end horns to provide a means of gathering a detached overhead contact wire to aid in lowering the pantograph and preventing underrunning and entanglements of the pantograph with the OCS.

8.4.2.2 Pantograph Frame and Base

- A. Provide all pantograph assemblies with tinned copper braided wire shunts that electrically bypass all movable joints and bearings.
- B. Provide pantograph assemblies that are spring raised when the lowering device's restraining mechanisms are released with the raising speed such that no damage occurs to the carbon strips and OCS on during contact on raising.

8.4.2.3 Pantograph Control

- A. Equip the LRVs with a trainlined pantograph raising and lowering circuit that is operable from any driver's cab in a Train, while the Train is at rest or moving, provided the Train is in a "Battery On" mode.
- B. Design the pantograph control system so that all systems dependent on primary power are put into a standby mode with minimal current demand prior to lowering the pantograph.
- C. Provide an emergency pantograph down button, co-located with the external emergency battery isolation switch on the outside of the LRVs secured behind a panel only accessible by Drivers and maintainers, that lowers the pantograph when activated.

8.4.2.4 Pantograph Lowering Device

- A. Equip each pantograph with a service-proven electrical lowering device that lowers the pantograph in a way that eliminates arcing when the collector head disconnects from the OCS and slows the pantograph before it reaches its locked down position.
- B. Equip the LRVs with a manual pantograph lowering device for raising and lowering the pantograph in the event of a loss of the LVPS or loss of pantograph electrical control circuits. The pantograph lowering device shall do the following:
 - 1. include a manual hand crank connectable to the lowering device, as follows:
 - a. the hand crank and the LRV carbody will remain insulated from the primary voltage any time the manual hand crank is connected to the lowering device;
 - b. the hand crank is stored within the LRVs; and
 - c. the hand crank is only accessible to authorized users; and
 - 2. the hand crank is operable by Driver or maintainer standing within the LRVs.
- C. Design the pantograph to be movable between its fully raised and locked-down positions within two minutes, measured from the time the Driver is standing in front of the location within the LRVs where the manual hand crank is stowed.

8.4.2.5 Pantograph Automatic Dropping Devices

- A. Provide the pantograph with an automatic dropping device that detects hard contact conditions regardless of the direction of travel the LRVs and immediately lowers the pantograph when a hard contact is detected between any part of the pantograph and the OCS.
- B. Provide the pantograph with a device that prevents accidental activation of the automatic dropping device during servicing of the pantograph.

8.4.3 PANTOGRAPH-TO-OCS INTERACTION MONITOR

- A. Provide a dedicated camera as part of the LRVs' CCTV system that monitors the pantograph-to-OCS interaction throughout the entirety of the pantograph's vertical operating range, designed according to Section 9.2.2A.4 [*CCTV Coverage*].

8.4.4 PANTOGRAPH STUDY

- A. Submit a Pantograph Study (CDRL 04-41) that includes the following:
 - 1. dimensioned drawings and renderings of the pantograph assembly that show the following:
 - a. the position of the pantograph assembly on the LRV and relative assembly positions, i.e. closest and furthest separations of the current collectors in a two-car Train;
 - b. the pantograph's working range on the LRV;
 - c. the pantograph's housed height and other controlled height positions on the LRV;
 - d. the collector head's width, length, skew, and profile; and
 - e. the contact strips and their spacing on the current collector head;
 - 2. the relationship between the LRV-mounted pantograph and the VDE;
 - 3. a curving study demonstrating the following:
 - a. the pantograph tracking of the OCS through the curves of the Valley Line LRT; and
 - b. the current collector's working width within the Valley Line LRT;
 - 4. the expected service life of the current collector strips; and
 - 5. installation drawings of the pantograph-to-OCS interaction camera and the projected views of the OCS and pantograph that the camera will provide at varying wire heights.

8.5 AUXILIARY POWER SUPPLY

8.5.1 GENERAL REQUIREMENTS

- A. Provide an IEC 61287-1, IEC 62236, IEC 60077, and IEEE 1476 compliant, convection-cooled or clean-air ventilated and convection-cooled, dual-redundant, auto-synchronous, fully automated APS that functions over the line voltage range specified in IEC 60850 to convert primary power to all of the voltages and frequencies required by the LRVs' auxiliary systems, control circuits, and battery charging circuits.

- B. Provide an APS with at least two equally rated, fully interchangeable, auxiliary converters configured such that loss of one auxiliary converter will not negatively affect either the operation of the LRV or the Passenger Experience.
 - 1. Provide each auxiliary converter with well-regulated sinusoidal AC outputs, well-regulated LVPS outputs, and well-regulated dedicated battery charger outputs independent of the LVPS output, suitable for the LRV systems connected to them.
 - 2. Automatically and continuously synchronize the AC and DC outputs of the auxiliary converters with the respective output on the other converter and feed onto LRV-wide AC and DC distribution buses.
 - 3. Or as an alternative to Section 8.5.1.B.1 and Section 8.5.1.B.2, provide an alternately configured fully redundant APS system where loss of one auxiliary converter will not negatively affect either the operation of the LRV or the Passenger Experience.
- C. Design every output of the APS and all distribution bus wiring as follows:
 - 1. galvanically isolated from the APS's HVDC input, the APS enclosure, and the carbody;
 - 2. rated for the worst-case peak and continuous loading; and
 - 3. have an additional reserve capacity of at least 20% to allow for future equipment installation.
- D. Design the APS to automatically start when primary power is applied regardless of the presence of battery power.
- E. Coordinate the design, selection, and installation of all equipment and wiring powered from the APS with the expected output characteristics of the APS so that the Design Service Life, performance, maintenance, and operation of equipment is not adversely affected.

8.5.2 LOW-VOLTAGE SYSTEM

- A. Power the LRV's control circuitry from an either 24 or 48 VDC distribution bus that is fed by the APS's LVPS and the LRV's battery.
- B. Provide a dedicated output on the LVPS that charges the LRV's battery, to maintain it at its rated charge, whenever the LRVs are connected to primary power unless the LRVs are in "Battery Isolation" mode.
 - 1. Design the LVPS bus such that the LVPS bus will not charge the batteries in connected LRVs.
- C. Design the LVPS such that it instantly transfers loads to the LRV's battery whenever there is a loss of LVPS output.
 - 1. Automatically disconnect non-emergency low-voltage loads when the LVPS output on LRVs is lost for more than 30 seconds and are automatically reconnected when the LVPS output is restored.
- D. Design the LVPS and LVPS bus with the capacity to supply LVPS power to an electrically coupled adjacent LRV with a non-functioning LVPSs such that none of the equipment in the failed LRV is operating at less than 70% of the nominal LVPS voltage with the battery disconnected in the failed LRV and with any cab in the pair in control.

8.5.3 MAINTENANCE OUTLETS

- A. Provide maintainer accessible, but Passenger inaccessible, duplex outlets in each driver's cab and the passenger area of each module of the LRVs that supply single-phase 120 VAC, 60 Hz, 20 A service with power quality as defined by IEC 60077 any time the APS has power.
 - 1. Feed each outlet from a dedicated GFCI circuit breaker.

8.5.4 VOLTAGE AND FREQUENCY REGULATION

- A. Design the APS such that no damage to the APS and equipment fed from the AC and DC distribution buses will result from a line voltage supply interruption of any duration.
 - 1. Sufficient energy storage capacity shall be provided to maintain the AC output voltage at nominal values for a 25 ms section isolator gap run-through.

8.5.5 LOAD AND FAILURE MANAGEMENT

- A. Design the APS to manage the application and removal of loads to and from itself and the shutdown and start-up sequences of major loads to limit peak loading, maintain voltage during loading, and reduce the delay of equipment starting or restarting due to application and interruption of line voltage.
- B. In the event of converter or primary voltage failures that fully or partially disable the power to the AC and DC distribution buses, design the LRVs to reduce the performance of non-critical LRV systems to shed some load while ensuring all systems remain functional such that the LRVs are not required to be immediately removed from service for this failure.
- C. Design the APS so that all other APS outputs remain fully functional in the event of a converter or load failure that fully or partially disables an APS output.

8.5.6 FAULT MONITORING AND CONTROL

- A. Design the APS so that failures of the APS and its subsystems will not result in damage to LRV systems powered from the AC and DC distribution busses.
- B. Design the APS control logic to permit the APS and equipment connected to the AC and DC distribution buses to automatically restart for shutdowns caused by self-correcting failure conditions.
 - 1. Design the APS so that major faults latch the APS or connected auxiliary powered equipment off until the APS and connected auxiliary powered equipment is reset.
 - 2. Provide the APS with a data logger that creates a record of relevant signals and time of recording whenever an unusual or erroneous condition is encountered during operation.
 - 3. Pass all fault occurrences and reoccurrences to the MDS.
- C. Design the APS to synchronize its system time to the common network time source derived from the Wi-Fi O&M Data Radio System.

8.6 BATTERY

8.6.1 GENERAL

- A. Equip the LRVs with an IEC 62973-1 compliant battery, composed of maintenance-free batteries that will provide a Design Service Life of not less than five years and will operate without degradation of

performance during all of the environmental operating conditions described in Section 1.3.14 [*Climatic Conditions*].

8.6.2 EMERGENCY POWER

- A. Design the LRV to provide emergency power, without support from the APS, and perform the following given an ambient exterior temperature of -40°C and batteries that are at 90% of full charge:
1. load shed non-essential auxiliary systems while maintaining power to systems required to facilitate moving LRVs with a Passenger load to the next Stop and Station under primary power;
 2. offload all Passengers at the next Stop and Station using the LRVs' door systems;
 3. provide emergency lighting throughout the LRV and external marker lighting for an hour, and then continue to provide emergency lighting in the driver's cab and exterior marker lighting for an additional hour; and
 4. maintain the temperature in the occupied driver's cab at or above 16°C for a period of two hours for any exterior ambient temperature experienced down to -40°C.

8.6.3 BATTERY INSTALLATION

- A. Install the LRVs' battery in a ventilated, welded stainless steel, battery compartment box in the LRV underframe or on the LRV roof.
1. Design the battery compartment box to allow the battery to fully function over the ambient exterior temperature range of 40°C to -40°C.
 2. Design the battery compartment box to allow all cells and their busbar interconnections to be readily accessible for servicing.
 3. Ensure battery compartment hinges, fasteners that are removed periodically, and all other devices that move by sliding or rolling on other devices are stainless steel.

8.6.4 BATTERY CIRCUIT AND OVER-TEMPERATURE PROTECTION

- A. Provide a circuit breaker rated to withstand the short circuit capacity of the battery to protect the LRV's battery and battery circuitry.
- B. Provide the battery with over-temperature protection that will remove loads from the battery and prevent further charging of the battery when temperatures are such that the battery would be damaged.

8.6.5 EMERGENCY BACK-UP BATTERY CUT-OUT SWITCH AND ISOLATION SWITCHES

- A. Provide an emergency battery cut-off switch in each driver's cab on the driver's cab Cut-Out panel.
- B. Provide battery isolation switches, co-located with the emergency pantograph down button, on each side of the LRVs that are accessible from ground level, located behind a lockable cover that is clearly identified for maintenance and emergency services access, and positioned to protect the switch against accidental operation and against damage as a result of collisions.

8.7 SHORE POWER SUPPLY CONNECTION

- A. Provide a shore power connector and related circuitry to allow connection of primary power to LRVs parked in a maintenance area from a Maintenance Facility power system.

1. Provide the same connector and interlock system as the Stage 1 LRVs.
 2. Locate the connector, or connectors, on the LRVs such that it is positioned in the same location relative to the Maintenance Facility shore power connection point regardless of the orientation of the vehicle.
- B. Design the shore power connector with interlocks so that when it is used to connect the LRVs to the shop power, all propulsion functionality is disabled but all other circuits are powered and functioning normally.

SECTION 9: COMMUNICATIONS

9.1 RADIO SYSTEM

- [REDACTED]
[REDACTED]
- [REDACTED]
[REDACTED]
 - [REDACTED]
 - [REDACTED]
 - [REDACTED]
[REDACTED]
[REDACTED]
 - [REDACTED]
[REDACTED]
- [REDACTED]
[REDACTED]
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 - [REDACTED]
[REDACTED]
 - [REDACTED]
[REDACTED]

9.2 CCTV SYSTEM

9.2.1 GENERAL

- [REDACTED]
[REDACTED]
[REDACTED]
- [REDACTED]
[REDACTED]
- [REDACTED]
[REDACTED]
 - [REDACTED]
 - [REDACTED];

- [Redacted]

- [Redacted]

- [Redacted]

- [Redacted]

- [Redacted]

9.2.3 CCTV SYSTEM REQUIREMENTS

9.2.3.1 System Requirements

- [Redacted]

9.2.3.2 Camera Requirements

- [Redacted]

■ [REDACTED]

9.2.4 VIDEO AND AUDIO STORAGE REQUIREMENTS

9.2.4.1 Video and Audio Storage

■ [REDACTED]
[REDACTED]
[REDACTED]

■ [REDACTED]
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- [Redacted]

- [Redacted]

- [Redacted]

9.3.1.3 Network Requirements

- [Redacted]

- [REDACTED]
- [REDACTED]
- [REDACTED].

9.4 WI-FI O&M DATA RADIO SYSTEM

- [REDACTED]
[REDACTED]
- [REDACTED]
[REDACTED]
[REDACTED]
- [REDACTED]
[REDACTED]
- [REDACTED]
[REDACTED]

SECTION 10: MONITORING AND DIAGNOSTIC SYSTEM

10.1 GENERAL

- A. Design the MDS to collect accurate, real-time operating-status information and historical fault data from all LRV systems and display relevant information to the Driver on the TOD.
- B. Provide the following elements in the MDS:
 - 1. LRV system diagnostics;
 - 2. TOD based user interface;
 - 3. PTU interface;
 - 4. storage of system logs in NVM; and
 - 5. an interface to the wayside through the Wi-Fi O&M Data Radio System.
- C. Use MDS firmware and Software that complies with Section 5 [*Software Systems*] of Schedule 3 [*Design and Manufacturing Protocols*].
- D. Provide an MDS fleet evaluation program for installation on the City's wayside servers to pull data from LRVs that will provide maintainers with the following functionality:
 - 1. imports processed and unprocessed data from an LRV's MDS;
 - 2. outputs plain-text information for the description of diagnostic messages;
 - 3. present fleet-level diagnostic data in tables, forms, and graphic views with the ability to drill down to specific LRVs; and
 - 4. store and delete diagnostics data.

10.2 TIME SETTING

- A. Design the MDS to synchronize its Master Clock to a common network time source whenever the LRVs are "Auxiliary On" within range of the Wi-Fi O&M Data Radio System. The MDS shall use GPS as a secondary network time source in the event of a failure of the Wi-Fi O&M Data Radio System.
- B. Design all LRV systems to sync their internal clocks to the MDS Master Clock upon "Auxiliary On".

10.3 MONITORING

10.3.1 GENERAL

- A. Design the MDS to continuously monitor the LRV's systems during normal operations and when a fault has been detected send an alarm and corrective measures to the TOD in the active driver's cab.
- B. Design the MDS to automatically update the train configuration on the TOD with at least the following information as LRVs are added to or removed from the Train:
 - 1. LRV numbers;

2. LRV orientation as it relates to the Train;
 3. lead LRV and active cab end; and
 4. direction of travel.
- C. Design the MDS to make the following LRV information available on the TCN such that it can be pushed to, or requested by, authorized external sources through the Wi-Fi O&M Data Radio System, and provide information in the MDS technical manuals on how to access this information through the TCN :
1. trip ID;
 2. route ID;
 3. next stop ID;
 4. Train number;
 5. LRV number;
 6. Train location information in GPS coordinates and distance in meters from the next stop;
 7. LRV speed;
 8. LRV direction
 9. LRV stop status;
 10. passenger congestion\occupancy status; and
 11. LRV health state as follows:
 - a. "LRV OK";
 - b. "Fault Class C";
 - c. "Fault Class B"; and
 - d. "Fault Class A".
- D. Design the MDS to time stamp all information that it pushes to the TCN.

10.3.2 PERFORMANCE

- A. Design the MDS with sufficient non-volatile storage to retain all recorded data, without overwriting, for at least 180 days.
- B. Design the MDS to be fully operational within 30 seconds of the LRV powering up from "Auxiliary Off" to "Auxiliary On" mode.
- C. Design the MDS such that any change in Train configuration status is displayed on the TOD within 15 seconds from the time the train configuration changes.

10.3.3 FAULT CLASSIFICATION

- A. Classify all faults as “Class A”, “Class B”, “Class C”, or “Class D” as follows, with each level being provided with a unique colour code and unique audible sound to allow the Driver to easily identify the severity of a fault:
1. Classify “Class A” faults as all LRV faults that result in a severe impairment of the Train such that propulsion is blocked;
 - a. classify “Class A” faults as all faults requiring at least one of the following actions:
 - i. the LRV and all malfunctioning parts must be shut down;
 - ii. the Train to be removed immediately from Revenue Service;
 - iii. the affected LRV to be towed; or
 - iv. an immediate corrective measure must be taken by the Driver to prevent further damage; and
 - b. design the MDS to notify the Driver through the TOD of the “Class A” fault with instructions on how to minimize the effects of the fault;
 2. Classify “Class B” faults as all LRV faults that result in an impairment of the Train such that a speed restriction is imposed;
 - a. classify “Class B” faults as all faults requiring at least one of the following actions:
 - i. malfunctioning LRV systems to be shut down or isolated;
 - ii. the Train to be removed after Revenue Service to the end of line; or
 - iii. corrective measures must be taken; and
 - b. design the MDS to notify the Driver through the TOD of the “Class B” fault with instructions on how to minimize the effects of the fault;
 3. Classify “Class C” faults as all LRV faults that result in a minor impairment of the Train such that no speed restriction is imposed;
 - a. classify “Class C” faults as all LRV faults requiring at least one of the following actions:
 - i. isolate or correct the fault such that the Train can continue in Revenue Service until the end of its shift; or
 - ii. corrective measures must be taken; and
 - b. design the MDS to notify the Driver through the TOD of the “Class C” fault with instructions on how to minimize the effects of the fault; and
 4. Classify “Class D” faults as all LRV faults that result in no impairment of the Train and require no further action from the Driver. “Class D” faults provide information to maintainers at the next scheduled preventive maintenance inspection.

10.3.4 FAULT LOGGING

- A. Provide the following in the fault data:
 - 1. time and date stamps in date YYYY-MM-DD and 24-hour clock hh:mm:ss formats;
 - 2. location determined by GPS coordinates;
 - a. in case of unavailable GPS signal, the last valid GPS coordinates including time and date, in a format specified in Section 10.3.4A.1 [*Fault Logging*], of that last GPS coordinate record.
 - 3. LRV number;
 - 4. LRV system concerned;
 - 5. the severity level of the fault in accordance with Section 10.3.3 [*Fault Classification*]; and
 - 6. a brief description of the fault.
- B. Format the individual LRV system fault logs consistently regardless of the source of the fault data.
- C. Design LRV system fault logs and fault logs to be both downloadable to the PTU and other storage media for review and viewable remotely via the Wi-Fi O&M Data Radio System.
- D. Arrange the memory of the fault data input such that when the recording capacity of the MDS or LRV system is reached, previously logged faults are overwritten on a FIFO basis.
 - 1. Design the MDS and each LRV system to have adequate storage to maintain a complete fault history for 180 days.
 - 2. Design the MDS to generate a “Class D” fault message when 75% of the MDS’s, or LRV system’s, memory available for fault logging has been used.

10.4 DIAGNOSTICS

10.4.1 GENERAL

- A. Design each LRV system to perform its own diagnostics, store fault log and health monitoring information locally, and push them to the MDS.
- B. Design the MDS to provide enough information, LRV system tests, and tools to allow a maintainer to troubleshoot the subsystems capable of self test/diagnosis down to the LRU level without requiring external test equipment.
- C. Design the MDS such that a failure of the MDS will not adversely affect the LRV system it is monitoring, and failures of monitored LRV system and sensors will not adversely affect the MDS.

10.4.2 LRV SYSTEM DIAGNOSTICS AND HEALTH MONITORING

- A. Provide a set of LEDs on each LRV system that displays the health of the LRV system.
- B. Provide each LRV system with a controlled system-level self-test that will verify correct operation of the system and run as required, when commanded by the MDS and PTU, and only under conditions that it would be safe for the self-test to run.

- C. Design LRV system-level fault logs to include date and time stamp, condition, and parameters relating to the event:
 - 1. program LRV systems such that system-level fault log information correlates directly with, and is more extensive than, that reported to the MDS;
 - 2. program LRV systems such that system-level fault logs are available to maintainers via a PTU and the TOD; and
 - 3. use a consistent fault record log format across all LRV systems with respect to date and time stamp, condition, and parameters relating to the event.

10.4.3 LRV SYSTEM-LEVEL DATA AND FAULT LOGGER

- A. The LRV Supplier shall provide each LRV system with a data and fault logger that will create a record of maintainer-selectable signals for a maintainer selectable time of recording at a maintainer-selectable sample rate whenever either of the following occurs:
 - 1. an unusual or erroneous condition is encountered during operation; or
 - 2. a set of maintainer-specified condition triggers is satisfied.
- B. The LRV Supplier shall design the data and fault logger to push a Class D fault to the MDS whenever a set of maintainer-specified conditions is triggered.
- C. The LRV Supplier shall design the data and fault logger to allow the trigger conditions, signals to be recorded, sample rate, and time of recording, specified in Section 10.4.3 [*LRV System-Level Data and Fault Logger*], as follows:
 - 1. be selectable through the PTU;
 - 2. provide the data and fault logger, for a given LRV system, with a sampling rate suitable to capture any signal within that system; and
 - 3. record all signals in SI and SI-derived units relevant to the type of signal being recorded.
- D. The LRV Supplier shall design LRV systems to log detailed fault information within their system control units and push higher level fault information to the MDS.

10.4.4 REAL TIME DATA GATHERING CAPABILITY

- A. Include the following real time data gathering functionality within the MDS and for all LRV systems within a connected Train:
 - 1. provide an interface into the real time gathering system through the PTU that allows a maintainer to set data-gathering parameters for real time data gathering sessions, including trigger points and data streams to record for the LRVs and LRV systems:
 - a. design the real time data gathering system such that sessions can be started manually or triggered by selected parameters crossing a maintainer selectable set point;
 - b. design the data collection of the real time data gathering session, from the subsystems capable of self test/diagnosis, such that real time data gathering sessions involving gathering LRV level data will be able to gather data suitable to identify system issues to an

LRU level and real time data gathering sessions involving gathering data at an LRV system level shall be able to gather data suitable to identify issues to an LLRU level;

2. capture real time data without requiring additional equipment on board; and
3. equip the MDS with channels that will accept the input of up to eight external digital and four external analog sensors and signals for real time data gathering sessions.

10.5 TRAIN DRIVER DISPLAY

10.5.1 GENERAL

- A. Ensure the main console in the driver's cab contains a touch sensitive TOD that provides a Driver with all the information required to safely operate a Train on the Valley Line LRT.
 1. The display screen hardware must be approved by a human factors engineering specialist, and must meet the following requirements:
 - a. be of a suitable size, colour range, and refresh rate to display the information on the operations and maintenance screens in an easily legible format; and
 - b. have an input method that allows it to function as the TOD.
- B. Have the layout of the TOD's "Operations Mode" and "Maintenance Mode" screen arrangements, the organizational structure of the TOD's screens, and the navigation between the TOD's screens approved by a human factors engineering specialist.
- C. Design the TOD with three functional modes: "Operations Mode", "Maintenance Mode", and "Mirror Mode" that are entered into as follows:
 1. When the Train is "Auxiliary On", all TODs in inactive cabs will enter "Mirror Mode" and mirror the information on the TOD within the "Cab Active" driver's cab. If not kept awake by an observer touching their screen the TODs in inactive cabs will enter a sleep mode where their screens will go blank after a predefined time interval of 1 minute and settable by a maintainer by means of a PTU.
 2. When a driver's cab goes "Cab Active" in the Train, all TODs in inactive cabs will remain in "Mirror Mode" while the TOD in the "Cab Active" driver's cab will enter "Operations Mode" and provide a Driver with all the information required to safely operate the LRVs on the Valley Line LRT.
 3. When commanded from the TOD's user interface and provided with the password, the TOD, in a "Cab Active" or inactive driver's cab, will enter "Maintenance Mode" and provide a maintainer access to the more in-depth diagnostics and information required to quickly locate LRV issues to the LRU level using only the TOD. All other TODs in the Train will remain in either "Operations Mode" if the cab they are in is "Cab Active" or "Mirror Mode" if the cab they are in is inactive.
- D. Submit a TOD Screen Arrangement (CDRL 04-45) that provides images and narratives of the proposed "Operations Mode" and "Maintenance Mode" screen arrangements, organizational structure, and screen hierarchies.

10.5.2 “OPERATIONS MODE” SCREEN ARRANGEMENT

10.5.2.1 “Driver Screen”

- A. Design the “Driver Screen” to include mode screen arrangements for a “Motion Screen” and a “No Motion Screen” that depict information both graphically and textually, are uncluttered, and present only the necessary information relating to operation and conditions that would affect the immediate operation of the Train in that state.
1. Develop the “Motion Screen” and “No Motion Screen” arrangements considering the state of the screen with and without additional faults and warnings being displayed.
- B. Display at least the following on the appropriate “Motion Screen” or “No Motion Screen”:
1. Train configuration;
 2. schedule information including but not limited to, next stop, departure countdown, and headway information;
 3. operating status of all critical systems logically laid out with multiple pages to manage the information; and
 4. fault display that graphically provides the location of the failed component within the Train and text further describing the location of the failed component and required mitigations.
- C. Display at least the following operating statuses for the Train:
1. train speed in analog and digital formats;
 2. overspeed;
 3. mandatory brake activated;
 4. doors released;
 5. doors open;
 6. doors closed and locked;
 7. pantograph raised or lowered for each LRV in the Train;
 8. friction brake on;
 9. friction brake released;
 10. track brake on;
 11. emergency stop activated;
 12. PEA activated;
 13. PEI activated;
 14. LRV headlights are in high or low beam;

- 15. actual temperature and temperature setting in the passenger area of each LRV in the Train; and
 - 16. passenger counts for each LRV in the Train.
- D. Submit an Operating Statuses Report (CDRL 04-46) that details the operating statuses to be displayed.
 - E. Display on the TOD and push to the OCC through the Wi-Fi O&M Data Radio System the Cut-Out status of all Vital and major systems, including the following:
 - 1. friction brake Cut-Out on a bogie-by-bogie basis;
 - 2. propulsion Cut-Out;
 - 3. regenerative brake Cut-Out;
 - 4. any Cut-Out that would prevent triggering of a mandatory brake;
 - 5. any single door or the door summary circuit for the Train bypassed or Cut-Out; and
 - 6. No Motion circuit Cut-Out.

10.5.2.2 “Fault Display”

- A. Display on the “Driver Screen” the active LRV faults and Train faults in order of criticality.
 - 1. Design the MDS to store “Class A”, “Class B”, “Class C”, and “Class D” faults in its fault log; inform the Driver of “Class A”, “Class B”, and “Class C” faults on the TOD.
 - 2. Design the MDS to continue informing the Driver of the “Class A”, “Class B”, and “Class C” faults, through the TOD, until the Driver acknowledges the fault status by pressing an acknowledgement button or soft key that will mute the visual and audible display of the fault for the Driver but leave the fault status as unacknowledged within the MDS’s maintainer viewable fault logs.
 - 3. Design the MDS to provide fault mitigation instructions on the TOD to the Driver when the Driver selects an active fault on the “Fault Display”.

10.5.3 “MAINTENANCE MODE”

- A. Design the TOD to have an interactive interface in “Maintenance Mode” that provides maintainers access to run diagnostic testing on and review diagnostic data from the MDS and LRV systems throughout the Train.
- B. Design the “Maintenance Mode” to provide enough information for a maintainer to identify a failed system to the LRU level and provide access to at least the following information and functionality:
 - 1. Software versions of the LRV systems throughout the Train;
 - 2. real-time data monitoring from the LRV systems throughout the Train;
 - 3. access to LRV system menus throughout the Train to run system-level diagnostics; and
 - 4. fault logs of Train-level, LRV -level, and system-level events.

10.6 AUTOMATIC PASSENGER COUNTING SYSTEM

- A. Provide an APC that is compatible and interfaces seamlessly with the City's APC databases.
- B. Equip each LRV with an APC system that will provide detailed passenger counts at every Stop and Station for Passenger alightings and boardings and automatically upload passenger count data logs containing the following information through the Wi-Fi O&M Data Radio System to the City's APC database:
 - a. date in YYYY-MM-DD format;
 - b. LRV number;
 - c. Stop and Station name and GPS coordinates of the Platform;
 - d. arrival time in hh:mm:ss format;
 - e. departure time in hh:mm:ss format;
 - f. door numbers with associated Passenger alightings and boardings; and
 - g. current LRV kilometrage.
- C. Design the APC system to display Passenger counts per LRV on the TOD and push Passenger counts per LRV to the OCC.

10.7 EVENT RECORDER

- A. Equip each LRV with one event recorder that complies with the requirements of IEEE 1482.1, stores a minimum of 60 days of the most recent Train data, is connected to the TCN and is accessible via the TCN and Wi-Fi O&M Data Radio System by maintainers using a PTU, and is located within the LRV interior in a tamper-resistant locked enclosure that is accessible only by a triangular maintenance key.
- B. Design the event recorder to record the following information:
 - 1. all signals required by IEEE 1482.1;
 - 2. additional required signals as follows:
 - a. event recorder self-test results;
 - b. all wired trainline functions; and
 - c. driver's cab controls relating to the following:
 - i. control of any Vital equipment;
 - ii. Cut-Out of LRV systems;
 - iii. control of passenger doors; and
 - 3. GPS location of the LRV.

- C. Equip the event recorder with spare two spare digital and one spare analog channels that are PTU-configurable and wired to an external terminal block.
- D. Provide PTU Software compliant with Section 10.3.2 [*Portable Test Units*] of Schedule 3 [*Design and Manufacturing Protocols*] for analyzing downloaded event recorder data.

SECTION 11: PASSENGER INFORMATION SYSTEM

11.1 LRV PA AND VMS SYSTEM

11.1.1 GENERAL

- A. Provide an LRV PA and VMS system that provides the following:
 - 1. automated announcements and Driver initiated announcements in both audible and visual text forms; and
 - 2. a means for the Driver to respond to emergencies and other requests for assistance by Passengers.
- B. Design the LRV PA and VMS system to provide the following features:
 - 1. two-way PTT audio communications from driver's cab-to-driver's cab, driver's cab-to-PEI, driver's cab-to-OCC, and provisions for OCC-to-PEI;
 - 2. zoned one-way PTT audio communications from driver's cab-to-passenger area and driver's cab-to-Train exterior;
 - 3. automated audible and visual announcements based on Train location, direction of travel, and route;
 - 4. recording of all audible and visual messaging passed through, displayed by, and annunciated by, the PA and VMS systems; and
 - 5. integration with the MDS for fault reporting and diagnosis.
- C. Co-ordinate related audible, PA, and text, VMS, messages such that playback to the Passengers occurs simultaneously. Provide provisions for unrelated audible and text messages to be transmitted independently of each other.
- D. Design all LRV PA and VMS system to Driver interfaces to meet the human factors requirements of Section 3 [*Driver's Cab*].
- E. Submit a comprehensive LRV Coverage Study (CDRL 04-47) to demonstrate that the LRV PA subsystem complies with the acoustic coverage and intelligibility requirements of Section 11.1 [*LRV PA and VMS System*] and that the LRV VMS subsystem complies with the requirements of Section 11.1.3 [*LRV Variable Message Signs*].

11.1.2 LRV PUBLIC ADDRESS SYSTEM

11.1.2.1 General

- A. Provide an LRV PA system on each LRV that permits the Driver to make ad hoc audible announcements throughout the passenger area and to the exterior of the Train, and that provides predetermined automatic Stop and Station audible announcements that include the name of the current Stop and Station, the next Stop and Station, and the Train destination.
 - 1. Provide automated announcements using a voice that is Accepted by the City.
 - 2. Design the automated announcement system to repeat Stop and Station information as follows:

- a. upon departure from each Stop and Station;
 - b. 30 seconds prior to arrival at each Stop and Station unless otherwise directed not to announce by the Driver or disabled in the PA system on an announcement-by-announcement basis by a maintainer; and
 - c. upon arrival at each Stop and Station.
3. Design the LRV PA system, and provide the Software that, will allow maintainers to generate, upload, and update visual and audible automatic announcements.
- B. Design the LRV PA system to be in compliance with AS 60849 and provide the following:
1. VOIP messaging compliant with RFC 3261;
 2. zoned one-way communication from the Driver to Passengers in an individual LRV or the full Train;
 3. two-way cab-to-cab PTT-enabled communication initiable from and inactive driver's cab to the active driver's cab;
 4. an initial tone that is the same as the Stage 1 LRV that precedes all audio messages to Passengers;
 - a. provide a method for maintainers to modify the audio level and frequency of this tone in the LRV's PA VMS system using a PTU;
 5. interface with the AAADS in accordance with Section 11.1.5 [*Automatic Audio Announcement and Display System*];
 6. interface with the CCTV system in accordance with Section 9.2 [*CCTV System*];
 7. LRV PA interior and side-specific exterior speaker selection;
 8. prioritized audio messages with the following order of decreasing priority:
 - a. PEI;
 - b. announcements initiated by the Driver; and
 - c. automated announcements;
 9. Driver control of the microphone through a PTT switch;
 10. Driver control of the audio volume within the driver's cab environment, with no Driver control of the audio volume within the passenger area;
 11. ambient noise compensation for each zone on a zone-by-zone basis; and
 12. system status indication and system health monitoring information pushed to the MDS.

11.1.2.2 Audio Characteristics

- A. Set the LRV PA volume to the configured parameter during LRV start-up. The interior volume shall be equipped with automatic gain control with sound-sensing microphones to maintain the following requirements within the LRVs:
 - 1. a frequency response from 150 Hz to 8,000 Hz;
 - 2. speech peaks limited to 5 dB above the average input level;
 - 3. a STIPA level of greater than 0.54 when the Train is at No Motion, and the HVAC system is off; and
 - 4. a STIPA level of greater than 0.5 when the Train is in motion and all typical noise sources, including HVAC, are on.
- B. Design the LRV PA announcement volume to automatically adjust its output level on a zone-by-zone basis, based on the ambient noise in each passenger area, such that a constant audio level is heard by the Passengers regardless of ambient noise.
- C. Ensure the maximum noise levels of the LRV PA system, when the Train, is at No Motion at a Stop and Station with all doors open does not exceed the requirements set within Section 1.9.1 [*Noise*].
- D. Submit an LRV PA System Design (CDRL 04-48) that describes the following:
 - 1. speaker layout within the driver's cab and passenger area;
 - 2. the sound coverage uniformity results attained by using commercially available sound modelling software;
 - 3. the sound levels within the driver's cab and passenger area; and
 - 4. simulated STIPA results for the LRVs.

11.1.2.3 LRV PA System Equipment

11.1.2.3.1 Speakers

- A. Provide interior speakers in the passenger area of each LRV that are flush mounted with the surface in which they are installed and have a grille that protects the speaker from foreign objects and a rear enclosure that protects the speaker from dust and moisture.
- B. Provide at least four exterior speakers on each side of each LRV that are impervious to the environmental conditions specified in Section 1.3.14 [*Climatic Conditions*], have a suitable power rating to make exterior announcements heard on a crowded Stop and Station, and are integrated into the LRVs in compliance with Design Guide.

11.1.2.3.2 Noise-Sensing Microphones

- A. Provide noise sensing microphones within the passenger area and driver's cab that meet the following requirements:
 - 1. are vandal-resistant and installed in a way to be inconspicuous to Passengers;

2. are IP66 IK10 rated where mounted on the LRV exterior and IP65 IK10 rated where mounted on the LRV interior; and
3. are of a suitable number and placement to allow ambient noise cancelling routines to compensate for the ambient noise in the LRVs.

11.1.2.3.3 Driver's Cab Microphones

- A. Provide an in-dash wide-range fixed-charge vandal-resistant rugged weatherproof condenser microphone in each driver's cab that is suitable for transportation applications and is used for all intercom, PEI, and PA modes.

11.1.2.3.4 Networked Audio Controller

- A. Provide networked audio controllers that meet the following requirements:
 1. have sufficient power to drive all speakers connected to them at maximum levels simultaneously, without distortion;
 2. supports zoned audio for the LRV exterior and LRV interior on a module-by-module basis;
 3. supports ambient noise cancellation to adjust the level of interior and exterior speaker volume with respect to ambient noise level;
 4. has LEDs to indicate operational, transmitting/receiving, and fault statuses and has a separate network port for PTU connection; and
 5. converts digital audio to analog audio and amplifies these signals to drive the interior and exterior speakers where ethernet has not been extended to the speakers.

11.1.2.4 Recording

- A. Design the LRV PA system to capture and record all audio passing through it, including the PA, PEI, intercom, and all audio generated by the driver's cab microphones or played through the driver's cab speakers, in the CCTV system's NVR in accordance with Section 9.2 [*CCTV System*].

11.1.3 LRV VARIABLE MESSAGE SIGNS

11.1.3.1 General

- A. Provide LRV VMS on the interior of the passenger area and the front and sides of the exterior of each LRV that meet the following requirements:
 1. display text graphics in a similar font and colour to that used on the Stage 1 LRVs;
 2. provide a character to height ratio between 3:5 and 1:1;
 3. provide a stroke width to height ratio between 1:5 and 1:10;
 4. have a minimum contrast ratio of 35:1;
 5. automatically adjust their intensity, based on ambient light levels, such that each LRV VMS is visible and legible under any ambient lighting condition; and
 6. do not appear to be discontinuous.

- B. Design the information displayed by the LRV VMS subsystem to be modifiable by maintainers using a PTU connected either locally to the LRVs or through the Wi-Fi O&M Data Radio System.
- C. Provide horizontal scrolling displays and have a scrolling speed not exceeding six characters per second.
 - 1. Provide a text scroll speed such that Stop and Station names, and any other complete words or messages, are displayed for a minimum of two seconds.
- D. Display the LRV VMS characters in lowercase with capitalization, with ascender and descender characters having a minimum size ratio of 20% to uppercase characters.
- E. Display words and numbers on LRV VMS that are as follows:
 - 1. contrasted with their background; and
 - 2. consistent with the Design Guide.
- F. Design all LRV VMS to meet the following requirements:
 - 1. installed in such a way as to not allow the formation of fog or ice on the sign and adjacent window under all environmental conditions;
 - 2. installed in such a way as to be readily removeable to permit cleaning of the glass in front of and behind them; and
 - 3. designed to store faults locally within the automatic announcement system and push them to the MDS.

11.1.3.2 Interior LRV VMS

- A. Provide a minimum of four high-resolution, high-output LED LRV VMSs positioned in the LRV interior such that at least one LRV VMS is legible from any location within the passenger area, including by the following:
 - 1. seated Passengers in an AW3 loaded LRV; and
 - 2. Passengers in Reference Wheelchairs, in wheelchair spaces, in an AW3 loaded LRV.
- B. Include in the Human Factors Engineering Report, described in Section 1.3.6 [*Human Factors Engineering*], confirmation that the interior LRV VMS are legible to Passengers from the greatest distance between any point in the passenger area and the nearest LRV VMS.
- C. Design each interior LRV VMS to alternately display the Train destination, next Stop and Station, the route map with current Train location, and other messaging as indicated by the AAADS in accordance with Section 11.1.5 [*Automatic Audio Announcement and Display System*].
 - 1. The interior LRV VMS shall display the “Next Stop + [Name of the next Stop and Station]” once the Train has left the preceding Stop and Station
- D. Provide interior VMS that can display two rows of text with between 30 and 50 characters per row of text.

11.1.3.3 Exterior LRV VMS

- A. Provide high-resolution, high-output LED LRV VMS at both ends of the LRVs and a minimum of three LRV VMSs along each side of the LRVs, located such that they are legible from the exterior of the LRVs by Passengers when the LRVs enter a Stop and Station and from anywhere on the Platform when the LRVs are at No Motion.
- B. Include in the Human Factors Engineering Report, described in Section 1.3.6 [*Human Factors Engineering*], confirmation that the exterior LRV VMS are legible to Passengers as follows:
 - 1. the side exterior VMS nearest to a Passenger standing anywhere on a Platform within a viewing angle of 70° from the center line of the VMS is legible to that Passenger; and
 - 2. the nearest end VMS is legible to a Passenger standing on a Platform from a distance of 100 m as the LRV approaches the Platform.
- C. Provide exterior LRV VMS with a viewing angle such that at a viewing angle of 60° from the centre, the brightness of the VMS will be no less than half the brightness measured when viewed from the center of the VMS.
- D. Integrate the exterior LRV VMS into the overall LRV form and to be flush with the LRVs' bodywork in a way that does not detract from the clean lines and shape of the LRVs and is visually consistent with the requirements of the Design Guide.
- E. Design each exterior LRV VMS to display the Train destination or other messaging as indicated by the AAADS in accordance with Section 11.1.5 [*Automatic Audio Announcement and Display System*].
- F. Provide exterior VMS that can display a single row of text with between 30 and 50 characters of text.

11.1.4 INTERNAL ADVERTISING

- A. Provide a digital multimedia system that displays advertising and other multimedia information throughout the passenger area.
- B. Locate multimedia displays such that they do not present a Hazard to Passengers and at least one multimedia display can be seen from any position within the passenger area.
- C. Design the multimedia system and all displays to comply with the following requirements:
 - 1. 16:9 display aspect ratio;
 - 2. 17" minimum display size. Alternatively, the multimedia display may be integrated with the interior LRV VMS using two 15" displays arranged side-by-side. Minimum unrestricted vertical clearway height from floor level to the bottom of display shall not be less than 1,900 mm;
 - 3. have the highest commercially available resolution;
 - 4. display content in HTML format; and
 - 5. permit uploading of multimedia content via the Wi-Fi O&M Data Radio System at any Maintenance Facility.
- D. Design the multimedia system to be compatible with the multimedia system installed on the Stage 1 LRV such that the same files can be uploaded and used on both LRVs.

11.1.5 AUTOMATIC AUDIO ANNOUNCEMENT AND DISPLAY SYSTEM

11.1.5.1 General

A. Provide an AAADS on the LRVs that meets the following requirements:

1. interfaces with the LRV PA system and LRV VMS system;
2. determines its route and functions automatically once the Driver has entered the starting location and destination:
 - a. Design the AAADS to accept any Stop and Station on the Valley Line LRT as a starting location;
3. maintains the last entered route when power cycled;
4. plays automated Stop and Station, door side, and informational announcements, based on the Train's status and route, the location of the active driver's cab in the Train as determined by GPS location and dead reckoning, and the side of the Train the Platform is located on;
5. logs the date in YYYY-MM-DD format, time in 24-hour format, and selected zones for all automated announcements made;
6. has an automated announcement database that meets the following requirements:
 - a. accepts the Stage 1 LRV's audio message data files;
 - b. has message content as specified by the City;
 - c. has built in capacity for a minimum of 1,000 routes and includes all possible forward-running and reverse-running Valley Line LRT routes;
 - d. includes all pre-programmed audio and visual message trigger locations;
 - e. is configurable offline; and
 - f. is updatable by maintainers using a PTU both locally on the LRVs and through the Wi-Fi O&M Data Radio System; and
7. pushes status indication and health monitoring information to the MDS.

B. Provide PTU functionality to allow maintainers to modify the following:

1. the automated announcement database offline, including the addition of new Stops and Stations and trigger locations; and
2. the association of automated announcements with trigger points.

C. Design the AAADS to meet the following requirements:

1. trigger audible and visual messages at predetermined locations prior to Stops and Stations, in Stops and Stations, and after Stops and Stations;
2. allow Drivers to set the line the Train is travelling on and the final destination for the route through the driver's cab console; and

3. allow the Driver to select messages to display on the LRV VMS from a pre-programmed set of 100 messages of maximum 50 characters each; and
- D. Provide two sets of all necessary hardware, Software, recording devices, and tools required to record and upload new messages and announcements.

11.1.5.2 Audio Messages

- A. Provide automatic audio messages using a common voice that are either audio message recordings created from human voice, stored audio message recordings generated by high-quality text-to-speech programs, or audio messages generated in real-time by high-quality text-to-speech programs.
- B. Do not provide audio messages that are a concatenation of message segments.
- C. Precede all announcements with a tone that is the same as the tone used on the Stage 1 LRV and that is 3 dB above the normal messaging audio level.

11.1.5.3 Message Storage

- A. Store all preprogrammed audio and visual messages in a non-proprietary format in NVM.
- B. Store each audio and text message digitally along with information identifying the conditions under which the message is to be triggered.
- C. Provide storage for a minimum of 1,000 visual and audible messages with a total time of not less than 120 minutes.
1. Provide the capability for maintainers to update the stored messages using a PTU connected both locally on the LRVs and remotely via the Wi-Fi O&M Data Radio System.

11.1.5.4 AAADS Data Files

- A. Submit an Automatic Announcement Database Document (CDRL 04-49) that includes the following:
1. the automated announcement database in a Microsoft 365 suite readable format;
 2. a map of the Valley Line LRT with all automated announcement trigger locations marked; and
 3. a description of the automated announcement database, including the following:
 - a. each visual message, its trigger locations and conditions, and the locations where it is being displayed on the Train;
 - b. transcriptions of each audio message, its trigger locations and conditions, and where it will be played on the Train; and
 - c. a linkage between the transcription of the audio message and the actual audio message file.
- B. Include the automatic announcement text and audio files, in their native format, with the submission of the Automatic Announcement Database Document.

- [REDACTED]
- [REDACTED]
- [REDACTED]

11.2.1.2 PEI Pre-Programmed Text Messages

- [REDACTED]
- [REDACTED]

11.2.1.3 Logging and Call Recording Capability

- [REDACTED]
- [REDACTED]
- [REDACTED]

11.2.2 PASSENGER EMERGENCY ALARM

- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]

APPENDIX 4A: LRV DESIGN INFORMATION PACKAGE

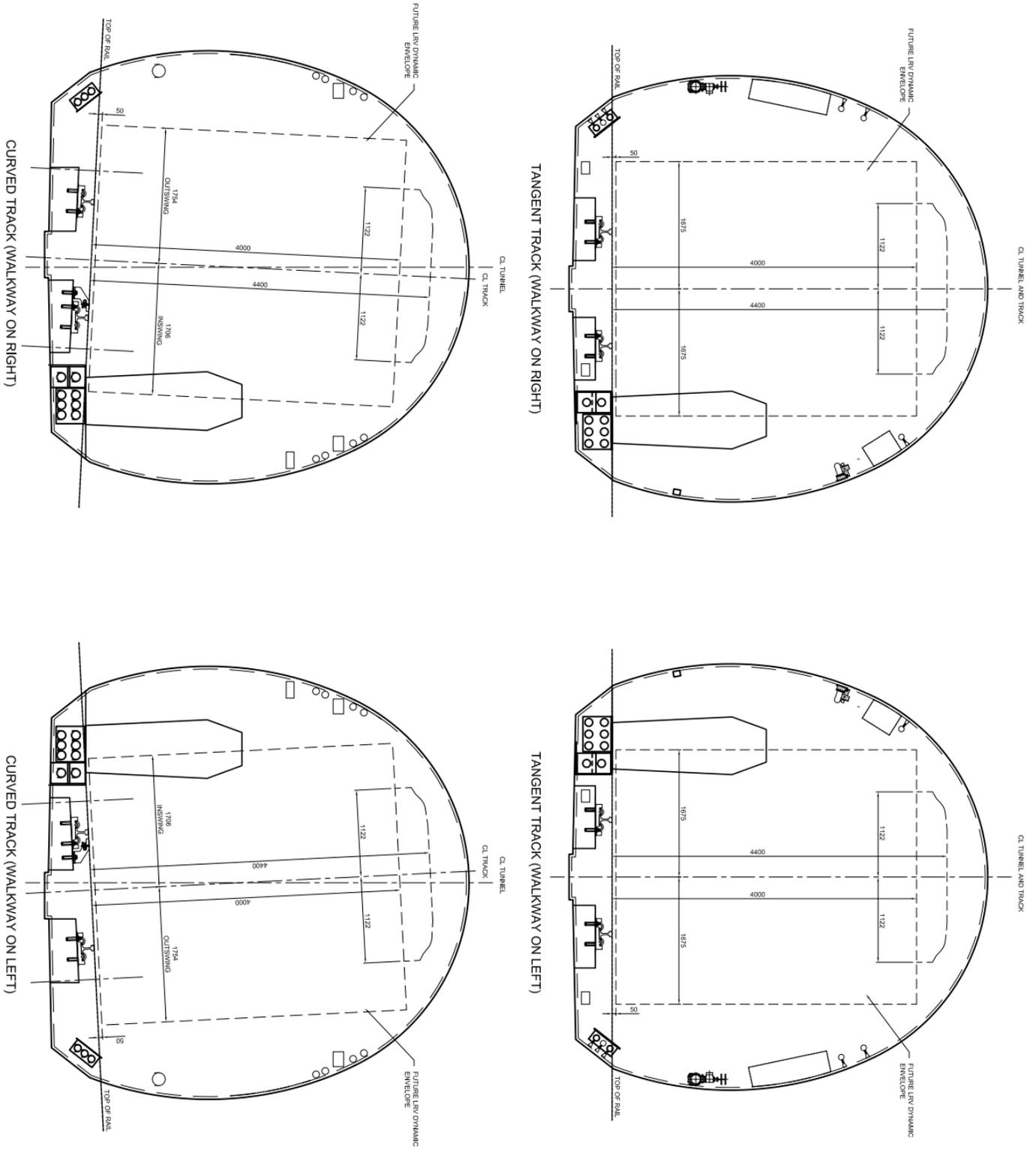
- A. The LRV Design Information Package included as a Bid Extract provides the parameters within which the LRVs must comply with the following:
1. LRV dimensioned general arrangement drawings showing the following:
 - a. LRV length, height, and width;
 - b. door locations and widths; and
 - c. bogie and axle locations and spacings;
 2. LRV clearance envelopes including the following:
 - a. the vehicle static envelope for all AW masses;
 - b. the vehicle static envelope's inswing and outswing on curves from 25 m to 300 m in 25 m increments, 350 m to 800 m in 50 m increments, and 900 m to 1,200 m in 100 m increments;
 - c. the vehicle dynamic envelope, including pantograph dynamic movement; and
 - d. 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 1,200 m in 100 m increments;
 3. maximum LRV masses including the following:
 - a. LRV mass at AW0 and AW3;
 - b. centre of gravity of the LRV at all loadings from AW0 to AW3;
 - c. axle loading at AW0 and AW3; and
 - d. mass of a fully assembled bogie;
 4. LRV power requirements including the following:
 - a. tractive effort curves with 50 VDC increments from 500 VDC to 900 VDC;
 - b. current draw curves with 50 VDC increments from 500 VDC to 900 VDC;
 - c. LRV continuous auxiliary power draw while connected to the OCS; and
 - d. 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;
 5. LRV pantograph characteristics including the following:
 - a. pantograph position on the LRV;
 - b. width of pantograph carbons; and

- c. pantograph working range and upwards pressure at all heights;
- 6. LRV lifting locations including the following:
 - a. locations of bogies on the LRVs for in-ground bogie lifts; and
 - b. locations of all body lifting points;
- 7. LRV special tooling requirements including the following:
 - a. all fixed-in-place Special Tools along with space requirements, including the working space, masses, input requirements, power requirements, and mounting requirements; and
 - b. BTE;
- 8. dimensions and maximum masses of major LRV components including the following:
 - a. the traction control unit;
 - b. the HVAC units;
 - c. the auxiliary power unit;
 - d. the pantograph; and
 - e. the powered and unpowered bogies;
- 9. side skirt and roof skirt clear opening dimensions;
- 10. position of major roof mounted components;
- 11. underfloor clearances to TOR on new wheels; and
- 12. a preliminary Recommended Spare Parts List, in accordance with Section 3.3.3 [*Spare Parts*] of Schedule 3 [*Design and Manufacturing Protocols*], that, at a minimum, includes the following information:
 - a. name and description of each part;
 - b. unit of measure;
 - c. recommended spare quantity of each Spare Part;
 - d. the storage dimensions of each Spare Part;
 - e. the mass of each Spare Part; and
 - f. if applicable, storage restrictions or requirements for each Spare Part.

APPENDIX 4B: VLW – VEHICLE LATERAL CLEARANCE TABLE

Curve Radius (m)	In-Swing (mm)	Out-Swing (mm)
25	1995	1955
30	1925	1865
35	1878	1840
40	1830	1815
50	1785	1790
60	1755	1777
70	1725	1765
90	1700	1750
100	1695	1745
135	1690	1732
200	1685	1720
300	1685	1710
500	1690	1705
1000	1690	1700
Tangent	1675	1675

APPENDIX 4C: FUTURE LRV DYNAMIC ENVELOPE



**THE CITY OF EDMONTON
VALLEY LINE WEST LRT**

LRV SUPPLY AGREEMENT

Schedule 5 – Integration Requirements

**VALLEY LINE WEST LRT
SCHEDULE 5 – INTEGRATION REQUIREMENTS**

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LIST OF FIGURES

Not applicable.

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Not applicable.

SECTION 1: RESPONSIBILITIES OF THE PARTIES

1.1 CITY INTEGRATION OBLIGATIONS

1.1.1 GENERAL

- A. The City shall appoint representatives to the Integration Committee described in Section 2.2 [*Integration Committee*].
- B. The City shall be responsible for the electromagnetic compatibility of the Valley Line LRT Stage 1 with its surroundings.

1.1.2 OPERATOR OBLIGATIONS

- A. The City shall, or shall cause the Operator to, provide the following in accordance with the LRV Protocol and LRV Commissioning Plan (as those terms are defined in the Interface Agreement):
 - 1. Drivers, trained by the LRV Supplier, to move the LRVs during delivery, testing, and Commissioning;
 - 2. wayside support personnel to support delivery, testing, and Commissioning activities; and
 - 3. an LRV that has received Conditional Acceptance for the demonstrations required for the Maintainability Demonstration.
- B. The LRV Supplier shall not be responsible for Operator personnel costs and energy costs when providing support to delivery, testing, and Commissioning activities that are required to comply with the LRV Protocol and LRV Commissioning Plan (as those terms are defined in the Interface Agreement).
- C. The City shall, or shall cause the Operator to, provide the LRV Supplier with office space, available from the LRV Delivery Start Date to the end of the LRV Primary Warranty, in the Gerry Wright OMF Part B building that meets the following requirements:
 - 1. is of suitable size to allow four LRV Supplier personnel to work simultaneously;
 - 2. is equipped with four desks and four office chairs;
 - 3. has access to the internal Wi-Fi; and
 - 4. has access to the Gerry Wright OMF Part B building's kitchen and washrooms.
- D. The City shall, or shall cause the Operator to, provide space in the Gerry Wright OMF Part B building, or as otherwise instructed by the City, to store up to six fully assembled LRVs that have not achieved Conditional Acceptance. The LRV Supplier shall coordinate the usage and location of this space with the City in accordance with Section 2.4.A [*Storage, Maintenance, and Testing*] of Schedule 8 [*Shipping and Delivery*].
- E. The City shall, or shall cause the Operator to, provide exclusive access to a light maintenance bay in the Gerry Wright OMF Part B building for the LRV Supplier. The LRV Supplier shall coordinate the usage and location of the light maintenance bay in accordance with Section 2.4.B [*Storage, Maintenance, and Testing*] of Schedule 8 [*Shipping and Delivery*].

1.2 PROJECT CO INTEGRATION OBLIGATIONS

- A. Project Co shall be responsible for all integration of the LRVs to the Valley Line LRT Stage 2, including the following:

1. integrate the LRVs physically, electrically, and functionally with the Valley Line LRT Stage 2 infrastructure;
2. integrate the LRVs' Software and firmware configuration with the Valley Line LRT Stage 2 infrastructure Software and firmware configuration, where applicable;
3. perform all Valley Line LRT Stage 2 infrastructure integration testing; and
4. where Valley Line LRT Stage 2 infrastructure integration testing requires the use of one or more LRVs, Project Co shall only use Conditionally Accepted LRVs and Stage 1 LRVs as applicable to the Valley Line LRT Stage 2 infrastructure integration testing being performed.

1.3 LRV SUPPLIER INTEGRATION OBLIGATIONS

1.3.1 GENERAL

A. The LRV Supplier shall do the following:

1. manage all aspects of Commissioning, in accordance with Section 9 [*Commissioning*] of Schedule 3 [*Design and Manufacturing Protocols*], for the LRVs at the Gerry Wright OMF Part B and on the Valley Line LRT Stage 1 track that is being used for testing and Commissioning;
2. request support from the Operator when LRV movements are required;
3. support Project Co during LRV-related Valley Line LRT Stage 2 infrastructure integration in accordance with this Schedule 5 [*Integration Requirements*] and Schedule 6 [*Interface Agreement*] and during the resolution of any related issues; and
4. support Project Co during the Infrastructure Performance Demonstration Period in accordance with Section 11 [*Performance Demonstration Support Requirements*] of Schedule 3 [*Design and Manufacturing Protocols*] and Schedule 6 [*Interface Agreement*] and during the resolution of any related issues.

B. The LRV Supplier shall provide the list of current Deficiencies and Warranty Deficiencies for a specific Conditionally Accepted LRV to be used for Valley Line LRT Stage 2 infrastructure integration testing when requested by the City within two Business Days of such request.

1. The LRV Supplier shall coordinate with the City with regard to the nature of the Deficiencies and Warranty Deficiencies to determine whether such Deficiencies and Warranty Deficiencies would impact the LRV's use in the Valley Line LRT Stage 2 infrastructure integration testing.

1.3.2 INTEGRATION INFORMATION

A. The LRV Supplier shall submit the LRV Design Information Secondary Package (CDRL 05-01) that includes the following LRV information:

1. LRV details for overrun protection including the following:
 - a. dimensioned drawings of the LRV coupler showing the LRV coupler in extended and stowed positions;
 - b. dimensioned drawings of the LRV anti-climbers showing the anti-climbers and their locations on the LRV relative to the centerline of LRV and top of rail; and
 - c. details of crash energy management systems on the 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 LRV;

2. LRV special tooling requirements for all system- and component-specific tooling required for system and component overhaul;
3. LRV noise and vibration limits at various speeds from 5 km/h to the maximum LRV speed, in 10 km/h increments; and
4. location of sanding points.

SECTION 2: INTEGRATION MANAGEMENT

2.1 GENERAL

- A. The LRV Supplier shall establish a formal integration management process that is designed to ensure the following:
1. the LRV and its system are successfully integrated to form a complete system;
 2. the LRV is successfully integrated into the Valley Line LRT; and
 3. all integration issues are proactively identified, tracked, and mitigated.
- B. The LRV Supplier shall submit an Integration Management Plan (CDRL 05-02) that includes the following information:
1. the LRV Supplier's approach to achieving integration of the LRV within itself and with the Valley Line LRT;
 2. a description of the organization, roles, and responsibilities for all integration management activities;
 3. a description of how the LRV Supplier will fulfil its integration requirements as set out in Schedule 6 [*Interface Agreement*];
 4. the processes and procedures that will be implemented to satisfy the requirements of this Schedule 5 [*Integration Requirements*];
 5. a description of any software tools to be used for integration management;
 6. a description of the Integration Register, including all data and tracking fields;
 7. the processes that will be implemented to ensure the internal and external integration points will be captured and tracked in the Integration Register;
 8. the processes that will be implemented to proactively identify, assign responsibility, coordinate, track, resolve, and test integration issues;
 9. a description of how the Integration Register and the requirement tracking system, detailed in the Accepted Requirements Traceability Plan, will be connected;
 10. a description of how the System Design Description, described in Section 4 A [*Systems Engineering*] of Schedule 3 [*Design and Manufacturing Protocols*], will be developed;
 11. a description of how the Systems Integration Matrix and Testing Plan, described in Section 4 B [*Systems Engineering*] of Schedule 3 [*Design and Manufacturing Protocols*], will be developed;
 12. the general format for ICDs;
 13. a description of how the Design Reviews will review the following:
 - a. integration between LRV design disciplines;
 - b. integration between the LRV design team and the LRV manufacturing team;
 - c. integration between the LRV design and the operability and maintainability requirements of the Supply Agreement; and

- d. integration between the LRV design and the Valley Line LRT requirements as specified in the Supply Agreement.
- C. The LRV Supplier shall base the Integration Management Plan on the preliminary Integration Management Plan included in the Bid Extracts.
- D. The LRV Supplier shall submit and maintain an Integration Register (CDRL 05-03) that documents all integration issues identified through the integration management process, requirements management, and systems engineering.
 - 1. The LRV Supplier shall provide the City with two read-only licenses, with the initial submission of the Integration Register, that provides viewing access to the Integration Register at any time.
 - 2. The LRV Supplier shall base the Integration Register on the preliminary Integration Register included in the Bid Extracts.

2.2 INTEGRATION COMMITTEE

- A. Within 15 days of NTP, the LRV Supplier and the City shall establish an Integration Committee to provide a formal forum for escalation and resolution of integration issues and to oversee the consultation and cooperation in all matters relating to the interface between the Valley Line LRT infrastructure and the LRV.
- B. The Integration Committee shall be chaired by the Integration Manager and made up of representatives from the LRV Supplier and the City. The City may invite representatives from Project Co, the Operator, and Other Contractors to attend Integration Committee meetings at their discretion.
 - 1. The City shall provide written notice to the LRV Supplier one Business Day in advance if a representative from Other Contractors is attending such Integration Committee meeting.
- C. The Integration Committee shall meet at least once each month with the first meeting to be within 45 days of NTP.
- D. The LRV Supplier shall host Integration Committee meetings in Edmonton in a location Accepted by the City or by virtual means at the reasonable discretion of the City.
- E. The LRV Supplier shall provide written notice of each meeting with an agenda identifying the issues for discussion and relevant background information no later than three Business Days in advance of each meeting.
- F. The LRV Supplier shall submit meeting minutes that contain the decisions, recommendations, action items with deadlines, and a meeting summary of each meeting in accordance with Section 1.3.1 [General] of Schedule 3 [Design and Manufacturing Protocols].

2.3 LRV INTERFACE CONTROL DOCUMENTS

- A. The LRV Supplier shall create and submit Interface Control Document Package for the LRV in accordance with Section 4 C [Systems Engineering] of Schedule 3 [Design and Manufacturing Protocols].
- B. The City may discuss and review ICDs for the LRV of interfaces with the Valley Line LRT infrastructure at Integration Committee meetings.
- C. The LRV Supplier shall require the Integration Manager to sign all completed ICDs for the LRV of interfaces with the Valley Line LRT infrastructure, in addition to all other signatures required, to confirm that the information contained therein can be relied upon and used by the City.

SECTION 3: INTERFACE AGREEMENT PERFORMANCE DEMONSTRATION

3.1 LRV PERFORMANCE DEMONSTRATION

- A. For the purposes of Schedule 6 [*Interface Agreement*], the following definitions apply:
1. “**LRV Performance Demonstration**” means the process pursuant to which LRVs achieve Conditional Acceptance and Final Acceptance;
 2. “**LRV Performance Demonstration Commencement Date**” is the date on which the first LRV received Conditional Acceptance; and
 3. “**LRV Performance Demonstration Period**” means the period of time commencing on the LRV Performance Demonstration Commencement Date and continuing until the last LRV in the Base Order receives Final Acceptance.

3.2 LRV PERFORMANCE DEMONSTRATION CERTIFICATE

- A. The Fleet Acceptance Certificate issued by the City shall be considered the Certificate of LRV Performance Demonstration.

**THE CITY OF EDMONTON
VALLEY LINE WEST LRT**

LRV SUPPLY AGREEMENT

Schedule 6 – Interface Agreement

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SCHEDULE 6
INTERFACE AGREEMENT

THIS AGREEMENT is dated as of .

AMONG:

THE CITY OF EDMONTON

("City")

AND:

[XX], a [XX], existing under the laws of the Province of [XX] ("**Project Co**")

AND:

[XX], a [XX], existing under the laws of [XX] ("**Operator**")

AND:

[XX], a [XX], existing under the laws of [XX] ("**LRV Supplier**")

WHEREAS:

- A. Project Co has entered into an agreement (the "**Project Agreement**") with the City, for the design, construction and financing of the Valley Line West LRT, defined as the "**Project Work**" in the Project Agreement.
- B. LRV Supplier has entered into a vehicle supply agreement (the "**LRV Contract**") with the City for the design, manufacture, supply and commissioning of the LRVs for the Valley Line West LRT (the "**LRV Services**");
- C. Operator has entered into an operation and maintenance contract (the "**Services Contract**") with the City for the provision of operations, maintenance and rehabilitation in relation to the Valley Line West LRT (the "**OM&R Services**");
- D. Project Co, Operator and LRV Supplier have agreed to cooperate in order to coordinate and integrate the conduct of certain of their activities to best meet the performance requirements of their respective obligations under the Project Agreement, the Services Contract and the LRV Contract in accordance with the terms of this Agreement; and
- E. This Agreement is entered into among the Parties as required by and in accordance with the Project Agreement, the LRV Contract and the Services Contract.

NOW THEREFORE THE PARTIES AGREE AS FOLLOWS:

ARTICLE 1
DEFINITIONS AND INTERPRETATION

1.1 Definitions - General

Unless defined or as otherwise provided herein, words and phrases used in this Agreement shall have the same meaning and shall be defined and interpreted in accordance with Schedule 1 *[Definitions and*

Interpretation] to the Project Agreement. Where the context of this Agreement so requires, the definitions from the Project Agreement will be read and interpreted with such changes as are necessary in order to carry out the intent and purpose of this Agreement and to facilitate the ability of the Parties to carry out and perform their mutual obligations to one another hereunder.

1.2 Definitions – Specific

“Agreement” means this interface agreement entered into among the City, Project Co, Operator and LRV Supplier, including all schedules, appendices and attachments thereto, as amended, supplemented or restated from time to time.

“Anticipated Delivery Date” means the date LRV Supplier reasonably expects to commence delivery of the LRVs to the Gerry Wright OMF pursuant to and in accordance with the LRV Contract.

“Chairman” has the meaning given to such term in Section 4.3(b).

“Change” means a variation, addition, reduction, substitution, modification, deletion, removal or other change to the whole or any part of:

- (a) the Design, Construction or the Design and Construction Requirements;
- (b) the OM&R Services; or
- (c) the LRV Services.

“City’s Representative” means the Person appointed by the City as the City’s Representative pursuant to the Project Agreement.

“City Person” means:

- (a) any elected official, officer, employee or agent of the City;
- (b) any representative, advisor (including any legal and financial advisor) of the City or subcontractor, consultant (of any tier) of the City in any such Person’s capacity as provider of services directly or indirectly to the City in connection with the Valley Line West LRT, excluding Project Co, Project Co Persons, Operator, Operator Persons, LRV Supplier and LRV Persons;
- (c) any invitee of the City or any of the City Persons referred to in (a) or (b) above who enters upon the Lands; or
- (d) any lessee or tenant of the City at any facility forming part of the Valley Line West LRT,

but does not include a Passenger.

“Confidential Information” has the meaning given to such term in Section 10.14 [*Confidential Information*].

“Contracts” means, collectively the Project Agreement, the Services Contract and the LRV Contract, and **“Contract”** means each such contract individually.

“Direct Losses” means all damages, losses, liabilities, penalties, fines, assessments, claims, actions, costs, expenses (including the cost of legal or professional services, legal costs being on a substantial indemnity basis), proceedings, demands and charges whether arising under statute, contract or at common law, except Indirect Losses.

“Emergency” means any unplanned event within the Lands that:

- (a) causes or could imminently cause a material disruption to movement of LRVs;
- (b) presents an immediate or imminent threat to the integrity of any part of the System Infrastructure, to the Environment, to the Lands, to property immediately adjacent to the System Infrastructure or the Lands or to the safety of Passengers, Drivers or the traveling public;
- (c) has jeopardized the safety of Passengers, Drivers or the traveling public; or
- (d) is recognized or declared an emergency by the City or other Governmental Authority with authority to declare an emergency.

“Executive Panel” has the meaning given in Section 4.3(d).

“Functions” has the meaning given in Appendix 5A *[Functions]* to Appendix 5 *[Independent Performance Demonstration Certifier Agreement]*.

“Gerry Wright Lands” means the Gerry Wright OMF Site excluding Gerry Wright OMF Parcel A.

“IA Dispute” has the meaning given in Section 9.1 of this Agreement *[Dispute Resolution Procedure]*.

“IA Dispute Resolution Procedure” means the procedure for final resolution of all IA Disputes hereunder as set out in Appendix 1.

“IA Effective Date” means the date of this Agreement.

“Independent Performance Demonstration Certifier” or **“IPDC”** has the meaning given in Section 7.1 *[Appointment of IPDC]*.

“Independent Performance Demonstration Certifier Agreement” or **“IPDC Agreement”** has the meaning given in Section 7.1 *[Appointment of IPDC]*.

“Indirect Losses” means all loss of revenue, loss of profits, loss of use, loss of contract, loss of goodwill, loss of production, loss of business, loss of business opportunity, exemplary or punitive damages or any indirect or consequential loss of any nature but “Indirect Losses” does not include:

- (a) deductions, payment adjustments under or in connection with the Project Agreement, the Services Contract or the LRV Contract which reduce payments to the relevant Party; and
- (b) payments to a Party pursuant to its Contract,

which constitute Direct Losses.

“Interface Committee” has the meaning given to such term in Section 4.1 *[Establishment of Interface Committee]*.

“IPDC’s Representative” means the person appointed by the IPDC to represent the IPDC on the Performance Demonstration Committee.

“LRV Commissioning” means inspection and testing of the LRVs, including all components, systems and sub-systems, for the purpose of verifying the performance of the LRVs and confirming that the LRVs comply with the requirements and specifications contained in the LRV Contract.

“LRV Commissioning Plan” has the meaning given in Section 3.8(a).

“LRV Contract” has the meaning set out in Recital B.

“LRV Deficiencies” has the meaning given to “Deficiencies” in the LRV Contract.

“LRV Obligations” means the obligations of LRV Supplier to provide the LRV Services in accordance with and as contemplated in the LRV Contract.

“LRV Performance Demonstration” means the process established pursuant to the LRV Contract to verify LRV reliability and availability for revenue service.

“LRV Performance Demonstration Commencement Date” means the date on which LRV Performance Demonstration is required to commence pursuant to the LRV Contract.

“LRV Performance Demonstration Period” has the meaning ascribed to **“LRV Performance Demonstration Period”** in the LRV Contract.

“LRV Person” means:

- (a) any Person engaged by the LRV Supplier or any Subcontractor of LRV Supplier from time to time as may be permitted by the LRV Contract to procure or manage the provision of the LRV Services (or any of them);
- (b) in respect of each of the above, their Subcontractors of any tier, agents, employees, officers and directors; and
- (c) any invitee of the LRV Supplier or any of the LRV Persons referred to in (a) and (b) above who enters upon the Lands.

“LRV Protocol” has the meaning given in Section 3.3(a) of this Agreement.

“LRV Requirements” means the standards, specifications, procedures, criteria, guidelines, and other requirements applicable to the LRV Contract.

“LRV Services” has the meaning set out in Recital B.

“LRV Set-Up Period” has the meaning given in Section 3.3(a) of this Agreement.

“LRV Supplier Infrastructure Integration Requirements” means those requirements set out in Section 1.3 [*LRV Supplier Integration Obligation*] of Schedule 5 [*Integration Requirements*] of the LRV Contract.

“LRV Supplier Person” means:

- (a) any Person engaged by LRV Supplier or any Subcontractor of LRV Supplier, from time to time as may be permitted by LRV Supplier to perform or manage the provision of the LRV Services (or any of them);
- (b) in respect of each of the above, their Subcontractors of any tier, agents, employees, officers and directors; and
- (c) any invitee of LRV Supplier or any of the LRV Supplier Persons referred to in (a) and (b) above who enters upon the Lands.

“LRV Supplier’s Commissioning Representative” means the Person appointed by LRV Supplier as the Commissioning Representative pursuant to the LRV Contract.

“LRV Supplier’s Representative” means the Person appointed by LRV Supplier as LRV’s Project Manager pursuant to the LRV Contract.

“OMF OM&R Protocol” has the meaning given in Section 3.2(a) of this Agreement.

“OMF OM&R Set-Up Period” has the meaning given in Section 3.2(g) of this Agreement.

“OM&R Infrastructure Requirements” has the meaning given in Section 3.7(a) of this Agreement.

“OM&R LRV Interface Requirements” has the meaning given in Section 3.9(a) of this Agreement.

“OM&R Obligations” means the obligations of Operator to OM&R Services in accordance with and as contemplated in the Services Contract.

“OM&R Protocol” has the meaning given in Section 3.2(b) of this Agreement.

“OM&R Services” has the meaning set out in Recital C.

“Operator Infrastructure Integration Requirements” means:

- (a) coordinating with Project Co to permit Project Co to promptly correct Phase 1 Construction Deficiencies and perform Warranty Work in respect of the Phase 1 Infrastructure following the Phase 1 Construction Completion Date;
- (b) coordinating with Project Co to permit Project Co to promptly correct Construction Deficiencies and perform Warranty Work in respect of the Infrastructure following the Construction Completion Date;
- (c) coordinating with the LRV Supplier to permit LRV Supplier to commission the LRVs;
- (d) coordinating with Project Co to permit Project Co to undertake Infrastructure Performance Demonstration;
- (e) coordinating with the LRV Supplier to permit the LRV Supplier to undertake LRV Performance Demonstration in accordance with and as contemplated by the LRV Supply Contract; and
- (f) coordinating with Project Co after the ICS Integration Ready Date for the design, supply, integration, testing and commissioning of the ICS.

“Operator Person” means:

- (a) any Person engaged by Operator or any Subcontractor of Operator, from time to time as may be permitted by Operator to perform or manage the provision of the OM&R Services (or any of them);
- (b) in respect of each of the above, their Subcontractors of any tier, agents, employees, officers and directors; and
- (c) any invitee of Operator or any of Operator Persons referred to in (a) and (b) above who enters upon the Lands.

“Operator’s Representative” means the Person appointed by Operator as Operator’s Representative pursuant to the Services Contract.

“Parties” means each of the City, Project Co, LRV Supplier and Operator and **“Party”** means any one of them without specificity.

“PDC Parties” and **“PDC Party”** have the meanings given in Section 8.1 [*Performance Demonstration Committee*] of this Agreement.

“Performance Demonstration” means LRV Performance Demonstration and/or Infrastructure Performance Demonstration.

“Performance Demonstration Committee” has the meaning given in Section 8.1 [*Performance Demonstration Committee*] of this Agreement.

“Performance Demonstration Period” has the meaning given in Section 8.2 [*Performance Demonstration*] of this Agreement.

“Project Agreement Termination Date” has the meaning given to Termination Date in the Project Agreement.

“Project Co Commissioning” means inspection and testing of the Infrastructure, including all Equipment, components, systems and sub-systems, for the purpose of verifying the performance of the Infrastructure and confirming that the Infrastructure complies with the Design and Construction Requirements.

“Project Co Operator Commissioning Resource Plans” has the meaning given in Section 3.6 [*Project Co Commissioning Procedures*].

“Project Co Infrastructure Integration Requirements” means those requirements set out in Section 7 – 1.2 [*Project Co Integration Obligations*] of Part 7 [*LRV Integration Requirements*] of Schedule 5 [*D&C Performance Requirements*] to the Project Agreement.

“Project Co Person” means:

- (a) any Person engaged by Project Co or any Subcontractor of Project Co, from time to time as may be permitted by Project Co to procure or manage the provision of the Project Work (or any of them);
- (b) in respect of each of the above, their Subcontractors of any tier, agents, employees, officers and directors; and
- (c) any invitee of Project Co or any of the Project Co Persons referred to in (a) and (b) above who enters upon the Lands.

“Project Co’s Commissioning Manager” means the Person appointed by Project Co as the Commissioning Manager pursuant to the Project Agreement.

“Project Co’s Representative” means the Person appointed by Project Co as Project Co’s Representative pursuant to the Project Agreement.

“Project Work” has the meaning set out in Recital A.

“Services Contract” has the meaning set out in Recital C.

“Service Readiness Date” has the meaning given in the Project Agreement.

“Subcontractor” means any subcontractor of a Party engaged by or through such Party and any subcontractor of any other subcontractor at any tier.

“System Infrastructure” means that portion of the Infrastructure which Operator is required to assume responsibility for pursuant to the Services Contract.

“System Ride Quality” has the meaning given in the Project Agreement.

“Train Delay” has the meaning given in the Project Agreement.

1.3 Interaction with Project Contracts – General Principles

- (a) To the extent of any conflict between:
 - (i) this Agreement and the Project Agreement, the Project Agreement shall, as between the City and Project Co, have precedence and prevail in respect of the obligations of the City and Project Co;
 - (ii) this Agreement and the Services Contract, the Services Contract shall, as between the City and Operator, have precedence and prevail in respect of the obligations of the City and Operator; and
 - (iii) this Agreement and the LRV Contract, the LRV Contract shall, as between the City and LRV Supplier, have precedence and prevail in respect of the obligations of the City and LRV Supplier.
- (b) Nothing in this Agreement shall derogate from:
 - (i) the obligations and liabilities of the City to Project Co and of Project Co to the City under the Project Agreement;
 - (ii) the obligations of the City to Operator and of Operator to the City under the Services Contract;
 - (iii) the obligations of the City to LRV Supplier and of LRV Supplier to the City under the LRV Contract; and
- (c) Nothing in this Agreement shall be construed as imposing an obligation:
 - (i) on Operator or LRV Supplier to perform any of the obligations of Project Co under the Project Agreement; or
 - (ii) on Project Co or LRV Supplier to perform any of the obligations of Operator under the Services Contract, or
 - (iii) on Project Co or Operator to perform any of the obligations of LRV Supplier under the LRV Contract.
- (d) Every right to claim compensation or indemnification or reimbursement under this Agreement shall be construed so that recovery is without duplication of any other amount recoverable under this Agreement, the Project Agreement, the Services Contract or the LRV Contract, as applicable.

- (e) Subject to Section 1.3(b), no Party shall be entitled to make any claim against any other Party for compensation, indemnification or reimbursement for circumstances described herein other than as expressly provided under this Agreement.

1.4 In Writing

Unless otherwise provided, any notice, certificate, consent, approval, determination, agreement or waiver which is required to be issued, made or given in terms of this Agreement shall be required to be issued, made or given in writing in accordance with Section 10.9 *[Notices]* of this Agreement.

1.5 Joint and Several Obligations

The obligations and liabilities of the individual members of any Party which is a joint venture under this Agreement are joint and several.

1.6 Appendices

The following Appendices are attached to and incorporated into this Agreement:

Appendix 1	-	IA Dispute Resolution Procedure
Appendix 2	-	Project Agreement
Appendix 3	-	Services Contract
Appendix 4	-	LRV Contract
Appendix 5	-	Independent Performance Demonstration Certifier Agreement
Appendix 5A	-	Functions

ARTICLE 2 GENERAL OBLIGATIONS

2.1 Purpose and Intent

The Parties wish to enter into this Agreement in order to commit to each other to work together cooperatively and act in good faith with each other to share information, prevent material adverse interference with their respective access rights and to effectively administer and determine any interaction and/or conflict between the Project Work, the OM&R Obligations and the LRV Obligations; and each Party recognizes the legitimate interests of the other Parties in effecting rational, economic and timely solutions to any conflict between the delivery of the Project Work, the satisfaction of the OM&R Obligations and the satisfaction of the LRV Obligations.

In the event of any IA Dispute as to the respective assignment of Project Co's scope in relation to the delivery of the Project Work, Operator's scope in relation to the delivery of the OM&R Obligations, or LRV Supplier's scope in relation to the delivery of the LRV Obligations, this Agreement provides for a means of resolution of such IA Disputes which shall be paramount to any other dispute resolution procedure specified in the Project Agreement, the Services Contract or the LRV Contract.

2.2 General Obligations of Cooperation

From and after the date of this Agreement, the Parties agree to cooperate to give effect to the purpose and intent of this Agreement and covenant as follows:

- (a) each of Project Co, Operator and LRV Supplier shall cause each of its Subcontractors, as applicable, to work cooperatively in carrying out their respective obligations under their respective subcontracts;

- (b) the Parties shall consult and cooperate with each other to facilitate performance of activities contemplated under their respective Contracts in a timely manner in accordance with the provisions thereof, and each of them shall take all reasonable steps not to unduly disrupt any other Party's performance of its obligations under its Contract or cause material adverse interference with any other Party's access rights under its Contract or this Agreement;
- (c) the Parties will, at all times, act reasonably and promptly in the performance of their respective obligations under their respective Contracts and this Agreement and they will exercise their respective rights and remedies, perform their respective obligations and use reasonable efforts to mitigate their respective Direct Losses under this Agreement in a commercially reasonable manner in order to carry out the provisions of this Agreement according to its spirit and intent;
- (d) subject to any confidentiality provisions contained in their respective Contracts or in this Agreement and at the request of another Party, each Party shall share with the requesting Party information in its possession or to which it has reasonable access to the extent reasonably required by the requesting Party for the performance by such Party of its obligations under its Contract;
- (e) each of Project Co, Operator and LRV Supplier undertakes not to unreasonably withhold or delay any approval, consent, agreement, information, action or response it is required to provide under its Contract or this Agreement and which is required by any other Party to the extent that the same is relevant to the discharge of any such Party's obligations under its Contract or this Agreement;
- (f) Project Co, LRV Supplier and Operator respectively agree not to interfere with, obstruct, impede or delay one another in the performance of their obligations under the Project Agreement and/or the LRV Contract and/or or the Services Contract, respectively, or in the performance of any obligations under this Agreement, provided that each of Project Co, LRV Supplier and Operator shall not be required to act in breach of its Contract and/or this Agreement;
- (g) Project Co, LRV Supplier and Operator shall ensure that their respective Subcontractors and employees work cooperatively in carrying out their respective obligations under the Project Agreement, the LRV Contract and the Services Contract provided that each of Project Co, LRV Supplier and Operator shall not be required to act in breach of its Contract;
- (h) None of the Parties shall knowingly permit any act or omission on either its part or the part of its Subcontractors or its directors, officers employees or agents to contribute to, cause or constitute a breach by any other Party of its Contract or any applicable permits, approvals or authorizations, or lead to any diminution or loss of any rights or entitlements on the part of any other Party under its Contract or any applicable permits, approvals or authorizations, provided that no Party shall be required to act in breach of its Contract or expend additional funds to comply with this Section 2.2(h);
- (i) Project Co shall remit to Operator and LRV Supplier all relevant quality management and environmental management records that relate to or otherwise affect Operator or LRV Supplier (as applicable), a list of all material suppliers used in the performance of the Project Work (and the names of other suppliers upon the reasonable request of Operator or LRV Supplier) and a copy of the maintenance and operational plans for the works performed or equipment supplied in the performance of the Project Work;

- (j) the Parties agree with one another that the provisions of this Agreement shall continue to apply notwithstanding any amendment to the Project Agreement, the Services Contract or the LRV Contract, provided that:
 - (i) Project Co and the City shall not initiate a Change or agree to any amendment to the Project Agreement that would reasonably be expected to:
 - (A) have a material adverse effect on Operator or its ability to perform the OM&R Obligations or result in a material increase in the cost to Operator of performing the OM&R Obligations without the prior written approval of Operator, which approval shall not be unreasonably withheld or delayed; or
 - (B) have a material adverse effect on LRV Supplier or its ability to perform the LRV Obligations or result in a material increase in the cost to the LRV Supplier of performing the LRV Obligations without the prior written approval of LRV Supplier, which approval shall not be unreasonably withheld or delayed;
 - (ii) Operator and the City shall not initiate a Change or agree to any amendment to the Services Contract that would reasonably be expected to :
 - (A) have a material adverse effect on Project Co or its ability to perform the Project Work or result in a material increase in the cost to Project Co of performing the Project Work without the prior written approval of Project Co, which approval shall not be unreasonably withheld or delayed; or
 - (B) have a material adverse effect on LRV Supplier or its ability to perform the LRV Obligations or result in a material increase in the cost to the LRV Supplier of performing the LRV Obligations without the prior written approval of LRV Supplier, which approval shall not be unreasonably withheld or delayed; and
 - (iii) LRV Supplier and the City shall not initiate a Change or agree to any amendment to the LRV Contract that would reasonably be expected to :
 - (A) have a material adverse effect on Project Co or its ability to perform the Project Work or result in a material increase in the cost to Project Co of performing the Project Work without the prior written approval of Project Co, which approval shall not be unreasonably withheld or delayed; or
 - (B) have a material adverse effect on Operator or its ability to perform the OM&R Obligations or result in a material increase in the cost to Operator of performing the OM&R Obligations without the prior written approval of Operator, which approval shall not be unreasonably withheld or delayed.

2.3 The Project Agreement, Services Contract and LRV Contract

- (a) Project Co and the City represent to Operator and LRV Supplier that attached hereto as Appendix 2 is a true copy of the Project Agreement as at the date of execution of this Agreement, except to the extent that Sensitive Information has been redacted.
- (b) Operator and the City represent to Project Co and LRV Supplier that attached hereto as Appendix 3 is a true copy of the Services Contract as at the date of execution of this Agreement, except to the extent that Sensitive Information has been redacted.

- (c) LRV Supplier and the City represent to Project Co and Operator that attached hereto as Appendix 4 is a true copy of the LRV Contract as at the date of execution of this Agreement, except to the extent that Sensitive Information has been redacted.
- (d) Operator acknowledges and agrees that it has reviewed the LRV Contract and shall be deemed to have notice of any variation thereof, of which it has previously been provided a copy.
- (e) Operator acknowledges and agrees that it has reviewed the Project Agreement and shall be deemed to have notice of any variation thereof, of which it has previously been provided a copy.
- (f) LRV Supplier acknowledges and agrees that it has reviewed the Services Contract and shall be deemed to have notice of any variation thereof, of which it has previously been provided a copy.
- (g) LRV Supplier acknowledges and agrees that it has reviewed the Project Agreement and shall be deemed to have notice of any variation thereof, of which it has previously been provided a copy.
- (h) Project Co acknowledges and agrees that it has reviewed the Services Contract and shall be deemed to have notice of any variation thereof, of which it has previously been provided a copy.
- (i) Project Co acknowledges and agrees that it has reviewed the LRV Contract and shall be deemed to have notice of any variation thereof, of which it has previously been provided a copy.

Operator's, LRV Supplier's and Project Co's acknowledgments under this Section 2.3 [*The Project Agreement, Services Contract and LRV Contract*] are made without prejudice to and shall not be construed against any Party in the event of an alleged breach of this Agreement by another Party, nor shall such acknowledgments be deemed a waiver by any Party of its right to assert claims for Direct Losses against another Party under this Agreement or be deemed to grant to any Party rights of third party beneficiaries under or pursuant to any other Party's Contract.

2.4 Changes

The City acknowledges that Project Co has not had the opportunity to review the final version of the Services Contract or the LRV Contract prior to the Financial Submission Date. Accordingly, the City acknowledges and agrees that, to the extent the provisions of the Services Contract and/or LRV Contract as finally determined cause Project Co to incur material additional costs or delays in performing its obligations under this Agreement, beyond what was reasonably foreseeable at the Financial Submission Date by an experienced contractor performing design and/or construction and/or other operations similar to those to be carried out by Project Co or any other Project Co Person in relation to the Project based on the scope of this Agreement and the provisions of the Project Agreement as at the Financial Submission Date, Project Co shall be entitled to require the City to issue a Change pursuant to Schedule 13 [*Changes*].

The City acknowledges that the LRV Supplier has not had the opportunity to review the final version of the Services Contract prior to NTP as outlined in the LRV Contract. Accordingly, the City acknowledges and agrees that, to the extent the provisions of the Services Contract as finally determined cause the LRV Supplier to incur material additional costs or delays in performing its obligations under this Agreement, beyond what was reasonably foreseeable at NTP as outlined in the LRV Contract by an experienced supplier performing design, manufacturing, delivery and commissioning of light rail vehicles and/or other operations similar to those to be carried out by LRV Supplier or any other LRV Supplier Person in relation to the Project based on the scope of this Agreement and the provisions of the LRV Contract as at the NTP

as outlined in the LRV Contract, LRV Supplier shall be entitled to require the City to issue a Change pursuant to Schedule 13 [*Changes*].

2.5 General Acknowledgments

The Parties acknowledge the following:

- (a) On Phase 1 Construction Completion, Operator shall assume responsibility for, and shall provide OM&R Services to and in respect of Gerry Wright OMF Stage 2;
- (b) From and following Construction Completion, the IPDC will require access to the Infrastructure, including Gerry Wright OMF Stage 2, and the LRVs to perform its obligations pursuant to the IPDC Agreement;
- (c) From and following Phase 1 Construction Completion, LRV Supplier will require access to Gerry Wright OMF Stage 1 for the purposes of deliveries of LRVs and to Gerry Wright OMF Stage 2 for LRV Commissioning;
- (d) From and following Phase 1 Construction Completion, Project Co will require access to Gerry Wright OMF Stage 2 for purposes of performing Warranty Work and rectification of Phase 1 Construction Completion Deficiencies;
- (e) From and following the ICS Integration Ready Date, Operator will require access to the Infrastructure and support from Project Co in connection with the installation and integration of the ICS and to facilitate the performance by Operator of its obligations under the Services Contract in relation to LRV Commissioning and Infrastructure Performance Demonstration;
- (f) On Construction Completion, Operator shall assume responsibility for, and shall provide OM&R Services to and in respect of the System Infrastructure, excluding Gerry Wright OMF Stage 2;
- (g) From and following Construction Completion, Project Co will require access to the System Infrastructure, excluding Gerry Wright OMF Stage 2, to perform Warranty Work and rectification of Construction Completion Deficiencies;
- (h) From and following the Infrastructure Performance Demonstration Commencement Date, Project Co will require access to the System Infrastructure for purposes of Infrastructure Performance Demonstration; and
- (i) From and following the LRV Performance Demonstration Commencement Date, LRV Supplier will require access to the System Infrastructure for purposes of LRV Performance Demonstration.

2.6 Defences

Each Party shall retain all rights, claims, defences, and limitations of liability possessed by such Party under the terms of its Contract and shall be able to assert any contractual defences available to it under its Contract against any other Party as if such Party was the City.

2.7 No Cross Default

Each Party acknowledges and agrees that any breach by any other Party of such Party's obligations under this Agreement will not constitute a breach of such Party's Contract except to the extent that such circumstances otherwise constitute a breach under such Contract.

2.8 Priority of Article 2

In the event of any inconsistency between the provisions of this Article 2 [*General Obligations*] and any other provisions of this Agreement (whether express or implied), the provisions of this Article 2 [*General Obligations*] shall prevail.

ARTICLE 3 SPECIFIC OBLIGATIONS

3.1 Performance Protocols

Without limiting the generality of Section 2.1 [*The Project Agreement, Services Contract and LRV Contract*], Project Co, LRV Supplier and Operator shall develop appropriate protocols to coordinate the performance of their respective obligations and activities.

3.2 Operator Protocols

- (a) Operator shall submit a draft protocol (the "**OMF OM&R Protocol**") to Project Co no later than six (6) months prior to the Target Phase 1 Construction Completion Date for the granting to Operator of such non-exclusive access to the whole or parts of the Gerry Wright Lands, subject to Section 5.1 [*Operator Access*], as may be reasonably required in order to enable Operator to carry out the activities reasonably required to prepare for the performance of the OM&R Obligations in respect of the Gerry Wright OMF Stage 2 in accordance with the Services Contract.
- (b) Operator and the City shall submit a draft protocol (the "**ICS Protocol**") to Project Co no later than six (6) months prior to the Target Construction Completion Date for the granting to Operator of non-exclusive access to certain parts of the Infrastructure and support from Project Co, subject to Section 5.1 [*Operator Access*], as may be reasonably required in order to enable Operator and the City to carry out activities reasonably required in connection with the installation of an Integrated Control System in accordance with the Services Contract and as contemplated in Section 13 of Schedule 4 [*Design and Construction Protocols*] to the Project Agreement.
- (c) Operator shall submit a draft protocol (the "**OM&R Protocol**") to Project Co no later than six (6) months prior to the Target Construction Completion Date for the granting to Operator of non-exclusive access to the whole or parts of the Lands (other than Gerry Wright OMF Stage 2), subject to Section 5.1 [*Operator Access*], as may be reasonably required in order to enable Operator to carry out the activities reasonably required to prepare for the performance of the OM&R Obligations (other than those pertaining to the Gerry Wright OMF Stage 2) in accordance with the Services Contract.
- (d) Within ten (10) Business Days of receipt of the draft of each of the OMF OM&R Protocol and the OM&R Protocol (collectively, the "**Operator Protocols**") and as subsequently required during the period prior to Phase 1 Construction Completion and Construction Completion (as applicable), Project Co and Operator shall (both acting fairly and reasonably) meet to seek to agree on the terms of or adjustments required to the Operator Protocols.
- (e) The terms of each of the Operator Protocols shall provide for Operator's activities to be carried out in a manner that (and in the following order of priority) is designed:

- (i) to ensure that Operator's activities do not delay the progress or completion of the Project Work; and
 - (ii) to ensure that Operator is able to undertake the activities reasonably required to enable Operator to perform the OM&R Obligations in accordance with the Services Contract.
- (f) If Operator and Project Co are unable to agree on the terms of either of the Operator Protocols, the matter shall be referred to the Interface Committee and the Interface Committee shall, as soon as reasonably practicable and acting reasonably, determine the terms of the Operator Protocols taking into account the provisions of Section 3.2(d) above. If the Interface Committee does not reach a decision within ten (10) Business Days of the referral to the Interface Committee, then a notice of IA Dispute in respect of the applicable Operator Protocol shall be issued and such IA Dispute shall be resolved in accordance with the IA Dispute Resolution Procedure.
- (g) Project Co shall provide Operator and any of its Subcontractors non-exclusive access to the Gerry Wright Lands as reasonably required in accordance with the OMF OM&R Protocol for a reasonable period of time prior to the Target Phase 1 Construction Completion Date to provide Operator sufficient time to conduct any necessary OM&R start-up procedures under the OMF OM&R Protocol (the access period specified herein being referred to as the "**OMF OM&R Set-Up Period**").
- (h) In furtherance of the OM&R Protocol, Project Co shall provide Operator and any of its Subcontractors non-exclusive access to the Lands and the System Infrastructure in accordance with the OM&R Protocol for a reasonable period of time prior to the Target Construction Completion Date to provide Operator sufficient time to conduct any necessary OM&R start-up procedures under the OM&R Protocol (the access period specified herein being referred to as the "**OM&R Set-Up Period**").
- (i) During the OMF OM&R Set-Up Period and the OM&R Set-Up Period (as applicable), Operator's rights of non-exclusive access to the Gerry Wright Lands and the Lands (other than the Gerry Wright Lands), as applicable, shall be subject only to the terms of the Operator Protocols and Section 5.1 [*Operator Access*] of this Agreement and those restrictions established by Project Co, acting reasonably, relating to any Project Work required to any part of Gerry Wright OMF Parcel B or the Lands (other than the Gerry Wright Lands) for Project Co to achieve Phase 1 Construction Completion or Construction Completion (as applicable). Any such restrictions imposed by Project Co shall be limited to the specific area of the Gerry Wright Lands or the Lands (other than the Gerry Wright Lands) requiring Project Work and for such time period as Project Co or any Project Co Person is actively carrying out any Project Work in respect of the relevant area. Operator shall use all reasonable commercial efforts during the OMF OM&R Set-Up Period and the OM&R Set-Up Period to minimize any interference with the activities of Project Co and/or any Project Co Person.
- (j) Project Co acknowledges that, for a 180 day period Immediately following the Construction Completion Date, the City and Operator shall commence preparations for Service Readiness and Project Co confirms to and in favour of the City and Operator its obligations pursuant to Section 14.1 [*Project Co Involvement in Service Readiness*] of Schedule 4 [*Design and Construction Protocols*] to the Project Agreement.

3.3 LRV Protocol

- (a) LRV Supplier shall submit a draft protocol (the "**LRV Protocol**") to Operator and Project Co (if the Anticipated Delivery Date is prior to the Phase 1 Construction Completion Date)

no later than two (2) months prior to the Anticipated Delivery Date for the granting to LRV Supplier of non-exclusive access to the whole or parts of the Gerry Wright Lands, subject to Section 5.3 [*LRV Supplier Access*], in order to enable LRV Supplier to carry out the activities reasonably required to prepare for the delivery of the LRVs and the performance of the LRV Obligations in accordance with the LRV Contract.

- (b) Within ten (10) Business Days of receipt of the draft of the LRV Protocol and as subsequently required during the period prior to the Anticipated Delivery Date, LRV Supplier, Operator and Project Co (if applicable) shall (each Party acting fairly and reasonably) meet to seek to agree on the terms of or adjustments required to the LRV Protocol.
- (c) The terms of the LRV Protocol will provide for LRV Supplier's activities to be carried out in a manner that (and in the following order of priority) is designed:
 - (i) to ensure that LRV Supplier's activities do not delay the progress or completion of the OM&R Obligations and/or the Project Work; and
 - (ii) to ensure that LRV Supplier is able to undertake the activities reasonably required to enable LRV Supplier to perform the LRV Obligations in accordance with the LRV Contract.
- (d) If LRV Supplier, Operator and Project Co (if applicable) are unable to agree on the terms of the LRV Protocol, the matter shall be referred to the Interface Committee and the Interface Committee shall, as soon as reasonably practicable and acting reasonably, determine the terms of the LRV Protocol taking into account the provisions of Section 3.3(c) above. If the Interface Committee does not reach a decision within ten (10) Business Days of the referral to the Interface Committee, then a notice of IA Dispute in respect of the LRV Protocol shall be issued and such IA Dispute shall be resolved in accordance with the IA Dispute Resolution Procedure.
- (e) In furtherance of the LRV Protocol, Operator or Project Co (as the case may be) shall provide LRV Supplier and any of its Subcontractors unrestricted access to Gerry Wright OMF Stage 2 for a reasonable period of time prior to and following the Anticipated Delivery Date to provide LRV Supplier sufficient time to conduct any necessary start-up procedures under the LRV Protocol (the access period specified herein being referred to as the "**LRV Set-Up Period**").
- (f) During the LRV Set-Up Period, LRV Supplier's rights of non-exclusive access to the Gerry Wright OMF shall be subject only to the terms of the LRV Protocol, Section 5.1 [*Operator Access*], and Section 5.2 [*Project Co Access*] of this Agreement and those restrictions established by the Operator or Project Co (as applicable), acting reasonably, relating to the performance of any OM&R Obligations or Project Work (as applicable) required to any part of Gerry Wright OMF Stage 2. Any such restrictions imposed by the Operator and/or Project Co will be limited to the specific area of the Gerry Wright Lands required in connection with the performance of any OM&R Obligations or requiring Project Work and for such time period as Operator or any of its Subcontractors or Project Co or any of its Subcontractors is actively performing any OM&R Obligations or carrying out any Project Work in respect of the relevant area. LRV Supplier shall use all reasonable commercial efforts during the LRV Set-Up Period to minimize any interference with the activities of Operator and/or any of its Subcontractors or Project Co and/or any Project Co Person.

3.4 Handover from Project Co to Operator

Operator and Project Co shall collaborate in connection with transition of custody, care, control and responsibility to Operator of:

- (a) the Gerry Wright Lands and Gerry Wright OMF Stage 2 upon Phase 1 Construction Completion; and
- (b) the Lands, excluding the Gerry Wright Lands, and the System Infrastructure, excluding Gerry Wright OMF Stage 2, upon Construction Completion.

Such collaboration shall include identification in a timely manner of any requirements reasonably necessary or desirable to facilitate an orderly transition.

3.5 Construction Schedule

Project Co shall keep Operator and LRV Supplier informed of all significant changes to the Construction Schedule, including changes to the Target Phase 1 Construction Completion Date and the Target Construction Completion Date.

3.6 Project Co Commissioning Procedures

- (a) No later than 180 days prior to the Target Phase 1 Construction Completion Date and the Target Construction Completion Date, respectively, Project Co shall prepare, and submit to Operator for its review and comment, a draft Phase 1 commissioning plan and a draft commissioning plan (as the case may be) (the Phase 1 commissioning plan and the commissioning plan being referred to herein, collectively, as the “**Project Co Operator Commissioning Resource Plans**” and individually as a “**Project Co Operator Commissioning Resource Plan**”) setting out those parts of the Project Co Commissioning that require Operator support, along with the anticipated roles and obligations of Project Co and Operator in relation to such Project Co Commissioning and target dates as stipulated in Schedule 4 [*Design and Construction Protocols*] to the Project Agreement.
- (b) Operator may provide comments to Project Co on each of the draft Project Co Operator Commissioning Resource Plans where such draft, in the opinion of Operator reasonably held, relates to or is reasonably likely to have an impact upon the carrying out by Operator of the OM&R Obligations. Notwithstanding the foregoing, Operator shall be obligated to provide comments on each draft Project Co Operator Commissioning Resource Plan within 5 Business Days of becoming aware that such draft is wholly or partly inconsistent with any requirement of the Services Contract.
- (c) Operator shall make all comments and provide all feedback on the drafts of the Project Co Operator Commissioning Resource Plans:
 - (i) by notice in writing to Project Co; and
 - (ii) in accordance with applicable timelines and periods set out in the Project Agreement as advised by Project Co, but allowing a reasonable period prior to the applicable deadline under the Project Agreement.

Such comments shall be limited to addressing those aspects of the Project Co Operator Commissioning Resource Plans referred to in Section 3.6(b) or addressing whether any role allocated to Operator under either of the draft Project Co Operator Commissioning Resource Plans properly falls within the OM&R Obligations.

- (d) Project Co shall, within two (2) Business Days of receiving written notice from Operator in accordance with Section 3.6(c), discuss Operator's comments on each of the draft Project Co Operator Commissioning Resource Plans set out in such notice and, within two (2) Business Days following such discussions, Project Co shall either:
- (i) inform Operator that Operator's comments were accepted as submitted, in which case Project Co shall deliver to Operator a revised version of the Project Co Operator Commissioning Resource Plans and the Project Co Operator Commissioning Resource Plans will be deemed settled and binding on the Parties with respect to the matters raised; or
 - (ii) inform Operator that Operator's comments were rejected, providing written reasons therefor (which reasons may include any adverse impact on Project Co) and the following will apply:
 - (1) within two (2) Business Days after the delivery by Project Co of the notice under Section 3.6(d)(ii), Operator shall notify Project Co whether or not Operator considers that Operator's comments should be accepted; and
 - (2) if the Operator's notice referred to in (1) above states that Operator's comments should be accepted, then the dispute regarding the acceptance of Operator's comments shall be resolved under the IA Dispute Resolution Procedure and to the extent that it is determined under the IA Dispute Resolution Procedure that:
 - (A) Operator's comments are required to be incorporated into the relevant Project Co Operator Commissioning Resource Plan; or
 - (B) any role allocated to Operator under the relevant Project Co Operator Commissioning Resource Plan does not properly fall within the OM&R Obligations,

Project Co shall revise the relevant Project Co Commissioning Plan in accordance with the outcome of the IA Dispute Resolution Procedure and the matters in dispute will accordingly be deemed settled and binding on the Parties.

3.7 Inspection by Operator

The Parties agree to the following pre-Construction Completion cooperative procedures:

- (a) At least fifteen (15) days prior to scheduled commencement of the Project Co Commissioning Work on the Gerry Wright OMF Part B and the remaining Project Work, respectively, Operator shall be afforded the access and opportunity to inspect the relevant Infrastructure and to attend at and observe all Project Co Commissioning activities to satisfy itself that the Infrastructure will permit Operator to satisfy the OM&R Obligations (the "**OM&R Infrastructure Requirements**").
- (b) At least ten (10) days prior to the Phase 1 Construction Completion Date and the Construction Completion Date (as applicable), Operator shall notify the City and Project Co in writing whether its inspection has revealed any Deficiencies or non-compliance with the OM&R Infrastructure Requirements. Such written notice will set out any Deficiencies or non-compliance with the OM&R Infrastructure Requirements identified by Operator in

the course of its inspection. Such notice will not constitute acceptance by Operator of the Infrastructure. If the City agrees that any of the items identified by Operator constitute Deficiencies, the City shall notify Project Co to that effect and Project Co will be required to correct or remedy same in accordance with Project Co's obligation to perform Warranty Work pursuant to the Project Agreement.

- (c) Under no circumstances shall Operator's actions under this Section 3.7 [*Inspection by Operator*] (including the failure to note Deficiencies or non-compliance with the OM&R Infrastructure Requirements) be construed to imply that Operator has assumed any obligation or liability with respect to the design, construction or commissioning of the Infrastructure, nor shall any such actions or failure to note deficiencies derogate from Project Co's obligation to design, construct and commission the Infrastructure in accordance with the Project Requirements.

3.8 LRV Commissioning Procedures

- (a) No later than ninety (90) days prior to the Anticipated Delivery Date, LRV Supplier shall prepare, and submit to Operator for its review and comment, a draft commissioning plan (the "**LRV Commissioning Plan**") setting out those parts of the LRV Commissioning that require Operator support, along with the anticipated roles and obligations of LRV Supplier and Operator in relation to such LRV Commissioning Work and target dates as stipulated in the LRV Contract.
- (b) Operator may provide comments to LRV Supplier on the draft LRV Commissioning Plan where such draft, in the opinion of Operator reasonably held, relates to or is reasonably likely to have an impact upon the carrying out by Operator of the OM&R Obligations. Notwithstanding the foregoing, Operator shall be obligated to provide comments on the draft LRV Commissioning Plan if it becomes aware that such draft is wholly or partly inconsistent with any requirement of the Services Contract.
- (c) Operator shall make all comments and provide all feedback on the drafts of the LRV Commissioning Plan:
 - (i) by notice in writing to LRV Supplier; and
 - (ii) in accordance with applicable timelines and periods set out in the LRV Contract as advised by LRV Supplier, but allowing a reasonable period prior to the applicable deadline under the LRV Contract.

Such comments shall be limited to addressing those aspects of the LRV Commissioning Plan referred to in Section 3.8(b) or addressing whether any role allocated to Operator under the draft LRV Commissioning Plan properly falls within the OM&R Obligations.

- (d) LRV Supplier shall, within five (5) Business Days of receiving written notice from Operator in accordance with Section 3.8(c), discuss Operator's comments on the draft LRV Commissioning Plan and, within two (2) Business Days following such discussions, LRV Supplier shall either:
 - (i) inform Operator that Operator's comments were accepted as submitted, in which case LRV Supplier shall deliver to Operator a revised version of the LRV Commissioning Plan and the LRV Commissioning Plan will be deemed settled and binding on the Parties with respect to the matters raised; or

- (ii) inform Operator that Operator's comments were rejected, providing written reasons therefor (which reasons may include any adverse impact on LRV Supplier) and the following will apply:
 - (1) within two (2) Business Days after the delivery by LRV Supplier of the notice under Section 3.8(d)(ii), Operator shall notify LRV Supplier whether or not Operator considers that its comments should be accepted; and
 - (2) if the Operator's notice referred to in (1) above states that Operator's comments should be accepted, then the dispute regarding the acceptance of Operator's comments shall be resolved under the IA Dispute Resolution Procedure and to the extent that it is determined under the IA Dispute Resolution Procedure that:
 - (A) Operator's comments are required to be incorporated into the LRV Commissioning Plan; or
 - (B) any role allocated to Operator under the LRV Commissioning Plan does not properly fall within the OM&R Obligations,

LRV Supplier shall revise the LRV Commissioning Plan in accordance with the outcome of the IA Dispute Resolution Procedure and the matters in dispute will accordingly be deemed settled and binding on the Parties.

3.9 Inspection by Operator of LRVs

The Parties agree to the following LRV Commissioning cooperative procedures:

- (a) As part of the LRV Commissioning Work, Operator shall be afforded the access and opportunity to inspect the LRVs and to attend at and observe all LRV Commissioning activities to satisfy itself that the LRVs shall permit Operator to satisfy the OM&R Obligations (the "**OM&R LRV Interface Requirements**") and LRV Supplier shall provide such assistance to Operator in undertaking inspection of the LRVs as Operator may require, acting reasonably.
- (b) At least five (5) days following access and inspection of any LRVs, Operator shall notify the City and LRV Supplier in writing whether its inspection has revealed any LRV Deficiencies or failure to satisfy the OM&R LRV Interface Requirements in respect of such inspected LRVs. Such written notice will set out any LRV Deficiencies or failure to satisfy the OM&R LRV Interface Requirements identified by Operator in the course of its inspection. Such notice will not constitute acceptance by Operator of the LRVs. If the City agrees that any of the items identified by Operator constitute LRV Deficiencies, the City shall notify LRV Supplier to that effect and LRV Supplier shall be required to correct or remedy same in accordance with LRV Supplier's obligation to correct LRV Deficiencies pursuant to the requirements of the LRV Contract.
- (c) Under no circumstances shall Operator's actions under this Section 3.9 [*Inspection by Operator of LRVs*] (including the failure to note LRV Deficiencies or failure to satisfy the OM&R LRV Interface Requirements) be construed to imply that Operator has assumed any obligation or liability with respect to the design, manufacture or commissioning of the LRVs, nor shall any such actions or failure to note LRV Deficiencies derogate from LRV

Supplier's obligation to design, manufacture and commission the LRVs in accordance with the LRV Requirements.

3.10 Deficiencies

Subject to Section 3.11(b) below, Project Co acknowledges and agrees that, as between Project Co and the City, Project Co shall be responsible for the rectification of all Deficiencies in respect of the Project Work or the Infrastructure during the Warranty Periods, subject to and in accordance with the terms of the Project Agreement; provided, however, that Project Co shall not be liable for any such Deficiency to the extent that such Deficiency is caused or contributed to by any act or omission of Operator or any Operator Person or of LRV Supplier or any LRV Supplier Person.

3.11 Deficiencies and Construction Latent Defects

- (a) If Operator becomes aware after the Phase 1 Construction Completion Date or the Construction Completion Date (as applicable) of any Deficiency or Construction Latent Defect, then:
 - (i) Operator shall continue to fulfill all of the OM&R Obligations in accordance with the terms of the Services Contract to the extent possible given the nature of the Deficiency or Construction Latent Defect; and
 - (ii) Operator shall use commercially reasonable efforts to mitigate the consequences arising from such Deficiency or Construction Latent Defect, to the extent that it is able to do so with temporary or permanent remedies.
- (b) Operator shall:
 - (i) in the case of an Emergency, promptly take all commercially reasonable and practicable corrective measures to rectify any Deficiency or Construction Latent Defect, at Project Co's expense, provided that if Operator performs corrective measures in an Emergency it shall notify Project Co of the occurrence of such Deficiency as soon as reasonably possible after its occurrence and give Project Co an opportunity to permanently repair or rectify the Deficiency; and
 - (ii) where a Deficiency has not resulted in or is otherwise not part of an Emergency, as soon as practicable but in any event within two (2) Business Days of discovery of such Deficiency, notify Project Co and the City of the occurrence of such Deficiency and request that Project Co immediately and diligently commence the repair or rectification of such Deficiency in accordance with Project Co's obligations under the Project Agreement.
- (c) If Project Co does not dispute whether a Deficiency exists, Project Co shall commence to correct, and shall correct, the Deficiency in accordance with its obligations under the Project Agreement and this Agreement:
 - (i) in the case of a Deficiency arising under Section 3.11(b)(i), no later than 24 hours following receipt of the notice from Operator referred to in Section 3.11(b)(i), Project Co shall rectify or, where rectification is not possible within such period, provide a rectification plan to Operator and the City setting forth the manner in which the Deficiency will be rectified within a reasonable period of time following such 24-hour period;
 - (ii) In the case of a Deficiency arising under Section 3.11(b)(ii), no later than 72 hours following receipt of the notice from Operator referred to in Section 3.11(b)(ii),

Project Co shall commence diligent repair or rectification of the Deficiency or put forward a reasonable plan setting out the way in which the Deficiency will be promptly permanently repaired or rectified. If Project Co fails to perform its obligations under this clause (ii) and deductions or operating period payment adjustments have begun to accrue under the Services Contract (or would have begun to accrue but for works or services having been undertaken by or on behalf of Operator as a result of the Deficiency, which works or services are in excess of the level of works and services that Operator provides or causes to be provided to fulfill the OM&R Obligations under the Services Contract in the normal course) and which relate to the Deficiency in question, Operator may take commercially reasonable and practicable corrective measures to repair or rectify the Deficiency in question at the expense of Project Co.

- (d) If Project Co disputes whether an alleged Deficiency exists, or the nature or extent of Project Co's obligations in respect thereof under the Project Agreement or this Agreement, such dispute will constitute an IA Dispute and shall be resolved pursuant to the IA Dispute Resolution Procedure.
- (e) If Operator performs corrective work pursuant to Section 3.11(b)(i) or 3.11(b)(ii) and it is later determined under the IA Dispute Resolution Procedure that it was not responsible for performing such corrective work under the Services Contract or this Agreement, then, absent negligent performance of any corrective work by Operator, Operator's corrective work will not affect the validity of any Project Co warranty obligation or any product or equipment supplier warranty or any LRV warranties.

3.12 Consequences of a Deficiency

To the extent Operator incurs Direct Losses (including, without limitation, any costs of rectification of any Deficiency or Construction Latent Defect, deductions or operating period payment adjustments under the Services Contract or costs relating to the IA Dispute Resolution Procedure) as a result of any Deficiency or Construction Latent Defects for which Project Co is responsible under the Project Agreement and this Agreement, Project Co shall indemnify Operator for Direct Losses in accordance with Section 6.4(b). Notwithstanding anything else in this Agreement, Project Co's obligations under Section 3.11 and this Section 3.12 are derivative of its obligations under the Project Agreement and shall only apply if, for so long as, and to the extent that Project Co has an obligation pursuant to the Project Agreement to rectify the relevant Deficiency or Construction Latent Defect. The aggregate liability of Project Co under this Section 3.12, shall in all events be limited to \$20,000,000.

3.13 Integration Requirements

Each of Project Co and Operator and LRV Supplier shall perform its respective obligations pursuant to (as applicable) the Project Co Infrastructure Integration Requirements, the Operator Infrastructure Integration Requirements and the LRV Supplier Infrastructure Integration Requirements.

3.14 Maintenance Log to be Made Available

Each of Operator and LRV Supplier shall maintain a log of maintenance and remedial services performed in respect of the System Infrastructure and LRVs which will be available for review from time to time by Project Co until this Agreement terminates pursuant to Section 6.2 *[Termination of Agreement]*. If Operator fails to comply with this Section 3.15 *[Maintenance Log to be Made Available]*, the burden of proof with respect to the existence of a Deficiency shall rest with Operator.

3.15 Equipment and Spare Parts

Immediately prior to each of Phase 1 Construction Completion and Construction Completion, Project Co shall deliver to the Gerry Wright OMF Stage 2 such spare parts as are referred to in Section 5.6.6 of Schedule 4 [*Design and Construction Protocols*] to the Project Agreement, together with all relevant Quality Control documentation. Project Co shall provide to Operator, at the time or times stipulated in Section 5.6.6 of Schedule 4 [*Design and Construction Protocols*] to the Project Agreement prior to each of the Target Phase 1 Construction Completion Date and the Target Construction Completion Date, all relevant information regarding the size, weight, storage requirements and OEM part numbers pertaining to such spare parts. Upon delivery of same, the City, Operator and Project Co shall inspect such spare parts and Quality Control documentation and shall notify Project Co promptly following completion of such inspection as to whether any part numbers pertaining to such spare parts are incorrect or if the correct configuration is not included or any firmware or software is not installed. Forthwith following delivery of such notification by the City, Project Co shall rectify any of the matters identified in such notice as a condition of achieving Phase 1 Construction Completion or Construction Completion, as applicable, pursuant to the Project Agreement.

For certainty, Project Co shall not use any such spare parts to rectify Deficiencies unless Project Co replenishes the supply of spare parts so used.

3.16 Project Co Training

Project Co acknowledges its obligations pursuant to Section 10.1 [*Training Program*], Section 10.2 [*Training Plan*], Section 10.3 [*Training Documentation*], Section 10.4 [*Instructional Aids*] and Section 10.5 [*Training Courses*] of Schedule 4 [*Design and Construction Protocols*] to the Project Agreement.

3.17 LRV Supplier Training

LRV Supplier shall provide such training to Operator as is required pursuant to the applicable provisions of the LRV Contract.

3.18 Operating and Maintenance Manuals

Project Co acknowledges its obligations pursuant to Section 10.6 [*Operating and Maintenance Manuals*] of Schedule 4 [*Design and Construction Protocols*] to the Project Agreement.

ARTICLE 4 INTERFACE COMMITTEE

4.1 Establishment of Interface Committee

The Parties agree to establish The Interface Committee within 30 days of the execution of this Agreement. The Interface Committee shall be constituted in accordance with the provisions of Section 3.1.2(d) of Schedule 4 [*Design and Construction Protocols*] to the Project Agreement and Section 4.3 [*Composition and Operating Procedures of the Interface Committee*] below, provided, however, that the Interface Committee shall have no authority to alter the respective rights or obligations of the Parties as set out in this Agreement, the Services Contract, the LRV Contract or the Project Agreement or any agreement delivered pursuant to or in connection with either of the foregoing agreements.

4.2 Purpose and Authority of Interface Committee

The Interface Committee is established for the purpose of providing effective dialogue between the Parties as to all issues and concerns relating to any conflict, areas of any potential conflict or other concerns as between the Parties with respect to their varying rights and obligations under this Agreement, the Project Agreement, the Services Contract and the LRV Contract. Unanimous decisions of the Interface Committee

(unless inconsistent with the express terms or conditions of the Project Agreement, the Services Contract or the LRV Contract, as the case may be) shall be binding upon the Parties and shall be carried out by the affected Parties in the manner and within the time periods (if any) specified in such decisions.

4.3 Composition and Operating Procedures of the Interface Committee

- (a) The Interface Committee shall be comprised of four individuals, being one representative from each Party (each, a “**Representative**”). Each Party shall have the right to appoint a primary Representative and an alternate Representative, who shall serve on the Interface Committee when a primary Representative of such Party is unavailable by reason of sickness, injury, vacation or other reasonable cause. Each Party may (but need not) have both its primary and alternate Representatives attend any meeting of the Interface Committee, provided that, for the purposes of quorum under Section 4.3(h) and any actions or decisions to be taken at such meeting, only one Representative per Party shall be deemed to be present. For greater certainty, this Section 4.3 is not intended to apply to the resolution of any IA Disputes, which shall be determined in accordance with Section 9.1 [*IA Dispute Resolution*] and the IA Dispute Resolution Procedure.
- (b) The City Representative (the “**Chairman**”) shall chair the Interface Committee and shall be responsible to keep minutes of all decisions of the Interface Committee and circulate such minutes to the members of the Interface Committee within five (5) Business Days of the holding of each meeting.
- (c) One Representative of each Party shall make reasonable efforts to attend all meetings of the Interface Committee. If any Representative is routinely absent, he or she shall be replaced by the Party that appointed such Representative upon the request of the other Representatives.
- (d) All decisions of the Interface Committee shall be made by consensus of all Representatives present at a meeting of the Interface Committee. In the event that there is a lack of consensus on any matter which comes before the Interface Committee, such matter shall be referred to a panel of four senior executives, one appointed by each Party (the “**Executive Panel**”). The senior executives selected shall not be involved in the day to day management or operation of the Project. The Executive Panel shall also act by consensus and a decision of such panel shall be binding upon the Parties as if it were a decision of the Interface Committee.
- (e) The Interface Committee shall hold monthly meetings in Edmonton, Alberta (or at such locations as the Representatives may determine, until the Service Readiness Date, after which meetings shall be held on an as needed basis. Additional meetings of the Interface Committee may be held at the request of any Representative provided that at least five days prior notice in writing of such meeting shall be given to each other Representative unless the requirement for such notice is expressly waived in writing by such Representative or such other Representatives attend the meeting and do not object to the absence of the required notice. Unless otherwise agreed to by the Representatives, each such notice shall be accompanied by a written agenda setting out in reasonable detail the matters to be discussed at the meeting together with any relevant supporting materials.
- (f) Any Representative may participate in a meeting of the Interface Committee, and any senior executive may participate in a meeting of the Executive Panel, by means of telephone conference or other communications equipment by means of which all persons participating in the meeting can hear and speak to each other, and a Representative or senior executive, as the case may be, participating in a meeting in such manner shall be deemed to be present in person at such meeting. Any decision made by the Executive Panel at such meeting shall be confirmed in writing by facsimile or electronic mail to all Parties. Any matter within the competence of the Interface Committee or the Executive

Panel, as the case may be, that is agreed or consented to in writing by Representatives or senior executives, as applicable, of each of the Parties entitled to attend a meeting of the Interface Committee or Executive Panel, as the case may be, shall be binding upon the Interface Committee or the Executive Panel, as the case may be, and the Parties as if approved at a duly constituted meeting of the Interface Committee or Executive Panel, as the case may be.

- (g) Except as otherwise provided for in this Agreement, the Interface Committee shall have the authority, by consensus approval of all Representatives, to establish its own reasonable procedures for meetings, notices, minutes and all other matters necessary for its efficient operation. Minutes shall be kept of all meetings of the Interface Committee which shall be approved by the Chairman and circulated to all Representatives within 15 days of each meeting.
- (h) A quorum for a meeting of the Interface Committee shall be four Representatives, including one Representative of each Party. If a meeting is called and a quorum is not present, the meeting shall be adjourned for not less than 24 hours, with notice thereof to be provided as contemplated in Section 4.3(e). A quorum for a meeting of the Executive Panel will be four (4) senior executives, one representing each Party. If the absence of the Representative of one party causes a quorum not to be present at three consecutive duly called meetings of either the Interface Committee or the Executive Panel, the fourth such duly called meeting will proceed with those Representatives who are present and will be deemed to have been duly constituted.

ARTICLE 5 ACCESS

5.1 Operator Access

- (a) To facilitate Operator and its activities with respect to any OM&R Obligations required to be performed by Operator and any Operator Person, including any Operator obligations in connection with Performance Demonstration or performance of the Operator Infrastructure Integration Requirements, each of Project Co and LRV Supplier (as the case may be) shall provide reasonable access to Operator and any Operator Person to perform the activities contemplated in the Operator Protocols. Without limiting the generality of the foregoing, from and after the date of this Agreement, Project Co and LRV Supplier shall, acting reasonably, accommodate requests from Operator to enter upon the Lands or to access the LRVs in order that Operator may sufficiently discharge its obligations under this Agreement (including, for greater certainty, its obligations as set out in the Operator Protocols) and any obligations set out in the Services Contract. For certainty and without limiting the generality of the foregoing:
 - (i) Project Co shall grant access to the relevant Infrastructure to the Operator prior to Construction Completion and shall provide support to the Operator from and after the ICS Integration Ready Date in order to enable the Operator to install the Integrated Control System in order that such system may be completed and installed within 180 days after Construction Completion; and
 - (ii) LRV Supplier shall grant access to the LRVs that have been delivered to the Gerry Wright OMF Stage 2 in order to enable Operator to provide support to LRV Supplier in connection with LRV Commissioning provided, however, that Operator and Operator Persons shall at all times adhere to the directions, procedures and safety guidelines established by LRV Supplier.

- (b) Neither Project Co nor LRV Supplier shall materially impede the ability of Operator or any Operator Person to carry out any of the activities contemplated in the Operator Protocols; provided, however, that, prior to each of Phase 1 Construction Completion and Construction Completion, Operator and all Operator Persons shall:
 - (i) at all times adhere to the directions, procedures and safety guidelines established by Project Co or any Project Co Person for Gerry Wright OMF Stage 2, the Lands, the Infrastructure and the Project; and
 - (ii) if required by Project Co or any Project Co Person, confine their activities to a specified location on Gerry Wright OMF Stage 2 or the Lands or remove themselves from Gerry Wright OMF Stage 2 or the Lands if, in the discretion of Project Co or any Project Co Person, acting reasonably, the presence of Operator or any Operator Persons and/or their respective activities, are:
 - (A) materially interfering with the Construction or the ability of Project Co or any Project Co Person to achieve any Construction milestones under the Project Agreement;
 - (B) delaying, impeding or interfering with the ability of Project Co or any Project Co Person to achieve Phase 1 Construction Completion or Construction Completion; or
 - (C) posing a threat to the safety of any Persons present on the Lands.
- (c) In the event that Project Co or any Project Co Person so confines or removes Operator or an Operator Person, Project Co shall provide Operator or such Operator Person with an alternate time to conduct such activities unless doing so would cause any of the events described in Sections 5.1(b)(ii)(A), (B) or (C) to occur.
- (d) If Operator suffers any Direct Losses as a result of Project Co's or LRV Supplier's (as applicable) failure to provide access to Operator as set out in this Agreement(except for any denial of access contemplated in Section 5.1(b)), then Project Co or LRV Supplier (as applicable) shall be liable to Operator for such Direct Losses; provided always that Operator shall take commercially reasonable steps to mitigate such Direct Losses and any relief, payment or benefit received by Operator pursuant to the Services Contract or any insurance (in each case in relation to such Direct Losses) shall reduce such Direct Losses.

5.2 Project Co Access

- (a) To facilitate Project Co and its activities with respect to any work required to be completed by Project Co and any Project Co Person after Phase 1 Construction Completion or Construction Completion (as applicable), rectification of any Deficiency or Construction Latent Defect and/or Performance Demonstration or performance of the Project Co Infrastructure Integration Requirements, each of Operator and LRV Supplier (as the case may be) shall provide reasonable access to Project Co and any Project Co Person to perform the activities contemplated above. Without limiting the generality of the foregoing, from and after the Phase 1 Construction Completion Date, Operator and LRV Supplier shall, acting reasonably, accommodate requests from Project Co to enter upon Gerry Wright OMF Parcel B or to access the LRVs in order that Project Co may sufficiently discharge its obligations under this Agreement and any obligations set out in the Project Agreement. Neither Operator nor LRV Supplier shall materially impede the ability of Project Co or any Project Co Person to carry out any such activities; provided, however, that Project Co and Project Co Persons shall:

- (i) at all times adhere to the directions, procedures and safety guidelines established by Operator or LRV Supplier (as applicable); and
- (ii) if required by Operator, acting reasonably, confine their activities to a specified location at Gerry Wright OMF Stage 2 or on the Lands, or remove themselves from Gerry Wright OMF Stage 2 or the Lands if, in Operator's discretion, acting reasonably, the presence of Project Co or any Project Co Person, and/or their activities, are:
 - (A) materially interfering with the OM&R Obligations; or
 - (B) posing a threat to the safety of any Persons present on the Lands.
- (b) In the event that Operator so confines or removes Project Co or a Project Co Person, Operator shall provide Project Co or such Project Co Person with an alternate time to conduct such activities, unless doing so would cause one of the events described in Sections 5.2(a)(ii)(A) or (B) to occur.
- (c) If Project Co suffers any Direct Losses as a result of Operator's or LRV Supplier's (as applicable) failure to provide access as set out in this Agreement (except for any denial of access contemplated in Section 5.2(a)(ii)), then Operator or LRV Supplier (as applicable) shall be liable to Project Co for such Direct Losses; provided, always that Project Co shall take commercially reasonable steps to mitigate such Direct Losses and any relief, payment or benefit received by Project Co pursuant to the Project Agreement or any insurance (in each case in relation to such Direct Losses) shall reduce such Direct Losses.

5.3 LRV Supplier Access

- (a) To facilitate LRV Supplier and its activities with respect to LRV Commissioning, Performance Demonstration and any work required to be completed by LRV Supplier and any LRV Supplier Person after delivery of LRVs, rectification of any LRV deficiencies or the undertaking by LRV Supplier of any warranty work in relation to the LRVs, each of Project Co and Operator (as the case may be) shall provide reasonable access to LRV Supplier and any LRV Supplier Person to perform the activities contemplated above. Without limiting the generality of the foregoing, from and after the date of this Agreement, Project Co and Operator shall, acting reasonably, accommodate requests from LRV Supplier to enter upon the Lands or to access the LRVs in order that LRV Supplier may sufficiently discharge its obligations under this Agreement (including, for greater certainty, its obligations as set out in the LRV Protocol) and any obligations set out in the LRV Contract. Neither Project Co nor Operator shall materially impede the ability of LRV Supplier or any LRV Supplier Person to carry out any such activities; provided, however, that LRV Supplier and LRV Supplier Persons shall:
 - (i) at all times adhere to the directions, procedures and safety guidelines established by Project Co or Operator (as applicable); and
 - (ii) if required by Project Co or Operator (as applicable), acting reasonably, confine their activities to a specified location at Gerry Wright OMF-B or on the Lands, or remove themselves from Gerry Wright OMF-B or the Lands if, in Project Co's Operator's (as applicable) discretion, acting reasonably, the presence of LRV Supplier or any LRV Supplier Person, and/or their activities, are:
 - (A) materially interfering with the Construction or the ability of Project Co or any Project Co Person to achieve any Construction milestones under the Project Agreement;

- (B) delaying, impeding or interfering with the ability of Project Co or any Project Co Person to achieve Phase 1 Construction Completion or Construction Completion;
 - (C) materially interfering with the OM&R Obligations; or
 - (D) posing a threat to the safety of any Persons present on the Lands; or
 - (E) causing payment deductions under the Services Contract to accrue.
- (b) If LRV Supplier suffers any Direct Losses as a result of Project Co's or Operator's (as applicable) failure to provide access as set out in the LRV Protocol (except for any denial of access contemplated in Section 5.1(b) or Section 5.2(a)(ii)), then Project Co or Operator (as applicable) shall be liable to LRV Supplier for such Direct Losses; provided always that LRV Supplier shall take commercially reasonable steps to mitigate such Direct Losses and any relief, payment or benefit received by LRV Supplier pursuant to the LRV Contract or any insurance (in each case in relation to such Direct Losses) shall reduce such Direct Losses.

5.4 Health and Safety

- (a) Each of the Parties acknowledges and agrees that responsibility for safety upon the Lands shall be assumed as specified in the Project Agreement for Project Co and in the Services Contract for Operator. For the avoidance of doubt, Project Co shall be responsible for all obligations relating to safety upon Gerry Wright OMF Parcel B until Phase 1 Construction Completion and upon the Lands (other than Gerry Wright OMF Parcel B) until Construction Completion.
- (b) Each of the Parties acknowledges and agrees that Project Co shall, during the time periods and in respect of the worksite(s) specified in Appendix 11A [*Prime Contractor Designation*] to Schedule 11 [*Construction Safety Requirements*] to the Project Agreement, perform or cause a Project Co Person to perform all of the obligations of the "Prime Contractor" and assume any and all liabilities of the "Prime Contractor" under the *Occupational Health and Safety Act* (Alberta) and all regulations thereto as required under Section 1.2 of Schedule 11 [*Construction Safety Requirements*] to the Project Agreement in respect of the worksite(s) specified in the 'Worksite' column in such Appendix.
- (c) Each of the Parties acknowledges and agrees that Operator shall:
- (i) at all times following the Phase 1 Construction Completion Date, perform or cause an Operator Person to perform all of the obligations of the "Prime Contractor" and assume any and all liabilities of the "Prime Contractor" under the *Occupational Health and Safety Act* (Alberta) and all regulations thereto on Gerry Wright OMF Parcel B specified in and as required under the Services Contract; and
 - (ii) at all times following the Construction Completion Date, perform or cause an Operator Person to perform all of the obligations of the "Prime Contractor" and assume any and all liabilities of the "Prime Contractor" under the *Occupational Health and Safety Act* (Alberta) and all regulations thereto in respect of the worksite(s) on the Lands and on Gerry Wright OMF Parcel A specified in and as required under the Services Contract;
- (d) The rights of access granted pursuant to this Agreement shall be exercised by each of Project Co, Operator and LRV Supplier in a manner that is consistent with all safety rules applicable to: (i) Gerry Wright OMF Stage 2 or (ii) the Lands, respectively. Furthermore,

each Party shall at all times avoid or minimize any disruption, hindrance or other impact with respect to the delivery of each other Party's obligations under the Project Agreement, the Services Contract and the LRV Contract, as applicable. Each of Project Co and Operator shall deliver or cause to be delivered a copy of the health and safety manuals and procedures for its respective project upon the execution of this Agreement and as amended from time to time.

- (e) Project Co shall, and shall cause all Project Co Persons to, comply with the health and safety program and procedures of Operator, or the Operator Person performing the "Prime Contractor" obligations at all times following the Phase 1 Construction Completion Date on Gerry Wright OMF-B and at all times following the Construction Completion Date in respect of the worksite(s) on the Lands and on Gerry Wright OMF Parcel A, as the case may be, while performing work or other activities on such worksite(s).
- (f) Operator shall, and shall cause all Operator Persons to, comply at all times with the health and safety program and procedures of Project Co, or the Project Co Person performing the "Prime Contractor" obligations described in Section 5.4(b) of this Agreement, while performing work or other activities on such worksite(s).
- (g) LRV Supplier shall, and shall cause all LRV Supplier Persons to, comply with the health and safety program and procedures of Project Co, or the Project Co Person performing the "Prime Contractor" obligations at all times described in Section 5.4(b) of this Agreement, while performing work or other activities on such worksite(s)
- (h) LRV Supplier shall, and shall cause all LRV Supplier Persons to, comply with the health and safety program and procedures of Operator or the Operator Person performing the "Prime Contractor" obligations under the *Occupational Health and Safety Act (Alberta)* and all regulations thereto at all times following the Phase 1 Construction Completion Date on Gerry Wright OMF-B and at all times following the Construction Completion Date in respect of the worksite(s) on the Lands and on Gerry Wright OMF Parcel A, as the case may be, while performing work or other activities on such worksite(s).

ARTICLE 6 TERMINATION, INDEMNIFICATION AND LIABILITY

6.1 Effective Date

This Agreement will be effective on and from the date above first written.

6.2 Termination of Agreement

This Agreement will terminate and cease to have effect upon the earlier of:

- (a) the Project Agreement Termination Date, and
- (b) the later of (i) date that the Services Contract terminates in accordance with its terms, and (ii) the date that the LRV Contract terminates in accordance with its terms,

without prejudice to Section 10.17 *[Survival]* and without prejudice to the final determination of any IA Dispute which has not been finally determined at the date of termination or expiration of this Agreement.

6.3 Termination Without Prejudice

The termination of this Agreement shall be without prejudice to the rights and liabilities of the Parties which shall have accrued under this Agreement prior to the date of termination.

6.4 Liability and Indemnification

- (a) Operator shall indemnify and save harmless Project Co and Project Co Persons and LRV Supplier and LRV Supplier Persons (in this Section 6.4(a) collectively, the “**Indemnified Parties**” and individually an “**Indemnified Party**”) from and against any and all Direct Losses to the extent suffered, sustained, incurred by or brought against the Indemnified Parties as a result of, in respect of or arising directly or indirectly, out of, or in consequence of any breach of this Agreement by Operator, except to the extent that such Direct Losses are caused, or contributed to, by any negligent act or omission, fraud or wilful misconduct, of an Indemnified Party or any person for whom an Indemnified Party is in law responsible; provided that there shall be excluded from the indemnity given by Operator any liability for the occurrence of risks against which an Indemnified Party is bound to insure under the Project Agreement or the LRV Contract (as applicable), to the extent of the proceeds available or which would have been available but for a failure by such Indemnified Party to properly insure in accordance with the terms thereof (other than insurance proceeds that are unavailable due to any act or omission of Operator).
- (b) Project Co shall indemnify and save harmless Operator and Operator Persons and LRV Supplier and LRV Supplier Persons (in this Section 6.4(b) collectively, the “**Indemnified Parties**” and individually an “**Indemnified Party**”) from and against any and all Direct Losses to the extent suffered, sustained, incurred by or brought against the Indemnified Parties as a result of, in respect of or arising directly or indirectly, out of, or in consequence of any breach of this Agreement by Project Co, except to the extent that such Direct Losses are caused, or contributed to, by any negligent act or omission, including fraud or wilful misconduct, of an Indemnified Party or any person for whom an Indemnified Party is in law responsible; provided that there shall be excluded from the indemnity given by Project Co any liability for the occurrence of risks against which an Indemnified Party is bound to insure under the Services Contract or the LRV Contract (as applicable), to the extent of the proceeds available or which would have been available but for a failure by such Indemnified Party to properly insure in accordance with the terms thereof (other than insurance proceeds that are unavailable due to any act or omission of Project Co).
- (c) LRV Supplier shall indemnify and save harmless Project Co and Project Co Persons and Operator and Operator Persons (in this Section 6.4(c) collectively, the “**Indemnified Parties**” and individually an “**Indemnified Party**”) from and against any and all Direct Losses to the extent suffered, sustained, incurred by or brought against the Indemnified Parties as a result of, in respect of or arising directly or indirectly, out of, or in consequence of any breach of this Agreement by LRV, except to the extent that such Direct Losses are caused, or contributed to, by any negligent act or omission, including fraud or wilful misconduct, of an Indemnified Party or any person for whom an Indemnified Party is in law responsible; provided that there shall be excluded from the indemnity given by LRV Supplier any liability for the occurrence of risks against which an Indemnified Party is bound to insure under the Project Agreement or the Services Contract (as applicable) to the extent of the proceeds available or which would have been available but for a failure by such Indemnified Party to properly insure in accordance with the terms thereof (other than insurance proceeds that are unavailable due to any act or omission of LRV Supplier).

6.5 Maximum Liability

The maximum aggregate liability of each Party in respect of all claims under this Agreement (including any liability of any Party in respect of claims for indemnification under Section 6.4 [*Liability and Indemnification*] and any liability of Project Co under Section 3.12 [*Consequences of a Deficiency*]) shall not exceed \$30,000,000. This limit shall be index linked and shall be exclusive of any insurance or performance security proceeds received or receivable by any indemnifying Party and shall not apply in cases of wilful misconduct or deliberate acts of wrongdoing.

**ARTICLE 7
INDEPENDENT PERFORMANCE DEMONSTRATION CERTIFIER**

7.1 Appointment

Promptly but not less than six (6) months prior to the Target Construction Completion Date, Project Co, Operator, LRV Supplier and the City shall conduct a competitive procurement process to jointly appoint a Person (the “**Independent Performance Demonstration Certifier**” or “**IPDC**”) to provide Performance Demonstration certification and other services for the benefit of the Parties throughout the Performance Demonstration Period, and that shall:

- (a) be qualified and experienced with respect to the design, construction and assessment of light rail infrastructure similar to the Infrastructure;
- (b) have professional engineering expertise sufficient to execute the functions of the IPDC;
- (c) be qualified and experienced with respect to the design, manufacture, operation and assessment of light rail vehicles similar to the LRVs;
- (d) be qualified and experienced with respect to civil, mechanical, electrical and systems engineering and other relevant matters associated with performance demonstration considerations of light rail projects similar to the Infrastructure using light rail vehicles similar to the LRVs; and
- (e) be independent from each of the Parties and any Affiliates of the Parties (including, if an Party is a partnership, each partner of such Party) (and who shall be impartial to the Parties).

The competitive procurement process shall be managed and administered by the City in accordance with its procurement policies. The other Parties shall cooperate and assist the City with the development of the procurement documents and evaluation criteria used to select the IPDC and shall participate in the evaluation of procurement responses.

The Parties shall enter into an agreement with the IPDC (the “**Independent Performance Demonstration Certifier Agreement**” or “**IPDC Agreement**”) substantially on the terms as set out in Appendix 5 [*Independent Performance Demonstration Certifier Agreement*].

No Party shall, without the prior written consent of the other Parties, enter into any agreement with the IPDC in connection with any aspect of the Project other than the Independent Performance Demonstration Certifier Agreement, and the Parties shall ensure that no Party Person enters into any separate agreement with the IPDC in connection with the Project.

7.2 IPDC Services

The services to be provided by the IPDC are described in the IPDC Agreement and specifically in Appendix 5A [*Functions*] to Appendix 5 [*Independent Performance Demonstration Certifier Agreement*].

7.3 Changes in Terms

Except as otherwise expressly provided in the IPDC Agreement, none of the Parties shall, without the other Parties’ prior approval (not to be unreasonably withheld or delayed):

- (a) waive, settle, compromise or otherwise prejudice any rights or claims which any other Party may from time to time have against the IPDC; or

- (b) vary the terms of the IPDC Agreement or the services performed, or to be performed, by the IPDC.

7.4 Performance of Obligations

Each of the Parties shall perform its respective obligations arising under, or in connection with, the IPDC Agreement.

7.5 Cooperation

The Parties agree to cooperate with each other in relation to all matters within the scope of, or in connection with, the IPDC and the IPDC Agreement. All instructions, inspection and meeting notices and representations issued or made by any of the Parties to the IPDC shall be simultaneously copied to the other Parties for information purposes, and in the case of inspections or meetings, all of the Parties shall be entitled to attend such inspections performed by, or meetings involving, the IPDC.

7.6 Appointment and Replacement

The Parties agree that the IPDC shall not provide any services or reports or other information to the Parties, or any other Person other than pursuant to the performance of the functions of the IPDC under this Agreement and the IPDC Agreement unless agreed to in writing by the Parties.

If, for any reason during the term of the Agreement, the IPDC's appointment has been terminated by the Parties, then, unless otherwise agreed, the Parties shall promptly conduct a competitive procurement process to jointly appoint a replacement IPDC. The competitive procurement process shall be conducted in accordance with the procedures set out in Section 7.1 [*Appointment*] of this Agreement and the Person appointed as a replacement IPDC shall satisfy the criteria set out in Sections 7.1(a) to (e) inclusive.

7.7 Permitted Access

The Parties shall grant the IPDC, or shall cause to be granted to the IPDC, access to the Gerry Wright OMF Site, the Lands, the Infrastructure and the LRVs as the IPDC reasonably requires in connection with the performance of the Functions and each of the Parties shall:

- (a) provide the IPDC with access to drawings, specifications, schedules, records, and other documents or data relating to the Infrastructure or LRVs, as applicable, including such information that is produced by or in the possession of any IA Person;
- (b) provide the IPDC with access to all plant, goods, products, commodities, materials, supplies, machinery, equipment, apparatus and other tangible property intended to form, or actually forming, part of the Infrastructure or the LRVs; and
- (c) permit the IPDC to attend all Performance Demonstration Committee meetings.

7.8 No Responsibility

Nothing in this Agreement or in the IPDC Agreement shall be interpreted as giving the IPDC any responsibility or authority for any aspect of the Project Work, the LRV Services or the OM&R Services or as relieving any Party of its responsibilities, as set out in this Agreement, or in any of the Project Agreement, the LRV Contract or the Services Contract.

7.9 Parties Not Relieved

None of the Parties shall be relieved from performing or observing its obligations, or from any other liabilities, under this Agreement as a result of the appointment or any act or omission of the IPDC.

7.10 Parties not Liable

On no account shall any of the Parties be liable to any other Party for any act or omission of the IPDC whether under or purportedly under a provision of this Agreement, the IPDC Agreement or otherwise, provided that any such act or omission shall not extinguish, relieve, limit or qualify the nature or extent of any right or remedy of any Party against or any obligation or liability of another Party which would have existed regardless of such act or omission.

ARTICLE 8 PERFORMANCE DEMONSTRATION

8.1 Performance Demonstration Committee

- (a) Not less than nine (9) months prior to the first scheduled Performance Demonstration activity, the City, the LRV Supplier, Operator, Project Co and the IPDC (collectively the **“PDC Parties”** and, individually, a **“PDC Party”**) shall establish and maintain until the completion of the Performance Demonstration Period, a joint liaison committee (the **“Performance Demonstration Committee”**) consisting of the Project Co Commissioning Manager, Project Co’s Representative, the City’s Representative, LRV Supplier’s Commissioning Representative, LRV Supplier’s Representative, Operator’s Representative, IPDC’s Representative and such other members as the Performance Demonstration Committee may agree from time to time.
- (b) The Performance Demonstration Committee shall provide a formal forum for the PDC Parties to consult and cooperate in all matters relating to Performance Demonstration, including discussion, clarification, planning and coordination of Performance Demonstration and measurement of performance criteria.
- (c) The Performance Demonstration Committee shall meet at least once every four weeks or more frequently, as necessary. If any member of the Performance Demonstration Committee requests an additional meeting, the PDC Parties shall act reasonably in accommodating this request. Meetings of the Performance Demonstration Committee shall be convened on not less than two (2) Business Days’ notice (which notice shall also identify the agenda items to be discussed at the meeting and include the then-current Performance Demonstration schedule), provided that, in the case of urgency, a meeting may be called at any time by any member on such notice as may be reasonable in the circumstances.
- (d) the City Representative shall chair the Performance Demonstration Committee throughout the Performance Demonstration Period and shall be responsible to keep minutes of all recommendations, action items and meetings of the Performance Demonstration Committee and circulate such minutes to the members of the Performance Demonstration Committee within five (5) Business Days of the holding of the meeting, including all relevant recommendations in respect of the action items;
- (e) each of Project Co, LRV Supplier and Operator shall submit to the members of the Performance Demonstration Committee all of the reports, data and other information that it is required to submit to the Performance Demonstration Committee pursuant to and in accordance with the Project Agreement, LRV Contract or the Services Contract, as applicable.

8.2 Performance Demonstration

- (a) The **“Performance Demonstration Period”** shall be a period commencing on the earlier of the Infrastructure Performance Demonstration Commencement Date and the LRV Performance Demonstration Commencement Date, and terminating on the later of:

- (i) the termination or expiry of the Infrastructure Performance Demonstration Period under the Project Agreement; and
 - (ii) the termination of the LRV Performance Demonstration Period under the LRV Contract.
- (b) During the Infrastructure Performance Demonstration Period, Project Co shall comply with its obligations under Schedule 7 [*Performance Demonstration Requirements*] to the Project Agreement, including:
- (i) identify and report any failures and incidents attributable to the Infrastructure;
 - (ii) provide all personnel and equipment necessary or required to conduct such monitoring activities where the required information cannot be obtained from Infrastructure sub-systems which will feed into the future ICS;
 - (iii) allow the City to witness any monitoring activities undertaken pursuant to Section 8.2(b) during the Infrastructure Performance Demonstration Period. Project Co shall keep an up-to-date Infrastructure Performance Demonstration activity schedule for the City's information; and
 - (iv) identify and report to the members of the Performance Demonstration Committee any failures and incidents attributable to Project Co.
- (c) During the Performance Demonstration Period, Operator shall:
- (i) perform the OM&R Services;
 - (ii) record on-time performance;
 - (iii) identify all Train Delays and make the initial identification of the underlying root cause;
 - (iv) provide information from the ICS that is relevant to any failure or incident and is necessary to determine the underlying root cause;
 - (v) identify and report to the members of the Performance Demonstration Committee any failures and incidents attributable to Operator; and
 - (vi) provide all personnel (including LRV drivers) and equipment necessary or required to perform such services.
- (d) During the LRV Performance Demonstration Period, LRV Supplier shall:
- (i) monitor System Ride Quality in accordance with the requirements of the LRV Contract;
 - (ii) perform Internal Noise monitoring on the LRVs;
 - (iii) provide all personnel and equipment necessary or required to conduct such monitoring activities where the required information cannot be obtained from Infrastructure sub-systems which shall feed into the future ICS; and
 - (iv) identify and report to the members of the Performance Demonstration Committee any failures and incidents attributable to the LRVs.

- (e) Pursuant to the IPDC Agreement, the IPDC shall assign the underlying root causes of failures to the appropriate Performance Demonstration Party based on the information provided by all Performance Demonstration Parties to the Performance Demonstration Committee.

8.3 Release From Obligations

- (a) Notwithstanding the foregoing, upon completion of the termination or expiry of the Infrastructure Performance Demonstration Period under the Project Agreement, if it occurs prior to the termination or expiry of the Performance Demonstration Period, Project Co shall be released from all further obligations pursuant to this Article 8.
- (b) Notwithstanding the foregoing, upon completion of the termination or expiry of the LRV Performance Demonstration Period under the LRV Contract, if it occurs prior to the termination or expiry of the Performance Demonstration Period, the LRV Supplier shall be released from all further obligations pursuant to this Article 8.

ARTICLE 9 DISPUTE RESOLUTION PROCEDURE

9.1 IA Dispute Resolution

All disputes, controversies, or claims arising out of or relating to any provision of this Agreement, or the alleged wrongful exercise or failure to exercise by a Party of a discretion or power given to that Party under this Agreement, or the interpretation, enforceability, performance, breach, termination, or validity of this Agreement (collectively and individually, an “**IA Dispute**”) shall be resolved in accordance with the procedure (the “**IA Dispute Resolution Procedure**”) set out in Appendix 1 [*IA Dispute Resolution Procedure*].

ARTICLE 10 MISCELLANEOUS PROVISIONS

10.1 Costs and Expenses

Except as otherwise provided herein or pursuant to the IA Dispute Resolution Procedure, each Party shall be responsible for the payment of its own costs and expenses in connection with this Agreement and all matters contemplated in this Agreement.

10.2 Payments

- (a) Any invoice issued pursuant to this Agreement shall be due for payment by the Party to whom it is addressed 30 days after the date of the invoice, unless otherwise specified in this Agreement or agreed to by the relevant Parties or (subject to Section 10.2(b) disputed in writing by the recipient.
- (b) If the recipient of an invoice issued pursuant to this Agreement disagrees with all or any portion of such invoice, the recipient shall make payment of the undisputed portion of the invoice in accordance with Section 10.2(a) and shall promptly notify the issuer of the invoice of the reasons for its disagreement with the balance of that invoice.

10.3 Interpretive Provisions

In this Agreement:

- (a) references to this Agreement include the Appendices and other attachments hereto;
- (b) references to “**hereunder**”, “**herein**” and “**hereof**” are to the provisions of this Agreement, and references to Articles and Sections herein refer to articles, sections, or Sections of this Agreement;
- (c) the headings of the Articles, Sections, Appendices and any other headings, captions or indices herein are inserted for convenience of reference only and shall not be used in any way in construing or interpreting any provision hereof;
- (d) references to a “**Section**”, “**Subsection**” or “**Appendix**” mean and refer to the specified section, Section or appendix of or to this Agreement;
- (e) whenever the singular or masculine or neuter is used, it shall be interpreted as meaning the plural or feminine or body politic or corporate, and vice versa, as the context requires;
- (f) where a term is defined herein, a derivative of such term shall have a corresponding meaning unless the context otherwise requires.
- (g) words indicating the singular also include the plural and words indicating the plural also include the singular;
- (h) provisions including the word “**agree**”, “**agreed**” or “**agreement**” require the agreement to be recorded in writing;
- (i) references to “including” and “includes” means “including, without limitation” and “includes, without limitation” respectively;
- (j) “**written**” or “**in writing**” means hand-written, type-written, printed or electronically made, and resulting in a permanent record;
- (k) “**day**” means a calendar day;
- (l) any reference to a statute shall include and shall be deemed to be a reference to such statute and to the regulations made pursuant thereto, and all amendments made thereto and in force from time to time, and to any statute or regulation that may be passed which has the effect of supplementing the statute so referred to or the regulations made pursuant thereto; and
- (m) unless otherwise expressly stated, references to dollars or \$ means Canadian dollars.

10.4 General Duty to Mitigate

Without limiting, and in addition to, all other obligations to mitigate required by this Agreement, at law or in equity, in all cases where a Party is entitled to receive from another Party any compensation, damages, indemnification or extension of time, the first mentioned Party will have a duty to mitigate its losses, damages, delay, or any other basis for such entitlement, as the case may be, and shall otherwise act in a commercially reasonable manner.

10.5 Interest

To the extent that any amount under this Agreement is due and payable, unless otherwise expressly provided for, interest shall accrue on such amount commencing thirty (30) days after such amount is due and payable at Prime plus 2% per annum calculated daily and compounded monthly until such amount is paid.

10.6 Entire Agreement

This Agreement (and the documents referred to in it) represents the entire agreement between Project Co, Operator and LRV Supplier and supersedes all prior negotiations, representations, agreements, and understandings, whether written or oral, unless the same have been incorporated into this Agreement by reference, with respect to the subject matter hereof. This Agreement may be amended only by written instrument signed by all Parties. As between Project Co, Operator and LRV Supplier, there are no representations, warranties, conditions or other agreements, whether direct or collateral, express or implied, that form a part of or affect this Agreement, or which induced any Party hereto to enter into this Agreement or on which reliance is placed by any Party hereto, except as specifically set out in this Agreement.

10.7 Severability

In case a provision of this Agreement is held to be invalid, illegal or unenforceable, the validity, legality and enforceability of the remaining provisions shall not be affected. In such event, the Parties shall negotiate in good faith to amend this Agreement in order to implement its provisions and the intent of the Parties.

10.8 Successors and Permitted Assigns

Subject to Section 10.11 [Assignment], this Agreement shall enure for the benefit of and be binding on the respective successors and permitted assigns of any Party.

10.9 Notices

All notices and approvals required or permitted by this Agreement (including notices to Representatives) will be in writing and delivered personally or by courier or sent by electronic mail or facsimile to the addresses provided below or as further amended by notice of the Parties:

City:

LRT Expansion and Renewal, Integrated Infrastructure Services
City of Edmonton
MNP Tower 102-5 - 101 Street
Edmonton, Alberta T5J 3G1

Attention: <*>

Fax: <*>

Email: <*>

With a copy to:

Law Branch, Office of the City Manager, City of Edmontonⁿ
9th Floor, Chancery Hall, #3 Sir Winston Churchill Square
Edmonton, Alberta T5J 2C3

Attention: <*>

Fax: <*>

Email: <*>

Project Co:

<*>

Attention: 
E-Mail: 
Facsimile: 

Operator:


Attention: 
E-Mail: 
Facsimile: 

LRV Supplier:


Attention: 
E-Mail: 
Facsimile: 

or at such other address, e-mail or facsimile number of which the Parties may, from time to time, notify one another. A notice will be deemed to have been sent and received on the next Business Day following the day it is delivered personally or by courier or on the next Business Day following the day on which transmission is confirmed, if by electronic mail or facsimile. A Party giving notice by facsimile shall retain the transmission confirmation slip and provide a copy of the same to the recipients of such notice upon request. All notices given by a Party to another Party shall be accompanied by a concurrent notice to the same effect to the remaining Party.

10.10 Governing Law and Attornment

This Agreement and any IA Disputes arising hereunder shall be governed exclusively by the laws of the Province of Alberta and those of Canada applicable therein. To the extent that this Agreement contemplates or allows the involvement of any court, the Parties hereby irrevocably attorn to the exclusive jurisdiction of the Courts of the Province of Alberta.

10.11 Assignment

Except as set out below, none of Project Co, Operator nor LRV Supplier shall assign, novate, or otherwise transfer its interest in this Agreement to any person except concurrently with an assignment, novation or transfer of the Project Agreement, the Services Contract or the LRV Contract (as applicable) to the same Person in accordance with the provisions of the applicable contract. With respect to assignment of the Project Agreement, the Services Contract or the LRV Contract (as applicable) and this Agreement to an Affiliate of Project Co, Operator or the LRV Supplier (as the case may be) in accordance with the applicable contract, the assigning Party agrees that it shall remain jointly and severally liable with the assignee for the performance of such contract and this Agreement.

Project Co's interest in this Agreement may be assigned, novated or otherwise transferred to the Lenders' Agent, the City or any replacement concessionaire approved by the City under the Project Agreement or permitted under the applicable Direct Lender Agreement, provided that there will be a concurrent assignment, novation or other transfer of the Project Agreement to the same person.

10.12 Further Assurances

The Parties shall do or cause to be done all such further acts and things as may be reasonably necessary or desirable to give full effect to this Agreement. Without limiting the foregoing, each of the Parties shall at any time and from time to time execute and deliver or cause to be executed and delivered such further instruments and take such further action as may be reasonably requested by any other Party in order to give full effect to the intent and purpose of this Agreement.

10.13 Third Party Beneficiaries

It is specifically agreed between the Parties executing this Agreement that it is not intended by any of the provisions of any part of this Agreement to create in the public or any member thereof a third party beneficiary hereunder, or to authorize anyone not a party to this Agreement to maintain a suit for personal injury or property damage pursuant to the terms or provisions of this Agreement.

10.14 Confidentiality

- (a) Each Party agrees, for itself and its respective directors, officers, employees and agents, to keep confidential and not to disclose to any person (save as hereinafter provided) any of the terms of this Agreement or any confidential or proprietary information (including documents, computer records, specifications, formulae, evaluations, methods, processes, technical descriptions, reports and other data, records, drawings and information) provided to or arising or acquired by it pursuant to the terms or performance of this Agreement (including any such documents or information supplied in the course of dispute resolution proceedings under Section 9.1 [*IA Dispute Resolution*]) (collectively, the “**Confidential Information**”).
- (b) Notwithstanding Section 10.14(a), and without prejudice to each Party's rights and obligations under the Project Agreement and/or the Services Contract relating to Confidential Information thereunder, a Party may disclose the whole or any part of the Confidential Information:
 - (i) to its parent company, directors, officers, employees, contractors, subcontractors, agents, or professional advisors to the extent necessary to enable it to perform (or to cause to be performed) or to protect or enforce any of its rights or obligations under this Agreement;
 - (ii) when required to do so by applicable laws and regulations or by or pursuant to the rules or any order having the force of law of any court, association or agency of competent jurisdiction or any governmental agency;
 - (iii) in the case of Project Co, to any bank, financial institution or other person from whom it is seeking or obtaining financing for its activities in relation to the Project;
 - (iv) to the extent that the Confidential Information has, except as a result of breach of confidentiality by the disclosing party, become publicly available or generally known to the public at the time of such disclosure;
 - (v) to the extent that the Confidential Information is already lawfully in the possession of the recipient or lawfully known to the recipient prior to such disclosure;
 - (vi) to the extent that it has acquired the Confidential Information from a third party who is not in breach of any obligation as to confidentiality to any other Party;
 - (vii) in connection with all meetings and proceedings for the resolution of IA Disputes;
 - (viii) to the extent required pursuant to the Project Agreement, the Services Contract or the LRV Contract;
 - (ix) in the case of Project Co, to the parties to the Project-related documents (including the Lenders' Agent, the Senior Lenders and the Senior Lenders' technical adviser), provided that such parties acknowledge the confidentiality of such Confidential Information;

- (x) in the case of Operator, to its Subcontractors as reasonably necessary to meet its obligations under the Services Contract and this Agreement; or
- (xi) in the case of LRV Supplier and, to its Subcontractors as reasonably necessary to meet its obligations under the LRV Contract and this Agreement.

Each Party acknowledges that it is aware of Schedule 18 [*Freedom of Information and Privacy*] to the Project Agreement and that the *Freedom of Information and Protection of Privacy Act* (Alberta) may apply to this Agreement and to all contractual submissions and other documents and records relating to this Agreement. No action taken or required to be taken by any Party for the purpose of complying with such Act shall be considered a breach of any obligation under this Agreement.

10.15 Independent Legal Advice

The Parties have had the opportunity to take, and have taken, independent legal advice on this Agreement and no provision hereof is, therefore, to be construed *contra proferentem*.

10.16 Waiver

Except as otherwise provided in this Agreement, any waiver of any provision of this Agreement, or of any right or option under or pursuant to this Agreement, or of any breach of any provision of this Agreement, will only be effective if in writing signed by the waiving Party, and no waiver will be implied by indulgence, delay or other act, failure to act, omission or conduct. Any waiver will only apply to the specific matter waived and only in the specific instance and for the specific purpose for which it is given.

10.17 Survival

The Parties agree that Section 9.1 [*IA Dispute Resolution*], Section 10.1 [*Costs and Expenses*] and Section 10.14 [*Confidentiality*] of this Agreement will survive the termination of this Agreement.

10.18 Execution in Counterparts

This Agreement may be executed in counterparts, in which case the counterparts together shall constitute one agreement.

10.19 Facsimile and Electronic Delivery

To evidence the fact that it has executed this Agreement or any other document contemplated by or delivered under or in connection with this Agreement, a party may transmit a copy of its executed counterpart to the other parties by facsimile (fax) or by electronic transmission of a pdf and, unless the parties agree to some other date as the date of delivery, the transmitting party shall be deemed to have delivered this Agreement on the date it transmitted such counterpart by facsimile (fax) or by electronic transmission of a pdf or such later date as the transmitting party specifies in a written notice to the other parties given with or prior to the transmission of its executed counterpart. Furthermore:

- (a) any Party transmitting an executed counterpart of this Agreement or such other document by facsimile (fax) or electronic transmission of a pdf shall promptly thereafter deliver to the other Parties a counterpart bearing its original signature (but any failure or delay in so doing, shall not derogate in any way from the sufficiency or effectiveness of that Party having transmitted its executed counterpart by facsimile (fax) or electronic transmission of a pdf); and
- (b) the signature of an individual executing this Agreement (or any notice, certificate or other document contemplated by this Agreement) on behalf of a Party, if sent and received by electronic transmission of a pdf or facsimile (fax) transmission, will be deemed to be

genuine in the absence of evidence to the contrary and thus effective in the hands of the recipient, and binding upon the individual whose signature it reproduces and upon the party on whose behalf that individual signed, for all purposes and with the same effect as if it were the original signature of that individual.

[signature pages follow]

IN WITNESS WHEREOF the Parties hereto have duly executed this Agreement as of the day and year first above written:

CITY OF EDMONTON

Legally Reviewed and Approved
as to Form:

Law Branch - <*>

Approved as to Content:

LRT Expansion and Renewal - <*>

Per: _____
Name:
Title:

[PROJECT CO]

Per: _____
Name:
Title:

I/We have authority to bind the Corporation.

[OPERATOR]

Per: _____
Name:
Title:

I/We have authority to bind the Corporation.

[LRV SUPPLIER]

Per: _____
Name:
Title:

I/We have authority to bind the Corporation.

APPENDIX 1
IA DISPUTE RESOLUTION PROCEDURE

ARTICLE 1
GENERAL

1.1 Capitalized Terms

Capitalized terms used in this Appendix have the definitions as set out in the Interface Agreement to which this Appendix is attached, unless expressed otherwise.

1.2 Section References

Unless otherwise provided, references to Section numbers are references to Sections in this Appendix.

1.3 Definitions

In this Appendix, the following expressions have the following meanings:

“IA Dispute Notice” means a notice from one Party to the other Parties providing details of an IA Dispute and invoking the IA Dispute Resolution Procedure in respect of that IA Dispute;

“Initiating Party” has the meaning given in Section 2.4;

“Referee” means the person appointed pursuant to Section 2.3 and performing the functions in respect to an IA Dispute, which person shall be independent, qualified and experienced in the subject matter of the IA Dispute;

“Responding Party” has the meaning given in Section 2.4; and

“Settlement Meeting” has the meaning given in Section 2.2.

ARTICLE 2
DISPUTES

2.1 IA Dispute Resolution

Any IA Dispute under the Agreement will be resolved in accordance with the IA Dispute Resolution Procedure set out in this Appendix, which procedure shall be followed in the order set out below unless all Parties agree otherwise in writing:

- (a) unless expressly provided otherwise in this Appendix, the IA Dispute Resolution Procedure shall be started by delivery of an IA Dispute Notice by one Party to the other Parties;
- (b) the Parties shall attempt to resolve the IA Dispute by a Settlement Meeting under Section 2.2;
- (c) if the Settlement Meeting does not result in resolution of the IA Dispute, the Parties shall engage, and obtain the decision of a Referee under Section 2.3; and
- (d) if the IA Dispute is not resolved through the Referee, either Party may refer the IA Dispute to arbitration.

Except as contemplated by this IA Dispute Resolution Procedure, no Party shall have the right to refer any IA Dispute for resolution by any other dispute resolution process.

2.2 Settlement Meeting

In the event of an IA Dispute which is not resolved in the normal course of business, a Party may deliver an IA Dispute Notice to the other relevant Parties. Within ten (10) Business Days from the delivery of the IA Dispute Notice, the Executive Panel, in accordance with Section 4.3 [*Composition and Operating Procedures of the Interface Committee*] of this Agreement shall meet at a mutually acceptable time and place to attempt to resolve the IA Dispute (a “**Settlement Meeting**”). The Parties through the Executive Panel shall make all reasonable efforts to resolve the IA Dispute and any Party may request that the Executive Panel engage a mediator to assist in connection therewith. If the IA Dispute is not resolved through the Settlement Meeting within 15 days from delivery of the IA Dispute Notice or any longer period mutually agreed by the Parties, then the IA Dispute may be referred by any party to the IA Dispute to a Referee in accordance with Section 2.3.

2.3 Referee Review Process

The Parties shall appoint a Referee to resolve any IA Disputes under this Agreement. Subject to completion of the process set out in Section 2.2, any Party can appoint the Referee and the appointment of the Referee will be deemed to be a joint appointment and will be irrevocable by each Party without the consent of the others. The appointment of the Referee will continue until the end of the term of the Agreement unless otherwise agreed to by the Parties. If the Referee resigns or dies or the Parties’ agreement with the Referee expires or is terminated before the end of the term of the Agreement, the Parties shall immediately appoint a replacement.

The fees and expenses of the Referee shall be set by the terms of the agreement between the Parties and the Referee. The Referee’s fees, disbursements and other costs, as agreed between the Parties and the Referee, shall be shared equally by the relevant Parties. Each Party shall bear its own costs and expenses in preparing submissions for and attending meetings with the Referee.

Before proceeding to arbitration of the IA Dispute, the Parties shall obtain a decision on the IA Dispute from the Referee. The Referee’s review will not be required if the Parties agree to waive the Referee’s review. The Referee shall participate in the IA Dispute as follows:

- (a) the Referee shall conduct a review of the IA Dispute in the manner the Referee decides is most suitable, including on-site inspections and discussions with any persons; provided, however, that each Party to the IA Dispute shall be entitled to provide a written submission to the Referee and a written response to each submission made by each other Party to the IA Dispute. The Parties shall comply with all reasonable requests from the Referee for additional information and documents which the Referee considers necessary for the review. Any information given to the Referee by a Party will be given to the other Parties. All information disclosed in accordance with this section shall be “Confidential Information” for purposes of the Agreement;
- (b) the Referee may, with the written approval of the Parties, retain others to assist with the review;
- (c) the Referee shall deliver to the Parties a brief written decision on the IA Dispute within ten (10) Business Days of referral to the Referee or such longer period as agreed to in writing by both Parties;
- (d) a decision of a Referee is not binding on the Parties, and a Referee’s review shall be sought only for the purpose of assisting the Parties to reach agreement with respect to the IA Dispute;
- (e) a Referee who has rendered a decision on an IA Dispute may not be retained by any Party and may not be called by any Party to give evidence with respect to the IA Dispute in any

subsequent arbitration or court proceeding to resolve the IA Dispute, nor shall any Party refer to or enter into evidence the decision of the Referee in such proceeding, unless required by applicable law or by a court of competent jurisdiction; and

- (f) the Parties shall agree to indemnify and save harmless the Referee from any liability arising from a review undertaken by the Referee.

2.4 Arbitration

If the IA Dispute is not completely resolved by agreement between the Parties within ten (10) Business Days after receipt of the Referee's decision, then any Party may refer the IA Dispute to arbitration. An IA Dispute referred to arbitration shall be decided by a single arbitrator. Arbitration proceedings shall be commenced by the Party desiring arbitration (the "**Initiating Party**") giving notice to the other Parties entitled to participate in the arbitration proceedings (the "**Responding Party**") specifying the matter to be arbitrated. The Parties shall agree on the arbitrator within ten (10) Business Days of the delivery of the Initiating Party's notice, failing which the Parties shall apply to the ADR Institute of Alberta ("**ADRIA**") for an arbitrator to be promptly appointed under the "National Arbitration Rules" of the ADR Institute of Canada ("**ADRIC**"). If none of the Parties applies to ADRIA as aforesaid for the appointment of an arbitrator on or before the fifth day following the delivery of the aforesaid notice from the Initiating Party, the referral of the IA Dispute to arbitration shall be deemed to have been withdrawn.

The arbitrator will have the authority to award any remedy or relief that a judge of a court of competent jurisdiction within the Province of Alberta could order or grant in accordance with the Agreement. The "National Arbitration Rules" of ADRIC will apply to the arbitration, as same may be modified by this Appendix 1.

Meetings and hearings of the arbitrator will take place in the City of Edmonton. Subject to the foregoing, the arbitrator may fix the date, time and place of meetings and hearings in the arbitration and shall give all Parties adequate notice of same. Subject to any adjournments which the arbitrator allows, the final hearing shall be continued on successive Business Days until it is concluded. All meetings and hearings shall be in private unless the Parties agree otherwise and both Parties are entitled to be represented at any meetings or hearings by legal counsel. Either Party may examine and re-examine all its own witnesses at the arbitration and may cross-examine any or all of the other Parties' witnesses.

The arbitration shall be kept confidential and the existence of the proceeding and any element of it (including, but not limited to, any pleadings, briefs or other documents submitted and exchanged, and testimony or other oral submission and any awards) shall not be disclosed beyond the arbitrator, the Parties, their counsel and any person necessary to the conduct of the proceeding, except as may be lawfully required in judicial proceedings relating to the arbitration or otherwise.

The arbitrator shall make and send a decision in writing not later than fifteen (15) Business Days after the conclusion of the hearing and, unless the Parties agree otherwise, shall set out reasons for the decision. Each Party shall pay its proportionate share of the Arbitrator's fees and expenses, and shall bear all of its own fees and expenses in connection with the arbitration. The Arbitrator shall, however, have the authority, in the Arbitrator's discretion, to award recovery of all costs and fees (including legal fees on a solicitor and own client basis, administrative fees, and the Arbitrator's fees and expenses, as applicable) to the prevailing Party in the arbitration unless the Parties have previously agreed on the basis for the apportionment of costs.

The decision of the arbitrator shall be final and binding on the Parties and shall not be subject to appeal, adjudication, arbitration, litigation or any other dispute resolution process, and each of the Parties expressly waives all rights of appeal in connection with the Arbitrator's decision.

**ARTICLE 3
STRICT COMPLIANCE WITH TIME LIMITS**

The Parties agree that timely resolution of any IA Dispute is mutually beneficial and, in order to achieve timely resolution, the time limits as set out in this Appendix shall be strictly enforced.

**ARTICLE 4
PERFORMANCE OF OBLIGATIONS**

Notwithstanding the existence of any IA Dispute, the Parties shall, to the extent not precluded by the matter in IA Dispute, continue with the Project and the performance of their respective obligations under the Agreement and their respective Contracts without prejudice to the right to contest, dispute and challenge the relevant matter in accordance with the provisions of the Agreement.

APPENDIX 2
PROJECT AGREEMENT

APPENDIX 3
SERVICES CONTRACT

APPENDIX 4
LRV CONTRACT

**APPENDIX 5
INDEPENDENT PERFORMANCE DEMONSTRATION CERTIFIER AGREEMENT**

THIS AGREEMENT is made as of the <*> day of <*>, 202<*>

AMONG:

THE CITY OF EDMONTON

("City")

AND:

[XX], a [XX], existing under the laws of the Province of [XX] ("Project Co")

AND:

[XX], a [XX], existing under the laws of [XX] ("Operator")

AND:

[XX], a [XX], existing under the laws of [XX] ("LRV Supplier")

AND:

<*>

(the "Independent Performance Demonstration Certifier" or "IPDC")

WHEREAS:

- A. the City, Project Co, LRV Supplier and Operator have entered into the Interface Agreement;
- B. the City, Project Co, LRV Supplier and Operator wish to appoint the IPDC, and the IPDC wishes to accept such appointment, to perform certain services in connection with the Interface Agreement; and
- C. the City, Project Co, LRV Supplier, Operator and the IPDC wish to enter into this Agreement in order to record the terms by which the IPDC will perform such services.

NOW THEREFORE in consideration of the mutual promises and agreements of the City, Project Co, LRV Supplier, Operator and the IPDC herein expressed and for other good and valuable consideration the receipt and sufficiency of which are hereby acknowledged, the City, Project Co, LRV Supplier and Operator and the IPDC covenant and agree as follows:

1 DEFINITIONS

1.1 Definitions

In this Agreement including the recitals and Schedules, unless the context indicates a contrary intention, terms which are defined in the Interface Agreement (and not otherwise defined in this Agreement) will have the meanings given to them in the Interface Agreement and the following terms will have the following meanings:

"Affected IA Party" has the meaning given in Section 3.5(b) of this Agreement.

“Agreement” means this Independent Performance Demonstration Certifier Agreement entered into by the City, Project Co, Operator, LRV Supplier and the IPDC including all schedules, appendices and attachments thereto, as amended, supplemented or restated from time to time.

“Auditor” has the meaning given in Section 7.4(c) of this Agreement.

“Change in Control” has the meaning ascribed thereto in the Project Agreement.

“Chargeable Failures” has the meaning ascribed thereto in the Project Agreement.

“Failures” means failure of the Infrastructure or LRVs to comply with the Project Requirements, LRV Requirements and/or Performance Demonstration requirements, including Chargeable Failures, Non-Chargeable failures, Service Affecting Failures and Non-Service Affecting Failures.

“Fee” means the fees payable by the IA Parties to the IPDC for the Functions, as such fees are specified and made payable in Appendix <*> [Fee] of this Agreement.

“FOIP Act” has the meaning given in Section 11.5(a) of this Agreement.

“Functions” means:

- (a) all of the responsibilities and obligations conferred on the IPDC under this Agreement, including the functions described in Schedule 1 [Functions] of this Agreement; and
- (b) all other things or tasks which the IPDC is required to do to comply with its obligations under this Agreement.

“Functions Change” means any change to the Functions;

“Functions Change Order” has the meaning given in Section 8.3(c) of this Agreement.

“Intellectual Property” means any and all intellectual property rights throughout the world, whether subsisting now or in the future, including rights of any kind in inventions, patents, copyrights, trademarks, service marks, industrial designs, integrated circuit topography rights, applications for registration of any of the foregoing, and know-how, trade secrets, confidential information and trade or business names;

“Infrastructure Performance Demonstration” means performance demonstration of the Infrastructure pursuant to and in accordance with the Project Agreement;

“Interface Agreement” means the Agreement titled “Interface Agreement” and made between the IA Parties as of the <*> day of <*>, 202<*> with respect to the coordination, cooperation and interface by and among the IA Parties in relation to certain matters, including Performance Demonstration;

“IA Parties” means the City, Project Co, LRV Supplier and Operator, collectively, and **“IA Party”** means any one of them individually;

“IA Party Persons” means any one or more of a City Person, LRV Person and Project Co Person;

“LRV Performance Demonstration” means performance demonstration of the LRVs pursuant to and in accordance with the LRV Contract;

“LRV Contract” means that certain agreement titled “LRV Contract” and made between the City and LRV Supplier as of <*> day of <*>, 202<*> with respect to the design, manufacturing, supply and commissioning of light rail vehicles for VLW LRT.

“Non-Chargeable Failures” has the meaning ascribed thereto in the Project Agreement.

“Non-Service Affecting Failures” has the meaning ascribed thereto in the Project Agreement.

“Performance Demonstration” means Infrastructure Performance Demonstration and LRV Performance Demonstration, collectively;

“Performance Demonstration Completion Certificate” means the certificate issued by the IPDC:

- (a) to Project Co to certify successful completion of Infrastructure Performance Demonstration pursuant to the Project Agreement

“Performance Demonstration Material” means all material:

- (a) provided to the IPDC that is created by or required to be created by any IA Party, whether pursuant to this Interface Agreement, this Agreement or its Relevant Contract; and
- (b) provided by or created by or required to be created by the IPDC as part of or for the purpose of performing the Functions,

including documents, equipment, reports, technical information, plans, charts, drawings, calculations, tables, schedules and data (stored and recorded by any means).

“Project Agreement” means that certain agreement entitled “Project Agreement” and made between the City and Project Co as of the ● day of ●, 2020 with respect to: (i) the design, construction, financing, testing and commissioning of the Infrastructure; and (ii) other ancillary work and services, as the same may be amended, supplemented or replaced from time to time;

“Relevant Contract” means:

- (a) as it relates to Project Co, the Project Agreement;
- (b) as it relates to LRV Supplier, the LRV Contract; and
- (c) as it relates to Operator, the Services Contract.

“Service Affecting Failures” has the meaning ascribed thereto in the Project Agreement.

“Services Contract” means that certain agreement titled “Services Contract” and made between the City and the Operator as of <*> day of <*>, 202<*> with respect to the operations, maintenance and rehabilitation of the VLW LRT.

“Substitute” has the meaning ascribed to such term in Section 3.10(c)(iii) of this Agreement.

“VLW LRT” comprises the Project Work, the LRV Services and the OM&R Services collectively.

2 INTERPRETATION

2.1 Interpretation

The division of this Agreement into Sections, the insertion of headings and the provision of a table of contents are for convenience only, do not form a part of this Agreement and will not be used to affect the construction or interpretation of this Agreement. The word **“including”** will not be construed as limiting the general term or statement immediately preceding. Unless otherwise specified:

- (a) each reference in this Agreement to “**Section**” and “**Schedule**” is to a Section of, and a Schedule to this Agreement;
- (b) each reference to a statute is deemed to be a reference to that statute and any successor statute, and to the regulations made under that statute and any successor statute, as amended or re-enacted from time to time;
- (c) words imparting the singular include the plural and vice versa and words importing gender include all genders;
- (d) references to time of day or date mean the local time or date in Edmonton, Alberta;
- (e) all references to amounts of money mean lawful currency of Canada; and
- (f) an accounting term has the meaning assigned to it, and all accounting matters will be determined, in accordance with Canadian GAAP consistently applied.

2.2 Obligations and Exercise of Rights by the IA Parties

The obligations of the IA Parties under this Agreement will be several. Except as specifically provided for in this Agreement, the rights of the IA Parties under this Agreement will be jointly exercised by each of the IA Parties.

3 ROLE OF THE INDEPENDENT PERFORMANCE DEMONSTRATION CERTIFIER

3.1 Engagement

The IA Parties hereby appoint the IPDC, and the IPDC hereby accepts such appointment, to carry out the Functions in accordance with this Agreement. The IPDC shall perform the Functions in accordance with this Agreement.

3.2 Acknowledgement by IPDC

The IPDC hereby acknowledges in favour of the IA Parties that it has received a copy of each of the Interface Agreement, the Project Agreement, the LRV Contract and the Services Contract.

3.3 Standard of Care

The IPDC shall exercise the standard and skill, care and diligence in the performance of the Functions that would be expected of an expert professional experienced in providing services in the nature of the Functions for projects similar to the VLW LRT.

3.4 Duty of Independent Judgment

In exercising the Functions, the IPDC shall act:

- (a) impartially, honestly and independently;
- (b) reasonably and professionally;
- (c) in accordance with Good Industry Practice;
- (d) in a timely manner;

- (i) in accordance with the times prescribed in this Agreement or the Interface Agreement, as applicable; and
- (ii) where no times are prescribed, within five (5) Business Days or such earlier time so as to enable the IA Parties to perform their respective obligations under the Interface Agreement.

Although the IPDC should take account of any opinions or representations made by the IA Parties, the IPDC shall not be bound to comply with any opinions or representations made by any of them in connection with any matter on which the IPDC is required to exercise its professional judgment.

3.5 Decisions Binding

The IA Parties acknowledge that:

- (a) The IPDC's decisions will be final and binding on the IA Parties in respect of the determination of responsibility for Failures of the Infrastructure or LRVs, as the case may be, whether in relation to Project Co or LRV Supplier, and for certainty, but without limitation, including:
 - (i) determinations in respect of the matters set out in Section 3.4 of Schedule 7 [*Performance Demonstration Requirements*] to the Project Agreement; and
 - (ii) determinations in respect of root cause Failures attributed to the LRV Supplier.
- (b) Notwithstanding Section 3.5(a) above, a determination by the IPDC not to certify completion of Performance Demonstration and or/failure to issue a Performance Demonstration Completion Certificate may be disputed by the IA Party affected by such determination (an "**Affected IA Party**") without requiring the consent or involvement of the other IA Parties and, for certainty, any such dispute shall be subject to and resolved pursuant to the Affected IA Party's Relevant Contract.

3.6 Authority to Act

The IPDC:

- (a) is an independent consultant and is not, and shall not purport to be, a partner, joint venturer or agent of any IA Party;
- (b) other than as may be expressly set out in the Interface Agreement, has no authority to give any directions to an IA Party or its officers, employees, contractors, consultants or agents; and
- (c) has no authority to waive or alter any terms of the Interface Agreement, nor to discharge or release an IA Party from any of its obligations under the Interface Agreement unless jointly agreed in writing by the IA Parties.

3.7 Knowledge of the IA Parties' Requirements

The IPDC represents, warrants and covenants that:

- (a) it has and shall be deemed to have informed itself fully of the requirements of the Interface Agreement;

- (b) it shall inform itself fully of the requirements of such other documents and materials as may become relevant from time to time to the performance of the Functions;
- (c) without limiting Sections 3.7(a) or 3.7(b), it has and shall be deemed to have informed itself fully of all time limits and other requirements for any Function which the IPDC carries out under the Interface Agreement and this Agreement;
- (d) it has and shall be deemed to have informed itself fully of the nature of the work necessary for the performance of the Functions and the locations of, means of access to, and facilities available for, performance of the Functions, including restrictions on any such access or protocols that are required; and
- (e) it has satisfied itself as to the correctness and sufficiency of its proposal for the Functions and that the Fee covers the cost of complying with all of the obligations under this Agreement and of all matters and things necessary for the due and proper performance and completion of the Functions.

3.8 Coordination by IPDC

The IPDC shall:

- (a) fully cooperate with the IA Parties;
- (b) carefully coordinate the Functions with the work and services performed by the IA Parties;
- (c) without limiting its obligations under Sections 3.4 [*Duty of Independent Judgment*] and 3.8(b), perform the Functions so as to avoid unreasonably interfering with, disrupting or delaying the work and services performed by the IA Parties;
- (d) provide copies to all IA Parties of all reports, communications, certificates and other documentation that it provides to any IA Party; and
- (e) without limiting Section 3.8(d), provide copies of any inspection and meeting notices:
 - (i) received by the IPDC, to the IA Parties forthwith upon receipt thereof; or
 - (ii) issued by the IPDC, simultaneously to all IA Parties,
 so as to enable the IA Parties a reasonable opportunity to attend such inspections or meetings involving the IPDC.

3.9 Conflict of Interest

The IPDC warrants that:

- (a) at the date of signing this Agreement, no conflict of interest exists or is likely to arise in the performance of its obligations under this Agreement; and
- (b) if, during the term of this Agreement, any such conflict of interest or risk of conflict of interest arises, the IPDC shall notify the IA Parties immediately in writing of that conflict of interest or risk of conflict of interest and take such steps as may be required by each of the IA Parties to avoid or mitigate that conflict of interest or risk.

The IPDC covenants not to enter into any agreement or relationship which could reasonably be expected to result in a conflict of interest in the performance of its obligations under this Agreement.

3.10 IPDC Personnel

- (a) Subject to Sections 3.10(b) and 3.10(c), the IPDC shall use the partners, directors or employees described in Appendix <*> [IPDC Personnel] of this Agreement in connection with the performance of the Functions and such persons' services will be available for so long as may be necessary to ensure the proper performance by the IPDC of the Functions. Such persons shall have full authority to act on behalf of the IPDC for all purposes in connection with this Agreement.
- (b) None of the persons listed in Appendix <*> [IPDC Personnel] shall be removed or replaced unless he/she ceases to work as a partner in, or director or employee of, the IPDC or he/she is unable to work because of death or illness. The IPDC will promptly notify the IA Parties of any such circumstances and shall be responsible for finding a replacement who shall previously have been approved in writing by the IA Parties.
- (c) Where the IPDC considers that the partners, directors or employees described in Appendix <*> [IPDC Personnel] of this Agreement do not possess all of the experience or expertise necessary for the proper performance of the Functions, the IPDC shall provide prompt written notice to the IA Parties detailing:
 - (i) the specific Functions for which the partners, directors or employees described in Appendix <*> [IPDC Personnel] of this Agreement do not possess the necessary experience or expertise;
 - (ii) the specific experience or expertise required for the proper performance of the applicable Functions; and
 - (iii) the persons or firms proposed to be retained by the IPDC (each a “**Substitute**”), including details of their relevant expertise and experience, the terms of their proposed engagement and the Substitute’s proposed compensation terms, if the Substitute is not a partner, director or employee of the IPDC.
- (d) The IPDC shall not engage the services of a Substitute without first obtaining the written approval of the IA Parties, such approval not to be unreasonably withheld. The IPDC agrees that:
 - (i) the terms of this Agreement shall in all events be binding upon the IPDC regardless of the existence of any inconsistent or contrary terms in any agreement between the IPDC and any Substitute whether or not and without regard to the fact that the IA Parties may have directly or indirectly had notice of any such inconsistent term;
 - (ii) the IPDC shall require each Substitute to comply with the terms and conditions of this Agreement to the extent applicable to the specific Functions performed by the Substitute; and
 - (iii) the IPDC is responsible and liable for the Functions performed by, and for the acts and omissions of, each Substitute and its personnel to the same degree as if the Functions were performed by, or the acts or omissions were those of, the IPDC or its partners, directors or employees.

No agreement between the IPDC and a Substitute creates any contractual or other legal relationship between any of the IA Parties and the Substitute.

4 ROLE OF THE IA PARTIES

4.1 Assistance

Each of the IA Parties shall cooperate with and provide reasonable assistance to the IPDC to familiarize the IPDC with all necessary aspects of the Project to enable the IPDC to carry out its obligations under this Agreement.

4.2 Instructions in Writing

All instructions to the IPDC by the IA Parties shall be given by all IA Parties, in writing, which may be provided by counterpart signature.

4.3 Information and Services

Each of the IA Parties shall make available to the IPDC, as soon as practicable from time to time, all information, documents and particulars in its possession which are necessary for the IPDC to perform the Functions, including such information, documents and particulars required in order for the IPDC to:

- (a) determine the cause of Failures and allocate responsibility for such Failures to the Infrastructure or LRVs, as applicable; and
- (b) determine whether or not the criteria for a Performance Demonstration Completion Certificate have been achieved,

and shall provide copies of all such information, documents and particulars to the other IA Parties.

4.4 Additional Information

If any information, documents or particulars are reasonably required to enable the IPDC to perform the Functions and have not been provided by the IA Parties, as the case may be, then:

- (a) the IPDC shall give notice in writing to the relevant IA Party, as the case may be, of the details of the information, documents or particulars required, demonstrating the need and the reasons why they are required; and
- (b) the relevant IA Party, as the case may be, shall arrange for the required information, documents or particulars to be provided to the IPDC as soon as reasonably practicable.

4.5 Right to Enter and Inspect

Upon giving reasonable notice to the IA Parties, the IPDC (and any person authorized by it) may enter the Gerry Wright OMF and/or the Lands and inspect the Infrastructure and the LRVs and the location of any work in progress at any reasonable time in connection with the exercise or proposed exercise of rights or obligations under this Agreement, subject to:

- (a) observance of the reasonable rules of the IA Parties as to safety and security for the Lands, the Infrastructure and the LRVs;
- (b) not causing unreasonable delay to the carrying out of the Performance Demonstration by reason of its presence at Gerry Wright OMF-B, the Lands, the Infrastructure or the LRVs; and
- (c) not causing any damage to the Infrastructure or the LRVs.

4.6 IA Parties Not Relieved

No IA Party shall be relieved from performing or observing its obligations, or from any other liabilities, under the Interface Agreement as a result of the appointment of, or any act or omission of, the IPDC.

4.7 IA Parties Not Liable

On no account shall an IA Party be liable to another IA Party for any act or omission of the IPDC whether under or purportedly under a provision of the Interface Agreement, this Agreement or otherwise, provided that any such act or omission shall not extinguish, relieve, limit or qualify the nature or extent of any right or remedy of any IA Party against or any obligation or liability of any IA Party to any other IA Party which would have existed regardless of such act or omission.

5 SUSPENSION

5.1 Notice

The Functions (or any part) may be suspended at any time by the IA Parties:

- (a) if the IPDC fails to comply with its obligations under this Agreement, immediately by the IA Parties giving joint notice in writing to the IPDC; or
- (b) in any other case, by the IA Parties giving seven days joint notice in writing to the IPDC.

5.2 Costs of Suspension

The IPDC shall have no entitlement to be paid any costs, expenses, losses or damages arising from a suspension under this Section 5.2 [*Costs of Suspension*].

5.3 Recommencement

The IPDC shall immediately recommence the carrying out of the Functions (or any part) on receipt of a joint written notice from the IA Parties requiring it to do so.

6 INSURANCE AND LIABILITY

6.1 IPDC's Insurance

- (a) The IPDC shall, at its cost, obtain and maintain:
 - (i) commercial general liability insurance covering the services and operations of the IPDC for bodily injury and/or property damage with policy limits of not less than five million dollars (\$5,000,000.00) per occurrence and a deductible not more than \$5,000 per occurrence for property damage; and
 - (ii) professional liability insurance with policy limits of not less than five million dollars (\$5,000,000) per claim and in the aggregate, a deductible not more than \$25,000 per claim and covering liability which the IPDC might incur as a result of breach by it of its obligations owed in a professional capacity to the IA Parties, or any of them, under or in connection with this Agreement or the provision of services or the performance of the Functions hereunder.
- (b) The IPDC shall:

- (i) ensure that each of the insurance policies described in Section 6.1(a) is in a form and with insurers and on terms acceptable to each of the IA Parties;
- (ii) ensure that each of the insurance policies required to be taken out by the IPDC under Section 6.1(a):
 - (A) is obtained and maintained with reputable and qualified insurers licensed in Alberta; and
 - (B) contains an endorsement to the effect that the insurer will not effect any material adverse change or amendment to the policy or any cancellation of the policy without first giving at least 30 days prior written notice by registered mail to each of the IA Parties;
- (iii) ensure that the commercial general liability insurance policy required under Section 6.1(a) contains a cross liability and severability of interest clause and may be primary and non-contributory with any similar insurance coverage (primary or excess) maintained by any of the IA Parties;
- (iv) be responsible for the payment of all premium and deductible amounts relating to the insurance policies;
- (v) maintain in force the commercial general liability insurance as required under Section 6.1(a) from the date of this Agreement until the expiry or termination of this Agreement;
- (vi) maintain in force the professional liability insurance required under Section 6.1(a) from the date of this Agreement until 36 months after the expiry or termination of this Agreement;
- (vii) endorse the commercial general liability insurance to include each of the IA Parties as additional insureds;
- (viii) endorse the commercial general liability insurance to include a waiver of subrogation in favor of the IA Parties;
- (ix) provide copies of each of the insurance policies described in Section 6.1(a) to each of the IA Parties upon request; and
- (x) provide evidence of renewal of each of the insurance policies described in Section 6.1(a) to each of the IA Parties not less than 30 days prior to the expiry dates of the policies. At the option of the IA Parties, evidence of insurance may be provided by an insurance certificate issued by the IPDC's insurance broker.

6.2 Workers' Compensation Insurance

The IPDC shall, at its own cost and at all times during the term of this Agreement, insure its liability (including its common law liability) as required under any applicable workers' compensation statute or regulation in relation to its employees engaged in the Functions.

7 PAYMENT FOR SERVICES

7.1 Fee

- (a) In consideration of the IPDC performing the Functions in accordance with this Agreement, the IA Parties shall pay the IPDC the Fee in accordance with the provisions of Section 7.2 [Payment of Fee].
- (b) The Fee shall include all taxes (except for Goods and Services Tax), disbursements and expenses (including accommodation, car rental, equipment and travel expenses), overheads and profit to perform the Functions.

7.2 Payment of Fee

- (a) Until the earlier of (i) the Infrastructure Performance Demonstration Completion Date; and (ii) the Infrastructure Performance Demonstration Longstop Date, each of the IA Parties shall pay its share of the Fee to the IPDC in accordance with the payment process and schedule specified in Appendix <*> [Fee] and which shall be invoiced by the IPDC separately (as to each IA Party's share of the Fee) to each of the IA Parties.
- (b) Following the earlier of (i) the Infrastructure Performance Demonstration Completion Date; and (ii) the Infrastructure Performance Demonstration Longstop Date, Project Co shall cease to be obligated to pay any portion of the Fee to the IPDC and the remaining IA Parties shall each be liable for the Fee on a proportionate basis.
- (c) The obligation of the IA Parties to each pay its proportionate share of the Fee to the IPDC is several (not joint and several) and no IA Party shall have any liability whatsoever for the non-payment by any other IA Party of any fees or costs payable by such other IA Party under this Agreement.
- (d) Each of the IA Parties acknowledges and agrees that if any amount due and payable by an IA Party to the IPDC is outstanding, the IPDC shall not have any obligation to the IA Parties to make any certification under the Interface Agreement.

7.3 Non-Resident Withholding Tax

- (a) Before paying the IPDC, the IA Parties shall determine if a non-resident withholding tax is applicable. If required, the IA Parties shall withhold and remit the withholding tax to the relevant government authority. This remission is considered payment in accordance with this Section 7 [Payment for Services] of this Agreement and the amount of the withholding tax remitted will constitute a payment to the IPDC.

7.4 Audit Rights

- (a) The IA Parties, jointly or severally, may audit all Performance Demonstration Material, including all financial and related records associated with the Functions provided pursuant to this Agreement.
- (b) The IPDC shall at all times during the term of this Agreement and for a period of seven years following the termination of this Agreement pursuant to Section 9 [Term and Termination] keep and maintain in accordance with Canadian GAAP, all Performance Demonstration Material.
- (c) The IPDC shall at all reasonable times make Performance Demonstration Material available for inspection and review by an auditor appointed by one or more of the IA Parties (the "Auditor"), and shall provide such copies or extracts requested by the Auditor.

- (d) The Auditor may at all reasonable times without prior notice, initiate a financial or operational audit and the IPDC shall facilitate access to property and cooperate fully with the Auditor or any person performing duties for the Auditor.
- (e) The Auditor may in the Auditor's discretion appoint experts, professionals and others including without limitation, quantity surveyors, accountants, engineers, scientists, lawyers, actuaries, tradesmen, appraisers or insurance personnel to provide services to the Auditor for any audit authorized by the terms of this Agreement.
- (f) The IPDC must expressly include the provisions of this Section 7.4 [*Audit Rights*] in any agreement entered into by the IPDC (including any agreement entered into with a Substitute) relating to its rights, duties or obligations under this Agreement.
- (g) Costs of any audits conducted under the authority of this Section 7.4 [*Audit Rights*] shall be borne by the IA Party or IA Parties that initiated the applicable audit.
- (h) Nothing in this Section shall be construed so as to restrict, limit, revoke, or abridge any other express or implied rights, powers, or obligations that any of the IA Parties may have in law or equity.

8 FUNCTIONS CHANGES

8.1 Notice of Functions Change

- (a) If the IPDC believes, other than a “**Functions Change Order**” under Section 8.3 [*Functions Change Procedure*], that any direction of the IA Parties constitutes or involves a Functions Change it shall:
 - (i) within seven days after receiving the direction and before commencing work on the subject matter of the direction, give notice to the IA Parties that it considers that the direction constitutes or involves a Functions Change;
 - (ii) within 21 days after giving the notice under Section 8.1(a)(i), submit a written claim to each of the IA Parties which includes detailed particulars of the claim, the amount of the claim and how it was calculated; and
 - (iii) the Functions Change procedure contemplated in Section 8.3 [*Functions Change Procedure*] shall be initiated by the IA Parties and the Fee shall be adjusted in accordance with Section 8.4 [*Cost of Functions Change*].
- (b) Regardless of whether the IPDC considers that such a direction constitutes or involves a Functions Change, the IPDC shall continue to perform the Functions in accordance with this Agreement and all directions of the IA Parties, including any direction in respect of which notice has been given under this Section.

8.2 No Adjustment

If the IPDC fails to comply with Section 8.1 [*Notice of Functions Change*], the Fee shall not be adjusted as a result of the relevant direction.

8.3 Functions Change Procedure

- (a) The IA Parties may jointly issue a document titled “Functions Change Price Request” to the IPDC which will set out details of a proposed Functions Change which the IA Parties are considering.

- (b) Within seven days after the receipt of a “Functions Change Price Request”, the IPDC shall provide each of the IA Parties with a written notice in which the IPDC sets out the effect which the proposed Functions Change will have on the Fee.
- (c) Each of the IA Parties may then jointly direct the IPDC to carry out a Functions Change by written document titled “Functions Change Order” which will state either that:
 - (i) the Fee is adjusted as set out in the IPDC’s notice; or
 - (ii) the adjustment (if any) to the Fee will be determined under Section 8.4 [*Cost of Functions Change*].

8.4 Cost of Functions Change

- (a) Subject to Section 8.2 [*No Adjustment*], the Fee shall be adjusted for all Functions Changes carried out by the IPDC by:
 - (i) the amount (if any) stated in the “Functions Change Order” in accordance with Section 8.3(c);
 - (ii) if Section 8.4(a)(i) is not applicable, an amount determined pursuant to the fee schedule for Functions Changes in Appendix <*> [*Fee*]; or
 - (iii) where such rates or prices are not applicable, a reasonable amount to be agreed between the IA Parties and the IPDC or, failing agreement, determined by the IA Parties jointly, acting reasonably.
- (b) Any reductions in the Fee shall be calculated on the same basis as any increases.

9 TERM AND TERMINATION

9.1 Term

Subject to earlier termination, this Agreement shall commence on the date of this Agreement and continue in full force until the earlier of: (a) the date on which all of the Functions have been performed in full by the IPDC; and (b) such other date, if any, on which termination of this Agreement takes effect in accordance with its terms (the “**Term**”).

9.2 Notice of Breach

If the IPDC commits a breach of this Agreement, the IA Parties may, acting jointly, give written notice to the IPDC:

- (a) specifying the breach; and
- (b) directing its rectification in the period specified in the notice, being a period not less than seven days from the date of service of the notice.

9.3 Termination for Breach

If the IPDC fails to rectify the breach within the period specified in the notice issued under Section 9.2 [*Notice of Breach*], the IA Parties may, without prejudice to any other rights of the IA Parties or any of them, jointly terminate this Agreement immediately.

9.4 Termination for Financial Difficulty

The IA Parties may, without prejudice to any other rights of the IA Parties or any of them, jointly terminate this Agreement immediately if:

- (a) events have occurred or circumstances exist which, in the opinion of the IA Parties, may result in or have resulted in the insolvency of the IPDC or the control of the IPDC passing to another Person; or
- (b) the IPDC has communications with its creditors with a view to entering into, or enters into, any form of compromise, arrangement or moratorium of any debts whether formal or informal, with its creditors.

9.5 Termination for Convenience

Notwithstanding anything to the contrary in this Agreement, the IA Parties may at any time jointly terminate this Agreement upon 30 days' prior written notice to the IPDC.

9.6 IPDC's Rights upon Termination for Convenience

Upon a termination under Section 9.5 [*Termination for Convenience*], the IPDC shall:

- (a) be entitled to be reimbursed by the IA Parties for the value of the Functions performed by it to the date of termination; and
- (b) not be entitled to any damages or other compensation in respect of the termination and (without limitation) any amount in respect of:
 - (i) the lost opportunity to earn a profit in respect of the Functions not performed from and after the date of termination; and
 - (ii) any lost opportunity to recover overheads from the turnover which would have been generated under this Agreement but for it being terminated.

9.7 Procedure upon Termination

Upon completion of the IPDC's engagement under this Agreement or earlier termination of this Agreement (whether under Sections 9.3, 9.4 or 9.5 of this Agreement or otherwise) the IPDC shall:

- (a) cooperate with the IA Parties;
- (b) deliver to the IA Parties all Performance Demonstration Material and all other information concerning the VLW LRT held or prepared by the IPDC; and
- (c) as and when required by the IA Parties, meet with them and with such other Persons nominated by them with a view to providing them with sufficient information to enable the IA Parties to perform their obligations in respect of Performance Demonstration.

9.8 Effect of Termination

Except as otherwise expressly provided in this Agreement, termination of this Agreement will be without prejudice to any accrued rights and obligations under this Agreement as at the date of termination (including the right of IA Parties to recover damages from the IPDC).

9.9 Survival

Termination of this Agreement will not affect the continuing rights and obligations of the IA Parties and the IPDC under Sections 6, 9.6, 9.7, 9.8, 11.5, 11.9, 11.10 of this Agreement and this Section 9.9 [Survival] or under any other Section which is expressed to survive termination or which is required to give effect to such termination or the consequences of such termination.

10 INDEMNITY

10.1 Indemnity

The IPDC shall indemnify and save harmless the IA Parties, and each of them, and their respective employees, agents, officers and directors from and against any and all losses incurred or suffered by any of them by reason of, resulting from, in connection with, or arising out of:

- (a) the breach by the IPDC, its employees, agents, officers or directors or any Person for whom it is responsible at law of any representation, warranty, covenant, term, duty or obligation of the IPDC set out in or arising under this Agreement or the Interface Agreement; or
- (b) any act or omission of the IPDC, its employees, agents, officers or directors or any Person for whom it is responsible at law in connection with the subject matter of this Agreement.

11 GENERAL

11.1 Entire Agreement

This Agreement and the Interface Agreement constitute the entire agreement between the IA Parties and the IPDC and supersede all communications, arrangements and agreements, either oral or written, made or entered into prior to the date of this Agreement between the IA Parties and the IPDC with respect to the subject matter of this Agreement.

11.2 Negation of Employment

- (a) The IPDC, its officers, employees, servants and agents and any other persons engaged by the IPDC in the performance of the Functions shall not by virtue of this Agreement or the performance of the Functions become or be deemed to be in the service or employment of the IA Parties (or any IA Party) for any purpose.
- (b) The IPDC shall be responsible for all matters requisite as employer or otherwise in relation to its officers, employees, servants and agents and other persons who are engaged by the IPDC.

11.3 Compliance with Laws

- (a) The IPDC shall comply with all relevant federal, provincial and municipal legislation, codes, bylaws, regulations and orders applicable to the Functions. Where there are two or more laws, bylaws, regulations or codes applicable to the Functions, the more restrictive of those shall apply and shall be complied with by the IPDC.
- (b) If the IPDC performs any Functions contrary to any applicable laws, bylaws, regulations, codes or orders of any authority having jurisdiction, the IPDC shall be responsible for and shall correct any breaches or violations thereof and shall bear all resulting costs, expenses, penalties and damages. If either, or both, of the IA Parties is required to do anything or take any steps or pay any sums to rectify such noncompliance, the IA Parties, or the applicable IA Party(ies), may set off the cost of any such rectifications from any amounts

owed to the IPDC. Such action shall not be deemed to be a waiver of any action that the IA Parties may pursue to collect any rectification amounts paid that exceed amounts owed to the IPDC.

11.4 Waiver

Failure by any IA Party or the IPDC to enforce a provision of this Agreement shall not be construed as a waiver by that IA Party or the IPDC of any right in respect of that provision or any other provision of this Agreement.

11.5 Freedom of Information and Protection of Privacy

- (a) The IPDC acknowledges and agrees that for the purposes of the Freedom of Information and Protection of Privacy Act, R.S.A. 2000, c. F-25 (“**FOIP Act**”), the City’s employees include any person who performs a service for the City including an appointee, volunteer, student, or under a contract or agency relationship with the City, and the IPDC is therefore, pursuant to the FOIP Act, deemed to be a City employee for the purposes of the FOIP Act. The IPDC acknowledges and agrees that the FOIP Act applies to all information and records within the IPDC’s custody or control that are collected or created for the purposes of this Agreement.
- (b) After receipt of a FOIP request under the FOIP Act, the IPDC shall provide to each of the IA Parties any Performance Demonstration Material within seven calendar days of notification by the City of such request.

11.6 Notices

Any document which is to be or may be issued or given to or served upon any of the IA Parties or the IPDC under this Agreement will be deemed to have been sufficiently issued or given to or served if it is:

- (a) delivered or sent by commercial courier, upon receipt; or
- (b) sent by e-mail or fax, upon confirmation of a successful transmission by a transmission report received by the sender,

to the addresses set out below:

- (c) if to the City:

LRT Expansion and Renewal, Integrated Infrastructure Services
City of Edmonton
MNP Tower 10235 - 101 Street
Edmonton, Alberta T5J 3G1
Attention: <*>
Fax: <*>
Email: <*>

With a copy to:

Law Branch, Office of the City Manager, City of Edmonton
9th Floor, Chancery Hall, #3 Sir Winston Churchill Square
Edmonton, Alberta T5J 2C3
Attention: <*>
Fax: <*>
Email: <*>

(d) if to Project Co:



With a copy to:



(e) if to Operator:



With a copy to:



(f) if to LRV Supplier:



With a copy to:



(g) if to the IPDC:



Any party may change its address for notice by notice given to the other parties in accordance with this Section.

11.7 Transfer and Assignment

(a) The IPDC:

- (i) shall not assign, transfer, mortgage, charge or encumber any right or obligation under this Agreement without the prior written consent of the IA Parties, which each IA Party may give or withhold in its absolute discretion; and
- (ii) agrees that any assignment, transfer, mortgage, charge or encumbrance will not operate to release or discharge the IPDC from any obligation or liability under this Agreement.

(b) For the purposes of this Section, an assignment shall be deemed to have occurred where there is a Change in Control of the IPDC after the date of this Agreement.

(c) Each of the IA Parties may assign, transfer, mortgage, charge or encumber any right or obligation under this Agreement in accordance with the terms of the Interface Agreement.

11.8 Governing Laws and Attornment

This Agreement shall be governed by and construed in accordance with the laws of the Province of Alberta and the federal laws of Canada applicable therein without regard to conflicts of law principles that would apply a different body of law, and each of the IA Parties and the IPDC hereby irrevocably submits and

attorns to the exclusive jurisdiction of the courts of that Province and all courts competent to hear appeals therefrom with respect to any action, suit, proceeding or dispute in connection with this Agreement.

11.9 Confidentiality

- (a) The IPDC shall ensure that:
 - (i) neither it nor any of its officers, directors, employees, servants, Substitutes or agents discloses, or otherwise makes public, any Performance Demonstration Material or any other information or material acquired in connection with or during the performance of the Functions without the prior written approval of the IA Parties; and
 - (ii) no Performance Demonstration Material is used, copied, supplied or reproduced for any purpose other than for the performance of the Functions under this Agreement.
- (b) The IA Parties may at any time require the IPDC to give and to arrange for its officers, directors, employees, servants, Substitutes and agents engaged in the performance of the Functions to give written undertakings, in the form of confidentiality agreements on terms required by the IA Parties, relating to the non-disclosure of confidential information, in which case the IPDC shall promptly arrange for such agreements to be executed and delivered.

11.10 Performance Demonstration Material

- (a) The IA Parties and the IPDC agree that the IPDC does not and shall not have any rights, including any Intellectual Property, in any Performance Demonstration Material provided to the IPDC or created or required to be created by any IA Party.
- (b) All title and ownership, including all Intellectual Property, in and to the Project Material created or required to be created by the IPDC as part of, or for the purposes of performing the Functions, is hereby assigned jointly to the IA Parties on creation. In addition, to the extent that copyright may subsist in such Performance Demonstration Material so created by the IPDC, the IPDC hereby waives all past, present and future moral rights therein and the IPDC shall ensure that any agent, Substitute or employee of the IPDC shall have waived all such moral rights.
- (c) The IPDC shall do all such things and execute all such documents as reasonably requested by any of the IA Parties in order to confirm or perfect the assignment of Intellectual Property in the Performance Demonstration Material referred to in Section 11.10(b).

11.11 Time of the Essence

Time is of the essence of this Agreement and of the transactions contemplated by this Agreement.

11.12 Amendment

No change or modification of this Agreement shall be valid unless it is in writing and signed by each party to this Agreement.

11.13 Severability

If any provision of this Agreement is declared invalid, unenforceable or illegal by the courts of any jurisdiction to which it is subject, such provision may be severed and such invalidity, unenforceability or illegality will not prejudice or affect the validity, enforceability or legality of the remaining provisions of this Agreement.

11.14 Enurement

Subject to the restrictions on transfer contained in this Agreement, this Agreement shall enure to the benefit of and be binding on the parties and their respective successors and assigns.

11.15 Counterparts

This Agreement may be executed in counterparts, in which case (i) the counterparts together shall constitute one agreement, and (ii) communication of execution by electronic transmission of a pdf copy shall constitute good delivery.

11.16 Choice of Language

It is the express wish of the parties that this document and any related documents be drawn up and executed in English. Les parties aux présentes ont expressément demandé que ce document et tous les documents s'y rattachant soient rédigés et signés en anglais.

[signature pages follow]

IN WITNESS WHEREOF the City, Project Co, Operator, LRV Supplier and the IPDC have executed this Agreement.

Legally Reviewed and Approved
as to Form:

Law Branch - <*>

Approved as to Content:

LRT Expansion and Renewal - <*>

CITY OF EDMONTON

Per: _____
Name:
Title:

[PROJECT CO]

Per: _____
Name:
Title:

I/We have authority to bind the Corporation.

[OPERATOR]

Per: _____
Name:
Title:

I/We have authority to bind the Corporation.

[LRV SUPPLIER]

Per: _____
Name:
Title:

I/We have authority to bind the Corporation.

**[INDEPENDENT PERFORMANCE
DEMONSTRATION CERTIFIER]**

Per: _____
Name:
Title:

I/We have authority to bind the Corporation.

APPENDIX 5A FUNCTIONS

The IPDC shall, subject to the provisions of the Interface Agreement, provide the services as set out below. In the event of a conflict between any provision of this Agreement, including this Appendix 5A and a provision of the Interface Agreement, the Interface Agreement shall prevail.

1. General

1.1 The IPDC shall do everything expressed in, or reasonably to be implied from, the Interface Agreement, the Project Agreement and the LRV Contract as the functions of the IPDC.

1.2 Without limiting the other provisions of this Agreement and the Interface Agreement, and without prejudice to the generality of Section 1 *[General]* of this Appendix, in order for the IPDC to perform in accordance with the standards required of the IPDC under this Agreement, the IPDC shall, amongst other things, provide the following services and perform the following functions:

(a) throughout the term of the Agreement, the IPDC shall:

- (i) consult with any IA Party Persons;
- (ii) conduct inspections of the Infrastructure;
- (iii) attend at and observe Project Co Commissioning and LRV Supplier commissioning activities; and
- (iv) conduct inspections of the LRVs,

as the IPDC determines is required for purposes of the performance of the IPDC's functions under the Interface Agreement;

(b) the IPDC's Representative shall chair the Performance Demonstration Committee throughout the term of this Agreement and shall be responsible to keep minutes of all recommendations, action items and meetings of the Performance Demonstration Committee and circulate such minutes to each of the members of the Performance Demonstration Committee within five (5) Business Days of the holding of the meeting, including all relevant recommendations or the action items;

(c) assign the underlying root causes of Failures to the appropriate IA Party based on the information provided by IA Parties involved in Performance Demonstration; and

(d) act as an arbiter when disputes arise in identifying the underlying root causes of Failures.

2. Completion of Infrastructure Performance Demonstration

2.1 Review by the IPDC

Upon delivery by Project Co to the IPDC of:

- (a) an application for a Certificate of Infrastructure Performance Demonstration Completion pursuant to Section 4.2 *[Application for Certificate of Infrastructure Performance Demonstration Completion]* of Schedule 7 *[Performance Demonstration Requirements]* to the Project Agreement; and

- (b) all relevant supporting documentation in accordance with Schedule 7 [*Performance Demonstration Requirements*] to confirm that all conditions precedent as described in Section 4.1 [*Conditions Precedent to Completion of Infrastructure Performance Demonstration*] of Schedule 7 [*Performance Demonstration Requirements*] to the Project Agreement have been satisfied,

the IPDC shall review all such supporting documentation to determine whether all conditions precedent as described in Section 4.1 [*Conditions Precedent to Completion of Infrastructure Performance Demonstration*] of Schedule 7 [*Performance Demonstration Requirements*] to the Project Agreement have been satisfied.

2.2 Certification of Infrastructure Performance Demonstration Completion

No longer than ten (10) Business Days after the submission of the documents pursuant to Section 4.3 [*Review by the IPDC*] of Schedule 7 [*Performance Demonstration Requirements*] to the Project Agreement, the IPDC shall either:

- (a) issue the Certificate of Infrastructure Performance Demonstration Completion, (the “**Certificate of Infrastructure Performance Demonstration Completion**”), stating the date, to Project Co; or
- (b) notify Project Co of its decision not to issue the Certificate of Infrastructure Performance Demonstration Completion and state the reasons in detail for such decision.

Any dispute in connection with or arising out of failure of the IPDC to issue the Certificate of Infrastructure Performance Demonstration Completion shall, unless otherwise agreed in writing by the Parties, be resolved in accordance with Schedule 20 [*Dispute Resolution Procedure*] to the Project Agreement.

2.3 Completion of Further Measures for Infrastructure Performance Demonstration Completion

In the event the IPDC delivers a notice under Section 4.4 of Schedule 7 [*Performance Demonstration Requirements*] to the Project Agreement, subject to Section 3.2(a) of Schedule 7 [*Performance Demonstration Requirements*] to the Project Agreement, Project Co may at any time thereafter submit such additional documentation as necessary or appropriate to remove the cause of the IPDC’s refusal to issue the Certificate of Infrastructure Performance Demonstration Completion. Upon submission of such additional documentation, the IPDC shall review such documentation and the provisions of Section 4.4 [*Certification of Infrastructure Performance Demonstration Completion*] and Section 4.5 [*Completion of Further Measures for Infrastructure Performance Demonstration Completion*] of Schedule 7 [*Performance Demonstration Requirements*] to the Project Agreement, inclusive, shall thereafter apply to additional documentation *mutatis mutandis*.

3 Completion of LRV Performance Demonstration

DELETED

**APPENDIX 5B
INDEPENDENT PERFORMANCE DEMONSTRATION CERTIFIER FEE**

[Note: To be developed having reference to the Independent Performance Demonstration Certifier’s proposal.]

Total fixed fee and hourly rates shall be all-inclusive and, without any limitation, shall include all taxes (except for GST), overhead and profit, all labour and materials, insurance costs, travel, hospitality, incidental expenses, disbursements (examples: duplicating, delivery and communications) and all other overhead including any fees or other charges required by law.

The Independent Performance Demonstration Certifier shall not be reimbursed for any disbursements or any travel, hospitality or incidental expenses. For greater certainty, disbursements and any travel, hospitality and incidental expenses shall not appear on invoices to the IA Parties.

The Fee shall be paid monthly in arrears within 30 days of invoice submission, subject to the IA Parties’ receipt of invoices describing the Functions performed for the relevant period, which invoices shall be in form and substance satisfactory to the IA Parties.

Fee = 

The total amount of the Fee invoiced at any time by the Independent Performance Demonstration Certifier shall be shared by the IA Parties on the following basis:

(a) City share of Fee invoice, “CSF” shall be:

$$\text{CSF} = \text{total invoice amount} \times (\text{Fee} - \$300,000) / \text{Fee}$$

(b) Project Co, Operator and LRV Supplier shares of Fee invoice, “OSF” shall each be:

$$\text{OSF} = (\text{total invoice amount} - \text{CSF}) / 3$$

Any additional fees, exceeding the Fee, payable to the Independent Performance Demonstration Certifier as a consequence of any Functions Variation(s), shall be paid by the IA Parties in equal shares, and shall be shown as a separate line item on each applicable invoice.

**THE CITY OF EDMONTON
VALLEY LINE WEST LRT**

LRV SUPPLY AGREEMENT

Schedule 7 – Warranty

**VALLEY LINE WEST LRT
SCHEDULE 7 – WARRANTY**

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LIST OF FIGURES

Not applicable.

LIST OF TABLES

Not applicable.

SECTION 1: WARRANTIES

- A. The LRV Supplier represents and warrants to the City that for the duration of the Warranty Periods outlined below,
1. there shall be no Warranty Deficiencies in the Work; and
 2. all Warranty Deficiencies will be rectified in accordance with this Supply Agreement.
- B. The LRV Supplier shall provide and maintain a Warranty Tracking System, that shall be accessible by the City at all times and that will track all Warranty Periods for all LRVs, Special Tools and Spare Parts.
- C. The Warranty Period
1. for each LRV, including all of the LRV's systems, subsystems, components, parts, equipment, hardware, and software provided shall commence at Conditional Acceptance of the LRV and continue until the earlier of:
 - a. 24 months following Conditional Acceptance of such LRV; and
 - b. such LRV reaches 200,000 km of accumulated mileage after Conditional Acceptance, as shown on the LRV's odometer(the "**Primary LRV Warranty**");
 2. for each item of Special Tools shall be a period of 36 months commencing on the date that such Special Tool is Accepted;
 3. for each Spare Part shall commence on Acceptance or installation, as applicable, and continue until the earlier of:
 - a. 24 months after being installed in an LRV that has achieved Conditional Acceptance; and
 - b. 36 months after Acceptance of such Spare Part.
 4. for the following components of each LRV shall commence on Conditional Acceptance of the LRV, or, in the case of a Spare Part, on Acceptance of that Spare Part and continue for the following periods:
 - a. 15 years for the carbody including all frame components at articulation connection points;
 - b. 15 years for the bogie frames;
 - c. five years for the gearboxes;
 - d. five years for the traction motors;
 - e. eight years for the traction motor insulation;
 - f. five years for the interior and exterior paint and finishes; and
 - g. five years for the axles.
- D. The LRV Supplier shall supply all Warranty Spares required in order for the LRV Supplier to ensure that Warranty Deficiencies arising during the Warranty Period are rectified within the Rectification Period.

- E. For greater certainty, the LRV Supplier is not required to rectify Excluded Deficiencies and any Warranty provided by the LRV Supplier does not include Excluded Deficiencies.

SECTION 2: WARRANTY DEFICIENCY RECTIFICATION

2.1 NOTIFICATION

- A. The LRV Supplier shall establish a 24 hour Warranty Notification System that enables the City to provide the LRV Supplier with Warranty Notices identifying and detailing Warranty Deficiencies.
- B. The City shall issue a Warranty Notice to the LRV Supplier as soon as reasonably practicable after a Warranty Deficiency becomes apparent to the City.
- C. The Warranty Notification System provided by the LRV Supplier shall enable the City to issue Warranty Notices with the following information:
 - 1. if the LRV is required immediately to meet service requirements;
 - 2. basic information about the suspected Warranty Deficiency; and
 - 3. when the City expects to make the Work available to the LRV Supplier for inspection and rectification if not immediately required to meet service requirements.
- D. The City shall provide the LRV Supplier with all available records requested by the LRV Supplier that are reasonably necessary to enable the LRV Supplier to carry out its obligations.

2.2 RECTIFICATION

- A. For Warranty Deficiencies relating to LRVs that are required to meet Revenue Service requirements, the City may, in its discretion, proceed with rectification of the Warranty Deficiencies concurrently with issuing a Warranty Notice.
- B. The LRV Supplier shall rectify Warranty Deficiencies:
 - 1. within four hours from the time the LRV is provided to the LRV Supplier for rectification; or
 - 2. if the rectification cannot be completed within four hours, the timeframe specified by the LRV Supplier to rectify the Warranty Deficiency in a Rectification Plan
(the “**Rectification Period**”).
- C. If the LRV Supplier believes that it will not be able to rectify the Warranty Deficiency within the Rectification Period, then the LRV Supplier shall do the following:
 - 1. within four hours of the issuance of the Warranty Notice, provide notice to the City that the rectification cannot be completed within the Rectification Period; and
 - 2. within two Business Days of the issuance of the Warranty Notice by the City, submit a plan to rectify the Warranty Deficiency that specifies the process that the LRV Supplier will take, and any maintenance facilities, equipment and space required, to correct the Warranty Deficiency (the “**Rectification Plan**”).
- D. In accordance with the Accepted Rectification Plan, the LRV Supplier shall:
 - 1. rectify the Warranty Deficiency; and
 - 2. in respect of Fleet Warranty Deficiencies, rectify the Fleet Warranty Deficiency in all Accepted LRVs, regardless of an individual LRV’s Warranty status.

- E. Without limitation to Section 2.2A, if the LRV Supplier fails to
 - 1. submit a Rectification Plan within two Business Days of the Warranty Notice, or
 - 2. rectify a Warranty Deficiency within the Rectification Period,
 then the City may carry out the rectification of the Warranty Deficiency.
- F. If a Rectification Plan is not Acceptable to the City, then the LRV Supplier may do the following
 - 1. revise the Rectification Plan so that it is Acceptable to the City; or
 - 2. refer the matter for Dispute Resolution.
- G. If the LRV Supplier refers a Rectification Plan for Dispute Resolution, then the City may proceed with rectification of the Warranty Deficiency that is the subject of the Rectification Plan.
- H. If the City proceeds with rectification of Warranty Deficiencies pursuant to A or E of this section, then the following applies:
 - 1. the City may use Spare Parts to rectify such Warranty Deficiencies;
 - 2. the LRV Supplier shall replace any Spare Parts used by the City for such rectifications within 30 Business Days or as otherwise agreed with the City; and
 - 3. the LRV Supplier shall reimburse the City for any additional labour at the rate of \$200 per hour and other material costs incurred by the City to rectify the Warranty Deficiency.
- I. In rectifying Warranty Deficiencies the LRV Supplier shall endeavour to minimize interference with, and impact on, the operation of the Valley Line LRT.
- J. The LRV Supplier shall coordinate with the City regarding the use by the LRV Supplier of maintenance facilities, equipment, and space required to rectify Warranty Deficiencies.

2.3 RESOLUTION

- A. After rectification of a Warranty Deficiency for an LRV, the LRV Supplier shall update all associated drawings, technical manuals, revision lists and other associated documentation that describe the LRV and provide all pertinent information to the City that is required to keep the Vehicle History Book up to date.
- B. If the repair of the Warranty Deficiency involves any part of any system, or subsystem, of the LRV that required validation prior to issuing a Safety and Security Verification Certificate for the LRV then the LRV Supplier shall re-issue the Safety and Security Verification Certificate for the LRV to the City after validating that the Deficiency has been rectified.
- C. Notwithstanding any rectification performed by the City, the LRV Supplier shall remain responsible for any further Warranty Deficiencies applicable to the Works so rectified.
- D. If the LRV Supplier believes that the City has issued a Warranty Notice relating to an Excluded Deficiency, the LRV Supplier may refer the matter to Dispute Resolution for determination. If a Warranty Notice is not referred to Dispute Resolution within 15 Business Days of the issuance of the Warranty Notice, then the LRV Supplier will be deemed to accept the Warranty Notice as notice of a Warranty Deficiency.

SECTION 3: EXTENSION OF WARRANTY

- A. For any part, component, or system of a Work that is repaired, rebuilt, or replaced in order to rectify a Warranty Deficiency, the Warranty Period for that part, component, or system of Work shall commence upon rectification and continue until the later of:
1. 24 months from the date of rectification;
 2. the expiry of the Warranty Period applicable to that rectified part, component or system of Work for that part, component or system of Work as provided for in Section 1.C.4 [*Warranties*], if applicable; and
 3. the expiry of a warranty provided by the manufacturer of the part, component, or system of Work.
- B. For greater certainty, the rectification of a Warranty Deficiency does not extend the Warranty Periods outlined in Section 1 [*Warranties*].

**THE CITY OF EDMONTON
VALLEY LINE WEST LRT**

LRV SUPPLY AGREEMENT

Schedule 8 – Shipping and Delivery

**VALLEY LINE WEST LRT
SCHEDULE 8 – SHIPPING AND DELIVERY**

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LIST OF FIGURES

Not applicable.

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Not applicable.

SECTION 1: GENERAL

1.1 IMPORTATION AND DELIVERY

- A. The LRV Supplier shall act as the importer of record of all components of the Work, including LRVs, Spare Parts and Special Tools and be responsible for the following:
 - 1. obtaining and providing all documentation required for any such importation and to support preferential tariff treatment; and
 - 2. the payment of customs duties, GST, and any other Taxes payable upon the importation of any particular component of the Work.
- B. The LRV Supplier shall be responsible for all costs associated with delivery and unloading of the Work to the Gerry Wright OMF Part A or Gerry Wright OMF Part B as applicable.
- C. All shipments shall be packaged and packed in a manner to ensure the integrity of product during transportation, handling, and temporary storage. Due regard shall be given to protection from loss and pilferage, physical damage, and the effect of the elements and environmental conditions.
- D. The LRV Supplier shall determine the haul routes to be used and confirm that the jurisdiction through which its haul routes will pass will permit the hauling operations with respect to laden weights, type of vehicle, frequency and dimension of loads, required traffic control, and hours of operation. The LRV Supplier shall obtain and pay for all necessary permits, licenses, and bonds.
- E. The LRV Supplier shall deliver all LRVs, Spare Parts, and Special Tools as “Delivered Duty Paid” to the Gerry Wright OMF, as per Incoterms 2010 ICC Publication No. 715. The LRV Supplier shall also be responsible for unloading each LRV at the Gerry Wright OMF Part A and transporting each LRV to Gerry Wright OMF Part B. For clarity, title to, and risk of loss of, each LRV, Spare Parts and Special Tools will pass to the City solely in accordance with the terms of Section 1.3 [*Ownership and Risk of Loss*].

1.2 DELIVERY SCHEDULE

- A. The LRV Supplier shall comply with the following requirements for delivery of each component of the Work:
 - 1. LRVs, Special Tools and Spare Parts cannot be delivered prior to the LRV Delivery Start Date unless otherwise agreed to by the City.
 - 2. At least one LRV must be Conditionally Accepted no later than the First Conditional Acceptance Date.
 - 3. At least four LRVs must be Conditionally Accepted no later than the LRV Ready for Integration Date.
 - 4. All LRVs included in the Base Order must be delivered and Conditionally Accepted no later than the VLW Service Commencement Date.
 - 5. LRV delivery dates shall be scheduled such that LRVs will be delivered at a consistent rate between the LRV Ready for Integration Date and December 31, 2026.
 - 6. LRV delivery dates shall be scheduled such that no more than six LRVs that have been delivered to the Gerry Wright OMF have not achieved Conditional Acceptance at any single point in time.

7. LRV delivery dates shall be scheduled such that no more than 36 LRVs are delivered by December 31, 2026.
 8. Each LRV, Spare Part and Special Tool shall be delivered to the Gerry Wright OMF unless otherwise agreed by the City.
- B. The LRV Supplier shall submit a Delivery Schedule (CDRL 08-01) detailing when each component of the Work, including each LRV, will be delivered as noted in Section 1.2 A above. The Delivery Schedule shall include the following information:
1. a shipping plan that details how the LRVs will be shipped to the Gerry Wright OMF, the protections to be implemented to protect the LRV from loss and pilferage, physical damage, and damage from environmental conditions during shipping and storage, and the impact recorder to be installed for shipment;
 2. a detailed delivery schedule for all Spare Parts; and
 3. a detailed delivery schedule for all Special Tools.
- C. The LRV Supplier shall confirm the Delivery Schedule 30 days prior to shipping the first LRV.
- D. The LRV Supplier shall update and resubmit the Delivery Schedule if the shipping date of any LRV is changed by 15 Business Days or more.

1.3 OWNERSHIP AND RISK OF LOSS

- A. The LRV Supplier shall retain ownership and be responsible for all risk of loss, theft or damage to each LRV until the LRV achieves Conditional Acceptance.
- B. Title to and all risk of loss, theft, or damage to each LRV shall pass to the City upon each LRV achieving Conditional Acceptance.
- C. Notwithstanding Section 1.3 B above, the LRV Supplier shall be responsible for all risk of loss, theft or damage to any component of the LRV during that period that the LRV is in the possession of the LRV Supplier to rectify Deficiencies or Warranty Deficiencies.
- D. The title and all risk of loss, theft or damage to all Spare Parts, Special Tools and Deliverable Materials (including manuals) shall pass to the City upon Acceptance of the Spare Part, Special Tool and Deliverable Material.
- E. The LRV Supplier warrants that it has or will at the time of the transfer of title as described in this Section 1.3 [*Ownership and Risk of Loss*] have good and marketable title to the LRVs, Special Tools, Spare Parts, and Deliverable Material free and clear of any and all liens, restrictions, reservations or claims of any kind and that it will defend the City's title to the LRVs, Special Tools, Spare Parts, and Deliverable Material.

SECTION 2: SHIPPING AND DELIVERY OF LRVs

2.1 SHIPMENT NOTIFICATION

- A. Each LRV shipped to the City shall be
1. completely assembled; or
 2. capable of being unloaded in accordance with Section 2.3 [*Unloading*] below and assembled by the LRV Supplier within the space provided at the Gerry Wright OMF and with tools provided by the LRV Supplier
- and in compliance with all pre-shipment requirements of the Supply Agreement.
- B. The LRV Supplier shall provide a shipping notice to the City at least 10 Business Days prior to the shipment of each LRV. Each shipping notice shall contain the following:
1. shipment tracking number;
 2. estimated delivery date;
 3. a list of all known Deficiencies and open items;
 4. confirmation that the LRV complies with the following:
 - a. has passed all pre-shipment tests and inspections, as described in Schedule 3 [*Design and Manufacturing Protocols*];
 - b. complies with the Accepted drawings and samples; and
 - c. meets other agreed-upon conditions for shipping; and
 5. confirmation that an up-to-date Vehicle History Book is shipped with the associated LRV.

2.2 SHIPMENTS

- A. If shipped by sea, the LRV Supplier shall provide for enclosed protection against damage from handling and from exposure to the marine environment and adjacent shipments for all LRVs and LRV components.
- B. During shipment, each LRV shall be equipped with an impact recorder provided by the LRV Supplier and Accepted by the City.
1. Prior to shipment of the first LRV the LRV Supplier shall provide the City with the impact limits that indicate the maximum acceptable impact the LRV can sustain during shipping.
 2. The recorder shall record all handling impacts. The LRV Supplier shall append the impact recorder records to the Vehicle History Book.
- C. The LRV Supplier shall require shippers to log and record any incidents of damage or potential damage to the LRVs and LRV components, and of interruption of shipments. The LRV Supplier shall provide written notice to the City within two Business Days of the LRV Supplier's receipt of such information, describing the nature of the shipment damage, potential damage, or interruption, and the actions taken and to be taken to complete the shipment and repair any damage.

2.3 UNLOADING

- A. The LRV Supplier shall provide written notice to the City at least ten Business Days in advance of unloading each LRV, detailing the time and location (at the Gerry Wright OMF Part A) of such unloading. The City shall provide the LRV Supplier with access to the LRV delivery track and concrete pad at the Gerry Wright OMF Part A for unloading of the LRV, or LRV sections, as required in accordance with the Delivery Schedule.
- B. The LRV Supplier shall make arrangements with the City to move the LRV from the Gerry Wright OMF Part A to the Gerry Wright OMF Part B.
- C. After arrival at the Gerry Wright OMF Part B, the LRV Supplier shall undertake a post-shipment inspection with the City in accordance with Section 2.6.11 [*Post-Shipment Inspection*] of Schedule 3 [*Design and Manufacturing Protocols*].
- D. The City will provide maintenance staff and other operations personnel through the Operator as required to comply with the LRV Protocol (as defined in the Interface Agreement) to facilitate unloading and moving of LRVs at the Gerry Wright OMF.
- E. The City will have shunting equipment available for the LRV Supplier to facilitate the unloading and movement of the LRVs from the unloading area to Gerry Wright OMF Part B. All other tools and equipment required to facilitate the unloading and movement of the LRV, or LRV sections, from the unloading point at Gerry Wright OMF Part A to and into the Gerry Wright OMF Part B, including adaptive plates to connect the shunting equipment to the LRV, or LRV segments, are the responsibility of the LRV Supplier.

2.4 STORAGE, MAINTENANCE, AND TESTING

- A. The LRV Supplier shall store each LRV that has not achieved Conditional Acceptance at the Gerry Wright OMF Part B, or as otherwise instructed by the City. The LRV Supplier shall coordinate with the City for the exact location within the Gerry Wright OMF Part B where such LRVs shall be stored.
- B. The LRV Supplier shall coordinate with the City to arrange the following:
 - 1. the usage of maintenance bays and Accepted Special Tools to perform maintenance and repairs on LRVs that have not achieved Conditional Acceptance; and
 - 2. the testing and Commissioning of LRVs that have not achieved Conditional Acceptance on the Gerry Wright OMF Part B yard track and on the Valley Line LRT mainline.

SECTION 3: DELIVERY OF SPARE PARTS, SPECIAL TOOLS, AND MANUALS

3.1 SPARE PARTS

- A. The LRV Supplier shall deliver Spare Parts only once they are of production configuration and successfully tested.
- B. The LRV Supplier shall deliver Spare Parts in accordance with the schedule provided in the CWS and Delivery Schedule.
- C. The LRV Supplier shall provide written notice to the City after delivery of each Spare Part.
- D. The LRV Supplier shall coordinate with the City for where each Spare Part shall be unloaded at the Gerry Wright OMF Part B.

3.2 SPECIAL TOOLS

- A. The LRV Supplier shall deliver Special Tools in accordance with the schedule provided in the CWS and Delivery Schedule.
- B. The LRV Supplier shall provide written notice to the City after delivery of each Special Tool.
- C. The LRV Supplier shall coordinate with the City for the location each Special Tool shall be unloaded at the Gerry Wright OMF Part B.

3.3 MANUALS

- A. The LRV Supplier shall provide written notice to the City after the hard copy delivery of technical manuals in accordance with Section 10.1.5.2 [*Submission Timing*] of Schedule 3 [*Design and Manufacturing Protocols*].
- B. The LRV Supplier shall submit draft technical manuals in accordance with Section 10.1.5.2 [*Submission Timing*] of Schedule 3 [*Design and Manufacturing Protocols*] and consisting of full sets of all technical manuals in the format and quantities indicated in Section 10.1 [*Technical Manuals*] of Schedule 3 [*Design and Manufacturing Protocols*].
- C. The LRV Supplier shall deliver final manuals in accordance with the requirements for timing, format, and quantities indicated in Section 10.1 [*Technical Manuals*] of Schedule 3 [*Design and Manufacturing Protocols*].

**THE CITY OF EDMONTON
VALLEY LINE WEST LRT
LRV SUPPLY AGREEMENT**

Schedule 9 – Pricing and Payment

**VALLEY LINE WEST LRT
SCHEDULE 9 – PRICING AND PAYMENT**

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SECTION 1: PRICING

1.1 CAPITAL COST AMOUNT

- A. The Capital Cost Amount is [REDACTED]; and
- B. The Capital Cost Amount is payable for the Base Order.

1.2 OPTION AMOUNTS

- A. The LRV Supplier hereby grants the City, and any permissible assignee pursuant to Section 19.7 [*Assignment by City*] of the Supply Agreement, the ability to purchase Spare Parts, Special Tools, and Supplementary LRVs, in accordance with Appendix 9B [*Options*].

1.3 PRICING CURRENCY AND ADJUSTMENTS

- A. All amounts owing by the City to the LRV Supplier or by the LRV Supplier to the City will be in CAD dollars.
- B. There shall be no adjustments to:
 - 1. the Capital Cost Amount indicated in Section 1.1 [*Capital Cost Amount*]; or
 - 2. the amounts listed in Appendix 9B.2 [*Pricing for Options*];for currency fluctuations or escalation throughout the Term.

1.4 PRICING TERMS

- A. The City shall pay and the LRV Supplier shall accept the amounts set forth in this Section 1 [*Pricing*] as full compensation for completing the Work and all associated requirements, in accordance with this Supply Agreement.
- B. All amounts owing to LRV Supplier for the pricing amount set forth in Section 1.1 [*Capital Cost Amount*] shall be paid as Milestone Payments and all amounts owing will be made in accordance with Section 2 [*Payment Terms*], Section 3 [*Milestone Payments*], and Section 4 [*Payment Administration and Invoicing*]. Subject to any express amounts payable to LRV Supplier pursuant to this Schedule 9 [*Pricing and Payment*], LRV Supplier shall not be paid more than 100% of the sum of the Capital Cost Amount for the Base Order.
- C. All amounts owing to the LRV Supplier for an Option set forth in Section 1.2 [*Option Amounts*] shall be paid in accordance with Section 2 [*Payment Terms*], Section 4 [*Payment Administration and Invoicing*], and Appendix 9B [*Options*].
- D. All amounts set forth in this Section 1 [*Pricing*] shall be inclusive of:
 - 1. all costs incurred by the LRV Supplier in connection with this Supply Agreement;
 - 2. all costs incurred by the LRV Supplier in connection with the Interface Agreement;

3. all costs incurred by the LRV Supplier in connection with warranties as outlined in Schedule 7 [*Warranty*];
4. all costs incurred by the LRV Supplier in connection with Insurance and Performance Securities as outlined in Schedule 11 [*Insurance and Performance Security Requirements*];
5. where applicable, and pursuant to Schedule 8 [*Shipping and Delivery*], all rail, freight, air and other similar charges incurred for the purpose of delivering each LRV to the designated delivery point, including:
 - a. ocean freight and related charges including dock dues, demurrage and penalties, if incurred;
 - b. rail freight and related charges including staging, switching and storage, if incurred;
 - c. road transportation and related charges including tolls, demurrage and penalties, if incurred;
 - d. transportation charges to a port of loading and/or from a port of discharge, if incurred;
 - e. insurance costs including marine risk insurance, all liability insurances, insurance for loss or damage;
 - f. handling charges;
 - g. documentation and agency charges; and
 - h. all sales taxes (except GST and other similar taxes payable pursuant to Section 2.4 [*Taxes*]), duties, excise taxes or similar taxes, import fees, export fees, tariffs and other similar charges, if incurred; and
6. all other costs and charges incurred by LRV Supplier to complete the Base Order, and if applicable, to deliver any Option exercised by the City in accordance with Appendix 9B [*Options*] for optional Spare Parts, Special Tools, and Supplementary LRVs, to the designated delivery point, and all associated services defined in the Supply Agreement and Interface Agreement.

SECTION 2: PAYMENT TERMS

2.1 PAYMENT BY THE CITY

- A. Subject to the LRV Supplier meeting the requirements for payment set out in this Supply Agreement, the City will pay the LRV Supplier amounts the City is expressly obligated to pay under this Supply Agreement, including:
1. amounts owing pursuant to this Schedule 9 [*Pricing and Payment*];
 2. amounts owing pursuant to Section 11.2 [*City's Indemnity*] of the Supply Agreement;
 3. amounts owing pursuant to Schedule 11 [*Insurance and Performance Security Requirements*];
 4. amounts owing pursuant to Section 12 [*Termination*] of the Supply Agreement;
 5. amounts owing pursuant to Schedule 13 [*Changes*];
 6. amounts owing as a result of Disputes pursuant to Section 15 [*Dispute Resolution*] of the Supply Agreement; and
 7. amounts owing pursuant to Section 7 [*Relief Events*] of the Supply Agreement;
- in accordance with the provisions of this Supply Agreement.

2.2 LIMITATIONS ON PAYMENT

- A. Other than the payments expressly provided for in this Supply Agreement, LRV Supplier will have no right to any further payment from the City in connection with the performance and completion of all or any portion of the LRV Supplier's obligations under the Supply Agreement; and
- B. The making of any payment by the City shall not constitute an acceptance or approval of incomplete, defective or improper performance by LRV Supplier of any of its obligations under this Supply Agreement nor shall it operate to relieve LRV Supplier from the performance of any of its obligations under this Supply Agreement which have not been performed.

2.3 PAYMENT BY LRV SUPPLIER

- A. LRV Supplier will pay the City amounts LRV Supplier is expressly obligated to pay under the Supply Agreement including:
1. amounts owing pursuant to this Schedule 9 [*Pricing and Payment*];
 2. amounts owing pursuant to Section 11.1 [*LRV Supplier's Indemnity*] of the Supply Agreement;
 3. amounts owing pursuant to Section 12 [*Termination*] of the Supply Agreement;
 4. amounts owing pursuant to Schedule 13 [*Changes*];
 5. amounts owing pursuant to Schedule 11 [*Insurance and Performance Security Requirements*];

6. amounts owing for Liquidated Damages pursuant to Section 2.4 [*Delivery and Work Milestones*] of the Supply Agreement; and
7. amounts owing as a result of Disputes pursuant to Section 15 [*Dispute Resolution*] of the Supply Agreement;

in accordance with the provisions of this Supply Agreement.

2.4 TAXES

- A. Except as otherwise provided in this Supply Agreement, all amounts specified in this Schedule 9 [*Pricing and Payment*] are expressed exclusive of GST and other similar taxes payable by the City but inclusive of all other Taxes. Applicable GST shall be paid in accordance with the Excise Tax Act (Canada). As required by the Excise Tax Act (Canada), in the event that the LRV Supplier is a GST/HST registrant, LRV Supplier shall provide to the City appropriate documentation containing all the information necessary for the City to claim an input tax credit or rebate, including the amount of GST payable and the registration number of LRV Supplier.
- B. The City shall pay all applicable GST properly payable in accordance with the Excise Tax Act (Canada) by the City upon and in connection with payments by the City to LRV Supplier under this Supply Agreement.
- C. The LRV Supplier shall notify the City, as soon as it undertakes any action or transaction that, if undertaken, would cause the City to have (or result in the City having) any obligation to deduct, withhold or remit any Taxes that are required by Applicable Law to be deducted, withheld or remitted from any amounts paid or credited to the LRV Supplier under this Supply Agreement or under any other Project Document.
- D. If (i) the LRV Supplier is or becomes a Non-Resident, or (ii) the City is or becomes required by Applicable Law to deduct and withhold any amount in respect of Taxes on or in respect of any amounts paid or credited to the LRV Supplier by the City under this Supply Agreement, then the City shall be entitled to make any applicable deductions or withholdings from any amount paid or credited or to be paid or credited to the LRV Supplier on or after the date on which (A) the LRV Supplier becomes a Non-Resident and at all times while it remains a Non-Resident; or (B) the City is required by Applicable Law to deduct or withhold amounts in respect of any such amounts, in each case, in respect of all Taxes that are required by Applicable Law to be deducted or withheld from amounts paid or credited to a Non-Resident or otherwise as required by Applicable Law; and all amounts paid or credited by the City under this Supply Agreement to the LRV Supplier shall be paid or credited net of such deductions or withholdings. Any amount deducted and withheld in respect of Taxes shall be deemed to have been paid to the LRV Supplier on the due date of the related amount payable, and the City shall remit the Taxes to the relevant Governmental Authority as per Applicable Law.
- E. If (i) the LRV Supplier is or becomes a Non-Resident, or (ii) the City is or becomes required by Applicable Law to deduct and withhold any amount in respect of Taxes on or in respect of any amounts paid or credited to the LRV Supplier or an LRV Supplier Person by the City under this Supply Agreement or under any of the Project Documents, the LRV Supplier shall, in each case, indemnify and hold harmless the City for (A) the full amount of all Taxes (in this Section "**Indemnifiable Taxes**") that arise, are imposed on or are required to be paid by the City in respect of any amounts paid or credited by the City to the LRV Supplier under this Supply Agreement as a result of either of the foregoing items less any amount withheld or deducted by the City in respect of such

Taxes, and (B) any liability payable or incurred in connection with Indemnifiable Taxes (including penalties, interest and reasonable expenses associated with Tax compliance, reporting and contesting such liability for Indemnifiable Taxes, including reasonable professional expenses payable or incurred in connection therewith) arising from or with respect to Indemnifiable Taxes, whether or not they were correctly asserted (in this Section “**Associated Liabilities**”), but only to the extent of the City’s failure to comply with its withholding or deduction obligations in respect of the aforesaid Indemnifiable Taxes.

- F. Payment of Indemnifiable Taxes and Associated Liabilities shall be made within 30 days from the date the City makes written demand for payment. A certificate containing reasonable detail as to the amount of Indemnifiable Taxes and Associated Liabilities submitted to the LRV Supplier by the City shall be conclusive evidence, absent manifest error, of the amount due from the LRV Supplier to the City. The City shall be entitled to exercise its rights of set off under Section 2.7 [Set-Off] of any amounts owing under this indemnification against other amounts owing to the LRV Supplier.
- G. If Section 182 of the Excise Tax Act (Canada) is applicable to any amount payable under this Supply Agreement, such payment will be increased by an amount such that after remitting the applicable GST the LRV Supplier will be in the same position as it would have been if Section 182 of the Excise Tax Act (Canada) were not applicable.
- H. The LRV Supplier acknowledges and understands that this Supply Agreement may require the performance of Scientific Research and Experimental Development (“SR&ED”) as defined in subsection 248(1) of the Income Tax Act (Canada). The City agrees that, to the extent that SR&ED is required, the SR&ED will be performed by the LRV Supplier and the LRV Supplier is entitled to claim such credits or incentives.
- I. GST Adjustment:
 - 1. The City will pay to the LRV Supplier amounts equal to any GST or similar taxes (e.g. HST, if applicable), incurred by the LRV Supplier or a Sub-Contractor in respect of the supply of any good or service to the City that is consumed, used or supplied or to be consumed, used or supplied exclusively by the LRV Supplier or a Sub-Contractor in the course of carrying out the Work or otherwise performing the LRV Supplier’s obligations under this Supply Agreement, to the extent that the LRV Supplier or the Sub-Contractor is unable to recover or be credited with input tax credits, refunds, rebates or exemptions for such taxes as a result of a change in Applicable Law after the Bid Response Date related to such taxes, and only to the extent necessary to leave LRV Supplier in no better or worse position than before such change in Applicable Law.
 - 2. The LRV Supplier will pay to the City, directly or by way of set-off against Payments, amounts equal to any GST or similar taxes (e.g. HST, if applicable), incurred by the LRV Supplier or a Sub-Contractor in respect of the supply of any good or service to the City that is consumed, used or supplied or to be consumed, used or supplied exclusively by the LRV Supplier or a Sub-Contractor in the course of carrying out the Project Work or otherwise performing the LRV Supplier’s obligations under this Supply Agreement, to the extent that the LRV Supplier or the Sub-Contractor is able to recover, or be credited with, input tax credits, refunds, rebates or exemptions for such taxes as a result of a change in Applicable Law after the Bid Response Date related to such taxes, and only to the extent necessary to leave the LRV Supplier in no better or worse position than before such change in Applicable Law.

2.5 PAYMENT PROCEDURE

- A. All payments by the City to LRV Supplier and by the LRV Supplier to the City shall be made in accordance with this Schedule 9 [*Pricing and Payment*].
- B. All payments under this Supply Agreement shall be made in Canadian dollars and shall be electronically transferred, quoting the invoice number, description or purchase order (PO) number against which payment is made, in immediately available funds on the payment due date to the bank accounts located in Canada as may be designated by the recipient from time to time by written notice to the other Party (acting reasonably).
- C. Unless specific timeframes are stipulated for payment of any amounts owing or payable by one Party to the other Party under this Supply Agreement, such amounts shall be paid not later than the 30th Business Day of receipt or deemed receipt of a complete and correct invoice.
- D. If the payment due date is not a Business Day, then the electronic funds transfer shall be made on the Business Day immediately succeeding such day.
- E. No delay in paying an invoice, whether attributable to an incomplete or unsupported invoice, a dispute in relation to the invoice, or any action or inactions of the LRV Supplier or the City, shall relieve LRV Supplier of its obligations to perform the Work (or of any of its other obligations hereunder) or entitle LRV Supplier to delay or suspend such performance.
- F. If upon completion of the Term, or if applicable, the Termination Date, there are amounts payable that are outstanding from LRV Supplier to the City, LRV Supplier shall pay such amounts to the City not later than the 30th Business Day following the earlier of completion of the Term, or if applicable, the Termination Date.

2.6 LUMP SUM PAYMENTS

- A. Notwithstanding anything else to the contrary in this Supply Agreement, to the extent a Party:
 - 1. is entitled to payment from the other Party under this Supply Agreement, other than a Milestone Payment expressly described in this Schedule; or
 - 2. is entitled to share in a benefit and to receive payment therefor from the other Party expressly provided for under this Supply Agreement;

the entitled Party may make written demand for such payments from time to time after becoming entitled to payment, including in respect of any Direct Losses after such Direct Losses have been incurred, and in respect of any shared benefit, after receipt by the other Party of the shared benefit. After delivery of written payment demand supported by all relevant information, the City or LRV Supplier as the case may be, shall make such payment by a lump sum amount within 30 Business Days unless:

- 3. the Parties mutually agree to an adjustment to the Milestone Payments as the means of structuring the payment;

When preparing the Change Estimate, in response to the foregoing City request, LRV Supplier shall take into consideration that as a result of the City's request it is intended that LRV Supplier shall be

in no better or worse position at the Expiry Date than had the payments been made on a lump sum basis in accordance with this Section 2.6 [*Lump Sum Payments*].

2.7 SET-OFF

- A. The City and the LRV Supplier agree that their rights of set-off at law or in equity are limited to the right of:
1. the City to set off against any amounts otherwise due to LRV Supplier pursuant to the terms of this Supply Agreement or any other agreement or arrangement between the Parties any amounts which are due to the City by LRV Supplier pursuant to the terms of this Supply Agreement or any other agreement or arrangement between the Parties; and
 2. LRV Supplier to set off against any amounts otherwise due to the City pursuant to the terms of this Supply Agreement or any other agreement or arrangement between the Parties any amounts which are due to LRV Supplier by the City pursuant to the terms of this Supply Agreement or any other agreement or arrangement between the Parties.

2.8 DISPUTED AMOUNTS

- A. A Party will pay any undisputed portion of any disputed amount payable to the other Party in accordance with this Supply Agreement, but any disputed portion or amount will not be payable until the Dispute is resolved in accordance with the Dispute Resolution Procedure. In the event that LRV Supplier disputes the amount of any payment, LRV Supplier shall bring such Dispute to the attention of the City within 45 days after the date the payment is received, failing which, in the absence of manifest error, LRV Supplier shall be estopped from later disputing the correctness of the amount so paid.
- B. In the event of a Dispute related to invoicing and payment, the Dispute shall be resolved in accordance with Section 15 [*Dispute Resolution*] of the Supply Agreement.

SECTION 3: MILESTONE PAYMENTS

3.1 MILESTONE PAYMENTS

- A. Subject to the provisions of this Schedule 9 [*Pricing and Payment*], the City shall pay the LRV Supplier for each Base Order Payment Milestone during the Term where such payments shall be due to LRV Supplier.
- B. Each Milestone Payment shall be calculated and paid in accordance with this Section 3 [*Milestone Payments*] and Section 4 [*Payment Administration and Invoicing*].
- C. Where applicable, Base Order Payment Milestones that will occur more than one time, will be paid to the LRV Supplier on a pro-rated basis upon completion of each individual occurrence of the Base Order Payment Milestone and in accordance with the value and amounts listed in *Table 1: Base Order Payment Milestones, Milestone Payment Value, and Milestone Payment Amounts* of Section 3.2 [*Base Order Payment Milestones*].

3.2 BASE ORDER PAYMENT MILESTONES

- A. The City will make payment of the Capital Cost Amount listed in Section 1.1 [*Capital Cost Amount*] in accordance with the Base Order Payment Milestones, as listed below in *Table 1* and as further described in Section 3.3 [*Eligibility Requirements for Milestone Payments*]:

Table 1: Base Order Payment Milestones, Milestone Payment Value, and Milestone Payment Amounts

Base Order Payment Milestone	Base Order Payment Milestone Description	Number of Milestone Payments	Individual Milestone Payment Value (%)	Individual Milestone Payment Amount (\$)	Total Milestone Payment Value (%)	Total Milestone Payment Amount (\$)
Capital Cost Amount						
<i>M₁</i>	Completion of Conceptual Design Review	1	6.000	\$ ██████████	6.000	\$ ██████████
<i>M₂</i>	Completion of Preliminary Design Review	1	12.000	\$ ██████████	12.000	\$ ██████████
<i>M₃</i>	Acceptance of Final Design Review	1	11.000	\$ ██████████	11.000	\$ ██████████
<i>M₄</i>	Completion of all activities on the First Article Inspection List	1	12.500	\$ ██████████	12.500	\$ ██████████
<i>M₅</i>	The first LRV in the Base Order to achieve Conditional Acceptance	1	8.525	\$ ██████████	8.525	\$ ██████████

Base Order Payment Milestone	Base Order Payment Milestone Description	Number of Milestone Payments	Individual Milestone Payment Value (%)	Individual Milestone Payment Amount (\$)	Total Milestone Payment Value (%)	Total Milestone Payment Amount (\$)
Capital Cost Amount						
<i>M₆</i>	The first LRV in the Base Order to achieve Final Acceptance	1	3.900	\$ [REDACTED]	3.900	\$ [REDACTED]
<i>M₇</i>	Conditional Acceptance of a subsequent LRV in the Base Order	39	0.375	\$ [REDACTED]	14.625	\$ [REDACTED]
<i>M₈</i>	Final Acceptance of a subsequent LRV in the Base Order	39	0.375	\$ [REDACTED]	14.625	\$ [REDACTED]
<i>M₉</i>	Conditional Acceptance of all LRVs in the Base Order	1	6.600	\$ [REDACTED]	6.600	\$ [REDACTED]
<i>M₁₀</i>	Completion of training programs	1	0.225	\$ [REDACTED]	0.225	\$ [REDACTED]
<i>M₁₁</i>	Final Acceptance Certificates have been issued for all LRVs in the Base Order	1	10.000	\$ [REDACTED]	10.000	\$ [REDACTED]
Total					100.000	\$ [REDACTED]

- B. For clarity, the Total Milestone Payment Value and the Total Milestone Payment Amount in *Table 1: Base Order Payment Milestones, Milestone Payment Value, and Milestone Payment Amounts*, are equal to the 100% of the Capital Cost Amount listed in Section 1.1 [*Capital Cost Amount*].
- C. The number of Milestone Payments listed in *Table 1: Base Order Payment Milestones, Milestone Payment Value, and Milestone Payment Amounts* are based on the Base Order. Payment for Supplementary LRVs shall be in accordance with Appendix 9B [*Options*].

3.3 ELIGIBILITY REQUIREMENTS FOR MILESTONE PAYMENTS

- A. The City will not, at any time, make a Milestone Payment to the LRV Supplier if a Base Order Payment Milestone has not been achieved or if the required Performance Security is not in place, pursuant to Section 17 [*Performance Security*] of the Supply Agreement.
- B. The LRV Supplier shall be considered to have achieved a Base Order Payment Milestone when the Eligibility Requirements for Milestone Payment, as indicated in *Table 2: Base Order Payment Milestone Eligibility Requirements* below, have been met.

Table 2: Base Order Payment Milestone Eligibility Requirements

Base Order Payment Milestone	Base Order Payment Milestone Description	Eligibility Requirements for Milestone Payment
<i>M₁</i>	Completion of Conceptual Design Review	<ul style="list-style-type: none"> A Conceptual Design Certificate has been issued by the City in accordance with Section 4.1.3.G of Schedule 2 [<i>Submittal Requirements and Review Procedure</i>].
<i>M₂</i>	Completion of Preliminary Design Review	<ul style="list-style-type: none"> A Preliminary Design Certificate has been issued by the City in accordance with Section 4.1.3.H of Schedule 2 [<i>Submittal Requirements and Review Procedure</i>].
<i>M₃</i>	Acceptance of Final Design Review	<ul style="list-style-type: none"> A Final Design Certificate has been issued by the City in accordance with Section 4.1.3.I of Schedule 2 [<i>Submittal Requirements and Review Procedure</i>].
<i>M₄</i>	Completion of all activities on the First Article Inspection List	<ul style="list-style-type: none"> The FAI Completion Certificate has been issued by the City in accordance with Section 2.6.5.K of Schedule 3 [<i>Design and Manufacturing Protocols</i>].
<i>M₅</i>	The first LRV in the Base Order to achieve Conditional Acceptance	<ul style="list-style-type: none"> The first LRV Conditional Acceptance Certificate for an LRV in the Base Order is issued by the City, in accordance with Section 9.4.2 [<i>Conditional Acceptance Certification Process</i>] of Schedule 3 [<i>Design and Manufacturing Protocols</i>].
<i>M₆</i>	The first LRV in the Base Order to achieve Final Acceptance	<ul style="list-style-type: none"> The first LRV Final Acceptance Certificate for an LRV in the Base Order is issued by the City, in accordance with Section 9.4.4 [<i>Final Acceptance Certification Process</i>] of Schedule 3 [<i>Design and Manufacturing Protocols</i>].
<i>M₇</i>	Conditional Acceptance of a subsequent LRV in the Base Order	<ul style="list-style-type: none"> An LRV Conditional Acceptance Certificate for an LRV in the Base Order is issued by the City, in accordance with Section 9.4.2 [<i>Conditional Acceptance Certification Process</i>] of Schedule 3 [<i>Design and Manufacturing Protocols</i>]. For clarity, this Milestone 7 cannot be achieved prior to completion of Milestone 5. The Eligibility Requirements for Milestone Payment of Milestone 7 will occur for each subsequent LRV in the Base Order that achieves Conditional Acceptance after the first LRV in the Base Order to achieve Conditional Acceptance.
<i>M₈</i>	Final Acceptance of a subsequent LRV in the Base Order	<ul style="list-style-type: none"> An LRV Final Acceptance Certificate for an LRV in the Base Order is issued by the City, in accordance with Section 9.4.4 [<i>Final Acceptance Certification Process</i>] of Schedule 3 [<i>Design and Manufacturing Protocols</i>]. For clarity, this Milestone 8 cannot be achieved prior to completion of Milestone 6. The Eligibility Requirements for Milestone Payment of Milestone 8 will occur for each subsequent LRV in the Base Order that achieves Final Acceptance after the first LRV in the Base Order to achieve Final Acceptance.
<i>M₉</i>	Conditional Acceptance of all LRVs in the Base Order	<ul style="list-style-type: none"> All LRV Conditional Acceptance Certificates for the LRVs in the Base Order have been issued by the City, in accordance with Section 9.4.2 [<i>Conditional Acceptance Certification Process</i>] of Schedule 3 [<i>Design and Manufacturing Protocols</i>]. For clarity, this Milestone 9 cannot be achieved prior to the completion of Milestone 7.

Base Order Payment Milestone	Base Order Payment Milestone Description	Eligibility Requirements for Milestone Payment
<i>M</i> ₁₀	Completion of training programs	<ul style="list-style-type: none"> The Training Program Completion Certificate has been issued by the City, in accordance with Section 10.4.7.B of Schedule 3 [<i>Design and Manufacturing Protocols</i>].
<i>M</i> ₁₁	The Fleet Acceptance Certificate has been issued	<ul style="list-style-type: none"> The Fleet Acceptance Certificate has been issued by the City, in accordance with Section 9.4.5 [<i>Fleet Acceptance</i>] of Schedule 3 [<i>Design and Manufacturing Protocols</i>]. For clarity, this Milestone 11 cannot be achieved prior to the completion of Milestones 1-10.

SECTION 4: PAYMENT ADMINISTRATION AND INVOICING

4.1 PAYMENT ADMINISTRATION

- A. Where applicable, any payment owing to the LRV Supplier may be adjusted in accordance with Section 2 [*Payment Terms*] for:
1. LRV Supplier Indemnities;
 2. City Indemnities;
 3. Termination;
 4. Changes;
 5. Insurance;
 6. Liquidated Damages; and
 7. Disputes as set out in Section 15 [*Dispute Resolution*] of the Supply Agreement;
- as set out in this Schedule 9 [*Pricing and Payment*] and otherwise in accordance with the Supply Agreement.
- B. When the LRV Supplier achieves a Base Order Payment Milestone or becomes eligible for payment of an Option, the LRV Supplier shall deliver a draft invoice to the City's Representative, that is consistent with the amount eligible for payment and any applicable adjustments pursuant to Section 4.1 A [*Payment Administration*].
- C. The invoice delivered pursuant to Section 4.1 B [*Payment Administration*] shall comply with all invoice requirements listed in Section 4.2 B. [*Invoicing Instructions*].
- D. Invoices that do not comply with Section 4.2 B [*Invoicing Instructions*] will be rejected by the City's Representative and the LRV Supplier will be required to deliver an updated draft invoice.
- E. To the extent that the City's Representative determines that the LRV Supplier has not met the requirements necessary to be entitled to receive a Milestone Payment or payment for an Option, the City's Representative shall provide the LRV Supplier with a notice setting out the deficiencies to be addressed by the LRV Supplier and the LRV Supplier shall provide an updated draft invoice.
- F. To the extent that the City's Representative determines that the LRV Supplier has met the requirements necessary to be entitled to receive a Milestone Payment or a payment for an Option and that the LRV Supplier has delivered a complete and correct draft invoice, in accordance with the requirements of this Schedule, then the LRV Supplier shall submit their final invoice to the City using SAP Ariba, or such other invoicing system as specified by the City, in PDF format, and the City shall pay the amount owing to the LRV Supplier, not later than the 30th Business Day after the City has received the invoice in SAP Ariba, or such other invoicing system as specified by the City, and all the documents required pursuant to Section 4.2 B [*Payment Administration*].

4.2 INVOICING INSTRUCTIONS

- A. The date of receipt of an invoice by the City in SAP Ariba, or such other invoicing system as specified by the City, shall be the invoice date for the purpose of calculating the payment due date pursuant to Section 4.1 F [*Payment Administration*]. In the event that SAP Ariba, or such other invoicing system as specified by the City, experiences technical disruption and sending an invoice for payment through SAP Ariba, or such other invoicing system as specified by the City, is not possible due to the technical disruption, the LRV Supplier shall comply with any direction provided by the City, with regard to issuing an invoice for payment through other means, if the City deems it necessary for an invoice for payment to be issued before the technical disruption is resolved.
- B. All invoices submit by the LRV Supplier shall contain the following items:
1. the LRV Supplier's full legal name, which must match with the LRV Supplier's name as recorded in the applicable City vendor master record;
 2. the word 'invoice';
 3. the PO number;
 4. a unique invoice number;
 5. an invoice date;
 6. the City's address;
 7. the contract number or contract description;
 8. the Base Order Payment Milestone number and description (if applicable)
 9. the description of the Option (if applicable);
 10. the calculation of the amount owing for payment, inclusive of:
 - a. the Milestone Payment amount (if applicable);
 - b. amounts owing for payment of an Option (if applicable);
 - c. amounts owing for Taxes;
 - d. amounts owing as a result of Section 2.1 [*Payment by the City*]; and
 - e. amounts owing as a result of Section 2.3 [*Payment by LRV Supplier*];
 11. the value of all GST charged, as a separate line item; and
 12. supporting documentation that includes, at minimum:
 - a. an LRV Supplier Payment Certificate;
 - b. a copy of the relevant certificate for the Base Order Payment Milestone, if applicable;
 - c. a copy of the relevant certificate for the Supplementary LRV Payment Milestone, if applicable;

- d. a copy of the relevant Spare Part Acceptance Certificate issued in respect of optional Spare Parts pursuant to Appendix 9B [*Options*], if applicable;
- e. a copy of the relevant Special Tool Acceptance Certificate issued in respect of optional Special Tools pursuant to Appendix 9B [*Options*], if applicable;
- f. documentation for amounts owing as a result of Section 2.1 [*Payment by the City*]; and
- g. documentation for amounts owing as a result of Section 2.3 [*Payment by LRV Supplier*].

APPENDIX 9A: LRV SUPPLIER PAYMENT CERTIFICATE

The invoice delivered pursuant to Section 4.1 B [*Payment Administration*] shall be accompanied by a monthly payment certificate in a form agreed to by the City substantially similar to the LRV Supplier Payment Certificate below:

LETTERHEAD + ...

This letter, together with the attached documents, constitutes LRV Supplier's request for payment in the amount of \$[●] for the **Base Order Payment Milestone [●] or Option for [●]**.

Capitalized terms used and not defined shall have the meanings given to them as defined in the Supply Agreement. "Disclosed" means disclosed to the City in writing prior to the date hereof or specifically set out in the attached documents with a reference to the applicable Section of this request.

LRV Supplier is familiar with and has examined the provisions of the Supply Agreement. As of the date hereof, LRV Supplier hereby represents, warrants and certifies to the City that:

1. LRV Supplier does not have knowledge, having made all reasonable enquiries, of any matter that is:
 - materially and adversely affecting or impairing the ability of LRV Supplier to perform its obligations under the Supply Agreement;
 - materially and adversely affecting or impairing the Work, including the ability of LRV Supplier to achieve all Key Dates; or
 - resulting in the occurrence of a Termination Event under the Supply Agreement;and that has not been disclosed;
2. LRV Supplier has provided notice, in accordance with this Supply Agreement, to the City of any Relief Events or Force Majeure Events that have affected Work during the period;
3. LRV Supplier has or will have available to it, as and when required, all the authorizations that are necessary to carry out the Work being performed;
4. To the best of LRV Supplier's knowledge, LRV Supplier has or will have the right to use, or has entered into a binding agreement under which it will acquire or have the right to use, all Intellectual Property rights necessary for it to perform its obligations under the Supply Agreement and LRV Supplier has notified the City of any assertion of adverse claim by a third party to any such Intellectual Property rights;
5. To the best of LRV Supplier's knowledge (after all due enquiry), no Intellectual Property right owned by LRV Supplier or any third party and necessary for LRV Supplier to perform its obligations under the Supply Agreement is being infringed, nor is there any threatened infringement of any such Intellectual Property right, and that has not been disclosed;
6. LRV Supplier has taken all formal and procedural actions (including payment of fees) required to maintain any material Intellectual Property rights owned by LRV Supplier;
7. The Work covered by this request is in accordance with LRV Supplier's obligations under the Supply Agreement;
8. All the Subcontractors have been paid in full all amounts that are due and owing as of the month immediately preceding the month represented by this request except for holdbacks (including for amounts disputed in good faith) required or permitted to be made under the Subcontracts, if applicable;
9. LRV Supplier is entitled to payment in the amount requested in this request; and
10. No Termination Event has occurred that is continuing.

This request is made subject to and in accordance with the terms and conditions of the Supply Agreement.

SIGNATURES +...

APPENDIX 9B: OPTIONS

APPENDIX 9B.1: OPTIONS

APPENDIX 9B.1.1: GENERAL

- A. The City, and any permissible assignee pursuant to Section 19.7 [*Assignment by City*] of the Supply Agreement, may exercise the option to purchase Spare Parts in excess of the Base Order Spare Parts and Special Tools in excess of the Recommended Special Tools and Diagnostic Test Equipment List (CDRL 03-113) that is included in the Base Order, and Supplementary LRVs in accordance with this Appendix 9B.1.1 [*General*].
- B. The City may exercise or assign some or all of the Options included in this Appendix 9B [*Options*] at its sole and absolute discretion.
- C. The City, or its permissible assignee pursuant to Section 19.7 [*Assignment by City*] of the Supply Agreement, shall order the quantities of each item included in an Option by written notice, using a purchase order, to the LRV Supplier on or before the deadline for selection of an Option listed in Appendix 9B [*Options*]. Any purchase orders issued by the City will be issued using SAP Ariba and the Contractor agrees to receive purchase orders in this form.
- D. The City, or its permissible assignee pursuant to Section 19.7 [*Assignment by City*] of the Supply Agreement, shall be permitted to place one or more such orders for Options provided the orders adhere to the timeline for each Option listed in this Appendix 9B.1 [*Options*].
- E. The required delivery date for each item ordered as an Option shall be subject to mutual agreement between the City, or its permissible assignee pursuant to Section 19.7 [*Assignment by City*] of the Supply Agreement, and the LRV Supplier.

APPENDIX 9B.1.2: OPTION FOR SPARE PARTS

- A. The City, and any permissible assignee pursuant to Section 19.7 [*Assignment by City*] of the Supply Agreement, has the option to purchase Spare Parts. The pricing for optional Spare Parts shall be in accordance with Appendix 9B.2.1 [*Pricing for Spare Parts*]. The City shall have the right to exercise its option to order Spare Parts at any time prior to Conditional Acceptance of the 40th LRV in the Base Order. Any option to purchase Spare Parts exercised after Conditional Acceptance of the 40th LRV in the Base Order shall be subject to mutual agreement by the LRV Supplier and the City. The City, or its permissible assignee pursuant to Section 19.7 [*Assignment by City*] of the Supply Agreement, and the LRV Supplier mutually agree to the payment for Spare Parts to be in accordance with Appendix 9B.3.1 [*Payment for Spare Parts*].
- B. All optional Spare Parts shall be provided in accordance with the terms of this Supply Agreement.

APPENDIX 9B.1.3: OPTION FOR SPECIAL TOOLS

- A. The City, and any permissible assignee pursuant to Section 19.7 [*Assignment by City*] of the Supply Agreement, has the option to purchase Special Tools. The pricing for optional Special Tools shall be in accordance with Appendix 9B.2.2 [*Pricing for Special Tools*]. The City shall have the right to exercise its option to order Special Tools at any time prior to Conditional Acceptance of the 28th LRV in the Base Order. Any option to purchase Special Tools exercised after Conditional Acceptance of the 28th LRV in the Base Order shall be subject to mutual agreement by the LRV Supplier and the

City. The City, or its permissible assignee pursuant to Section 19.7 [Assignment by City] of the Supply Agreement, and the LRV Supplier mutually agree to the payment for Special Tools to be in accordance with Appendix 9B.3.2 [Payment for Special Tools].

B. All optional Special Tools shall be provided in accordance with the terms of this Supply Agreement.

APPENDIX 9B.1.4: OPTION FOR SUPPLEMENTARY LRVs

A. The City, and any permissible assignee pursuant to Section 19.7 [Assignment by City] of the Supply Agreement, has the option to purchase up to six Supplementary LRVs. The pricing for Supplementary LRVs shall be in accordance with Appendix 9B.2.3 [Pricing for Supplementary LRVs]. The City shall order in increments of two Supplementary LRVs and the maximum total quantity ordered under this option is six Supplementary LRVs. The City shall have the right to exercise its option to order Supplementary LRVs on the following basis:

1. At any time prior to the 180th day after Notice to Proceed. Supplementary LRVs ordered under this option shall achieve Conditional Acceptance by the date which is three months after the scheduled date of Conditional Acceptance of the 40th LRV in the Base Order.
2. At any time later than the 180th day after Notice to Proceed, but prior to the 90th day after Conditional Acceptance of the 4th LRV in the Base Order. Supplementary LRVs ordered under this option shall achieve Conditional Acceptance by the date which is nine months after the scheduled date of Conditional Acceptance of the 40th LRV in the Base Order.

Any option to purchase Supplementary LRVs exercised later than the 90th day after Conditional Acceptance of the 4th LRV in the Base Order shall be subject to mutual agreement by the LRV Supplier and the City. The City, or its permissible assignee pursuant to Section 19.7 [Assignment by City] of the Supply Agreement, and the LRV Supplier mutually agree to the payment for Supplementary LRVs to be in accordance with Appendix 9B.3.3 [Payment for Supplementary LRVs].

B. All Supplementary LRVs shall be provided in accordance with the terms of this Supply Agreement.

APPENDIX 9B.2: PRICING FOR OPTIONS

APPENDIX 9B.2.1: PRICING FOR SPARE PARTS

A. The price for each optional Spare Part is:

Table 9B-1: Pricing for Optional Spare Parts

Item Description	Price	Unit of Measure	Minimum Order Quantity
██████████	██████████	█	█
██████████	██████████	█	█
██████████	██████████	█	█
██████████	██████████	█	██████
██████████	██████████	█	█
██████████	██████████	█	█
██████████	██████████	█	█

Item Description	Price	Unit of Measure	Minimum Order Quantity
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

- B. Upon submission of the Recommended Spare Parts List (CDRL 03-36), the LRV Supplier shall provide justification for all new Spare Parts that are not listed in the table included in Appendix 9B.2.1 A. The LRV Supplier shall also provide justification for all pricing that has increased and/or decreased by 10% or more from the Spare Parts listed in the table included in Appendix 9B.2.1 A.
- C. Upon acceptance of the Recommended Spare Parts List (CDRL 03-36) by the City, the LRV Supplier shall be entitled to a Change Order pursuant to Schedule 13 [Changes] incorporating the Recommended Spare Parts and their associated pricing into Appendix 9B.2.1 A.

APPENDIX 9B.2.2: PRICING FOR SPECIAL TOOLS

- A. The price for each optional Special Tool is:

Table 9B-2: Pricing for Optional Special Tools

Item Description	Price	Unit of Measure	Minimum Order Quantity
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

Item Description	Order Confirmation	Price	Unit of Measure
Supplementary LRV	At any time later than the 180 th day after Notice to Proceed, but prior to the 90 th day after Conditional Acceptance of the 4 th LRV in the Base Order	██████████	Each

APPENDIX 9B.3: OPTION PAYMENTS

APPENDIX 9B.3.1: PAYMENT FOR SPARE PARTS

- A. Subject to the provisions of this Schedule 9 [*Pricing and Payment*], the City shall pay the LRV Supplier for optional Spare Parts where such payments shall be due to LRV Supplier.
- B. Payment for an optional Spare Part shall be due to the LRV Supplier upon the City’s issuance of a Spare Part Acceptance Certificate, in respect of an optional Spare Part, pursuant to Section 9.4.9 [*Spare Parts Acceptance Process*] of Schedule 3 [*Design and Manufacturing Protocols*].
- C. Each payment for optional Spare Parts shall be calculated and paid in accordance with this Appendix 9B.3.1 [*Payment for Spare Parts*] and in accordance with Section 2 [*Payment Terms*] and Section 4 [*Payment Administration and Invoicing*].
- D. The City will make payment of each optional Spare Part in accordance with the price listed in Appendix 9B.2.1 [*Pricing for Spare Parts*].
- E. Notwithstanding anything else to the contrary in this Supply Agreement, to the extent that the City exercises an Option to purchase Spare Parts in accordance with Appendix 9B.2 [*Pricing for Options*], payment administration and invoicing for Spare Parts, shall be in accordance with Section 4 [*Payment Administration and Invoicing*].
- F. The LRV Supplier shall be eligible for payment of each optional Spare Part upon the City’s issuance of a Certificate of Acceptance issued in respect of the Spare Part.

APPENDIX 9B.3.2: PAYMENT FOR SPECIAL TOOLS

- A. Subject to the provisions of this Schedule, the City shall pay the LRV Supplier for optional Special Tools where such payments shall be due to LRV Supplier.
- B. Payment for optional Special Tools shall be due to the LRV Supplier upon the City’s issuance of a Special Tool Acceptance Certificate, in respect of an optional Special Tool, pursuant to Section 9.4.7 [*Special Tools Acceptance Certification Process*] of Schedule 3 [*Design and Manufacturing Protocols*].
- C. Each payment for optional Special Tools shall be calculated and paid in accordance with this Appendix 9B.3.2 [*Payment for Special Tools*] and in accordance with Section 2 [*Payment Terms*] and Section 4 [*Payment Administration and Invoicing*].
- D. The City will make payment of each optional Special Tool in accordance with the price listed in Appendix 9B.2.2 [*Pricing for Special Tools*].

- E. Notwithstanding anything else to the contrary in this Supply Agreement, to the extent that the City exercises an Option to purchase Special Tools in accordance with Appendix 9B.2 [*Pricing for Options*], payment administration and invoicing for Special Tools, shall be in accordance with Section 4 [*Payment Administration and Invoicing*].
- F. The LRV Supplier shall be eligible for payment of each optional Special Tool upon the City's issuance of a Certificate of Acceptance issued in respect of the Special Tool.

APPENDIX 9B.3.3: PAYMENT FOR SUPPLEMENTARY LRVs

- A. Subject to the provisions of this Schedule, the City shall pay the LRV Supplier for Supplementary LRVs where such payments shall be due to the LRV Supplier.
- B. Each Milestone Payment for Supplementary LRVs shall be calculated and paid in accordance with this Appendix 9B.3.3 [Payment for Supplementary LRVs] and in accordance with Section 2 [*Payment Terms*] and Section 4 [*Payment Administration and Invoicing*].
- C. The City will make payment of each Supplementary LRV price listed in Appendix 9B.2.3 [Pricing Amount for Supplementary LRVs] in accordance with the Supplementary LRV Payment Milestones as listed below in *Table 9B-4: Supplementary LRV Payment Milestones* below:

Table 9B-4: Supplementary LRV Payment Milestones

Supplementary LRV Payment Milestone No.	Supplementary LRV Payment Milestone Description	Supplementary LRV Milestone Payment Value (%)	Supplementary LRV Milestone Payment Amount (\$)	Supplementary LRV Milestone Payment Amount (\$)
			At any time prior to the 180 th day after Notice to Proceed	At any time later than the 180 th day after Notice to Proceed, but prior to the 90 th day after Conditional Acceptance of the 4 th LRV in the Base Order
<i>SM</i> ₁	Submittal of Supplementary LRV order acknowledgement	35.000	██████████	██████████
<i>SM</i> ₂	Conditional Acceptance of a Supplementary LRV	25.000	██████████	██████████
<i>SM</i> ₃	Final Acceptance of a Supplementary LRV	20.000	██████████	██████████
<i>SM</i> ₄	Final Acceptance Certificates have been issued for all Supplementary LRVs	20.000	██████████	██████████
Total		100.00	██████████	██████████

- D. For clarity, the Supplementary LRV Milestone Payment Value and the Supplementary LRV Milestone Payment Amount in *Table 9B-4: Supplementary LRV Payment Milestones*, are equal to 100% of the

Supplementary LRV price listed in Appendix 9B.2.3 [Pricing for Supplementary LRVs] and shall be applied to each Supplementary LRV ordered by the City.

- E. The City will not, at any time, make a Supplementary LRV Milestone Payment to the LRV Supplier if a Supplementary LRV Payment Milestone has not been achieved.
- F. The LRV Supplier shall be considered to have achieved a Supplementary LRV Payment Milestone when the Eligibility Requirements for Supplementary LRV Milestone Payment, have been met and the relevant certificate has been issued by the City, as described in *Table 9B-5: Eligibility Requirements for Supplementary LRV Payment Milestones* below:

Table 9B-5: Eligibility Requirements for Supplementary LRV Payment Milestones

Supplementary LRV Payment Milestone No.	Supplementary LRV Payment Milestone Description	Supplementary LRV Milestone Payment Eligibility Requirement
<i>SM₁</i>	Submittal of Supplementary LRV order acknowledgement	<ul style="list-style-type: none"> • The LRV Supplier has returned a signed copy of the purchase order, or other such document as specified by the City, to the City, indicating acknowledgement of the Supplementary LRV(s) ordered.
<i>SM₂</i>	Conditional Acceptance of a Supplementary LRV	<ul style="list-style-type: none"> • An LRV Conditional Acceptance Certificate for a Supplementary LRV is issued by the City, in accordance with Section 9.4.2 [<i>Conditional Acceptance Certification Process</i>] of Schedule 3 [<i>Design and Manufacturing Protocols</i>]. • For clarity, this Supplementary Milestone 2 cannot be achieved prior to completion of Supplementary Milestone 1.
<i>SM₃</i>	Final Acceptance of a Supplementary LRV	<ul style="list-style-type: none"> • A Final Acceptance Certificate for a Supplementary LRV is issued by the City, in accordance with Section 9.4.4 [<i>Final Acceptance Certification Process</i>] of Schedule 3 [<i>Design and Manufacturing Protocols</i>]. • For clarity, this Supplementary Milestone 3 cannot be achieved prior to completion of Supplementary Milestone 2.
<i>SM₄</i>	Final Acceptance Certificates have been issued for all Supplementary LRVs	<ul style="list-style-type: none"> • Final Acceptance Certificates have been issued by the City in respect of all Supplementary LRVs ordered, in accordance with Section 9.4.4 [<i>Final Acceptance Certification Process</i>] of Schedule 3 [<i>Design and Manufacturing Protocols</i>]. • For clarity, this Supplementary Milestone 4 cannot be achieved prior to the completion of Supplementary Milestones 1-3 for all Supplementary LRVs ordered.

**THE CITY OF EDMONTON
VALLEY LINE WEST LRT**

LRV SUPPLY AGREEMENT

Schedule 10 – Representatives and Key Individuals

VALLEY LINE WEST LRT
SCHEDULE 10 – REPRESENTATIVES AND KEY INDIVIDUALS

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LIST OF FIGURES

Not applicable.

LIST OF TABLES

Not applicable.

SECTION 1: CITY REPRESENTATIVE

1.1 APPOINTMENT OF THE CITY REPRESENTATIVE

- A. The City has appointed the City Representative to act as its representative and agent for the Supply Agreement and all aspects of the Work. The City Representative shall be entitled to exercise the functions set out in Section 1.3 [*Functions of the City Representative*].
- B. During any period when there is no City Representative, the functions that would otherwise be performed by the City Representative shall be carried out by another person that the City may designate by notice to the LRV Supplier.
- C. The City shall use commercially reasonable efforts to give reasonable advance notice of any such designation to the LRV Supplier where practicable.
- D. Except as expressly stated in this Supply Agreement, the City Representative does not have any authority to release or relieve the LRV Supplier of any of its obligations under this Supply Agreement or any other Project Document.
- E. The LRV Supplier and the Project Manager, except as otherwise notified by the City to the LRV Supplier and subject to Section 1.1 F, are entitled to treat any act of the City Representative as being expressly authorized by the City, and shall not be required to determine whether any express authority has, in fact, been given to such individual.
- F. Any decision by the City Representative is specific to the circumstances to which it relates, and shall not be construed as binding on, or limiting, any other decision to be made by the City or the City Representative, whether in the same or similar circumstances or otherwise.
- G. In the exercise of any of its functions, the City Representative may do any of the following:
 - 1. refer any matter to the City or any other person for advice or determination;
 - 2. rely upon any advice received or determination made following a reference in accordance with Section 1.1 G.1;
 - 3. rely on any other advice the City Representative considers necessary or appropriate in the circumstances; and
 - 4. in accordance with, and subject to the limitations in, Section 1.4 [*Delegation*], designate any other person to attend any meeting, review, inspection, test, or other activity that is permitted to be attended by the City under the terms of this Supply Agreement.
- H. The City Representative shall work with the Project Manager in the spirit of partnering and cooperation in the administration of this Supply Agreement.

1.2 CHANGE OF THE CITY REPRESENTATIVE

- A. The City may at any time and from time to time by notice to the LRV Supplier terminate the appointment of the City Representative or appoint one or more substitute City Representative(s) or temporary "acting" City Representative(s). Any such notice shall specify the effective date of such termination, appointment, or substitution, and the City shall use commercially reasonable efforts to give reasonable advance notice of any such appointment to the LRV Supplier where practicable.

1.3 FUNCTIONS OF THE CITY REPRESENTATIVE

- A. The City Representative may perform functions under this Supply Agreement including the following:

1. monitoring all aspects and activities of the LRV Supplier's performance of the Work in accordance with the requirements of the Supply Agreement by any means, including the system of inspection, testing, certification, review, and audits set out in this Supply Agreement;
2. attending site and other progress and technical meetings, including in the company of such other City representatives, consultants, contractors, Governmental Authorities, and advisors as the City Representative considers appropriate, and receiving and reviewing records and reports;
3. monitoring and reviewing the compliance by the LRV Supplier with Applicable Law, Good Industry Practice, and the requirements of the Supply Agreement;
4. requesting Changes in accordance with Schedule 13 [*Changes*], receiving and considering Innovation Proposals in accordance with Schedule 13 [*Changes*], negotiating and making all consequential decisions on behalf of the City, including issuing Change Enquiries and Change Directives under Schedule 13 [*Changes*], and countersigning Change Order Confirmations under Schedule 13 [*Changes*] in respect of such Changes and Innovation Proposals;
5. making and receiving claims in respect of Force Majeure Events and Relief Events, and negotiating and making all consequential decisions on behalf of the City for such claims;
6. auditing and monitoring the LRV Supplier's implementation of and compliance with the QMS and Quality Manual described in Section 2 [*Quality Assurance*] of Schedule 3 [*Design and Manufacturing Protocols*];
7. monitoring the LRV Supplier's implementation of and compliance with the RAMS Program described in Section 3 [*Reliability, Availability, Maintenance, and Safety*] of Schedule 3 [*Design and Manufacturing Protocols*];
8. inspecting and auditing the Project Records required to be retained in accordance with this Supply Agreement;
9. receiving and dealing with all matters submitted to the Review Procedure or for information only in accordance with any provision of this Supply Agreement or any other Project Document; and
10. performing any other functions under this Supply Agreement or any other Project Document that are to be carried out by the City.

1.4 DELEGATION

- A. The City Representative may delegate any of its authorities, duties, or functions under this Supply Agreement to a committee, individual, or other representative by written notice to the Project Manager.
- B. The City Representative notice of delegation shall include the name of the committee, individual, or other representative to whom the authority, duty, or function has been delegated and the time frame or period to which this delegation shall extend.
- C. The City Representative may rescind, change, modify, supplement, or terminate in whole or in part any delegation as contemplated by Section 1.4 [*Delegation*] at any time by written notice to the Project Manager.

SECTION 2: KEY INDIVIDUALS

2.1 KEY INDIVIDUALS

- A. The LRV Supplier shall appoint competent and qualified persons to act as Key Individuals in connection with the Supply Agreement and in compliance with this Schedule.
- B. The LRV Supplier shall do the following:
 - 1. ensure the Key Individuals remain involved in the Work in the capacity set out in Section 2 [*Key Individuals*] in respect of their particular roles;
 - 2. provide each Key Individual sufficient access to the LRV Supplier's senior leadership and to the resources and information necessary for each Key Individual to perform the role and responsibilities; and
 - 3. empower each Key Individual to perform their roles and responsibilities.
- C. Unless otherwise stated, and notwithstanding transition periods described in Section 2.2 [*Change of Key Individual or Job Specifications or Responsibilities*], each Key Individual role will only be filled by a single individual at any single point in time.

2.2 CHANGE OF KEY INDIVIDUAL OR JOB SPECIFICATIONS OR RESPONSIBILITIES

- A. The LRV Supplier shall appoint, with the prior written consent of the City Representative, such consent not to be unreasonably withheld, a substitute Key Individual to serve in the place of the then current Key Individual during any temporary unavailability of any Key Individual to ensure that at all times during the relevant period there is an accepted Key Individual available for each position in compliance with this Section 2 [*Key Individuals*]. For the purpose of this provision, "temporary unavailability" arises as a result of vacation, illness, family emergencies, or other such temporary circumstances that may arise and are acceptable to the City acting reasonably, and not longer than 40 Business Days in the aggregate in any one calendar year.
- B. The LRV Supplier shall not change any Key Individual or change any Key Individual's job specifications or responsibilities without the prior written consent of the City Representative, except in the case of death, serious illness, other bona fide extenuating circumstance that in the opinion of the City, acting reasonably renders the change to the Key Individual to be in the best interests of the Supply Agreement, or resignation of the Key Individual from the organization through which he/she is employed. For clarity, a transfer, including by way of resignation and rehiring, or other reallocation of such Key Individual from one organizational entity to an affiliated organizational entity does not constitute a resignation of such Key Individual for the purposes of this Section 2.2.
- C. In the case of death, serious illness, extenuating circumstance, or resignation as described in Section 2.2 B, the LRV Supplier shall do the following:
 - 1. use all reasonable efforts to retain a temporary replacement with similar qualifications and experience to the unavailable Key Individual, pending consent to a permanent replacement by the City Representative; and
 - 2. seek the consent of the City Representative to a permanent replacement, with qualifications and experience as outlined in Section 2 [*Key Individuals*], as soon as practicable following the unavailability of such Key Individual and shall have a consented to permanent replacement no later than 60 days following the date of first unavailability.
- D. If the LRV Supplier considers it necessary to change any Key Individual other than in cases of death, serious illness, extenuating circumstances, or resignation as described in Section 2.2 B, or to change

a Key Individual's job specifications or responsibilities, then the LRV Supplier shall request the changes in a written notice to the City Representative together with relevant information on the proposed changes and consult with the City Representative on the proposed changes.

- E. The LRV Supplier shall not implement any such proposed changes without the prior written consent of the City Representative, such consent not to be unreasonably withheld.
- F. For the purposes of Section 2.2 [*Change of Key Individual or Job Specifications or Responsibilities*], the City will be deemed to be acting reasonably in withholding its consent to the proposed change to a Key Individual if the qualifications, work experience, commitment, and other credentials of the proposed replacement do not meet the requirements set out in Section 2 [*Key Individuals*] for that particular position.
- G. If there is a Dispute in respect of whether the City is acting reasonably for any particular decision, the LRV Supplier shall defer making the proposed appointment, change, or substitution until the Dispute has been resolved in accordance with the Dispute Resolution Procedure.
- H. A Key Individual cannot and shall not delegate or abdicate any of their authority or power under this Supply Agreement, except where a delegation or abdication is expressly provided for by a specific provision of this Supply Agreement, or the delegation or abdication is agreed to by the City in writing.

2.3 KEY INDIVIDUALS GENERAL REQUIREMENTS

- A. The LRV Supplier will appoint the following Key Individuals for the Supply Agreement:
 - 1. Project Manager;
 - 2. Lead Engineer;
 - 3. Integration Manager;
 - 4. Quality Director; and
 - 5. Commissioning Manager.
- B. For each of the Key Individuals referred to in Section 2.3 A, such Key Individual shall do the following:
 - 1. be specifically designated for the purpose of such role and devote sufficient working time, energy, and skill as required for carrying out the duties of and meeting the commitment requirements for the respective Key Individual role; and
 - 2. be instructed and enabled by the LRV Supplier to act in a fair and impartial manner in carrying out their roles; and
 - 3. be fluent in English.

2.4 PROJECT MANAGER

2.4.1 ROLE DESCRIPTION

- A. The Project Manager Key Individual is the project manager, director, and leader of the LRV Supplier's organization, including Subcontractors, involved with the Work. They are the ultimate point of authority and decision-making on the Supply Agreement and have the day-to-day responsibility for ensuring that the LRV Supplier fulfills its ongoing obligations to the City.
- B. The Project Manager shall be directly responsible for and fully engaged in the performance of the LRV Supplier's obligations in all aspects of the Work. Without limiting the generality of the foregoing, the Project Manager role includes the following:

1. managing the Supply Agreement, ensuring all Work, including the design, manufacturing, commissioning, LRV integration, and performance demonstration, is in full compliance with this Supply Agreement;
 2. serving as the single point of contact for the LRV Supplier to the City and the City Representative for all purposes of the Work;
 3. developing the Program Management Plan, and ensuring compliance to such plan throughout the Work;
 4. developing and updating the CWS, and ensuring adherence to such schedule throughout the Work;
 5. managing contracts of all Subcontractors contracting directly with the LRV Supplier, and the oversight of contract management of all other Subcontractors, including addressing and communicating to the City Representative any issues raised by Subcontractors in respect of the Work;
 6. managing the LRV Supplier's relationships with all Subcontractors, Other Contractors, and any other key stakeholders;
 7. making decisions on behalf of the LRV Supplier in fulfillment of its obligations under this Supply Agreement;
 8. ensure all roles identified as Key Individuals are continuously occupied by high-performing individuals that are compliant with the requirements of this Supply Agreement;
 9. ensuring appropriate resources are available to support the Work;
 10. establishing clear communication and roles within the project team structure to support the Work;
 11. overseeing the safety performance, environmental performance, and quality performance of the LRV Supplier in relation to the Work;
 12. ensuring project controls such as scope, schedule, and general document control management activities are being successfully carried out;
 13. ensuring robust and effective project controls and change management procedures are implemented; and
 14. conducting and completing all project management activities required by and in accordance with the Supply Agreement and Good Industry Practice.
- C. The Project Manager shall have full authority to act on behalf of the LRV Supplier for all purposes of the Supply Agreement, and the City and the City Representative are entitled to do the following:
1. treat any act of the Project Manager in connection with this Supply Agreement or any other Project Document as being expressly authorized by the LRV Supplier, and shall not be required to determine whether any express authority has in fact been given to such individual; and
 2. refuse to recognize any act in connection with this Supply Agreement or any other Project Document of any employee or representative of the LRV Supplier other than the Project Manager.
- D. The Project Manager shall work together with the City Representative in the spirit of partnering and cooperation.

2.4.2 COMMITMENT

A. The Project Manager shall do the following:

1. become responsible for the management and administration of the Work as of NTP;
2. throughout the Term, be physically located and present 25% of each three-month period in the Greater Edmonton Area and be accessible at the LRV Supplier's office space in Edmonton; and
3. at all times throughout the Term, be available to fulfill the full extent of the role and be reasonably available to meet, virtually or in-person, with the City Representative on 24 hours' notice, or as otherwise required in the circumstances.

B. Notwithstanding Section 2.3 B [*Key Individuals General Requirements*], the Project Manager shall devote all working time, energy, and skill to the Supply Agreement and to carrying out the duties of the Project Manager.

2.4.3 QUALIFICATIONS

A. The Project Manager shall have qualifications that are, in the opinion of the City, substantially equivalent to the following:

1. be an employee of the LRV Supplier;
2. have direct experience performing in a similar role, with similar responsibilities to what is described in the role description for this Key Individual, for a substantial time period on a similarly scoped rail transit vehicle design-manufacturing project at least once since the year 2015;
3. have demonstrated leadership ability in managing large multidisciplinary design-manufacturing teams on projects valued over \$250 million CAD and achieving project objectives;
4. have demonstrated relevant experience being the single point of contact with a public sector client;
5. hold a professional designation relevant to the role; and
6. be reasonably able to commit for the duration of the Term.

2.5 LEAD ENGINEER

2.5.1 ROLE DESCRIPTION

A. The Lead Engineer Key Individual is responsible for the day-to-day direction, management, and coordination of all of the design and manufacturing work, having the authority within the LRV Supplier organization to give direction on all design and manufacturing responsibilities and decisions. This Key Individual reports directly to the Project Manager.

B. The Lead Engineer shall be directly responsible for and fully engaged in the following:

1. ensuring the design and manufacturing is in full compliance with this Supply Agreement, including matters relating to quality, safety, environment, and life cycle performance;
2. developing the Design Quality Management Plan and the Manufacturing Quality Management Plan, and ensuring compliance to such plans throughout the Work;
3. liaising with other Key Individuals to ensure that design, manufacturing, and integration activities are coordinated to meet the requirements of the Work;

4. establishing, confirming, and continuously developing the design concepts to meet the identified and derived requirements of the Supply Agreement;
 5. leading and managing the design teams and design process to ensure design deliverables are coordinated and delivered to meet the Requirements of the Supply Agreement;
 6. leading and managing the manufacturing teams and manufacturing process to ensure manufacturing deliverables are coordinated and delivered to meet requirements of the Work;
 7. ensuring that all aspects of the Work adhere the processes established in the Change Management Plan and the Configuration Management Plan;
 8. stamping and signing documentation as required;
 9. providing project closeout documentation related to the design as manufactured;
 10. ensuring both the quality of the engineering designs and documentation, and the quality processes being used to check the engineering designs and documentation, comply with the QMS; and
 11. conducting and completing all design and manufacturing activities required by and in accordance with the Supply Agreement and Good Industry Practice.
- C. The Lead Engineer role may be filled by up to two individuals, if consented to in writing by the City acting reasonably, provided that each individual satisfies all the qualifications of Section 2.5.3 [*Qualifications*].
1. Where the Lead Engineer role is filled by two individuals, each individual will be considered as a Key Individual and will be subject to all of the same requirements, including time and location commitments, described in Section 2 [*Key Individuals*].

2.5.2 COMMITMENT

- A. The Lead Engineer shall, at all times throughout the Term, be available to fulfill the full extent of their role and be reasonably available to meet virtually, or in-person, with the City Representative on no less than 24 hours' notice.

2.5.3 QUALIFICATIONS

- A. The Lead Engineer shall have qualifications that are, in the opinion of the City, substantially equivalent to the following:
1. be an employee of, or an independent contractor directly engaged by, the LRV Supplier, or an Affiliate of the LRV Supplier;
 2. be a Professional Engineer or be eligible to become a Professional Engineer at NTP;
 3. have at least 10 years of experience in LRV design and manufacturing;
 4. have direct experience in a similar role for a substantive time period on an LRV project at least twice within the last 10 years;
 5. have demonstrated leadership ability in managing large multidisciplinary design teams on projects valued over \$250 million CAD and achieving project objectives; and
 6. be reasonably able to commit for the duration of the Term.

2.6 INTEGRATION MANAGER

2.6.1 ROLE DESCRIPTION

- A. The Integration Manager Key Individual is responsible for implementing and managing all integration and system engineering processes to ensure the LRV's systems and subsystems, when integrated with each other and with the Valley Line LRT, will produce an LRV that meets the requirements of the Supply Agreement. With respect to integration decisions, the Integration Manager shall have the full authority to act on behalf of the LRV Supplier and shall be responsible for integrating all aspects of the LRV design.
- B. The Integration Manager shall be directly responsible for and fully engaged in the following:
 - 1. serving the primary representative for the LRV Supplier in all discussions with Other Contractors, Project Co, and the Operator in regard to the integration of the LRV with the Valley Line LRT;
 - 2. providing leadership and oversight of the LRV Supplier's integration management processes;
 - 3. raising and working to resolve potential integration issues such that impacts to the Work and to the Valley Line LRT Stage 2 infrastructure timeline are minimized;
 - 4. participating in all aspects of integration management, including the oversight of the requirements management processes and implementing system engineering processes to ensure that the integrated designs meet the requirements of the Supply Agreement;
 - 5. managing the internal interfaces between all LRV systems and the external interfaces between the LRV and the Valley Line LRT, such that the LRV meets the requirements of the Supply Agreement; and
 - 6. conducting and completing all integration activities required by and in accordance with the Supply Agreement and Good Industry Practice.
- C. The Integration Manager shall liaise with the Lead Engineer to ensure integration between all aspect of the design.
- D. When requested by the City, the Integration Manager shall attend Infrastructure Integration Committee Meetings.

2.6.2 COMMITMENT

- A. The Integration Manager shall, at all times throughout the Term, be available to fulfill the full extent of the role and be reasonably available to meet virtually, or in person, with the City Representative on no less than 24 hours' notice.

2.6.3 QUALIFICATIONS

- A. The Integration Manager shall have qualifications that are, in the opinion of the City, substantially equivalent to the following:
 - 1. be an employee of, or an independent contractor directly engaged by, the LRV Supplier;
 - 2. be a Professional Engineer, or be eligible to become a Professional Engineer at NTP, with relevant project and systems engineering experience;
 - 3. have experience in the design and manufacturing of LRVs, including experience with the following:
 - a. integrating new LRVs into brownfield LRT systems;
 - b. integrating new LRVs into greenfield LRT systems; and

- c. integrating LRV systems with each other;
- 4. have experience in requirements management, including documenting high-level project requirements, generating derived requirements, analyzing, tracing, prioritizing, and confirming all requirements are incorporated in final designs;
- 5. have experience in interface and integration management, including defining, controlling, and communicating the information needed to enable integration of design elements, using a well-defined, transparent, and systemic approaches;
- 6. have detailed understanding of the LRV operation and maintenance requirements and processes;
- 7. have experience applying system engineering processes on LRV projects for the following integration activities:
 - a. LRV dynamic wheel to rail interfaces, considering wheel wear, noise mitigation, and flange interface with track infrastructure;
 - b. LRV clearance envelopes and Stop and Station Platform interfaces;
 - c. transit signal priority, train signalling, and LRV on-board signalling equipment interfaces;
 - d. track and road elevation interfaces;
 - e. LRV pantograph to OCS interfaces;
 - f. EMC between the LRV and the infrastructure;
 - g. accessibility compliance between the Platforms and the LRV thresholds;
 - h. electrical power interfaces; and
 - i. communication between the LRV and the wayside infrastructure; and
- 8. be reasonably able to commit for the duration of the Term.

2.7 QUALITY DIRECTOR

2.7.1 ROLE DESCRIPTION

- A. The Quality Director Key Individual is responsible for quality management and will have the authority to immediately stop any work activity not being performed in accordance with the requirements of the Supply Agreement, the Accepted designs, or any applicable quality documentation. This Key Individual reports directly to the Project Manager.
- B. The Quality Director shall be directly responsible for and fully engaged in the following:
 - 1. developing, implementing, maintaining, and ensuring the effective operation of the QMS;
 - 2. initiating annual quality management reviews and taking other actions necessary to ensure the continuous improvement of the QMS;
 - 3. auditing and reporting on the status of the Work and its compliance with the QMS by doing the following:
 - a. preparing the Quality Audit Plan;

- b. scheduling and coordinating Quality Audits;
 - c. ensuring all Quality Audits are conducted; and
 - d. preparing or approving quality audit reports;
4. developing and implementing a program for Corrective Actions and Preventive Actions for Deficiencies;
 5. approving and signing off on the actions taken in the close out of Deficiency Reports;
 6. managing and overseeing all reviews, checking, testing, and inspection activities and quality personnel;
 7. managing third-party testing agencies;
 8. appointing the QMS Team;
 9. immediately stopping any Work that is not being performed or carried out in accordance with the QMS;
 10. ensuring all materials or equipment received for the Work meet the specified requirements for quality;
 11. ensuring a complete and accurate record of all quality-related activities is maintained;
 12. liaising with the City and acting as the primary representative for the LRV Supplier on all matters relating to quality management;
 13. coordinating all activities that demonstrate to the LRV Supplier and the City that the QMS meets the requirements of the Supply Agreement; and
 14. carrying out any other matters that, in accordance with this Supply Agreement and Good Industry Practice, are the responsibility of the Quality Director.

2.7.2 COMMITMENT

- A. The Quality Director shall, at all times throughout the Term, be available to fulfill the full extent of the role and be reasonably available to meet virtually, or in person, with the City Representative on no less than 24 hours' notice.

2.7.3 QUALIFICATIONS

- A. The Quality Director shall have qualifications that are, in the opinion of the City, substantially equivalent to the following:
 1. be an employee of, or an independent contractor directly engaged by, the LRV Supplier;
 2. have a minimum of seven years of relevant quality management experience;
 3. have worked on a rail transit manufacturing projects, in a quality leadership role, within the last 10 years;
 4. currently hold an international certification in quality management that will be maintained for the Term; and
 5. be reasonably able to commit for the duration of the Term.

2.8 COMMISSIONING MANAGER

2.8.1 ROLE DESCRIPTION

- A. The Commissioning Manager Key Individual is responsible for directing and managing Commissioning Work and any other relevant requirements for the commissioning of each LRV.
- B. The Commissioning Manager shall be directly responsible for and fully engaged in the following:
 - 1. organizing and overseeing all Commissioning;
 - 2. organizing and performing FAIs, Type Tests and Routine Tests, acceptance tests, SATs, and SITs of LRV systems and the entire LRV;
 - 3. developing, implementing, maintaining, and ensuring the effective testing and commissioning of the LRV;
 - 4. developing the Commissioning Plan and ensuring compliance to such plan throughout the Work;
 - 5. coordinating with the Quality Director for test plans of key processes, and adhering to the developed process for identifying, reporting, and correcting Deficiencies;
 - 6. coordinating with Other Contractors, Project Co, and the Operator regarding Commissioning activities that require infrastructure integration matters on site; and
 - 7. conducting and completing all Commissioning activities required by and in accordance with the Supply Agreement and Good Industry Practice.

2.8.2 COMMITMENT

- A. The LRV Supplier shall retain a qualified Commissioning Manager, not less than three months prior to the first Commissioning Activity.
- B. The Commissioning Manager shall do the following:
 - 1. prior to delivery of the First LRV, be physically located and present as needed in Edmonton to perform the required duties; and
 - 2. at all times throughout Commissioning, be available to fulfill the full extent of the role and be reasonably available to meet virtually, or in person, with the City Representative on no less than 24 hours' notice.

2.8.3 QUALIFICATIONS

- A. The Commissioning Manager shall have qualifications that are, in the opinion of the City, substantially equivalent to the following:
 - 1. have a minimum of 10 years experience in Commissioning LRVs;
 - 2. experience performing a testing and commissioning management role on two or more completed supply contracts comparable to the Supply Agreement in size and scope;
 - 3. be a Professional Engineer; and
 - 4. be reasonably able to commit for the duration of the Term.

**THE CITY OF EDMONTON
VALLEY LINE WEST LRT**

LRV SUPPLY AGREEMENT

Schedule 11 – Insurance and Performance Security Requirements

VALLEY LINE WEST LRT
SCHEDULE 11 – INSURANCE AND PERFORMANCE SECURITY REQUIREMENTS

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LIST OF FIGURES

Not applicable.

LIST OF TABLES

Not applicable.

SECTION 1: INSURANCE REQUIREMENTS

1.1 THE LRV SUPPLIER INSURANCE

- A. The LRV Supplier shall take out, maintain in force and renew, or shall cause to be taken out, maintained in force and renewed, the insurance covers set out in Appendix 11A [*Insurance Requirements*].
- B. The LRV Supplier shall take out, maintain in force and renew, or cause to be taken out, maintained in force and renewed, insurance required by Section 2.4 [*Additional and Elective Insurance*].

SECTION 2: GENERAL INSURANCE PROVISIONS

2.1 INSURANCE ACT

- A. All of the insurance policies required to be taken out, maintained in force and renewed by or caused to be taken out, maintained in force and renewed by the LRV Supplier pursuant to this Supply Agreement shall comply with Applicable Law, including but not limited to the *Insurance Act* (Alberta).

2.2 LIABILITY NOT LIMITED BY INSURANCE

- A. Except to the extent otherwise expressly provided in this Supply Agreement, none of the insurance coverage amounts, values, limits or sub-limits specified in this Schedule shall limit the LRV Supplier's liability or obligations to the City arising under this Supply Agreement.

2.3 INSURERS AND TERMS OF POLICIES

- A. The LRV Supplier shall ensure that all policies for the insurance that it is required to obtain, maintain and renew pursuant to this Schedule are obtained, maintained and renewed with Qualified Insurers authorized or licensed, where required by law or statute, to insure the risks in question in Alberta and, subject to this Schedule 11 [*Insurance and Performance Security Requirements*], are in such forms and contain such terms and conditions which are equal to or better than those that would be obtained, maintained and renewed by a prudent manufacturer of light rail transit vehicles of similar scope and magnitude to the LRVs to be supplied pursuant to this Supply Agreement and, in addition to the required inclusions or permitted exclusions for each policy specifically described in this Schedule, include such other inclusions and exclusions as such a prudent manufacturer would require or permit.
- B. The LRV Supplier shall ensure that all insurance policies that it is required to obtain, maintain and renew pursuant to this Schedule must be in forms and with terms and conditions acceptable to the City, acting reasonably. The purpose of this Section 2.3 B is to give the City the right to have modified or deleted from the actual insurance policies terms and conditions that the City becomes aware of, including those that the City becomes aware of only after receiving certified copies of the insurance policies, that are contrary to the express intent or the spirit of the insurance requirements in this Supply Agreement.
- C. Subject to this Section 2.3 [*Insurers and Terms of Policies*], the insurance covers required under this Supply Agreement may be structured as single policies or as combinations of primary, excess and umbrella policies.

2.4 ADDITIONAL AND ELECTIVE INSURANCE

- A. The LRV Supplier shall obtain and maintain, or cause to be obtained and maintained, at its cost, all such other policies of insurance required by Applicable Law to be obtained and maintained by the LRV Supplier in connection with the performance of its obligations under this Supply Agreement ("**Additional Insurance**"); and may increase the limits or decrease the deductibles of the insurance policies it is required to take out, maintain and renew under this Schedule, provided that such increase or decrease does not reduce the amount or extent of cover available, and may obtain and maintain all such other policies of insurance which the LRV Supplier deems necessary having regard to the policies of insurance which a prudent owner and operator of light rail transit vehicles of similar scope and magnitude to the LRVs to be supplied pursuant to this Supply Agreement would obtain

and maintain, or cause to be obtained and maintained (together “**Elective Insurance**”), including directors and officers liability and corporate indemnification insurance.

- B. The City reserves the right to require the LRV Supplier to purchase such additional insurance coverage as the City may reasonably require. The City also reserves the right to request such higher or lower limits of insurance or otherwise alter the types of coverage requirements, their minimum amounts and deductibles (taking into consideration such matters as the nature of the required operations, maintenance and rehabilitation for the Infrastructure, contract value, industry standards, and/or availability of insurance) as the City may reasonably require from time to time. Any additional costs of such additional and/or amended insurance shall be borne by the City and any costs savings resulting from the implementation of such additional and/or amended insurance shall be for the account of the City.

2.5 OTHER REQUIREMENTS OF POLICIES

Each policy of insurance required to be taken out, maintained and renewed by the LRV Supplier shall:

1. be primary and not require the sharing of any loss or contribution by the City or any insurer of the City;
2. contain an endorsement to the effect that the insurer will not effect any material adverse change or amendment to the policy or any cancellation of the policy without first giving at least 90 days prior written notice by registered mail to the City and each of the other named insureds and loss payees except that this Clause (2) shall not apply to the automobile liability insurance described in Section 1.2 [*Automobile Liability Insurance*] of Appendix 11A [*Insurance Requirements*] where 60 days prior written notice of cancellation of the policy by registered mail to the City and loss payees shall be given; and
3. contain an endorsement to the effect that the policy will not be invalidated and coverage thereunder will not be denied to any insureds by reason of any breach or violation of warranties, representations, declarations or conditions contained in the policy other than as a result of a negligent act, misrepresentation or omission of such insured, except that this clause (3) shall not apply to the following insurance policies:
 - a. the automobile liability insurance described in Section 1.2 [*Automobile Liability Insurance*] of Appendix 11A [*Insurance Requirements*]; and
 - b. the workers compensation insurance described in Section 1.6 [*Workers’ Compensation Insurance*] of Appendix 11A [*Insurance Requirements*];

2.6 WAIVER OF SUBROGATION

- A. Except with respect to the insurances required under Section 1.2 [*Automobile Liability Insurance*] and Section 1.6 [*Workers’ Compensation Insurance*] of Appendix 11A [*Insurance Requirements*], each policy of insurance shall contain a waiver of subrogation as against the City, City Persons, their respective shareholders, officials, directors, officers, employees, elected officials, servants, consultants (other than design consultants) and agents.

2.7 SUBCONTRACTOR INSURANCE

- A. Except with respect to the insurances required under Section 1.3 [*All Risk Marine Cargo Insurance*] and Section 1.4 [*All Risk Property Insurance*] of Appendix 11A [*Insurance Requirements*], the LRV Supplier shall require that all Subcontractors are covered by, or obtain, the insurance described in this Schedule 11 [*Insurance and Performance Security Requirements*], provided that the LRV Supplier shall determine the applicable limits to be obtained for such insurance. The LRV Supplier shall be solely responsible and liable for any damages which the City may suffer as a direct result of the LRV Supplier's failure to comply with the foregoing.
- B. If the LRV Supplier receives notice that any Subcontractor employed by or through the LRV Supplier is not covered by any insurance required by this Schedule 11 [*Insurance and Performance Security Requirements*] to be obtained (or cause to be obtained) by the LRV Supplier, the LRV Supplier shall:
 - 1. ensure that such insurance coverage is immediately put in place;
 - 2. remove the Subcontractor from the site and ensure that such Subcontractor does not perform any further part of the Supply Agreement until after such insurance coverage is put in place; or
 - 3. if the Subcontractor cannot be covered by a particular policy as required by this Schedule 11 [*Insurance and Performance Security Requirements*], replace the Subcontractor with a new Subcontractor who can be covered by insurance required by this Schedule 11 [*Insurance and Performance Security Requirements*] or who can obtain the required insurance coverage; it being acknowledged by the LRV Supplier that the requirements of and restrictions set forth in this Supply Agreement regarding new and replaced Subcontractors shall be complied with.

2.8 EVIDENCE OF INSURANCE

- A. Prior to the execution of the Supply Agreement, the LRV Supplier will provide the City with certificates of insurance confirming that the insurances specified in this Schedule 11 [*Insurance and Performance Security Requirements*] and Appendix 11A [*Insurance Requirements*] are in full force and effect.
- B. The LRV Supplier shall provide or cause to be provided, not less than 30 days prior to expiration of any then current policy, certificates of insurance evidencing to the satisfaction of the City (acting reasonably) the renewal, extension or replacement of such insurance.
- C. No delivery to, or review or approval by, the City of any insurance certificate, insurance policy or other documentation evidencing insurance cover shall derogate from or diminish the City's or the LRV Supplier's obligations under this Supply Agreement.

2.9 THE LRV SUPPLIER DEDUCTIBLES AND SELF-INSURED RETENTIONS

- A. The LRV Supplier shall be responsible for the payment of deductibles or self-insured retentions under any policy of insurance under which it is an insured party or under any policy of insurance the LRV Supplier is required to maintain (or cause to be maintained) under this Schedule 11 [*Insurance and Performance Security Requirements*].

2.10 NO INDEMNIFICATION FOR INSURED CLAIMS

- A. The LRV Supplier shall not be entitled to claim compensation, indemnification or reimbursement from the City under this Supply Agreement to the extent that the LRV Supplier:

1. is entitled to recover any such amounts under any insurance in force at the time of loss; or
2. would have been entitled to recover any such amounts under any insurance if it had complied with its obligation to take out and maintain, or cause to be taken out and maintained, insurance in accordance with this Supply Agreement.

2.11 COMPLIANCE

- A. The LRV Supplier shall comply with the warranties, terms, conditions and requirements of all policies for the insurance required by this Schedule 11 [*Insurance and Performance Security Requirements*] and shall not do, or omit to do, or permit to be done or omitted by any LRV Supplier Person, anything with respect to the Supply Agreement or the Work that could reasonably be expected to result in the cancellation or avoidance of any insurance required by this Schedule, or that would reasonably be expected to entitle any insurer to partially or fully refuse to pay any claim under any policy for any such insurance.
- B. The City and the LRV Supplier shall, and the LRV Supplier shall cause the Subcontractors to:
 1. comply with all insurance policy warranties, terms and conditions made known to them; and
 2. take any and all special precautions necessary to prevent loss or damage occurring in or about the Work as required by the terms of any applicable policy required pursuant to Appendix 11A [*Insurance Requirements*] of this Schedule.

2.12 INCIDENT REPORTING AND INSURANCE CLAIM SETTLEMENT

- A. The LRV Supplier shall:
 1. maintain a written register of all damages, events, losses, circumstances, situations, claims or occurrences, including but not limited to incidents which might result in a claim under any of the policies of insurance required under this Schedule and of all claims made by third parties involving bodily injury, illness, death, personal injury or property damage in respect of the Work (each such incident, an “**Incident**”). Such register shall indicate the date of the Incident, the type of Incident, the circumstances giving rise to the Incident, and quarterly updates reflecting developments in such Incident until each such Incident is resolved, completed and designated as closed;
 2. allow the City to inspect such register at any time and provide a copy of such register to the City quarterly and on the City’s reasonable request;
 3. meet with the City at the City’s reasonable request to discuss any such Incident;
 4. provide reasonable access, support, documents and information to City representatives, including City insurance and risk management personnel in respect of any Incident; and
 5. without prejudice to the provisions of this Supply Agreement, comply with the City’s reasonable requests regarding communication, including but not limited to communication with claimant(s) and members of the public, in respect of any such Incident and claim arising therefrom.
- B. Wherever the requirements of this Section 2.12 are at variance with the terms and conditions of the actual insurance policy(ies), the terms and conditions of the actual insurance policy(ies) will prevail.

- C. The address for provision of notice of Incidents to the City's Director of Insurance & Claims Management is as follows:

██
Director, Insurance & Claims Management
OFFICE OF THE CITY MANAGER | LEGAL SERVICES
4th Floor Chancery Hall
3 Sir Winston Churchill Square
Edmonton AB T5J 2C3
██

2.13 INSURANCE REPRESENTATIVE

- A. Before commencement of the Work, the LRV Supplier shall appoint an insurance representative who shall communicate with the City and keep the City advised of all material matters of insurance, including claims, possible claims and policy changes or amendments. The LRV Supplier shall at all times maintain such a representative throughout the Term. The LRV Supplier shall notify the City promptly of any change in such representative during the Term.

2.14 COOPERATION WITH INSURER'S CONSULTANT

- A. If an insurer or an insurer's appointed consultant, for underwriting purposes or as a term of an insurance policy, needs to review any part of the performance of this Supply Agreement, then the City and the LRV Supplier shall, and shall require the City Persons and the LRV Supplier Persons, respectively, to:
1. cooperate with the insurer and its consultant, including providing them with such information and documentation as they may reasonably require; and
 2. allow the insurer and its consultant to attend meetings between the LRV Supplier and the City (or, as applicable, and if reasonably required by the insurer, between the LRV Supplier and those engaged by or through the LRV Supplier).

2.15 FAILURE TO INSURE

- A. If the LRV Supplier at any time fails or refuses to obtain, maintain in force or renew any insurance required to be effected by it under this Schedule, or to furnish the City with evidence of any required insurance or renewals in relation thereto as and when required and in accordance with this Schedule, the City shall, upon 5 days' written notice to the LRV Supplier, without prejudice to any of its other rights under this Supply Agreement or otherwise, have the right itself to procure such insurance, in which event the LRV Supplier shall immediately reimburse the City for all amounts paid by the City for that purpose together with all reasonable costs incurred by the City in procuring such insurance.
- B. Without prejudice to this Section 2.15 [*Failure to Insure*], the City may, acting reasonably, require that any Person, including but not limited to the LRV Supplier or any Subcontractor, shall not access the Site if any insurance relating to such access or Person is not obtained or maintained as required under this Supply Agreement.

SECTION 3: INSURANCE PREMIUM PAYMENT

3.1 GENERAL

- A. The LRV Supplier shall pay or cause to be paid all premiums payable in respect of the policies of insurance required to be taken out, maintained in force or renewed by the LRV Supplier pursuant to this Supply Agreement.

SECTION 4: PERFORMANCE SECURITY

4.1 LETTERS OF CREDIT

- A. The Advance Payment and Performance Letter of Credit and Warranty Letter of Credit must be issued by a Permitted Letter of Credit Provider.
- B. The LRV Supplier may at any time replace or substitute the Advance Payment and Performance Letter of Credit or Warranty Letter of Credit with another letter of credit issued by any one or more Permitted Letter of Credit Provider(s) and in a form acceptable to and approved by the City, acting reasonably.
- C. In the event that the Advance Payment and Performance Letter of Credit or the Warranty Letter of Credit must be renewed at any time, the LRV Supplier shall provide to the City reasonable evidence of the renewal of such Advance Payment and Performance Letter of Credit or Warranty Letter of Credit no later than 10 Business Days prior to the renewal date, if any, of such Advance Payment and Performance Letter of Credit or Warranty Letter of Credit.

APPENDIX 11A: INSURANCE REQUIREMENTS

Insurances to be provided, or caused to be provided, by the LRV Supplier

Type	Amount	Maximum Deductibles	Principal Cover
1.1 Commercial General Liability and Non-Owned Automobile Liability Insurance	<p>\$50 million per occurrence and in the annual aggregate with respect to Products and Completed Operations</p> <p>Principal Extensions:</p> <ul style="list-style-type: none"> • Non-owned automobile liability • Owner's and contractor's protective liability • Blanket contractual liability (written) • Direct and contingent employer's liability • Personal injury (nil participation) • Cross liability and severability of interests • Loss of use without property damage • Broad form property damage • Broad form completed operations • Intentional injury committed to protect persons or property • Worldwide territory subject to claims being brought in Canada or the U.S. • The City, City Persons as Additional Insureds <p>Principal Exclusions:</p> <ul style="list-style-type: none"> • Injury to employees, where Workers Compensation provides valid coverage • Property in the care, custody or control of the insured, except as provided under Broad Form Products and Completed Operations • Operation of licensed motor vehicles, other than attached machinery, while used for its purpose or at the Lands • Cyber risk • Mould, fungi and fungal derivatives • Professional liability of engineers, architects and other professional consultants 		<p>Commercial General Liability insurance covering all operations on an occurrence basis against claims for Bodily Injury (including Death), Broad Form Property Damage (including Loss of Use) and including Broad Form Products and Completed Operations Liability</p> <p>Coverage shall be maintained continuously from NTP until the end of the Term.</p>

	<ul style="list-style-type: none"> • Nuclear or radioactive contamination, except release of radioactive isotopes intended for scientific, medical, industrial or commercial use • Asbestos • Sanctions clause • Communicable disease <ul style="list-style-type: none"> • Coverage in the amount of not less than \$5,000,000 per occurrence and in the annual aggregate with respect to broad form completed operations for Subcontractors, consultants, and sub-consultants, workers or trades or other persons involved in the Work. 		
1.2 Automobile Liability Insurance	<p>Automobile liability insurance for third party property damage and bodily injury, including accident benefits, arising out of the use of any automobile in connection with the Work, including all vehicles owned, operated or licensed in the name of the LRV Supplier.</p> <p>Insured limits of not less than \$10 million per occurrence in respect of the LRV Supplier and Subcontractors' vehicles.</p> <p>Insured limits of not less than \$5 million per occurrence in respect of vehicles of any consultants, sub-consultants, workers, trades or other persons involved in the Work.</p>		<p>Standard Owners Form for all vehicles operated by LRV Supplier, Subcontractors, consultants and sub-consultants involved in the Work.</p> <p>Business Automobile Liability insurance covering third party property damage and bodily injury liability (including accident benefits) arising out of any licensed vehicle.</p> <p>Coverage shall be maintained continuously when LRV Supplier and Subcontractors' automobiles are in operation.</p>

1.3 “All Risk” Marine Cargo Insurance	<p>“All Risk” Marine Cargo, insuring property of every description destined for incorporation into the LRVs, Spare Parts, Warranty Spares, Special Tools and other deliverables, during marine transit and in-land transit, including:</p> <ul style="list-style-type: none"> • 100% replacement cost valuation basis • No co-insurance provision 		<p>Coverage shall be maintained continuously until unloading at the Gerry Wright OMF Part B, or as otherwise instructed by the City.</p>
1.4 “All Risk” Property Insurance	<p>“All Risk” Property, insuring property of every description destined for incorporation into the LRVs, Spare Parts, Warranty Spares, Special Tools and other deliverables, including:</p> <ul style="list-style-type: none"> • 100% replacement cost valuation basis • No coinsurance provision 		<p>Coverage shall be maintained continuously from unloading at the Gerry Wright OMF Part B, or as otherwise instructed by the City until Conditional Acceptance.</p>
1.5 “All Risk” Contractors’ Equipment	<p>“All Risk” Contractors’ Equipment insurance for equipment owned, leased, rented or borrowed for use on the Work, including:</p> <ul style="list-style-type: none"> • an insured value of not less than the actual cash valuation of insured equipment 		<p>All Risks coverage on all owned, rented, leased or borrowed contractors’ equipment, used at the site.</p> <p>Coverage shall be maintained continuously from NTP until the end of equipment usage.</p>
1.6 Workers’ Compensation Insurance	<p>In accordance with Alberta statutes established benefits and schedules</p>		<p>Cover in accordance with Applicable Law and the requirements of any Governmental Workers’ compensation insurance coverage for all employees of the LRV Supplier, Sub-Contractors, consultants and sub-</p>

			<p>consultants engaged in the performance of the Work, in accordance with Applicable Law and the requirements of any Governmental Authority.</p> <p>Coverage shall be maintained continuously from NTP until the end of the Term.</p>
--	--	--	---

APPENDIX 11B: FORM OF LETTER OF CREDIT

LETTER OF CREDIT

[Note: Each Letter of Credit must be issued by a bank that satisfies the requirements set out in the Supply Agreement and must be callable at the bank's counters in Edmonton, Alberta.]

Letter of Credit: #[●]

Date: [●]

The City of Edmonton
[Address]

Attn: ●

Dear Sir/Madam:

RE: The City of Edmonton – Valley Line West LRV Supply Agreement

At the request of our client, [●] (the "LRV Supplier"), we, [insert name and address of issuing bank], hereby issue in your favour an irrevocable standby letter of credit (the "Letter of Credit") in the amount of [●]Dollars (\$[●]).

The amount available under this Letter of Credit is payable to the City of Edmonton (the "City"), at any time and from time to time, upon (a) receipt by us of a written demand for payment, accompanied by a certificate signed by two officers of the City certifying that the City is entitled to draw on this Letter of Credit pursuant to an LRV supply agreement dated [●] (as amended from time to time, the "Supply Agreement"), and (b) presentation of the original of this Letter of Credit.

This Letter of Credit will expire at 5:00 p.m. on [insert relevant expiry date] (the "Expiry Date"), and the City may call for payment of any amount outstanding under this Letter of Credit at any time up to 5:00 p.m. on that date should this Letter of Credit not be renewed.

It is a condition of this Letter of Credit that it shall be automatically extended, without amendment, for one year from the expiration date hereof, or any future expiration date, unless, at least 30 days prior to any expiration date, we notify you, in writing, that we elect not to consider this Letter of Credit renewed for any such additional period. Upon receipt by you of such notice, you may draw the full amount hereunder by means of your demand.

Partial drawings are permitted.

We hereby agree that demands delivered under this Letter of Credit will be duly honoured upon presentation provided that all terms and conditions herein have been complied with.

Written demands drawn under this Letter of Credit shall state on their face that they are drawn under Letter of Credit #[●].

It is understood that **[insert name of issuing bank]** is obligated under this Letter of Credit for payments of monies only.

The Supply Agreement is referred to herein for reference purposes only and does not form part of the terms of this Letter of Credit.

This Letter of Credit is subject to the Uniform Customs and Practice for Documentary Credits (2007 Revision) of the International Chamber of Commerce (ICC Publication No. 600) (the "UCP") with the exception of Articles 18-30 inclusive (other than Article 29a, which shall apply) and Articles 31b, 31c and 32 except to the extent, if any, inconsistent with the express terms of this Letter of Credit. Notwithstanding Article 36 of the UCP, if this Letter of Credit expires during an interruption of business as contemplated in such Article 36, we shall honour any demand made under this Letter of Credit prior to the Expiry Date within 30 days after the date on which such interruption of business ends (and we shall notify you promptly when it does so end). For matters not covered by such publication, this Letter of Credit shall be governed by and construed in accordance with the laws of the Province of Alberta.

Yours very truly,

[Name of Issuing Bank]

By: _____
Name:
Title:

By: _____
Name:

APPENDIX 11C: FORM OF PARENTAL GUARANTEE

DELETED

**THE CITY OF EDMONTON
VALLEY LINE WEST LRT**

LRV SUPPLY AGREEMENT

Schedule 12 – Bid Extracts

**VALLEY LINE WEST LRT
SCHEDULE 12 – BID EXTRACTS**

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LIST OF FIGURES

Not applicable.

LIST OF TABLES

Not applicable.

SECTION 1: BACKGROUND

1.1 GENERAL

- A. As provided for in the RFP, all or certain portions of the LRV Supplier's Bid may be incorporated into and made part of this Supply Agreement. This Supply Agreement has been finalized, and the Bid Extracts have been selected on the basis set out in the RFP.

1.2 SELECTION OF EXTRACTS

- A. As confirmed in the RFP, the City determined in its discretion which parts of the LRV Supplier's Bid have been incorporated by reference or otherwise into this Supply Agreement. The City has, however, voluntarily conferred and consulted with the LRV Supplier and taken their input in finalizing the City decisions.

1.3 LOCATION OF EXTRACTS

- A. As confirmed in the RFP, the City determined in its discretion the parts or sections of this Supply Agreement where the Bid Extracts will be added or referred to in this Supply Agreement, and any additional wording required to be made to this Supply Agreement to confirm their inclusion based on the subject matter of the Bid Extracts. The City has, however, voluntarily conferred and consulted with the LRV Supplier and taken their input in finalizing the City decisions.

1.4 PURPOSE AND INTERPRETATION PRINCIPLES

- A. The purpose of incorporating the Bid Extracts into this Supply Agreement is to further define, describe, and clarify the Work and the requirements of this Supply Agreement. The contract interpretation principles set out in Section 19.15 [*Order of Precedence*] of this Supply Agreement have been adopted to clarify contract intent and to manage any potential conflicts or inconsistencies in the interpretation of the Bid Extracts with the rest of this Supply Agreement.

SECTION 2: CONTRACT INTERPRETATION PRINCIPLES

2.1 POTENTIAL DEFICIENCIES

- A. Notwithstanding that deficiencies may exist in the Bid Extracts, the LRV Supplier continues to be fully bound to perform all of its obligations under this Supply Agreement. The City is not responsible for identifying deficiencies in the Bid Extracts, and irrespective of whether the City has identified or has failed to identify any such deficiencies, the LRV Supplier is not relieved in any way from meeting all of its Work requirements and other obligations of this Supply Agreement.

2.2 BID SUPERSEDED

- A. Except for those parts of the LRV Supplier's Bid that are incorporated by reference into this Supply Agreement by the Bid Extracts, the LRV Supplier's Bid shall be superseded entirely by this Supply Agreement and rendered null and void, and shall not be relied upon or used by the LRV Supplier, the City, or anyone else (including anyone pursuant to Schedule 14 [*Dispute Resolution Procedure*] or any arbitral body or any court) in any way to interpret or qualify the Work, any obligations, or liabilities of the LRV Supplier, or anything else contained in this Supply Agreement.

SECTION 3: LISTING OF BID EXTRACTS

3.1 APPENDIX

A. Attached at Appendix 12A [*Bid Extract Listing*] of this Schedule are the Bid Extracts.

APPENDIX 12A: BID EXTRACT LISTING

- B. Attached to this Appendix 12A [*Bid Extract Listing*] are the Bid Extracts. Portions of the LRV Supplier's Bid that do not form part of the Bid Extracts have been redacted as shown by the blacked out areas of text.

**THE CITY OF EDMONTON
VALLEY LINE WEST LRT**

LRV SUPPLY AGREEMENT

Schedule 13 – Changes

**VALLEY LINE WEST LRT
SCHEDULE 13 – CHANGES**

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LIST OF FIGURES

Not applicable.

LIST OF TABLES

Not applicable.

SECTION 1: GENERAL PROVISIONS

1.1 CHANGES

- A. Subject to the provisions of this Schedule 13 [*Changes*] and without invalidating this Supply Agreement, the City may from time to time propose or require the LRV Supplier to carry out and implement a Change. The LRV Supplier shall not be entitled to any payment, compensation, or extension of time for a Change except in accordance with this Supply Agreement and this Schedule 13 [*Changes*].

1.2 NO ENTITLEMENT TO PERFORM A CHANGE

- A. Without prejudice to the Parties' rights under this Supply Agreement, the City may, at any time, perform or engage any Person to perform other work associated with the Work, and none of the LRV Supplier or an LRV Supplier Person shall have any right or entitlement to perform any such work. The LRV Supplier may submit a proposal to the City for the performance of such work, but nothing in this Supply Agreement will obligate the City to consider or accept such proposal.

1.3 DEFICIENCIES NOT A CHANGE

- A. The cost of the correction of a Deficiency shall not be included in the valuation of any Change.

1.4 RESPONSIBILITY FOR CHANGES AND INNOVATION PROPOSALS

- A. Except as specifically provided in this Supply Agreement, the City bears no risk or liability whatsoever arising from any Change or Innovation Proposal, other than the liability to make payment in connection therewith. Notwithstanding the previous sentence, the City shall pay to the LRV Supplier increased costs or any Direct Losses suffered by the LRV Supplier as a result of any particular design, materials, goods, or method of manufacture that the City specifies must be incorporated in a Change or Innovation Proposal and is subsequently shown to be defective (other than as a result of the Legal Fault of the LRV Supplier or any LRV Supplier Person), if the following occur:
 - 1. the LRV Supplier objected in writing to the incorporation of such design, materials, goods, or method of construction prior to issuance of the relevant Change Order Confirmation and provided the following:
 - a. a reasonable and reasoned justification for its objection; and
 - b. details of the specific increased costs or Direct Losses that would result from incorporation of such design, materials, goods, or method of construction; and
 - 2. the City confirms its direction to incorporate the particular design, materials, goods, or method of construction after receipt of the LRV Supplier's objection.

1.5 VALUATION AND PAYMENTS FOR REDUCTIONS OR AVOIDED COSTS

- A. If a Change involves any reductions in the Work, and results in net savings in costs to the LRV Supplier for completing the Work, then the value of all such savings shall be reflected in a lump sum payment to the City, or in adjustments to the payments outlined in Schedule 9 [*Pricing and Payment*], as determined by the Parties, acting reasonably.
- B. The LRV Supplier shall not be entitled to claim for any losses, costs, or damages for fixed overhead or profit due to the reduction, deletion, or removal of any part of the Work, except to the extent that

any of such amounts would have been incurred by the LRV Supplier and are included in a payment payable by the City after the date on which the Work is reduced, deleted, or removed.

1.6 RESTRICTIONS ON CHANGES

- A. Unless otherwise agreed to by the Parties, the City shall not at any time during the Term require, and the LRV Supplier may refuse to implement, a Change that is as follows:
 - 1. would be contrary to Applicable Law;
 - 2. would have a material and adverse effect on the performance of the Work in a manner not compensated pursuant to this Schedule;
 - 3. would be a departure from Good Industry Practice; or
 - 4. would render the insurance policies required under this Supply Agreement void or voidable.
- B. If the LRV Supplier, acting reasonably, determines that a Change is unacceptable because it contravenes one or more of the items in Section 1.6 A [*Restrictions on Changes*] above, then the LRV Supplier shall promptly give notice to the City of its objection, with written reasons. If the City disagrees, it may deliver a Dispute Notice to the LRV Supplier, and the Parties will cooperate to have the issue resolved in a timely manner pursuant to the Dispute Resolution Procedure.

1.7 EFFECT ON CONTRACT WORK SCHEDULE

- A. The LRV Supplier shall use all reasonable efforts and Good Industry Practice to minimize the effect of a Change on the Contract Work Schedule and Key Dates, and, subject to the foregoing and Section 1.1 [*Changes*] and Section 2.3 B.2 [*Change Estimate Requirements*], the applicable Key Date shall be adjusted by such time as is reasonable in the circumstances to take account of the effect of the delay caused by the Change, as confirmed in the applicable Change Order Confirmation.
- B. Adjustments to Key Dates will be based on Forensic Schedule Analysis demonstration of the effect of the Change on achieving the Key Date.

SECTION 2: CHANGE ENQUIRY PROCESS

2.1 INITIATING A CHANGE ENQUIRY

- A. If the City proposes or requires a Change, it shall deliver to the LRV Supplier a Change Enquiry. The Change Enquiry will describe the proposed Change with sufficient detail to enable the LRV Supplier to prepare a Change Estimate.

2.2 DELIVERY OF CHANGE ESTIMATE

- A. As soon as practicable and, in any event, not more than 15 Business Days after receipt of a Change Enquiry or such longer period as the Parties, acting reasonably, mutually agree, the LRV Supplier shall deliver to the City a Change Estimate prepared in accordance with and meeting the requirements of Section 2.3 [*Change Estimate Requirements*].

2.3 CHANGE ESTIMATE REQUIREMENTS

- A. It is the LRV Supplier's responsibility to have conducted its own investigations, analysis, and review of the Supply Agreement requirements, the Work, and the risks assumed before submitting its Change Estimate.
- B. The Change Estimate shall include such information as is applicable to the proposed Change, in sufficient detail to demonstrate the following to the City's reasonable satisfaction:
 - 1. the steps the LRV Supplier shall take to implement the proposed Change, in such detail as is reasonable and appropriate in all the circumstances;
 - 2. any impact on achieving a Key Date and any impact on the Contract Work Schedule. Failure to provide this information with the Change Estimate will preclude the LRV Supplier from claiming amendments to a Key Date due to the proposed Change, or making any other claims for changes to the Contract Work Schedule, including any ripple effects that may result;
 - 3. any subcontractors required in addition to or in substitution for any existing Subcontractors;
 - 4. subject to Section 2.3 F [*Change Estimate Requirements*], the estimated Change value has been determined on the basis of applicable costs and criteria described in Section 4.1 [*Cost Plus Percentage Valuation*];
 - 5. the proposed methods of certification of any requirements applicable to the Work arising from the proposed Change, if not currently contemplated within the provisions of this Supply Agreement, in each case, together with such supporting information and justification as the City may reasonably require;
 - 6. that the full amount of any and all expenditures that have been reduced or avoided have been taken into account and applied in total to reduce the amount of all Change costs;
 - 7. that the LRV Supplier has mitigated or will mitigate the schedule impact of the proposed Change;
 - 8. the value of the loss or reduction in benefits resulting from the proposed Change;
 - 9. a description of any actions that would be reasonably required by the City to implement the proposed Change; and
 - 10. the commercially reasonable efforts that the LRV Supplier will make to obtain the best value for money when procuring any work, services, supplies, materials, or equipment required by the

proposed Change in compliance with Good Industry Practice and to a standard no less than the LRV Supplier would apply if all costs incurred were to its own account.

- C. As soon as practicable and, unless the Parties agree otherwise, not more than 15 Business Days after the City receives a Change Estimate, including any consequential changes to the Change Estimate resulting from a modification, the LRV Supplier and the City shall discuss and seek to agree on the Change Estimate including, if applicable, any adjustment to the Contract Work Schedule, the relevant Key Dates, and the payments outlined in Schedule 9 [*Pricing and Payment*].
- D. The City may modify a Change Enquiry in writing at any time prior to the agreement between the Parties referred to in Section 2.3 C [*Change Estimate Requirements*], in which case the LRV Supplier shall, as soon as practicable and, in any event, not more than 10 Business Days after receipt of such modification or such longer period as the Parties acting reasonably mutually agree, notify the City in writing of any consequential changes to the Change Estimate including, if applicable, any adjustment to the Contract Work Schedule, relevant Key Dates, or the payments outlined in Schedule 9 [*Pricing and Payment*].
- E. If the Parties cannot agree on the reasonableness and validity of a Change Estimate provided pursuant to a Change Enquiry including, if applicable, any adjustment to the Contract Work Schedule, relevant Key Dates, or the payments outlined in Schedule 9 [*Pricing and Payment*], then the Dispute shall be determined in accordance with the Dispute Resolution Procedure.
- F. Notwithstanding Section 2.3 B.4 [*Change Estimate Requirements*], the City may request, in its discretion, that the valuation of a proposed Change be determined on the basis of one of the following:
 - 1. unit prices acceptable to the City;
 - 2. lump sum price acceptable to the City;
 - 3. time and material using Force Account Rates as outlined in Section 4.2 [*Time and Material Using Force Account Rates Valuation*]; or
 - 4. a combination of any of the above and the cost plus percentage valuation basis as outlined in Section 4.1 [*Cost Plus Percentage Valuation*].
- G. In the event the City requests the valuation of a Change pursuant to Section 2.3 F [*Change Estimate Requirements*] and the LRV Supplier objects to such method of valuation, the LRV Supplier shall promptly notify the City in writing of its objection. The LRV Supplier and the City shall, as soon as practicable and, in any event, not more than five Business Days after the LRV Supplier delivers notice of its objection to the City, discuss and seek to agree on the method of valuation. If the Parties cannot agree on the method of valuation within 10 Business Days following delivery of the notice of objection, the City shall do either of the following:
 - 1. withdraw the Change Enquiry by written notice to the LRV Supplier; or
 - 2. agree to value the Change on the basis set forth in Section 4.1 [*Cost Plus Percentage Valuation*]; and

in the case of the City agreeing to value the Change on the basis set forth in Section 4.1 [*Cost Plus Percentage Valuation*], the period pursuant to Section 2.2 [*Delivery of Change Estimate*] for delivery by the LRV Supplier of the Change Estimate shall be extended by such period as has elapsed between the delivery of the original Change Enquiry and the City's agreement to value the Change on the basis set forth in Section 4.1 [*Cost Plus Percentage Valuation*].

2.4 CHANGE ORDER CONFIRMATION

- A. As soon as practicable, and in any event not more than 10 Business Days (unless an extension is agreed to by the LRV Supplier, acting reasonably while taking into consideration the approval process associated with the Change Order Confirmation within the City) after the date on which the Change Estimate, including if applicable, any adjustment to the Contract Work Schedule, a Key Date, or the payments outlined in Schedule 9 [*Pricing and Payment*], was agreed to, the City shall do either of the following:
1. withdraw the Change Enquiry by written notice to the LRV Supplier; or
 2. issue a Change Order Confirmation.
- B. If the City does not issue a Change Order Confirmation within 10 Business Days (or such extended period as may have been agreed to), after the date on which the Change Estimate was agreed to, then the Change Enquiry shall be deemed to have been withdrawn, and the Change process in this regard concluded.
- C. Upon the Change Order Confirmation being issued, the following shall occur:
1. the Parties shall as soon as practicable thereafter do all acts and execute all documents necessary to implement the Change;
 2. the LRV Supplier shall implement the Change as provided for in the Change Order Confirmation;
 3. if applicable, the Contract Work Schedule and affected Key Dates will be adjusted in accordance with the terms of the Change Order Confirmation;
 4. the payments outlined in Schedule 9 [*Pricing and Payment*] will be adjusted in accordance with the terms of the Change Order Confirmation, if applicable; and
 5. if applicable, the City will pay to the LRV Supplier the fixed amount specified in the agreed Change Estimate for the Change in accordance with the terms of the Change Order Confirmation.
- D. The Change Order Confirmation represents the full and final obligation of the City for all costs and Contract Work Schedule adjustments associated with the scope covered in the Change Order Confirmation, including direct effects, indirect effects, ripple effects, effects associated with delays, productivity impacts, or any other subsequent impacts to the LRV Supplier of whatsoever nature or kind, regardless of whether known, expected, foreseen, or unforeseen at the time of issuance of the Change Order Confirmation.

SECTION 3: CHANGE DIRECTIVE PROCESS

3.1 INITIATING A CHANGE DIRECTIVE

- A. At any time and from time to time, including whether or not the City has made a Change Enquiry; or the LRV Supplier fails to provide a Change Estimate within the time required; or a Change Estimate is not promptly agreed upon by the Parties; or there is a Dispute as to whether a matter is a Change or the reasonableness and validity of a Change Estimate, if the City wishes to proceed with a proposed Change, then, subject to Section 1.6 [*Restrictions on Changes*], the City may issue a Change Directive. A Change Directive shall describe the proposed Change with sufficient detail to enable the LRV Supplier to prepare a Change Estimate and to proceed with the work attributable to the Change.

3.2 PROCEEDING WITH WORK

- A. The LRV Supplier shall immediately proceed to implement the work attributable to a Change, including the appropriate method of procurement, if applicable, upon receipt of a Change Directive. Without limiting the preceding sentence, where the Change Directive includes a specific schedule or other requirements, the LRV Supplier shall implement the Change in accordance with such requirements unless it is not practicable to do so. Where the LRV Supplier believes that it is not technically practicable to implement a Change in accordance with any specific schedule or other requirements set out in a Change Directive, the LRV Supplier shall promptly give notice to the City of its objection with written reasons. If the City disagrees, it may deliver a Dispute Notice to the LRV Supplier, and the Parties shall cooperate to have the issue resolved in a timely manner pursuant to the Dispute Resolution Procedure.

3.3 CHANGE ESTIMATE AND CHANGE ORDER CONFIRMATION

- A. If the LRV Supplier has not previously done so, the LRV Supplier shall, as soon as practicable, and in any event not more than 15 Business Days after the issuance of the Change Directive or such longer period as the Parties acting reasonably mutually agree, provide a Change Estimate to the City prepared in accordance with, and meeting the requirements of, Section 2.3 [*Change Estimate Requirements*].
- B. As soon as practicable and, in any event, not more than 15 Business Days after the City receives a Change Estimate, the LRV Supplier and the City shall discuss and seek to agree on the Change Estimate, including any adjustment to the Contract Work Schedule, relevant Key Dates, or the payments outlined in Schedule 9 [*Pricing and Payment*].
- C. As soon as practicable and, in any event, not more than 10 Business Days (unless an extension is agreed to by the LRV Supplier, acting reasonably) after the date the Change Estimate was agreed to, the City shall issue a Change Order Confirmation.
- D. As soon as practicable after the City has issued the Change Order Confirmation, the following shall occur:
1. the Parties shall do all acts and execute all documents necessary to implement the Change;
 2. if applicable, the Contract Work Schedule and affected Key Dates will be adjusted in accordance with the terms of the Change Order Confirmation;
 3. if applicable, the City shall pay the LRV Supplier for the Change in accordance with the terms of the Change Order Confirmation; and
 4. if applicable, the payments outlined in Schedule 9 [*Pricing and Payment*] will be adjusted in accordance with the terms of the Change Order Confirmation.

SECTION 4: VALUATION OF CHANGES

4.1 COST PLUS PERCENTAGE VALUATION

- A. Subject to Section 2.3 F [*Change Estimate Requirements*], at the City's discretion, a Change and a Change Directive shall be valued on the following basis:
1. For the work performed by the LRV Supplier's own directly owned or employed forces or by a LRV Supplier Person's directly owned or employed forces, that portion of the Change (the "**Own Forces Work**") shall be valued as follows (with all necessary supporting information):
 - a. for all labour directly involved in the Own Forces Work, the City shall pay
 - i. the actual direct cost of labour of the Own Forces Work calculated based on the direct wages plus payroll burden in accordance with Applicable Law and an additional 15% mark-up of the direct cost of labour for the Own Forces Work; and
 - ii. reasonable travel and accommodation costs for labour required to travel to Edmonton to perform the Work associated with a Change;
 - b. for each piece of equipment used directly in the Own Forces Work but excluding small tools ("small tools" means tools having a value of less than or equal to \$2,500), the City shall pay the actual direct cost of equipment of the Own Forces Work calculated based on:
 - i. the LRV Supplier's reasonable direct cost based on the LRV Supplier's rates, provided these rates were approved in writing by the City prior to commencement of the Change work, plus an additional 10% mark-up of the direct cost of equipment for the Own Forces Work; and
 - ii. for third-party equipment rental account rates, at the actual direct cost invoiced by the third-party, provided these rates were approved in writing by the City prior to the commencement of the Change work, plus an additional 10% mark-up;
 - c. for all materials purchased by the LRV Supplier solely to perform or incorporate into the Own Forces Work, the City shall pay the amount shown on the original material supplier's invoices, plus an additional 10% mark-up;
 2. For the LRV Supplier's work (including without limitation direct costs, indirect costs, overhead, and profit) on the Own Forces Work performed by Subcontractors, the LRV Supplier shall be paid an amount equal to the actual cost of the invoiced amounts plus an amount equal to 10% mark-up of the sum ; and
 3. The mark-ups specified in this Section 4.1 A.1 of this Schedule shall only be applied once and are not duplicated for every tier of Own Forces Work performed by Subcontractors. For greater certainty, mark-ups are not to be applied on top of mark-ups on any Own Forces Work

4.2 TIME AND MATERIAL USING FORCE ACCOUNT RATES VALUATION

- A. If, pursuant to Section 2.3 F [*Change Estimate Requirements*], the City in its discretion, request the LRV Supplier to value a Change on the basis of time and material using Force Account Rates, the following shall apply:
1. The Force Account Rates for regular and overtime labour and equipment for field work and non-field work will apply for Changes that are to be valued using time and materials.

2. The Force Account Rates shall be consistent with industry average actual wages for the various labour categories to be employed for the Work, plus the payroll burden and an overhead allowance of 15% (excluding payroll burdens). The City may audit the rates for consistency with industry average rates and the LRV Supplier shall cooperate with any such audit by the City or its representatives.
3. For all Work performed by Subcontractors, third party work, and materials, a 10% mark-up will be applied to cover all of the LRV Supplier costs.

4.3 DISPUTE RESOLUTION OF VALUATION

- A. If the City has issued a Change Directive and the City and the LRV Supplier have not been able to reach agreement on the Change Estimate, any such dispute shall be determined by the Dispute Resolution Procedure, applying the criteria set out in Section 2.3 B and having regard to the manner in which value is to be determined pursuant to Section 2.3 B.4 or, in the event that the Parties have agreed on an alternative method of valuation pursuant to Section 2.3 F, the applicable agreed method of valuation.

4.4 CONTEMPORARY RECORDS

- A. For any determination of valuation of Changes pursuant to this Schedule 13 [*Changes*], the LRV Supplier shall provide to the City appropriate contemporary records to substantiate the Direct Losses or valuation, as applicable.

SECTION 5: INNOVATION PROPOSALS

5.1 INNOVATION AND VALUE ENGINEERING

- A. The LRV Supplier may at any time submit a proposal to the City (an “**Innovation Proposal**”) to implement modifications to the Work, including through innovation or value engineering, for the purpose of achieving efficiencies, reducing the overall cost to the City of the Work or the operation or maintenance of the LRVs, or realizing other benefits. An Innovation Proposal must be as follows:
1. be originated and initiated solely by the LRV Supplier without the involvement of the City or any City Person; and
 2. offer savings, innovations, efficiencies, or other benefits that are not otherwise called for or provided by this Supply Agreement.

5.2 CONTENT OF INNOVATION PROPOSAL

- A. An Innovation Proposal shall be as follows:
1. set out all the information required in a Change Estimate as required under Section 2.3 [*Change Estimate Requirements*], modified to apply to an Innovation Proposal;
 2. specify the LRV Supplier’s reasons and justification for proposing the Innovation Proposal;
 3. request the City to consult with the LRV Supplier with a view to the City deciding whether to agree to the Innovation Proposal and, if so, what consequential changes the City may require;
 4. indicate any implications of the Innovation Proposal, including the differences between the existing and the proposed requirements of this Supply Agreement, impacts on operations or maintenance, including utility usage during operations, and the comparative advantages of each to the LRV Supplier and the City;
 5. indicate whether a lump sum payment by the City or a variation to the payments outlined in Schedule 9 [*Pricing and Payment*] is proposed, and, if so, give a detailed estimate of such proposed payment or variation;
 6. indicate if there are any dates by which a decision by the City must be made; and
 7. include such other information and documentation as may be reasonably requested by the City to fully evaluate and consider the Innovation Proposal.

5.3 PRELIMINARY INFORMATION

- A. Prior to the development of an Innovation Proposal, the LRV Supplier may, at its option, prepare and submit to the City preliminary information with respect to a potential Innovation Proposal. Where the LRV Supplier submits preliminary information with respect to a potential Innovation Proposal, the LRV Supplier’s submission shall include the following:
1. a proposal with respect to the sharing or allocation of the costs of developing the Innovation Proposal (if applicable);
 2. any other information about the potential Innovation Proposal in respect of which the LRV Supplier is seeking the City’s preliminary input; and
 3. sufficient information to permit the City to make informed decisions with respect to the potential Innovation Proposal.

- B. Where the LRV Supplier submits preliminary information with respect to a potential Innovation Proposal, the City's Representative shall, within 15 Business Days, evaluate and consider the potential Innovation Proposal, including any proposal for the sharing or allocation of development costs. The City may request clarification or additional information regarding the potential Innovation Proposal and may request modifications to the LRV Supplier's proposal.
- C. Notwithstanding anything else in this Section 5 [*Innovation Proposals*], unless the City, in its discretion, agrees to pay or share the costs of developing an Innovation Proposal, the costs of investigating and developing a potential Innovation Proposal will be borne entirely by the LRV Supplier.

5.4 EVALUATION OF INNOVATION PROPOSAL

- A. The City shall evaluate and consider an Innovation Proposal, taking into account all relevant issues, including whether the following apply:
 - 1. a change in the payments outlined in Schedule 9 [*Pricing and Payment*] will occur;
 - 2. the Innovation Proposal affects the Quality or delivery of the LRV, or the operation and maintenance of the LRVs, including utility usage during operations;
 - 3. the Innovation Proposal will interfere in the relationship of the City with any third parties;
 - 4. the residual value of the LRVs is affected;
 - 5. the Innovation Proposal materially affects the risks or costs to which the City is exposed; and
 - 6. any other matter the City, in its discretion, considers relevant.
- B. The City may request clarification or additional information regarding an Innovation Proposal and may request modifications to an Innovation Proposal.

5.5 ACCEPTANCE AND IMPLEMENTATION OF INNOVATION PROPOSAL

- A. Notwithstanding any potential cost savings, efficiencies, or other benefits of an Innovation Proposal, the City is under no obligation to accept an Innovation Proposal and may, in its discretion, elect not to accept or implement any Innovation Proposal.
- B. An Innovation Proposal that is Accepted by the City shall be implemented as a Change, and the LRV Supplier shall not implement an Innovation Proposal prior to the issuance of a Change Order Confirmation.

5.6 SHARING BENEFITS OF AN INNOVATION PROPOSAL

- A. If an Innovation Proposal causes or will cause one of the following:
 - 1. a decrease in the costs incurred by the LRV Supplier or a Subcontractor; or
 - 2. any other benefit;

after taking into account the agreed implementation and reasonably allocated development costs of the Innovation Proposal incurred by the LRV Supplier, the Subcontractors, and the City and taking into account any other uses of the Innovation Proposal by the LRV Supplier, and notwithstanding Section 1.5 [*Valuation and Payments for Reductions or Avoided Costs*], the net cost savings and other benefits arising from the Innovation Proposal will be shared equally by the LRV Supplier and the City, unless the Parties otherwise agree in the applicable Change Order Confirmation.

APPENDIX 13A: FORCE ACCOUNT RATES

Labour Rate	
Role	Hourly Rate (CAD)
[REDACTED]	[REDACTED]

NOTES:

[REDACTED]

[REDACTED]

[REDACTED]

**THE CITY OF EDMONTON
VALLEY LINE WEST LRT**

LRV SUPPLY AGREEMENT

Schedule 14 – Dispute Resolution Procedure

VALLEY LINE WEST LRT
SCHEDULE 14 – DISPUTE RESOLUTION PROCEDURE

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LIST OF FIGURES

Not applicable.

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Not applicable.

SECTION 1: DISPUTE RESOLUTION

1.1 PROCEDURE

- A. Unless both Parties otherwise agree, all Disputes shall be resolved in accordance with the provisions of this Schedule 14 [*Dispute Resolution Procedure*] (the “**Dispute Resolution Procedure**”).
- B. The Parties agree that at all times, both during and after the Term, each of them will make bona fide efforts to:
 - 1. resolve by amicable negotiations any and all Disputes arising between them on a without prejudice basis; and
 - 2. have all Disputes resolved at the lowest level of management before engaging the Dispute Resolution Procedure.

1.2 DISPUTE NOTICE AND RESPONSE

- A. If the Parties are unable to resolve a Dispute at the lowest level of management pursuant to Section 1.1 , either Party (the “**Initiating Party**”) may give a written notice to the other Party (the “**Dispute Notice**”) briefly setting out the nature of the Dispute, the remedy or relief sought and the grounds on which such remedy or relief is sought.
- B. Within five Business Days of receiving a Dispute Notice, the Party that received the Dispute Notice (the “**Receiving Party**”) will provide a response to the Dispute Notice (the “**Response**”) to the Initiating Party briefly setting out the Receiving Party’s response to the Dispute, including the remedy or relief sought by the Receiving Party and the grounds on which such remedy or relief is sought by the Receiving Party.

1.3 DILIGENT NEGOTIATION

- A. Within three Business Days of the Initiating Party receiving a Response from the Receiving Party or, if a Response was not received, within five Business Days following receipt of the Dispute Notice by the Receiving Party, the City’s Representative and the Project Manager will meet and, in a diligent manner, make bona fide efforts to resolve the Dispute on a without prejudice basis.
- B. The Parties will attempt to resolve the Dispute within five Business Days of the meeting or within such longer period as the Parties may mutually agree in writing (the “**Negotiation Period**”).
- C. Each Party shall provide to the other, on a without prejudice basis, timely disclosure of all relevant facts, information and documents (except such documentation that is subject to legal privilege) as may be required or reasonably requested by the other to facilitate the resolution of the Dispute.

SECTION 2: REFEREES

2.1 APPOINTMENT OF REFEREES

- A. The Parties shall appoint and enter into an agreement with one or more referees (collectively, the “**Referees**”) within 120 days following NTP.

2.2 REFEREE QUALIFICATIONS

- A. Unless otherwise agreed by the Parties, the Referees shall:
1. have the relevant qualifications for their specified area of expertise and membership to the relevant professional bodies which licences them to give their opinions and carry out the relevant duties as detailed within this Supply Agreement; and
 2. through training and experience, is qualified to act as a referee on rail vehicle design.

2.3 NO CONFLICTS

- A. Subject to Section 2.4 [*Termination*], each Referee shall be appointed for the duration of the Term and shall be reasonably available to act as the Referee at any time during the Term.
- B. No Referee shall act as a Referee in respect of any Dispute in which he or she may have a conflict of interest in so acting, including being financially, or otherwise in any way, interested in the conduct of the Work or in the business affairs of the City, the LRV Supplier or any consultant, subconsultant or subcontractor of any of them.

2.4 TERMINATION

- A. Each Referee’s appointment may be terminated, which termination will be without prejudice to any accrued rights and obligations of the Parties and the Referee as at the date of termination, by:
1. mutual agreement of the City and the LRV Supplier on 15 days’ notice to the Referee;
 2. either the City or the LRV Supplier in the event of a breach by the Referee of the agreement pursuant to which the Referee is retained by the Parties that has not been rectified within seven days following receipt by the Referee of notice of such breach; or
 3. the Referee on 120 days’ written notice of termination to the City and the LRV Supplier.
- B. Following termination of a Referee, the Parties shall appoint a replacement Referee meeting the requirements of Section 2.2 [*Referee Qualifications*] as soon as practicable following such termination.

SECTION 3: REFEREE PROCESS

3.1 REFEREE NOTICE

- A. If a Dispute is not resolved pursuant to Section 1.3 [*Diligent Negotiation*] to the mutual satisfaction of the Parties during the Negotiation Period, either Party may, within five Business Days of the end of the Negotiation Period by written notice to the other (a “**Referee Notice**”), refer the Dispute for resolution by a Referee as outlined in this Section 3 [*Referee Process*].
- B. If neither Party requests the appointment of a Referee on or before the fifth Business Day following the end of the Negotiation Period, the Dispute Notice shall be deemed to have been withdrawn.

3.2 REFEREE SELECTION

- A. The Referee shall be appointed as an expert to resolve the Dispute and shall be selected in the following manner:
 - 1. The Party that issues the Referee Notice (the “**Referee Initiating Party**”) shall identify a Referee that such Party proposes should be appointed as the Referee to resolve the Dispute.
 - 2. Unless the Party receiving the Referee Notice (the “**Referee Receiving Party**”) objects to the individual Referee identified by the Referee Initiating Party within 2 Business Days of receiving the Referee Notice, the Referee identified in the Referee Notice shall be selected to resolve the Dispute.
 - 3. If the Parties fail to select another Referee within three Business Days of the Referee Receiving Party objecting to a proposed Referee, then either Party may apply to the ADR Institute of Alberta for a referee to be promptly appointed under the “National Arbitration Rules” of the ADR Institute of Canada to act as the Referee in relation to the Dispute.
 - 4. If a Referee has not been selected and neither party applies to the ADR Institute within 10 Business Days of the issuance of the Referee Notice, then the Dispute Notice shall be deemed to have been withdrawn.
 - 5. The Referee’s selection or appointment shall be deemed to have been confirmed on the date that the Referee delivers to the Parties written notice accepting his or her selection or appointment. Such notice shall include the Referee’s email address for delivery of submissions as provided herein.

3.3 FEES AND EXPENSES

- A. One-half of all fees and expenses, including any retainer amounts, of a Referee appointed pursuant to Section 3 [*Referee Process*] (including the fees and expenses of any professional persons or experts retained by the Referee pursuant to Section 3.5.1 [*Referee Review*], shall be paid by each of the City and the LRV Supplier.
- B. The City shall pay the full amount of such fees and expenses on the day that such fees and expenses are due and payable and the LRV Supplier shall reimburse the City for the LRV Supplier’s share of all such fees and expenses within five Business Days of receipt of a written demand from the City, failing which the City shall be entitled to deduct the amount of the LRV Supplier’s share of such fees and

expenses from amounts otherwise due to the LRV Supplier under the provisions of this Supply Agreement.

- C. Each Party shall otherwise bear all of its own fees and expenses in connection with the Dispute Resolution Procedure.

3.4 REFEREE SUBMISSIONS

- A. Within five Business Days of the Referee confirming his or her selection or appointment, the Referee Initiating Party shall deliver to both the Referee and the Referee Receiving Party a written submission setting forth the Referee Initiating Party's position in regards to the Dispute including:
 - 1. a copy of the Dispute Notice and the Response;
 - 2. a written summary of the facts, information and arguments, and
 - 3. copies of all the documents on which the Referee Initiating Party intends to rely (the "**Initial Submission**").
- B. If the Referee Initiating Party fails to deliver its Initial Submission to the Referee and the Referee Receiving Party within such five-Business Day period, the Dispute Notice shall be deemed to be withdrawn.
- C. Within five Business Days of the delivery to the Referee and the Referee Receiving Party of the Initial Submission, the Referee Receiving Party may deliver to the Referee and the Referee Initiating Party a written submission (the "**Rebuttal Submission**") responding to the submissions contained in the Initial Submission.
- D. If the Referee Receiving Party fails to deliver its Rebuttal Submission to the Referee and the Referee Initiating Party within such five-Business Day period, the Referee Receiving Party shall be deemed to have adopted the Referee Initiating Party's Initial Submission.
- E. Notwithstanding Section 3.4 C and Section 6.2 [*Strict Compliance with Time Limits*], the Referee Receiving Party may, within five Business Days of the delivery of the Initial Submission, on notice to the Referee Initiating Party, apply to the Referee for, and the Referee may (in his or her discretion) make, a direction extending the time provided in Section 3.4 C for the delivery of a Rebuttal Submission if the Initial Submission contains evidence (including expert evidence) that has not been previously communicated to the Referee Receiving Party.
- F. The Referee Initiating Party may, within two Business Days of the delivery of the Rebuttal Submission, on notice to the Referee Receiving Party, apply to the Referee for, and the Referee may (in his or her discretion) by notice in writing grant, permission to the Referee Initiating Party to deliver to the Referee and the Referee Receiving Party a further submission ("**Surrebuttal Submission**") if the Rebuttal Submission contains evidence (including expert evidence) that has not previously been communicated to the Referee Initiating Party. If the Referee grants permission to the Referee Initiating Party to deliver a Surrebuttal Submission, such Surrebuttal Submission shall be delivered by the Referee Initiating Party to the Referee and the Referee Receiving Party no more than five Business Days following the grant of permission by the Referee.
- G. Upon request by the Referee, the Parties shall provide the Referee with paper copies of their respective Initial Submissions, Rebuttal Submissions, and Surrebuttal Submissions.

3.5 REFEREE'S RIGHTS AND OBLIGATIONS

3.5.1 REFEREE REVIEW

- A. The Referee selected shall conduct an impartial consideration of the relevant Dispute in such manner as the Referee thinks fit, including (in his or her sole discretion) carrying out on-site inspections and interviews with any persons that the Referee considers appropriate.
- B. In considering the Dispute, the Referee shall rely on the Dispute Notice, the Response, the Initial Submissions, the Rebuttal Submissions, and any Surrebuttal Submission as applicable and any advice or assistance provided by other professional persons or experts retained by the Referee as contemplated below.
- C. The Referee shall not be obligated to conduct his or her enquiries in the presence of the Parties or to receive further submissions from the Parties, except to the extent that the Referee considers appropriate, and may render his or her decision notwithstanding the failure of a Party to participate in any proceedings, hearings or enquiries.
- D. The Referee may from time to time request supplemental submissions from either Party or from both Parties, but such supplemental submissions will not modify any of the time periods stipulated herein for the rendering of a decision by the Referee.
- E. Any submission or documentation in respect of the Dispute provided to the Referee by a Party will also be provided by the Referee to the other Party.
- F. In considering the Dispute and rendering a decision, the Referee may also, with the prior written approval of both Parties, retain other professional persons or experts to provide assistance or advice to the Referee and the Referee shall pay due regard to any request by either Party for the Referee to retain such other professional persons or experts.

3.5.2 STANDARD OF CARE

- A. The Referee shall exercise the standard of skill, care, and diligence that would be expected of an expert professional experienced in providing services of a similar nature to those of the Referee on projects of a similar nature to the Work.

3.5.3 DISCLOSURE OF CONFLICTS

- A. The Referee shall disclose to the Parties, as soon as the Referee becomes aware of same, any conflict or potential conflict of interest that arises during the Referee's appointment.

3.5.4 REFEREE'S DECISION

- A. The Referee will render a decision in writing, with detailed reasons, and shall provide a copy of the decision to each Party within ten Business Days of the Rebuttal Submission or the Surebuttal Submission, if applicable.

3.5.5 PARTIES' COOPERATION

- A. The Parties shall cooperate with the Referee and comply with all reasonable requests from the Referee for additional information, documents and access to personnel and/or Work which the Referee considers necessary or desirable for consideration of the Dispute.

3.5.6 REFEREE'S DECISION BINDING

A. Subject to Section 4.1 [*Commencement of Arbitration Proceedings*], the Parties agree that the Referee's decision shall be final and binding on both Parties and shall not be subject to appeal, adjudication, arbitration, litigation or any other dispute resolution process.

3.5.7 NO LIABILITY FOR REFEREE

A. The Parties hereby release and save harmless each Referee appointed pursuant to Section 3 [*Referee Process*] from any liability arising from such Referee's actions, made in good faith and in accordance with the standard of care required under Section 3.5.2 [*Standard of Care*], in carrying out the duties of the Referee as described in this Schedule 14 [*Dispute Resolution Procedure*].

3.5.8 INDEPENDENCE/AUTHORITY OF REFEREE

A. The Referee:

1. shall be an independent consultant and shall not, and shall not purport to be, a partner, joint venturer, or agent of either Party or otherwise related to either Party;
2. other than as may be expressly set out in this Supply Agreement (including this Schedule 14 [*Dispute Resolution Procedure*]), shall have no authority to give any directions to the Parties or to the Parties' officers, employees, contractors, consultants, or agents; and
3. shall have no authority to waive or alter any terms of this Supply Agreement nor to discharge or release either Party from its obligations under this Supply Agreement unless jointly agreed in writing by the Parties.

3.6 CONFIDENTIALITY

3.6.1 CONFIDENTIALITY OF REFEREE PROCESS

A. The proceedings under Section 3 [*Referee Process*] shall be confidential and all information, data or documentation disclosed or delivered by either Party to the Referee as a result of or in connection with the Referee's duties as the Referee shall be treated as confidential and neither of the Parties nor the Referee shall, except as required by Applicable Law, disclose to any Person any such information, data or documentation unless the Parties otherwise agree in writing.

3.6.2 EVIDENCE IN ARBITRATION

A. Notwithstanding Section 3.6 [*Confidentiality*], the decision of the Referee and any and all documents, evidence, and submissions relating to a Dispute decided under Section 3 [*Referee Process*] may be submitted as evidence or background information by either Party in arbitration proceedings relating to the same Dispute under Section 4 [*Arbitration*].

SECTION 4: ARBITRATION

4.1 COMMENCEMENT OF ARBITRATION PROCEEDINGS

- A. If either:
1. the amount in Dispute is more than \$500,000 (index linked); or
 2. the Dispute involves material and significant issues other than monetary claims by one Party against the other Party
- such Party may, at any time up to 90 days following the issuance of the Referee's decision, commence proceedings to have the Dispute settled by arbitration under this Section 4 [*Arbitration*].
- B. In any such proceedings, the scope of issues will not be limited strictly to the terms of the Dispute Notice but may extend to include directly related matters for the purpose of completely resolving the Dispute, including, without limitation, issues that are the subject of the Referee's decision.
- C. Any arbitration commenced under Section 4 [*Arbitration*] shall be decided on a *de novo* basis and shall not be, or considered to be, an appeal of the Referee's decision.
- D. For greater certainty the arbitrator selected to hear the Dispute shall not be bound by, or be required to adhere to, any findings of fact by, or any other findings or decisions or determinations, of the Referee, and Section 3.6.2 [*Evidence in Arbitration*] shall apply to the arbitration of the Dispute.

4.2 GENERAL

- A. If a Party is entitled under Section 4.1 [*Commencement of Arbitration Proceedings*] to commence proceedings to have a Dispute settled by arbitration, then the Party may commence such proceedings at such time and according to the protocol set out below in this Section 4 [*Arbitration*] by giving the other Party notice of its intention to submit the Dispute to binding arbitration, which notice shall set out the name of the proposed arbitrator and the scope of issues to be determined by arbitration in addition to those set out in the Dispute Notice, if any.
- B. The "National Arbitration Rules" of the ADR Institute of Canada Inc. will apply to the arbitration, as modified by this Schedule 14 [*Dispute Resolution Procedure*] or as otherwise agreed by the Parties;

4.2.2 SINGLE ARBITRATOR

- A. A single arbitrator shall be selected (the "**Arbitrator**") as follows:
1. Within 20 days after receipt of an notice to submit the Dispute to binding arbitration, the other Party shall give notice to the first Party advising whether such other Party accepts the arbitrator proposed by the first Party, and, if not, proposing another individual to be the single arbitrator.
 2. If such notice is not given by the other Party within such 20 day period, the other Party shall be deemed to have accepted the arbitrator proposed by the first Party.
 3. If the Parties do not agree upon a single arbitrator within 20 days after the other Party proposed an alternate individual, any Party may apply to a court of competent jurisdiction under the *Arbitration Act* (Alberta) for the appointment of a single arbitrator.

4.2.3 SCOPE OF AWARD

- A. The Arbitrator shall have the authority to award any remedy or relief that a court or judge of the Court of Queen's Bench of Alberta could order or grant in accordance with the Agreement, including specific performance of any obligation created under the Agreement, the issuance of an interim, interlocutory or permanent injunction, or the imposition of sanctions for abuse or frustration of the arbitration process;

4.2.4 ARBITRATION PROCEEDINGS

- A. The place of arbitration shall be Edmonton and all meetings and hearings of the Arbitrator shall take place in the City of Edmonton or in such other place as the Parties agree and such meetings and hearings will be conducted in the English language unless otherwise agreed by such Parties;
- B. The Arbitrator may at any time fix the date, time and location of meetings and hearings in the arbitration, upon reasonable notice to the Parties;

4.2.5 CONFIDENTIALITY

- A. All meetings and hearings held in respect of the arbitration will be in private unless the Parties agree otherwise, and either Party may be represented at any meetings or hearings by legal counsel;
- B. The arbitration (including the Arbitrator's decision) will be kept confidential and the existence of the proceeding and any element of it (including any pleadings, briefs or other documents submitted or exchanged, and testimony or other oral submission and any awards) will not be disclosed to any party other than the Arbitrator, the Parties (and their respective directors, officers, shareholders, experts and legal counsel) and such other persons as may be necessary to the conduct of the proceeding or as may be required by law;

4.2.6 ARBITRATOR'S DECISION

- A. The Arbitrator shall deliver a decision in writing as soon as possible in the circumstances after the conclusion of the hearing and, unless the Parties agree otherwise, will set out reasons for the decision;
- B. The decision of the Arbitrator shall be final and binding on both Parties and shall not be subject to appeal, adjudication, arbitration, litigation or any other dispute resolution process, and both Parties expressly waive all rights of appeal in connection with the Arbitrator's decision.

4.2.7 FEES AND EXPENSES

- A. Each Party shall pay one-half of the Arbitrator's fees and expenses, and shall bear all of its own fees and expenses in connection with the arbitration. The Arbitrator shall, however, have the authority, in the Arbitrator's discretion, to award recovery of all costs and fees (including legal fees on a solicitor and own client basis, administrative fees, and the Arbitrator's fees and expenses, as applicable) to the prevailing Party in the arbitration.

SECTION 5: CONSOLIDATION OF PROCEEDINGS

5.1 CONSOLIDATION

A. For all Disputes that arise prior to the Conditional Acceptance of all LRVs included in the Base Order, unless:

1. both Parties otherwise agree; or
2. the issue in a particular Dispute is such that waiting until after the Conditional Acceptance of all LRVs included in the Base Order to resolve the Dispute would cause material harm to one of the Parties; or
3. the issue in a particular Dispute arises in connection with requirements of achieving or deficiencies in not achieving the Conditional Acceptance of all LRVs included in the Base Order,

all arbitration proceedings between the Parties prior to the Conditional Acceptance of all LRVs included in the Base Order shall be stayed and consolidated into a single arbitration proceeding, with the arbitration proceeding promptly and expeditiously after the Conditional Acceptance of all LRVs included in the Base Order.

SECTION 6: GENERAL

6.1 OTHER REMEDIES

- A. Neither Party may initiate a proceeding in a court of competent jurisdiction, whether before or after a Dispute has been initiated by a Dispute Notice, in respect of any aspect of the Dispute, including the application or interpretation of any provision of this Agreement, except as expressly permitted by
1. this Supply Agreement;
 2. the *Arbitration Act* (Alberta); or
 3. the prior written approval of both Parties.

6.2 STRICT COMPLIANCE WITH TIME LIMITS

- A. The Parties acknowledge that timely resolution of Disputes is mutually beneficial and the time limits set out in this Schedule 14 [*Dispute Resolution Procedure*], or as otherwise agreed to by the Parties, shall be strictly complied with and enforced.

6.3 THE CITY'S DIRECTIVE

- A. If a Dispute occurs, then the City and the LRV Supplier will diligently carry out their respective obligations under this Supply Agreement pending resolution of the Dispute pursuant to this Schedule 14 [*Dispute Resolution Procedure*].
- B. Prior to resolution of the Dispute, the City may in its discretion by notice to the LRV Supplier, direct the LRV Supplier to proceed with work activities in respect of the matter in Dispute or any related matter and the LRV Supplier will comply with and implement the direction.
- C. If the LRV Supplier fails to comply with the City's direction within five Business Days from the issuance thereof, the City shall be entitled to engage others to perform the Work activities specified in such direction at the risk and cost of the LRV Supplier and the City may deduct any cost incurred from any payment or payments to the LRV Supplier this Supply Agreement.
- D. Such City direction shall be without prejudice to the LRV Supplier's rights to claim compensation or other relief as an element or aspect of the resolution of the relevant Dispute or as a Change to the extent such City directions establish a supplemental or incremental scope of work, or increased cost, to the Work or to assert other rights under the Supply Agreement.
- E. Nothing in this Schedule 14 [*Dispute Resolution Procedure*] shall limit the City's right to require a Change in circumstances where the Dispute is determined in favour of the LRV Supplier.

6.4 NO DISRUPTION TO WORK

- A. It is the intent of the City and the LRV Supplier that no Dispute shall disrupt, compromise, limit, restrict or otherwise adversely affect the performance of their respective obligations or the exercise of their rights under this Supply Agreement while the Dispute is outstanding and in progress and not fully resolved between the Parties. Each Party will use commercially reasonable efforts at all times in a diligent manner to take such steps or actions as may be reasonably necessary to avoid or mitigate any potential or possible disruption, compromise, limitation, restriction or other adverse impact to the

Work or the performance of obligations and the exercise of rights of or by the Parties in relation to a Dispute.

6.5 LIMITATION PERIODS

- A. The limitation of actions as outlined in section 51 of the *Arbitration Act* (Alberta) is suspended pursuant to section 7 of the *Limitations Act* (Alberta) once a Dispute has been referred for resolution pursuant to this Schedule 14 [*Dispute Resolution Procedure*].