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APPENDICES

SCHEDULE 15-2
DESIGN AND CONSTRUCTION REQUIREMENTS

PART 4
STATIONS

ARTICLE 1 INTRODUCTION

1.1 Introduction

(a) The Project Stations shall be efficient, universally accessible, sustainable facilities that provide Passengers with an enjoyable, comfortable and safe transit experience.

(b) Stations shall act as a catalyst for TOD and shall enhance connectivity to surrounding neighbourhoods while not precluding integration opportunities with future planned developments.

(c) DB Co shall provide complete Stations and Ancillary Facilities to fully support the operational requirements of the Project while minimizing crowding, travel impedances and physical barriers.

1.2 Overview

(a) The project consists of the design and construction of a total of seventeen Stations consisting of new Stations, renovated Stations, and/or the conversion of BRT Stations to LRT Stations.

(b) DB Co shall design and construct the Stations and all Ancillary Facilities, and shall obtain necessary Permits, Licences and Approvals for the same. Station Structures and systems shall be designed and constructed to satisfy the Design Life requirements of Schedule 15-2, Part 1, Article 4 – Design and Construction. DB Co shall provide the Facilities including but not limited to the following:

(i) Stations including;

A. Types of Stations constructed or modified for the Confederation Line shall include the following (note classifications are not mutually exclusive):

i. Line Stations; Westboro, Dominion, Cleary, New Orchard, Lincoln Fields, Iris, Queensview, Pinecrest, Bayshore, Montreal, Jeanne d'Arc, Orléans Boulevard and Place d'Orléans.

ii. Terminal Stations; Baseline, Moodie, and Trim

iii. Transfer Stations; Tunney's Pasture, Blair, Bayshore, Lincoln Fields, Moodie, and Place d'Orléans.

iv. All Terminal Stations are also Transfer Stations. Where requirements are defined by Station types in this Schedule 15-2 – Design and Construction Requirements, the requirements for both Station types shall be applied.

(ii) Ancillary Facilities

A. Bicycle Facilities

B. Retail Facilities

C. Bus Terminals

D. On-street bus stops

E. Bus Operator and Maintenance Buildings

F. Plaza(s)

G. PPUDO

H. TPSS

I. Tunnel Ventilation Shafts

J. EEBs

K. Off-street Non-Revenue Vehicle parking

L. Maintenance Facilities: Refer to Schedule 15-2, Part 5 – LMSF.

M. Bus supervisor office

N. Public washrooms

O. Pedestrian overpass or underpass structures;

P. Passenger shelter structures;

Q. Structures containing mechanical, electrical, communications or other service equipment;

R. SER;

S. Entrances; and,

T. Bus lay-by areas.

(c) Emergency Planning:

(i) DB Co shall be responsible for the preparation, and submission (including revisions as necessary) of fire safety plan(s), for approval by the authority having jurisdiction, pursuant to Ontario Fire Code, Section 2.8 Emergency Planning, where applicable.

(d) Stations design shall consider pedestrian circulation as a critical element. Station designs shall facilitate the transfer of Passengers from one mode of transportation to another by minimizing transfer effort and to ensure safe exiting under Emergency conditions.

(e) Station capacity shall be provided to serve the projected operations contained in Schedule 15-2, Part 1, Article 3 – Operational Performance Requirements and the ridership forecast data provided in this Part 4.

(f) DB Co shall provide calculations and Passenger modeling simulations to demonstrate that generous public spaces have been achieved in Station design and the level of service required by this Article 1 has been provided for Passenger circulation including calculations for entry and exit volumes. Modelling shall include all physical barriers, such as columns and Station furniture, and include surge spaces around Station equipment such as fare equipment and elevators. Station designs shall provide intuitive Passenger flow, minimizing obstacles and pinch-points.

(g) Calculations and Passenger modeling shall be submitted in accordance with Schedule 10 – Review Procedure.

(i) Passenger modeling at Transfer Stations shall include the entire Facility and site, inclusive of bus and Train operations; and,

(ii) Passenger modeling for the Baseline Station site shall be expanded to be inclusive of the crossing of the Woodroffe and College Avenue intersection and bus operations.

(h) Stations Platforms shall be constructed to satisfy the requirements of the operational performance requirements defined in Schedule 15-2, Part 1, Article 3 – Operational Performance Requirements and the ridership forecast data provided in the Part 4 as follows:

(i) All At Grade Stations shall be constructed to satisfy the requirements of the operational requirements for design year 2031.

(ii) Baseline, New Orchard, and Cleary Stations shall be constructed to satisfy the operational requirements for design year 2048.

(i) Stations shall be provided with space and utility services provisions for installation of a fare control system to be installed by the City**.**

(i) DB Co shall provide the required supporting infrastructure to allow power and communications connections, including walker ducts and conduits.

(ii) DB Co shall design and construct the location of equipment as to ensure the year round operation of the fare equipment. DB Co shall ensure that all fare gate equipment is protected from the weather as required by Clause 2.5(b)(iii)Bi.

(iii) All fare collection, vending, and control equipment shall be located within the Station Structure.

(iv) DB Co shall provide a study of the building envelope with respect to the micro-climatic and geographical location of each Station to determine the extent of the weather protection required.

(j) All Stations shall include weather protection including roof Structures and canopies in accordance with this Part 4. Stations shall not be required to be climate controlled, however provisions shall be made for radiant on-demand heating where specified elsewhere in this Part 4.

(k) The Platform width of the Underground Stations shall be such as to protect for future installation of PEDs. Protection for PEDs shall include an electrical isolation membrane between the structure of the Platform and Platform finish material and the construction of a 3m x 4m dedicated PED equipment room.

(l) Federally Mandated Stations (Lincoln Fields, Iris and Moodie) and the LMSF (refer to Schedule 15-2, Part 5 – LMSF) are subject to review by the NCC. DB Co shall be responsible for advancing the designs of Stations and the LMSF in accordance with the following:

(i) The National Capital Act makes the NCC responsible for coordinating and approving projects related to federally owned lands and buildings in Canada's National Capital Region. The NCC is a Crown Corporation and therefore functions at a distance from the federal government, reporting to Parliament through the Minister of Canadian Heritage.

(ii) All individuals and federal organizations need NCC approval before undertaking projects on Federal Lands and buildings in Canada's National Capital Region.

(iii) The NCC's mandate to approve federal land uses, transactions and designs is set out in sections 12 and 12.1 of the National Capital Act.

(iv) Three Stations (Lincoln Fields, Iris and Moodie) and the LMSF (refer to Schedule 15-2, Part 5 – LMSF) are subject to FLUDTA, and design approval by the NCC under Section 12 of the National Capital Act. DB Co's approach to the Stations are subject to review by the NCC and will be assessed in terms of compliance with the guiding principles contained within this Project Agreement:

A. DB Co shall be responsible to develop designs and Design Presentation documentation to support the City in obtaining the FLUDTA approval, including but limited to:

i. Attending meetings with the City and NCC;

ii. Providing design documentation, reports, renderings specifications, etc. to be used in the FLUDTA process; and

iii. DB Co shall be responsible for the presentations of the Stations/Project to the Advisory Committee on Planning Design and Realty at the NCC.

(m) All Stations shall be designed and constructed to permit Emergency vehicle access. If any new Works are required to ensure Emergency vehicle access, then these Works shall be the responsibility of DB Co.

(i) At the following Stations, Emergency vehicle access can be via the bus transfer area: Tunney's Pasture, Westboro, Lincoln Fields, Baseline, Moodie, Bayshore, Blair, Place d'Orléans, and Trim;

(ii) At the following Stations, Emergency vehicle access can be via the nearest City street: Dominion, Cleary, New Orchard, Iris, Montreal, Jeanne d'Arc, Place d' Orléans, and Orléans;

(iii) At Pinecrest Station, Emergency vehicle access can be from the off street bus stopl and,

(iv) At Queensview Station, Emergency vehicle access can be from the parking lot and loading dock facilities of 2600 Queensview Drive.

1.3 Design Principles and Guidelines

(a) Accessibility

(i) DB Co shall ensure all Stations and all public spaces are designed for accessibility for persons with disabilities in accordance with Universal Design principles. This shall include satisfying the requirements of relevant federal, provincial and municipal accessibility legislation, standards, guidelines, practices and criteria, including but not limited to Transport Canada, Canadian Transportation Agency Code of Practice - Terminal Accessibility, AODA, OBC, COADS, as well as CSA Standards (including but not limited to CAN/CSA B651). The application of accessible design legislation, standards, guidelines, practices and criteria shall accommodate the needs of persons with different types of disabilities, including those with auditory, intellectual, physical, developmental, visual, learning, and mental health disabilities.

A. Adequate clearances shall be provided to accommodate Passengers with mobility devices, luggage, strollers, bicycles, service animals, and support persons, access to benches, and equipment at Stations, public facilities, and all TSA including Station Platforms and bus Platforms.

(ii) DB Co shall ensure all accessible public spaces and interior routes are connected to accessible entrances and accessible exterior routes.

(b) Crime Prevention Through Environment Design

(i) DB Co shall design all Station-related public accessible areas (Platforms, concourses, entrances and passageways, sidewalks, landscaping, PPUDO's, cycling facilities, MUPs, parking areas, plazas bus Platforms elevators, washrooms and Emergency access) using CPTED principles. An independently contracted CPTED review and report of the Project design shall be provided to the City by DB Co as part of each design submittal, in accordance with Schedule 10 – Review Procedure, and all of the CPTED report requirements shall be incorporated into the Project by DB Co. The independently contracted CPTED review provided by DB Co shall be performed by a qualified CPTED practitioner or practitioners, in good standing with a recognized CPTED national or international organization and who holds current CPTED certification(s).

(c) DB Co shall implement bird friendly design as follows:

(i) All glazing utilized in the Facilities shall be non-reflective type glazing;

(ii) Expanses of glazing system in excess of 2 m^2 shall include pattern to create a visual maker to allow birds to identify the Facilities as solid objects. The pattern density shall be maximum 5cm by 5cm between each element; the pattern elements shall be at least 0.32cm wide; and the visible pattern shall be on the outside of the glass; the glazing shall have a low degree of external reflection (max. 15 %).

(d) Snow Storage:

(i) DB Co shall include the capacity for snow storage in the design of all bus facilities, including bus Platform, bus loop and bus lay-by areas.

(ii) DB Co shall provide and install salt-tolerant plants, should landscape areas be used for snow storage.

(e) DB Co shall design and construct all Stations with provision for maintenance including the following:

(i) Access to Station areas without passing through fare gates;

(ii) Access into and through Stations for maintenance equipment;

(iii) Consideration of roof and ceiling heights above finished floor elevation for maintenance or replacement of ceiling mounted or supported items;

(iv) Roof access and fall protection for roof mounted equipment; and,

(v) Other requirements listed elsewhere in this Part 4.

1.4 Key Individuals

(a) Design Architect

(i) Project Co shall assign a Design Architect with the qualifications identified in Schedule 9 – Key Individuals, to lead the design of the Project including the following:

A. Responsible for development of the overall architectural language and overseeing the design of the Project is executed throughout all phases of design and construction;

B. Responsible for overseeing that public art is coordinated with the architectural design;

C. Responsible for review and approval of all Level One Structures in accordance with Schedule 15-2 Part 2, Clause 4.4 m (iii);

D. Responsible for the presentations of the Stations/Project to the Advisory Committee on Planning Design and Realty at the NCC; and,

E. Responsible to ensure all Stations and Facilities submissions for architectural drawing and rendering deliverables (Schedule 10 – Review Procedure) reflect the architectural design intent.

(b) Lead Architect

(i) Project Co shall assign a Lead Architect with the qualifications identified in Schedule 9 – Key Individuals, to lead all aspects of the Stations and Ancillary Facilitates, design planning and execution of the same for the Project including the following:

A. Responsible for the ensuring the execution of the architectural design of all facilities is consistent across the Project, including compliance with Federally Mandated Station requirements and compatibility of all other Stations with the Existing Confederation Line Stations;

B. Responsible for coordination and integration of all signage and wayfinding, mechanical, structural, electrical, communications, public art and systems, to ensure the integrity of the architectural design;

C. Responsible for Stations and Ancillary Facilities interface and coordination with the City and third parties;

D. Responsible for the interface with all Governmental Authorities; and,

E. Responsible for the content and completion of all Stations and Facilities Schedule 10 – Review Procedures deliverables.

ARTICLE 2 ARCHITECTURAL DESIGN CRITERIA

2.1 Introduction

(a) This Article 2 presents the specific general criteria that are necessary for DB Co to carry out the design and construction of the components and elements of Stations and other building-type Structures on the system.

(b) Where Design Criteria related to site specific requirements differs from general requirements, site specific Design Criteria take precedence over general Design Criteria.

(c) The Confederation Line Stations are an extension of the Existing Confederation Line Stations.

(i) For Federally Mandated Stations, DB Co shall design the Stations using the same architectural vocabulary, materials and overall architectural design approach as the existing Confederation Line Stations;

(ii) For all Stations not identified as Federally Mandated Stations, DB Co shall develop a single architectural language for the Stations, to be implemented during design and construction. The architectural language shall be aesthetically compatible with the Confederation Line Station designs, and where indicated in Table 4-2.1 Station Elements of Continuity (C)/Variability (V), specific elements of DB Co's design shall be consistent with the Existing Confederation Line Stations utilizing the same materials configuration; and,

(iii) Refer to Appendix B of this Part 4 for exemplary drawings and renderings of the Existing Confederation Line Stations.

2.2 Codes and Standards

(a) DB Co shall design and construct all Facilities in accordance with applicable laws, codes, standards, regulations, guidelines and Governmental Authority.

(b) Where the requirements stipulated in this document or any referenced sources are in conflict, refer to Schedule 15-2, Part 1, Article 1 – Reference Documents and Submittals for order of precedence.

(c) The following codes, standards and regulations shall apply to the Works:

(i) OBC;

(ii) AODA;

(iii) COADS;

(iv) OFC;

(v) NFPA 130;

(vi) OC Transpo Transitway and Station Design Guidelines;

(vii) The Ontario Heritage Act;

(viii) CSA including:

A. CAN/CSA B44 Safety Code for Elevators and escalators (latest edition including Appendix E);

B. CAN/CSA-B651 Accessible Design for the Built Environment;

(ix) MNECB;

(x) CPTED as defined on the CPTED website: cptedontario.ca;

(xi) OHSA;

(xii) MTO; OPSD, OPSS

(xiii) NBC, applicable to Federally Mandated Stations;

(d) Code Analysis

(i) DB Co shall perform a code analysis with respect to the OBC and NFPA 130: Standard for Fixed Guideway Transit and Passenger Rail Systems. For Federally Mandated Systems, a code analysis for NBC shall also be performed. The code analysis for each Station shall address the following minimum requirements:

A. Building Size, Use and Occupancy;

i. Building area and number of storeys;

ii. Mezzanines; and

iii. Description of Stations as either open or enclosed;

B. Structural Design:

i. Including where the existing Transitway retaining walls that form part of a Station;

C. Occupant load;

D. Construction requirements;

E. Interconnected floor spaces;

F. Spatial separation;

G. Fire department access;

H. Fire separations and compartmentalization;

I. Egress and exiting;

J. Fire protection systems, Emergency power and communication systems;

K. Emergency Ventilation;

L. Washrooms;

M. Barrier free design; and

N. Alternative Solutions:

i. Description of performance; and

ii. Proposed method of compliance.

2.3 Elements of Continuity and Variability:

(a) The design of each Station shall utilize a common vocabulary of elements and features that unifies and identifies the system as a whole maintaining an equal quality of design.

(b) Station design elements are divided into two classifications: Elements of Continuity and Elements of Variability.

(i) Elements of Continuity are standard designs established for the purpose of overall system identity, functional consistency, and a reduction in capital, operations, and maintenance costs. They shall include system-wide components such as signage, elevators, and escalators; systems equipment; handrail and guardrail, and Ancillary Facilities. Where identified as Existing Confederation Line (ECL), DB Co shall utilize same designs as implemented in the Existing Confederation Line Station design and construction.

(ii) Elements of Variability shall not be required to be consistent between Stations.

Table 4-2.1

Station Elements of Continuity (C)/Variability (V)		
Element	**C or V**	**ECL [(1)]**
Information devices, all signs/graphics, including accessibility signs/graphics		
• Station lanterns	C	ECL[(2)]

• System and Station vicinity/maps	C	ECL[2]
• Bus information	C	ECL[2]
• Directional signage and graphics	C	ECL[2]
• Identification	C	ECL[2]
• Regulatory	C	ECL[2]
• Variable message signs	C	ECL[2]
• Transit Information Panels	C	ECL[2]
• Advertising Panels	C	ECL[2]
Vertical circulation		
• Stairs with bicycle runnels	C	ECL
• Escalators	C	
• Escalator cladding, lighting, and detailing	C	ECL[2]
• Elevators	C	
• Elevator enclosure design and detailing[3]	C	ECL[2]
• Elevator cab design and detailing	C	ECL[2]
Communications		
• PA speakers	C	
• PA systems for hearing impaired	C	
• Emergency telephones	C	ECL[2]
• Passenger information telephones	C	ECL[2]
• PIDS	C	ECL[2]
• Maintenance telephones	C	
Station control and security		
• Intrusion alarms	C	
• CCTV equipment	C	
Fare collection equipment (Provide infrastructure and coordination only and Emergency egress gates if required)		
• Ticket Machines	C	ECL[2]
• Fare gates	C	ECL[2]
• Emergency exit gates, if required	C	ECL

Site development plazas		
• Paving	V	
• Streets, curbs, and gutters	C	ECL
• Walkways	V	
• Retaining walls	V	
• Bollards, bumpers	V	
• Handrails/railings	V	
• Landscaping	V	
• Fences	C	
• Accessible benches	C	ECL[(2)]
• Bus stop shelters	C	ECL[(2)]
• Four stream trash and recycling receptacles	C	ECL[(2)]
• Planters	V	
• Lighting (lamp)	C	ECL[(2)]
• Lighting (fixtures and standards)	V	
• Bicycle racks and shelters	C	ECL[(2)]
• Bus Platforms	V	
• TWSIs	C	ECL[(2)]
• PPUDOs	C	
• After-hours entrance into Fare –Paid Zone bus Platforms	C	
Station Elements		
• Roof form (design) and Materials	C	ECL
• Platform seating	C	ECL[(2)]
• Trash and recycling receptacles	C	ECL[(2)]
• Utility cabinets	C	ECL[(2)]
• PA speaker housing	C	ECL
• Doors, gates, and hardware	C	
• Floor material	C	ECL
• Wall and ceiling finishes public areas	C	ECL
• Hose bibs	C	

• Lighting (lamp)	C	
• Lighting (fixture)	C	ECL
• Security gates at Station entrances	V	
• Acoustical materials and details	V	
• Concourse configuration	V	
• Smoke and exhaust enclosure	V	
• Canopies and windscreens	C	ECL
• Screens for Mechanical equipment	C	ECL
• Handrails—public areas	C	ECL
• Guardrails—public areas	C	ECL
• Railings/handrails—Emergency exits	C	
• Linear Platform edge detail and material	C	ECL(2)
• Stairway details and materials	C	ECL
• Electrical outlets	C	
• Platform service gates	C	ECL
• Fire hose cabinet	C	ECL
• Emergency telephone	C	ECL(2)
• TWSIs	C	ECL(2)
• Heat traced Platforms	C	ECL
• TSA waiting Area	C	ECL
• Retail Areas	C	ECL(2)
Ancillary rooms		
• Incoming power room	C	
• SER	C	
• Communication room	C	
• Substations	C	
• Auxiliary electrical rooms	C	
• Miscellaneous auxiliary rooms	C	
• Toilet room—fixtures, accessories materials	C	
• Custodial rooms	C	

• Maintenances Staff room	C	
• Fan rooms	C	
• Storage rooms	C	
• Utility boxes	C	
• Doors and hardware	C	
• Elevator Machine Room	C	
• Mechanical grates, louvers, and grilles	C	
• OC Transpo staff multi-purpose room	C	
Artwork	V	
C = Elements of continuity *V = Elements of variability*		
ECL=Existing Confederation Line detailing required		

Table Notes:

(1) All items listed as ECL are applicable to Federally Mandated Stations.
(2) Indicates consistency with ECL required at all Stations.
(3) Enclosure includes the formed perforated metal shroud.

2.4 Station Sizing and Capacity

(a) DB Co shall provide Stations sized to meet the following general requirements:

(i) DB Co shall provide Station designs sized to accommodate the ridership forecast data provided in this Part 4, and the operational performance requirements as outlined Schedule 15-2, Part 1, Article 3 – Operational Performance Requirements utilizing the Passenger demand forecast for 2031AM peak with the exception of the Underground Stations which shall be designed to accommodate the Passenger demand forecast for 2048 AM peak.

(ii) DB Co shall provide bus transfer Stations and Platforms to accommodate the peak hour bus transfer operations, including Passenger flows and bus volumes for 2031.

(iii) DB Co shall ensure Stations, Platforms and circulation elements, both horizontal and vertical, are sized to meet the following minimum requirements:

A. Minimum Emergency egress provision shall satisfy the requirements of the OBC.

B. A Platform clearance time of no more than 0.8 times the shortest Headway anticipated under normal operations for the design capacity.

i. Two Trains arriving at the same time shall be considered as the base case for modeling purposes for centre Station Platforms.

ii. Two Trains arriving at the same time shall be considered as the base case for modeling purposes for side Station Platforms with a shared mezzanine level.

C. The maximum calculated Train load utilized for code compliance and Station planning and design shall be calculated by DB Co in accordance with the OBC based on the following Train configurations:

i. For design years 2023-2031, the crush load, as defined in the OBC shall be calculated for the maximum capacity of a two-car Train;

ii. For Design year 2048, and beyond, the crush load shall be calculated for the maximum capacity of a two-car Train plus an additional module added in one car.

(b) DB Co shall provide Platforms sized to meet the following general requirements:

(i) Platform length shall be as follows:

A. The minimum finished Platform length at all Stations shall be as follows:

i. All Station Platforms, with the exception of Cleary, New Orchard, and Baseline Stations shall be constructed to an initial length of 90m and protected and planned for an ultimate length of 100m. Protection shall involve ensuring that the future extension of the Platforms can be performed without requiring Track realignment, additional property acquisition, and/or demolition or relocation of any SI or public and private utilities services; and

ii. Cleary, New Orchard and Baseline Stations shall have an initial Platform length of 100m. The below grade portion of the Station structure shall be constructed to allow for Platform extensions to 120m in the future without disruption to Revenue Service.

(ii) Platform width shall be as follows:

A. Platform width shall be calculated in accordance with the requirements of the OBC, NFPA, Passenger data and the level of service for the Platform space as required in this Article 2.

B. The final width of the Platform shall be the greater of the following: the minimum required by OBC; the minimum required by NFPA 130; or the minimum width to satisfy the LOS requirements

i. Calculation of Platform width shall be based upon this Part 4 and Schedule 15-2, Part 1, Article 3 – Operational Performance Requirements, and operational Headways described in Schedule 15-2, Part 1, Article 3 – Operational Performance Requirements.

ii. Platform width minimums for Stations shall be as follows:

1. The calculated width of all Station Platforms, with the exception of Cleary, New Orchard, and Baseline Stations shall be for 2031 operations; and,

2. The calculated width of Cleary, New Orchard and Baseline Stations shall be for 2048 operations.

iii. Both Platforms in a side Platform configuration shall be equal in size based upon the greater of the calculated required width per direction.

iv. Shelters, equipment and amenities shall be placed in the centre of the Platform, for centre Platform configuration, to maximize the clearance from shelters, equipment and amenities to edge of Platform for circulation.

v. Shelters, equipment and amenities are to be placed adjacent to the side walls, for side Platform configurations

(c) DB Co shall provide Station elements that meet the Levels of Service as follows:

(i) The LOS indicated below shall be provided in the design of public spaces as referenced in other parts of this Article 2:

Location	**LOS**	**Measure**
Platforms (Normal)*	C	0.8m^2 per person
Platforms (Emergency)*	D	0.4m^2 per person
Waiting Areas	C	0.8m^2 per person
Passageways – 1 way	D	50 ppm per metre
Passageways – 2 way	C	40 ppm per metre
Stairways – 1 way	E	55 ppm per metre
Stairways – 2 way	D	35 ppm per metre

**Note: Normal Platform refers to the LOS during the daily peak 15 minutes. Emergency Platform refers to the level of service provided during an Emergency in accordance with OBC.*

(d) DB Co shall utilize Passenger modeling software to develop and verify the design of all aspects of the Station circulation including but not limited to the interior circulation, vertical circulation, site circulation and bus Platform operations based upon the 2031 and 2048 ridership forecast data provided in this Part 4 and the 2031 and 2048 Operational

requirements as outlined in Schedule 15-2, Part 1, Article 3 – Operational Performance Requirements as applicable at each Station.

(i) The software utilized by DB Co shall be a proven and widely used product in the design and analysis of rapid transit and intermodal transit facilities.

(ii) DB Co shall provide modeling simulations for each Underground Station utilizing Passenger data reflecting Passenger carrying capacities for 2048 as outlined in this Part 4.

(iii) Passenger modelling shall to include all physical barriers, such as columns and Station furniture, and include surge spaces around Station equipment such as fare equipment and elevators.

(iv) The design of the Station Facilities shall be adjusted based upon the results of the simulation.

(v) The Passenger simulation analysis shall be submitted in accordance with Schedule 10 – Review Procedure.

(vi) Assumptions used in modelling simulations shall be confirmed and agreed upon between DB Co and the City.

(vii) Data and assumptions related to bus activities at Transfer Stations required for the modeling of bus terminal shall be reviewed with the City prior to commencement of any modeling.

(e) Surge spaces, queuing and runoff

(i) DB Co shall be responsible for determining the amount of queuing space required at each element within the design to meet the LOS required in each area. The calculated requirements shall be equal to or greater than the requirements below for the following items;

A. Runoff provided at the top and bottom of escalators shall be a minimum of 5000mm.

B. Surge space provided at the top and bottom of public stairs shall be a minimum of 5000mm.

C. Runoff provided space in front of an elevator shall be a minimum of 3000mm.

D. Queuing distance provided at fare gates, entry and exit sides shall be a minimum of 5000mm measured from the leading and trailing limits of the gate pedestal.

i. The coiling door shall not be located as such to reduce the required 5m surge space from the fare gates where coiling doors, are provided at a Station entrance.

ii. Queuing distances conforming with the above shall be provided at all fare gates including future gates.

E. Queuing space provided at a Ticket Machine or automatic teller shall be a minimum 3000mm when facing a wall or obstruction.

F. Queuing space provided at a Ticket Machine or automatic teller shall be a minimum 2000mm when adjoining another queue space.

G. Queuing space provided at doors for use by the public to and within Stations within the flow path of Passengers to and from entries, Platforms and vertical circulation, exclusive of coiling doors and grills, shall be a minimum of 3000mm.

H. Where two or more elements listed above converge, the surge or runoff spaces shall be cumulative.

(f) Vertical Circulation shall be sized as follows:

(i) Vertical circulation for all stations shall be sized to meet the Passenger carrying capacity of the 2048 operations.

(g) Ridership Forecast Data

(i) DB Co shall be responsible for ensuring that the SI supports the Passenger demand in Table 4-2.2 and Table 4-2.3 below, and in accordance with this Part 4 and Schedule 15-2, Part 1, Article 3.3 – Operational Design and Construction Requirements.

(ii) DB Co shall utilize a ratio of 82.5% to convert the AM peak hour ridership forecast to a PM peak hour ridership forecast.

Table 4-2.2: 2031 AM Peak Hour Ridership Forecast

Stations	2031 AM Peak Hour Ridership Forecast					
	EB Boardings	EB Alightings	EB Load	WB Boardings	WB Alightings	WB Load
Moodie	4,226	0	4,226	0	688	0
Bayshore	1,305	64	5,467	106	180	688
Pinecrest	561	36	5,992	43	156	762
Queensview	376	77	6,291	67	118	875

Baseline	4,881	0	4,881	0	2,230	0
Iris	279	33	5,127	13	31	2,230
Lincoln Fields	891	863	11,446	734	157	2,248 to Iris 926 to Queensview
New Orchard	411	123	11,734	112	110	2,596
Cleary	565	404	11,895	110	163	2,594
Dominion	152	39	12,008	26	24	2,647
Westboro	661	168	12,501	163	246	2,645
Tunney's Pasture	1,916	851	**13,566**	304	1,131	2,728
Bayview	554	960	13,160	148	203	3,555
Pimisi	518	458	13,220	210	325	3,610
Lyon	3,852	4,089	12,983	941	3,748	3,725
Parliament	274	3,876	9,381	239	2,959	6,532
Rideau	545	2,566	7,360	763	1,466	9,252
uOttawa	388	3,989	3,759	491	2,759	9,955
Lees	211	215	3,755	217	206	**12,223**
Hurdman	626	1,535	2,846	4,444	1,059	12,212
Tremblay	52	280	2,618	71	162	8,827
St. Laurent	202	928	1,892	948	707	8,918
Cyrville	58	403	1,547	340	192	8,677
Blair	138	886	799	2,395	720	8,529
Montreal	89	163	725	277	85	6,854
Jeanne d'Arc	62	207	580	1,474	46	6,662
Orleans Blvd	41	170	451	851	56	5,234
Place d'Orléans	13	402	62	2,828	38	4,439
Trim	0	61	1	1,649	0	1,649

Table 4-2.3: 2048 AM Peak Hour Ridership Forecast

Stations	**2048 AM Peak Hour Ridership Forecast**					
	EB Boardings	**EB Alightings**	**EB Load**	**WB Boardings**	**WB Alightings**	**WB Load**
Moodie	4,758	0	4,758	0	775	0
Bayshore	1,469	72	6,155	119	203	775

Pinecrest	632	41	6,746	48	176	858
Queensview	423	87	7,083	75	133	985
Baseline	5,496	0	5,496	0	2,511	0
Iris	314	37	5,773	15	35	2,511
Lincoln Fields	1,003	972	12,887	826	177	2,531 to Iris 1,043 to Queensview
New Orchard	463	138	13,211	126	124	2,923
Cleary	636	455	13,393	124	184	2,921
Dominion	171	44	13,520	29	27	2,980
Westboro	744	189	14,075	184	277	2,978
Tunney's Pasture	2,157	958	**15,274**	342	1,273	3,071
Bayview	624	1,081	14,817	167	229	4,003
Pimisi	583	516	14,884	236	366	4,065
Lyon	4,337	4,604	14,618	1,059	4,220	4,194
Parliament	308	4,364	10,562	269	3,332	7,354
Rideau	614	2,889	8,287	859	1,651	10,417
uOttawa	437	4,491	4,232	553	3,106	11,208
Lees	238	242	4,228	244	232	**13,762**
Hurdman	705	1,728	3,204	5,004	1,192	13,750
Tremblay	59	315	2,948	80	182	9,938
St. Laurent	227	1,045	2,130	1,067	796	10,041
Cyrville	65	454	1,742	383	216	9,769
Blair	155	998	900	2,697	811	9,603
Montreal	100	184	816	312	96	7,717
Jeanne d'Arc	70	233	653	1,660	52	7,501
Orleans Blvd	46	191	508	958	63	5,893
Place d'Orléans	15	453	70	3,184	43	4,998
Trim	0	69	1	1,857	0	1,857

2.5 Circulation and Egress

(a) DB Co shall provide vertical circulation in accordance with the following:

(i) DB Co Shall provide elevators in accordance with the following:

A. Where Station design requires elevators, except where noted in this Article 2, each Station Platform, concourse, and entrance shall be serviced by redundant elevators or other alternative route as described in this Part 4.

i. The crossing of City or private streets to satisfy the redundancy requirements shall not be permitted.

ii. An alternative accessible means of vertical transportation, such as a ramp, shall be permitted, provided the alternative means is within 50m, lit, winter maintained and comply with CAN-CSA B-651,

iii. Passengers shall not be required to exit the Fare Paid Zone to access the redundant elevator or alternative route.

B. Where Station design requires elevators, a minimum of one elevator serving each Platform, and all levels of the Station, shall be sized to allow for an ambulance stretcher in the prone position and customers with bicycles. The other elevator shall provide redundancy for accessibility purposes.

C. All elevators shall meet the following general requirements:

i. Conform to all applicable Acts and codes, including the CAN/CSA B44 Safety Code for Elevators and Escalators (latest edition including Appendix E), OBC, NFPA, NBC, AODA, CSA Accessible Design for the Built Environment CAN/CSA B651, and City of Ottawa Accessibility Design Standards;

ii. Be of heavy duty components and construction designed specifically for transportation system usage;

iii. All elevator doors including existing refurbished elevators shall be constructed utilizing glass with stainless steel frames to maintain sightlines into the elevator cab.

iv. Traction elevators shall be provided where they serve more than 14m of travel; and

v. Running time, cycle counters or trip counters that would cause the elevators to shut down or alter their operation in any way, shall not be permitted.

D. In addition, all new elevators shall have the following:

i. The elevator car walls and hoistway walls shall be constructed utilizing glass to maintain sightlines inside and outside of elevator. Both elevator cab and hoistway enclosure shall be constructed of glass.

ii. Where all glass cab and hoistway is not feasible, a minimum, of 50% of the total elevator cab and hoist way's vertical enclosure surface area shall be constructed of glass;

1 Glass surfaces of the elevator and elevator hoistway shall be aligned.

2 Panels within the elevator shaft required to meet TSSA requirements shall not be opaque.

3 All glass used in the construction of the elevator cab, hoistway, and panels used to meet TSSA requirements where door opening in the hiostway shaft are not present, to reduce gaps between cab an hoistway, etc. shall be transparent vision glass.

4 In lieu of panels located where door openings in the hiostway do not exist, DB Co may substitute, with TSSA approval, a positive door interlock to prevent doors from opening at no door opening locations.

iii. CCTV camera coverage shall be provided within the cab and at each landing;

iv. Access locations to elevators shall be weather protected so as to prevent the infiltration of precipitation into the elevator shafts and or cabs;

v. Elevator cab flooring shall be aluminum, rubber, or other durable, non-absorbent material with a non-slip surface with coefficient of friction of not less than 0.60;

vi. Elevators shall accommodate a minimum capacity of 1815kg, or the heaviest piece of equipment to be transported between levels for replacement or maintenance of the equipment, whichever is greater;

vii. The minimum inside cab dimensions shall be 1526mm wide x 2413mm deep with 1200mm wide (clear opening) x 2135mm high doors.

viii. Minimum car operating speeds shall be 0.5m per second for elevators with a travel distance of less than or equal to 20m and 1m per second for elevators with a travel distance of more than 20m;

ix. Elevator machine rooms shall be located as near as possible to hoistways with a maximum distance of 20m clear of public walking and landing areas;

x. Oil heaters shall be installed in the hydraulic elevator storage tank if the elevator is not in a heated area;

xi. Elevators shall be equipped with a self-recharging battery pack which shall maintain lighting, return the elevator to level of fire department access, open the doors, and render the elevator inoperative in the event of a power failure;

xii. All elevator keying shall match the keying of the existing elevators within the Existing Confederation Line;

xiii. Elevators shall be equipped with a hands-free telephone connected with TOCC;

xiv. Elevators shall contain graffiti-resistant finish material in the cab interior;

xv. Elevators shall be equipped with a urine detection system;

xvi. Lighting in elevator cabs shall be LED fixtures. Lighting shall be covered with a protective transparent shield to prevent vandalism;

xvii. The operating status of the elevator shall be monitored by the BMS system and the TOCC;

xviii. Elevators shall be controlled at the Station only;

xix. Elevators intended for use in moving equipment to and from locations within the facility shall be sized to accommodate the intended equipment:

xx. Elevator pit walls shall be lined with a non-porous material and shall be drained and waterproofed; and

xxi. Existing elevators within Station Facilities shall be refurbished to meet at a minimum the following:

1 Existing cab and shaft doors shall be replaced with full glass doors;

2 Existing control equipment shall be compatible with the BMS and TOCC monitoring requirements and shall be upgraded, if required;

3 DB Co shall ensure existing elevator cabs are provided with CCTV cameras; and,

4 DB Co shall be responsible to make all upgrades to existing elevators in order to obtain certification of the equipment.

5 DB Co shall upgrade the existing elevator, cabs, controls, signage, etc. to meet the current accessibility requirements, excluding any modifications to the cab size.

(ii) DB Co shall provide escalators in accordance with the following:

A. Where escalators are required to serve the Train Platform level, DB Co. shall provide a minimum of one escalator serving each Train Platform.

B. Escalators shall be provided to serve Baseline Station.

i. DB Co shall provide a minimum of one escalator serving each entrance and each level inclusive of the Train Platform, Entrance level and pedestrian Bridge level;

C. Escalators shall be provided to serve Lincoln Fields Station.

i. DB Co shall provide a minimum of one escalator serving each Train Platform to the Carling Avenue entrance level; and,

ii. DB Co shall provide an escalator serving the bus terminal level to the Carling Avenue entrance level.

D. Escalators shall be provided to serve Moodie Station.

i. DB Co shall provide a minimum of one escalator serving each Train Platform to the pedestrian Bridge level.

E. Escalators shall be provided to serve Place d' Orléans Station.

i. DB Co shall provide a minimum of one escalator serving the Train Platform to the new pedestrian Bridge level to the bus terminal within the Fare Paid Zone.

F. Escalators shall be provided to serve Trim Station.

i. DB Co shall provide a minimum of one escalator serving the Train Platform to the pedestrian Bridge level connecting to the Fare Paid entrance adjacent to the bus terminal; and,

ii. DB Co shall provide a minimum of one escalator serving the fare paid entrance and bus terminal to the pedestrian Bridge level;

G. Escalators shall meet the following requirements:

i. Conform to all Applicable Codes and acts including the CAN/CSA B44 Safety Code for Elevators and Escalators OBC, NFPA, NBC, AODA, CSA Accessible Design for the Built Environment CAN/CSA B651, and City of Ottawa Accessibility Standards;

ii. Shall be of components and construction that meet or exceed the requirements for the "Heavy Duty Transportation System Escalator Design Guidelines," published by the APTA; and

iii. Running time, cycle counters or trip counters that would cause the escalators to shut down or alter their operation in any way, shall not be permitted.

H. In addition, the escalators shall meet the following requirements:

i. Shall have a minimum step width of 1000mm;

ii. Shall have a running headroom of not less than 2200mm;

iii. Shall have reversing capabilities. A keying device shall be required to change direction;

iv. Shall be capable of operating with a full passenger load at a speed of 0.5m per second in both directions;

v. Shall be designed for continuous operation, 24 hours a day, 365 days a year;

vi. Shall be capable of operating with full specified performance capability while exposed to the following climatic and environmental conditions:

1 Natural elements of weather and other man made environmental conditions, including sunlight, rain, slush, snow and ice, all conditions of relative humidity while exposed to road salt, airborne dust and debris; and in dry bulb temperature -40°C to 40°C;

vii. Step chain rollers shall be mounted outside the chain link;

viii. Shall have 3 flat steps at each of the top and bottom landings;

ix. Shall have brushes along the skirt panels;

x. The sides and bottom of the escalators shall be clad in Type 304 alloy stainless steel conforming to ASTM A167, where exposed;

xi. Escalators forming part of the required egress route shall be capable of being interlocked with the fire alarm system and shut down in the event of an alarm;

xii. Shall have a high deck with angled stainless steel balustrades;

xiii. Status shall be monitored by the BAS in the Station and at the TOCC; and,

xiv. Shall be able to be controlled at the escalator in the Station.

xv. Shall have provisions to be controlled remotely at the TOCC.

xvi. The use of wood, inclusive of fire treated, non-combustible wood shall be prohibited from use in any portion of the escalator or escalator cladding.

(b) DB Co shall provide stairs and ramps in accordance with the following:

(i) Stairs

A. New stairs shall be constructed of precast or cast in place concrete with precast concrete treads with cast in nosings. Tactile warning strips shall be provided as required by OBC, CAN-CSA B-651, AODA and COADS.

B. Exterior stairwells within the Station, Emergency egress stairs from the Station, and stairs providing access to the Station shall be fully weather protected or heat-traced to ensure safe usage during the winter;

C. Sizing shall be per code minimum requirements and per LOS requirements as defined in this Part 4.

D. DB Co shall design and construct all stairways in compliance with the following criteria.

i. Open risers shall not be permitted;

ii. Continuous railings shall be provided on both sides of the stairs;

iii. Stairs rise and run shall be 30 degrees.

iv. Exterior stairway landing levels shall include a grated drainable catchment basin to trap grit, water and snow.

v. All public stairs, interior and exterior, shall include a bicycle wheel trough on one side of each flight of stairs.

1 For new construction, the bicycle trough shall be integral with the stair construction.

2 For existing stair construction, the trough is permitted to be surface applied, provided the trough, fasteners and accessories to do not reduce the required egress width.

3 All bicycle wheel troughs shall include textured, non-slip surfaces to provide traction for bicycle wheels.

E. Existing stairs shall be refurbished or replaced to satisfy the Design Life requirements outlined in Schedule 15-2, Part 1, Article 4 – Design and Construction.

(ii) DB Co shall provide railings in accordance with the following:

A. Guardrails and handrails shall be provided where required by code and CAN-CSA B-651 as follows:

i. The design and construction of guardrails for all Stations shall be consistent and an element of Continuity.

1 Guardrails for Federally Mandated Stations shall be consistent with the Existing Confederation Line per drawings contained in Appendix B of this Part 4: STAIR RAILING / GUARD DETAILS; and,

2 For Stations other than Federally Mandated Stations, Guard Materials and detailing shall be of any material and detailing conforming with the requirements of the OBC and satisfying the Design Life requirements per Schedule 15-2, Part 1, Article 4 – Design and Construction.

ii. All handrails associated with public stairs and ramps within the Station Fare Paid Zone, on the Station site and providing access to the Station site, shall be stainless steel pipe sections Type 304 alloy conforming to ASTM A167, with smooth brushed finish, supported by cast aluminum or stainless steel bracket supported from wall or guard rail system;

(iii) DB CO shall provide ramps in accordance with the following:

A. All interior and exterior ramps shall be universally accessible, including satisfying the requirements of OBC, AODA COADS and applicable CSA Standards, including but not limited to CAN/CSA B651; and,

B. All interior ramps and exterior ramps providing access to the Station shall be fully weather protected or heat-traced to ensure safe usage during the winter.

C. For Station designs that rely only on ramps in lieu of elevators as the accessible route, DB Co shall design the vertical circulation in accordance with the following:

i. Each level served by ramps only shall also be served by a stair;

ii. The landings of the stairs in the direction of travel from the Station entry to the Platform shall be directly adjacent to each other; and,

iii. The landings of the stair and ramp at Platform level shall be separated by a maximum distance of 15.0m.

(c) DB Co shall provide doors in accordance with the following:

(i) Power door operators shall be provided for at least one public door into each publicly accessible space and room.

(ii) All doors shall have a 980 mm minimum clear width.

(iii) Exposed edges of frameless transparent glass public doors and panels shall be framed with a 70% colour contrast material compared to surrounding wall surfaces.

(iv) Framed glass public doors shall be finished with a 70% colour contrast material compared to surrounding wall surfaces.

(v) Opaque door and frame assemblies shall be finished with a 70% colour contrast compared to surrounding wall surfaces

(vi) All doors and gates securing the perimeter of the Station, inclusive of service doors shall be provided with electronic key card access and shall be monitored at the TOCC.

(vii) All Emergency egress doors and gates shall be provided with an exterior light that remains on during all hours of darkness and shall be signed for restricted access.

(d) DB Co shall provide circulation in accordance with the following:

(i) Public Passageways

A. The width of public passageways:

i. Shall meet or exceed exiting requirements set forth in the OBC;

ii. Shall be a minimum of 4000mm; and

iii. Shall be sized in order to satisfy the LOS indicated in this Article 2.

B. Corridors and passageways shall have a minimum clear height of 3500mm, excluding space required for mechanical and electric services.

C. The main accessible path of travel for public passageways in an open area from entrances to the Platform level and all Passenger amenities shall be identified by tactile floor wayfinding.

(ii) Non public

A. The minimal acceptable width of passageways for non-public use shall be the greater of the following: code calculated minimum, 1200mm, as required by accessibility requirements or sized as required to move equipment for maintenance.

(iii) Public-use pedways within Fare Paid Zone (Overpass / Underpass)

A. The minimum clear width shall be 4000mm, unless existing to remain.

B. The minimum clear height shall be 3500mm, unless existing to remain.

(e) DB Co shall provide Emergency egress in accordance with the following:

(i) Egress to Track level from the Platform along the length of the Platform for purposes of satisfying code exiting requirements shall be prohibited.

(ii) Where required, exiting from the end of the Platform into the Guideway area is acceptable for At Grade Stations in accordance with the following:

A. Doors/gates at Platform ends shall be sized appropriately to satisfy code requirements. The door/gate assembly overall height shall be 2450mm;

i. For Federally Mandated Stations door/gate design shall be consistent with the Existing Confederation Line per drawings contained in Appendix B of this Part 4: END OF PLATFORM DOOR DETAILS; and,

ii. For Station other than Federally Mandated Stations door/gate design shall be similar to the Existing Confederation Line per drawings contained in Appendix B of this Part 4: END OF PLATFORM DOOR DETAILS utilizing a glazing and support system as selected by DB Co.

B. Doors/gates at Platform ends shall be equipped with panic device hardware;

C. The position of doors/gates shall be monitored at the TOCC. Unauthorized opening of the door/gate shall sound an audible signal in the Station and notify the TOCC;

D. Beyond the Platform end, the egress path shall be segregated from Track level with a fence or railing system to prevent public access to the Tracks and or crossing the Tracks;

i. Railing system shall be designed to meet the OBC requirements for a guardrail including but not limited to structural capacity and balustrade spacing.

E. The path of travel shall lead to a public way;

F. The path of travel must be designed and constructed to allow winter maintenance; and,

G. Crossing of the Tracks to access the public way shall be prohibited.

(iii) Pathways connecting a Station Platform to a MUP, roadway, or sidewalk, to satisfy Emergency egress requirements from the Stations, shall include the following requirements:

A. Egress lighting;

i. The lighting level shall at a minimum meet the requirements of OBC for Emergency egress lighting; and

ii. Lighting shall be interconnected with the fire alarm system and be activated only in the event of an Emergency situation.

(f) DB Co shall provide Station entrances in accordance with the following::

(i) Entrances to Stations for use by the public shall be equipped with doors, coiling grilles or ornamental gates or other means to secure the Station buildings during hours of non-operation.

A. All doors, inclusive of coiling grills shall be capable of being remotely opened, closed and locked from the TOCC;

B. All doors shall be equipped with IAC and card access; and,

C. The status of all doors shall be remotely monitored by the TOCC.

(ii) Each mode of transportation at Transfer Stations shall be capable of being secured separately when hours of operations differ.

A. Public access to/from the bus terminal at Transfer Stations shall be maintained 24 hours per day.

B. Bus Passengers shall have access to Ticket Machines during bus operating hours.

(iii) All doors, coiling grills, etc. used to secure the Stations shall be equipped with electric operators, and controlled both locally and remotely from the TOCC.

(iv) Each Station entrance shall have a maintenance access in accordance with the following:

A. Maintenance door shall have a clear width of at least 1200 mm;

i. Use of fare gate for maintenance access shall be prohibited; and

B. Maintenance door shall be accessible when the Station is closed to public use.

(v) DB Co shall provide recessed floor grilles at all Station entrances located directly adjacent to the fare gates:

A. The floor grills shall extend the full width of the fare gate array, inclusive of the future fare gate allowances, and a minimum distance of 2.5m from the leading and trailing face of the fare gate pedestal.

B. Each floor grille shall be equipped with a floor drain.

C. Each floor grille drain and drainage pan shall be heat traced.

(g) DB Co shall provide wayfinding in accordance with the following:

(i) Provide tactile floor wayfinding throughout all Stations inclusive of bus Facilities including bus boarding locations within the Fare Paid Zone, and on street bus stops in compliance with OBC, COADS and CAN/CSA B651: Accessible Design for the Built Environment.

2.6 Functional Requirements

(a) DB Co shall design and construct the Stations to meet the functional requirements as indicated in Appendix A of this Part 4:

(b) Where bus services are provided, the DB Co shall provide all surface facilities including bus Platforms, drives, slips, etc. to accommodate all buses including articulated and double decker buses and in accordance with the following:

(i) All OC Transpo facilities, (bus operator rooms, washrooms, multipurpose room, lunchrooms, etc.), shall be designed to be universally accessible.

(ii) All OC Transpo facilities, (eg: bus operator rooms, washrooms, multipurpose room, lunchrooms, etc.), shall be access controlled by key card.

(iii) All washrooms for use by OC Transpo shall be designed and constructed to meet the requirements of OBC and COADS.

(iv) Where required in Appendix A of this Part 4, bus operator Facilities shall be provided as follows:

A. All bus operator Facilities at all Stations, with the exception of Place d'Orléans and Bayshore Stations, shall be standalone Facilities.

B. All bus operator Facilities, with the exception of Place d'Orléans and Bayshore Stations, shall be located as to separate OC Transpo bus operators from Passenger areas and bus Platforms.

C. New Facilities shall be constructed to meet the requirements of the City's standard bus operator building.

D. All bus terminals shall be provided with a designated walking area for bus operators to safely walk between the bus lay-up and bus operator facility.

E. DB Co shall register each new Facility with the GBC and provide documentation for all credits necessary for "Certified" status.

F. Program elements within the facility shall include the following:

i. Multiple occupancy male washroom with ceiling mounted embossed stainless steel partitions with the following plumbing fixture count;

1 Two lavatories;

2 Two water closets; and,

3 One urinal.

ii. Multiple occupancy female washroom with ceiling mounted embossed stainless steel partitions with the following plumbing fixture count;

1 Two lavatories; and,

2 Two water closets.

iii. Universal washroom satisfying the requirements of COADS and CAN-CSA B-651;

iv. Washroom fixtures and accessories shall meet OC Transpo requirements, including but not limited to mirror, toilet tissue dispenser, soap dispenser, paper towel dispenser, and trash receptacle.

v. Janitor closet with mop sink, accessible from within the Facility;

vi. Breakroom with kitchenette and casework for concurrent use by four people;

vii. General power requirements, including dedicated power circuits for each of the following: microwave oven, refrigerator, and toaster oven; and vending machines;

viii. Space for a refrigerator, vending machine, and microwave;

ix. Water cooler with bottle filler;

x. Staff work areas;

xi. Maintenance room with slop sink, accessed from the exterior and interior from the staff arear;

1 Shall be a minimum of $60m^2$, with no side less than 6m in length;

2 Shall be equipped with a personnel door and a 4m wide overhead door to the exterior.

3 Shall be equipped with a personnel door and a 4m wide overhead door to the staff area;

4 Shall have at a minimum of one floor drain.

xii. Building entry and maintenance room shall have electronic access control;

xiii. Mechanical and electrical support rooms;

1 DB Co shall provide a building automation system per Article 5 - Mechanical Design Criteria of this Part 4, which is compatible with existing OC Transpo BMS.

xiv. Communication room to support City equipment;

xv. New buildings shall be designed and constructed with materials compatible with the adjacent Station; and,

xvi. New buildings at Federally Mandated Stations shall be consistent with the Existing Confederation Line bus operators' buildings.

G. Buildings shall provide illumination level of 25fc to be achieved via natural daylighting over 75% of all floor spaces. Windows shall conform to City's standard bus operator building requirements; and

H. Building shall be equipped with telephone and data services.

i. All staff spaces shall be equipped with data and communications outlets.

I. The flooring in all spaces, excluding building service support spaces and the maintenance space, shall be finished with Stonehard flooring system or other similar resinous flooring system as approved by the City.

(v) All Transfer Station bus drives, Platforms, and lay-by areas shall have a vertical clearance of no less than 5m.

(c) DB Co shall design and construct LRT Operator rooms per the following:

(i) Shall be provided as indicated in Appendix A of this Part 4;

(ii) Shall at a minimum include the following:

A. Breakroom with kitchenette and casework designed for concurrent use by four people;

B. General power requirements, including dedicated power circuits for each of the following: microwave oven, refrigerator, vending machine, and toaster oven;

C. Data/communication outlets;

D. Phone line;

E. Space for a refrigerator, vending machine, and microwave;

F. Two small work stations, one with a computer;

G. Water cooler with bottle filler;

H. Double tier lockers

i. 16 unit, 300mm w x 300mm d x 900mm h each

I. Universal single occupancy male washroom;

J. Universal single occupancy female washroom;

K. Stonehard flooring system or other similar resinous flooring system as approved by the City; and,

L. DB Co shall provide space for and provide one 900mm wall mounted electronic display with power and data connection.

(iii) Shall be located at Platform level with direct access to a Platform without using vertical circulation; and,

(iv) DB Co shall provide one 32" wall mounted electronic display with power and data connection for the HASTUS.

(d) DB Co shall provide public washrooms within the Fare Paid Zone in accordance with the OBC at Terminal Stations, Moodie, Trim and Baseline.

(i) In addition to the Terminal Stations, DB Co shall provide public washrooms within the Fare Paid Zone, complying with OBC Terminal Station requirements at Lincoln Fields Station and Place d' Orléans Station.

(e) Bus supervisor's office

(i) DB Co shall provide bus supervisor's office at the Transfer Stations as indicated in Appendix A of this Part 4. The bus supervisor's office shall have the following requirements:

A. Shall be located at bus Platform level, within the Station;

B. Shall be located adjacent to the bus transfer Platform and contain a line of site to monitor bus operations;

C. Shall be have a minimum area of $12m^2$ with no side less than 3m;

D. Shall be conditioned;

E. Shall be accessed from the bus Platform area; and

F. Shall be equipped with a minimum of two data and two telephone connections.

(f) Retail spaces

(i) DB Co shall provide retail spaces as indicated in Appendix A of this Part 4.

(ii) DB Co shall design and construct Third Party retail spaces as follows:

A. Shall be a minimum of a $20m^2$ accessible from within the Fare Paid Zone;

B. Shall be protected from exposure to precipitation;

C. Shall have electrical, mechanical, and communications services roughed in for the protection of future development;

D. Shall provide power provisions and sufficient space for a third party distribution panel with 100amp service;

E. Shall Provide sufficient power provision for HVAC (min 100 amp service); and,

F. Shall have domestic water, fire suppression water, and sanitary services roughed in for the protection of future development.

(iii) Once developed and occupied by a tenant, control of retail spaces and revenue generated from the retail space shall belong to the City.

(g) OC Transpo Multi-purpose Rooms

(i) DB Co shall provide OC Transpo Multi-purpose Rooms as indicated in Appendix A of this Part 4.

(ii) DB Co shall design and construct OC Transpo Multi-purpose Rooms as follows:

A. Shall be a minimum of $16m^2$;

B. Accessible from within the Fare Paid Zone;

C. Provided with one workstation;

D. Provided with electrical, City data outlets and communications;

E. Table and chairs designed for concurrent use by up to three people;

F. Space for storage of printed materials;

G. Space for displaying fares and service information/posters; and,

H. Shall be secured with electronic access control.

(h) Automatic teller machines:

(i) DB Co shall provide all required infrastructure to support the installation of ATM and coordinate their location with the City in the following Stations:

A. Lincoln Fields, Baseline, Bayshore, and Place d'Orléans.

(i) DB Co shall design and construct public parking as follows:

(i) Park and Ride Facilities shall be provided at the Stations indicated in Appendix A to this Part 4.

(ii) All Park and Ride Facilities shall be designed and constructed as follows:

A. Vehicle parking spaces:

i. Shall be between 2.6m to 2.75m wide; universal accessible parking spaces shall be compliant to CAN-CSA B-651, COADS and;

1 Surface lot parking spaces shall be 90 degree;

2 A maximum of 5% of parking spaces located in each Park and Ride Facility are permitted to be reduced a width of 2.4m and length of 4.6m provided the spaces are clearly signed for compact cars only; and,

3 The reduction in parking space width permitted in the City of Ottawa Zoning By-law, Parking Space Provisions (Sec. 106) subsection (3) shall not apply to this Project.

ii. Shall be 5.2m in length;

iii. DB Co shall provide each Park and Ride Facility with charging stations for plug in electric vehicles in accordance with the following:

1 0.5% of the spaces in each Park and Ride shall have charging stations. Each space shall be served by one unit, or two spaces can be shared by a unit with two independently functioning dispensers;

2 Each charging station shall be Level 2 charging stations with credit card payment;

3 Each charging station shall have power conduits, handholes etc. for electric supply;

4 Each charging station shall have conduits, handholes etc. for data and communications;

5 Each charging station shall have foundation and concrete slab per manufacture's requirements; and,

6 Each charging station shall have identification and operating signage for each charging station.

B. Drive aisles:

i. Drive aisles within the parking areas shall be a minimum of 6.7m wide.

C. Snow Storage

i. DB Co shall design and construct the Park and Ride Facilities accommodate snow storage with no reduction to the minimum number of required parking spaces.

ii. Vegetation located in areas identified for snow storage or within the drainage area of the snow storage area shall be salt resistant.

(j) DB CO shall design and construct support spaces required for the operation of Stations and Facilities consistent with the Existing Confederation Line Stations including but not limited to the following:

(i) Support spaces shall not be accessible to the public and shall be access controlled by key card system compatible with the Existing Confederation Line access control system.

(ii) DB Co shall design and construct access to all areas of the Station that require maintenance with personnel doors. Access hatches to rooms or areas such as TVS rooms and vent shafts, which would be considered confined spaces, shall not be permitted.

(iii) DB Co shall design and construct Stations with provisions for the removal and installation of all fixed equipment including:

A. Equipment install/removal routes for TVS fans, transformers, rectifiers and all other large equipment including pathway through open space, corridors and openings;

B. The Structure within all equipment removal/installation routes shall be designed and constructed to support the live load of the equipment; and,

C. DB Co shall provide all fixed equipment to facilitate the installation/removal including lifting beams.

(iv) Support spaces and area requirements listed below are minimums only, and may not represent all spaces required to support a fully functioning Station. DB Co shall be responsible to determine the final space requirements to support the system and required sizes to house all equipment and maintain clear working space clearances.

A. Maintenance staff washrooms:

i. Each Station shall have 1 maintenance staff unisex washroom, in addition to OCT washrooms and public washrooms, for the exclusive use by maintenance staff;

ii. Maintenance staff washrooms are not required to meet COADS; and

iii. Washroom accessories shall include mirror, toilet tissue dispenser, soap dispenser, paper towel dispenser and trash receptacle.

B. OC Transpo Washrooms

i. Westboro and Pinecrest Stations shall have one OC Transpo staff unisex washroom, in addition to maintenance washroom, for the exclusive use by OC Transpo staff;

ii. OC Transpo staff washrooms shall meet COADS; and,

iii. Washroom fixtures and accessories shall meet OC Transpo specifications, including but not limited to mirror, toilet tissue dispenser, soap dispenser, paper towel dispenser and trash receptacle.

C. SER

i. A dedicated SER shall be located in Baseline, Moodie, Lincoln Fields, Dominion, Montreal, Orleans Blvd, and Trim Stations;

ii. Minimum room size shall be $60m^2$.

D. Communications room:

i. A dedicated communications room shall be located in all Stations:

ii. Minimum room size shall be $60m^2$.

E. Electrical room:

i. A dedicated electrical room shall be located in all Stations;

ii. Minimum room size shall be $45m^2$.

F. Telephone room:

i. A dedicated telephone room shall be located in all Stations;

ii. Minimum room size shall be $2m^2$.

G. Mechanical room:

i. A dedicated mechanical room housing equipment to heat and cool support spaces shall be located in all Stations;

ii. Minimum room size shall be $40m^2$.

H. Janitor room:

i. A minimum of 1 janitor room shall be located in all Stations;

ii. Shall have a mop sink, 48”x12”x75” 5 shelf stainless steel shelving unit;

iii. Minimum room size shall be $20m^2$;

i. In addition to the janitor room identified in Clause i above, DB Co. shall provide an additional janitor closet within 5.0m of all public washroom facilities; and,

ii. DB Co shall provide at a minimum one janitor room at the LRT Platform location at Trim Station and Place d’ Orléans Station.

I. Snow removal equipment room:

i. A minimum of 1 snow equipment removal room shall be located in all Stations;

1 Minimum room size shall be $20m^2$;

2 DB Co shall design and construct all snow removal equipment rooms to allow the storage of up to 2, 25L containers of gasoline, including ventilation and fire rating as required by all applicable Codes and Standards; and,

3 Snow room shall be shared with Emergency Services.

ii. In addition to the above, Westboro, and Baseline Stations shall have one additional snow removal room located adjacent to the bus terminal for use by the City.

J. Elevator machine room:

i. This section applies only to Stations where elevator equipment requires a machine room;

ii. Each Station equipped with elevators shall have elevator machine room(s);

iii. Elevator machine room minimum size shall be as required by equipment manufacturer; and,

iv. Elevator machine room shall contain only elevator equipment and equipment to support the same.

K. TPSS rooms within Stations:

i. TPSS rooms shall be located within Stations at Lincoln Fields and Cleary Stations;

ii. Minimum size of TPSS room shall be 120 m^2;

iii. Minimum clear height shall be 4m;

iv. Room shall be equipped with pair of doors or overhead door with a nominal clear opening of 3.2 m x 3.2 m; and,

v. DB Co shall design and construct the Station for the removal and replacement of equipment.

L. TPSS package units adjacent to Stations:

i. DB Co shall design and construct all TPSS packaged units located within the Guideway and adjacent to a Station as follows:

1 A hard surface walkway with a minimum width of 1200mm shall be provided for personnel access to the TPSS;

2 Access to the walkway shall be restricted from all public areas of the Station including the Platform by an access controlled gate or door;

3 Access walkway shall be segregated from the guideway by protective fencing with a minimum height of 1.0 m;

4 Access to Track level of the Guideway from the access walkway shall be restricted by an access controlled gate; and,

5 DB Co shall design and construct the Station, and systems for the removal and replacement of equipment.

M. Fan room:

i. Fan rooms shall be provided as required in Underground Stations;

ii. Fan room shall be sized to house required equipment; and,

iii. Fan room and pathway shall be sized for the replacement of largest piece of equipment within the room.

N. Mobile generator

i. Where required in Article 6 – Electrical Design Criteria of this Part 4, DB Co shall provide parking for a vehicle and trailer mounted generator within 6m of the generator connection point to the Station electrical system; and,

ii. Where dedicated parking area is not available within the vicinity of the Station, DB Co shall request permission from the City to allow vehicle and trailer parking on the public roadway, prior to submission of the Final Design Development submittal.

O. Refuse room:

i. A minimum of one refuse storage room shall be located in all Stations;

1 Minimum room size shall be 8 m^2; and,

2 At Moodie, Trim and Place d'Orléans, DB Co shall locate one refuse room in the LRT Platform area of the site.

P. Rail operations storage room:

i. DB Co shall provide a storage room for the exclusive use of the City rail operations in each Station;

1 Minimum room size shall be 8 m^2 with no side less than 2.5m.

(k) Rail supervisor's office

(i) DB Co shall provide rail supervisor's office at Baseline Station and Trim Station. The rail supervisor's office shall have the following requirements:

A. Shall be located at Platform level within the Station;

B. Shall be located adjacent to LRT Operator's room;

C. Shall be have a minimum area of 12m^2 with no side less than 3m;

D. Shall be conditioned;

E. Shall be accessed from the Platform area; and,

F. Shall be equipped with a minimum of two data and two telephone connections.

(l) Maintenance crew room

(i) DB Co shall provide a maintenance crew room as indicated in Appendix A of this Part 4. The maintenance crew room shall have the following requirements:

A. Shall be a minimum of $16m^2$;

B. Accessible from within the Fare Paid Zone;

C. Shall be conditioned;

D. Provided with one workstation; and,

E. Provided with general use electrical, data outlets, and communications.

2.7 Project Elements

(a) DB Co shall provide Train Platforms in accordance with the following:

(i) Platform Vehicle interface

A. The finished level of the Platform at Platform edge shall be level with finished floor height of the Revenue Vehicle, 356mm above TOR.

B. The finished edge of the Platform shall be located 1440mm from the centerline of Track.

(ii) Platform Drainage

A. The cross slopes of the Platforms shall not exceed 2% with a minimum of 1% toward the Track or away from the Track.

B. The longitudinal slope of the Platform surface shall not exceed 1.5%.

C. The path of travel lanes on the Platform shall comply with OBC, NFPA and all accessibility requirements.

(iii) Platform floor finish

A. The finished floor material shall have an integral non-slip surface with a wet static coefficient of friction of at least 0.60 or higher by ASTM C 1028.

B. A detectable tactile warning strip, comprised of a non-slip, colour contrasting surface consistent with the Existing Confederation Line Stations shall be placed along the trackside edge of the Platform.

C. Floor colour and texture shall be different from the flooring in the areas approaching the Platform.

D. The floor finish in all Stations, except Underground Stations and Federally Mandated Stations, shall be cast in place concrete with consistent colour, pattern, Platform edge tile treatment, etc. applied through all Stations.

E. The floor finish in Federally Mandated Stations shall be consistent with the Existing Confederation Line Stations, including material, colour, pattern, Platform edge tile treatment, etc.

F. The floor finish for Underground Station Platforms shall be porcelain tile having a non-slip surface with a coefficient of friction of at least 0.60.

G. Wall finishes for all Station Platforms shall be as follows:

i. Station Platform walls at Cleary, New Orchard and Baseline, inclusive of the existing CMU walls separating the Revenue Service Tracks from the future Storage Tracks, shall be finished with a unique colour accent and/or tiled design or pattern to be selected by the City during the design phase of the Project to provide each Station with a unique, distinctive look and feel to aid with customer navigation, identification, and enjoyment of the system.

ii. For Federally Mandated Stations wall finishes shall be consistent with Existing Confederation Line Stations, including but not limited to large format porcelain panel system and glazing.

iii. For Stations other than Federally Mandated Stations, wall finishes shall be nonporous, durable materials meeting the Design Life requirements of Schedule 15-2, Part 1, Article 4 – Design and Construction, and shall be impact resistant to a height of 2.5m above the adjacent walking surface. Acceptable materials shall include, glass, precast concrete, porcelain tile, cast in place concrete, and natural stone and composite metal panels. Exposed or paint CMU is prohibited from use in public areas, with the exception of the CMU at Baseline separating the Revenue Service Tracks from the future Storage Tracks, which shall be sealed and painted.

H. Lighting fixtures shall be installed at the ceiling, signage band or underside of the roof Structure to provide continuous light on the Platform edge warning strip.

I. Floor hatches and or floor access doors shall not be placed within the Platforms.

(iv) Clearances from Platform

A. Vertical Clearances above Platform Surface

i. Any Station element that could be targeted for theft or vandalism (e.g. light fixtures, speakers, CCTV cameras, etc.) shall be located a minimum of 3050mm above the finished Platform surface. DB Co shall consider the possible use of benches, waste receptacles and other items by vandals to stand on to reach these elements; the placement of all items in DB Co's design shall reduce this potential.

(v) Service Outlets

A. Service outlets required for power and water shall be as follows:

i. Electrical – provide 15 A/120 V split receptacles at 20m intervals along the Platform area in addition each TSA shall have one 15A/120 V split receptacle.

ii. Water Hose Bibs – provide a minimum of 1 tamper proof hose bib on each Platform.

1 Water hose bibs shall be designed, located, and selected as to be protected from freezing.

(vi) Service/Maintenance Personnel Access Requirements

A. DB Co shall provide access from the Platform to Track level at each end of each Station Platform. Access off of the end of the Platform shall be restricted by and end of Platform door. Door shall be signed and alarmed to prevent unauthorized access. Door status shall be monitored by the TOCC. Door design shall be as per Clause 2.5 (e) of this Part 4.

B. DB Co shall provide an access path with a minimum clearance of 1200mm throughout all areas of the Station for the movement of maintenance equipment.

(vii) DB Co shall provide inner-car barrier protection on all Train Platforms as follows:

A. Inner-car barrier shall be consistent with the Existing Confederation Line;

B. Comprised of flexible bollards spaced as required to provide a clear distance between bollards of not greater the 200mm;

C. Shall be located on the Platform edge, centered on a coupled Train;

D. Minimum length of 6m;

E. Located within the detectable Platform edge warning tile;

F. No less than 900mm above the Platform finished floor level; and,

G. Color shall be safety yellow.

(viii) Inter-Track barriers:

A. All side Platform configured Stations shall be provided with a continuous barrier fence between Tracks.

i. The barrier shall be 1960mm high from TOR and extend a minimum of 15m beyond the end of the Station Platform at each end of the Station.

ii. Inter-Track barrier shall be as per Appendix B of this Part 4.

iii. A gap of no more than 100mm between the bottom of the barrier and the surface below, (ballast, concrete, etc) shall be permitted; and,

iv. The barrier shall be non-climbable and designed to allow visibility from Platform to Platform.

(ix) Platform snow melting

A. All Platforms, with the exception of Underground Stations, shall be provided with in slab electrical heating elements to remove snow and ice;

B. Platform heating shall include the area of the Platform edge warning tile; and

C. Platform heating electrical supply shall be sub metered.

(b) DB Co shall provide weather protection for the Stations in accordance with the following:

(i) DB Co shall provide a micro climate study of the building envelope and its configuration with respect to the micro-climatic and geographical location of each Station to determine the extent of the weather protection required. DB Co shall reflect the requirements of the micro climate in the design of the Stations.

(ii) The micro climate study shall be submitted in accordance with Schedule 10 – Review Procedure.

(iii) Roof requirements:

A. DB Co shall provide roof structures covering the Platform area at all Stations, with the exception of the Baseline Station, as per the following:

i. DB Co shall determine the extent of roof coverage required utilizing the Passenger forecast data and the results of the micro climate study for each Station identified in (i) above;

ii. Roof structures shall cover the entire width of the Platform with the exception of "Type C" roof canopy design contained in Appendix B;

iii. DB Co shall be responsible to determine the applicability of extending the roof coverage beyond the edge of the Platform based upon the results of the micro-climate study for each Station identified in Clause 2.7(b)(i) of this Part 4 above;

iv. DB Co shall determine the appropriate height of the roof structure above the Platform surface based upon the results of the micro-climate study for each Station identified in Clause 2.7(b)(i) of this Part 4 above;

v. DB Co shall design all roofs including Station roofs and pedestrian Bridges to prevent snow and ice from falling on to adjacent pedestrian or vehicular areas including roadways, sidewalks, MUPs, and plazas; and,

vi. The use of fritted glazing with up to 20% opaque surface shall be permitted in the "Type C" roof canopy design contained in Appendix B. Fritting shall be integral with glazing panel composition. The use of surface applied fritting on exposed surfaces of the glazing system shall not be permitted.

B. Roof structures shall cover all vertical circulation elements (stairs and ramps within the Stations, stairs providing access to the Stations outside of the Fare Paid Zone, escalators and elevators) and Fare Control equipment.

i. All fare gates shall be weather protected from rain infiltration and snow accumulation at fare gates in accordance with the following:

1 DB Co shall design the Station entries to limit exposure of the fare gates to direct precipitation in the form of rain and wind blown rain to 1.1% (95 hours) of the hours in a year;

2 DB Co shall design the Station entries to limit exposure of the fare gates to direct precipitation in the form of snow to 6.1% (265 hours) of the total hours between October 15 to April 15 months; and,

3 DB Co shall validate the values above for each entrance of each Station by computer simulation and shall submit the findings of the micro climate simulation in accordance with Schedule 10 – Review Procedure, as part of the Works Submittal for each Station.

ii. DB Co shall be responsible to implement any required design changes as a result of the microclimate studies for each required submission.

1 In the event that DB Co makes modifications to any entry design following the submission of the final micro climate study, DB Co, at no cost to the City and without schedule impact, shall resubmit the microclimate study for the affected Station to ensure conformance with the requirements of Clause 2.7(b)(iii)B,i of this Part 4. Should the study indicate nonconformance with the requirements, DB Co shall redesign and repeat the process until conformance with Clause 2.7(b)(iii)B,i of this Part 4, is confirmed.

C. DB Co shall be responsible for all interfaces and implications of the Platform roof structures, where applicable, and all Platform elements, including but not limited to the following:

i. Interface of roof structure with Train;

ii. Protection of OCS from falling ice and debris;

iii. Protection/isolation of any roof structure from stray current;

iv. Support of OCS;

v. Integration of lighting and signage requirements; and

vi. Integration of any other Station or systems element.

D. Any and all roof top equipment shall be completely screened from all public areas, inclusive of views from within the Lands and all surrounding areas.

E. DB Co shall design all roofs including Station roofs and pedestrian Bridges to prevent snow and ice from falling on to adjacent pedestrian or vehicular areas including roadways, sidewalks, MUPs, and plazas.

(c) Windscreens:

(i) DB Co shall provide wind screens for Passenger protection from the elements. Windscreens shall be predominately glass walls.

A. The use of wood windscreens shall only be permitted in locations not accessible to the public.

B. The design of windscreens for Federally Mandated Stations shall be consistent with the Existing Confederation Line designs: and,

C. The design of windscreens for Stations other than Federally Mandated Stations shall be of glazing and support system as selected by DB Co.

(ii) At a minimum, windscreens shall be provided at the perimeter edge of the Platform (side Platform) or outside edge of the Guideway (centre Platform).

A. Wood windscreens shall not be permitted for use in this application.

B. For Stations located within the median of a highway, windscreens shall be constructed of an MTO approved precast concrete sound barrier.

(iii) In addition to the above, the micro climatic and geographical location study of each Station shall determine the extent of the windscreen, including: where windscreens are required, extent of windscreen required, and required height of windscreen.

(d) Fare collection and control:

(i) DB Co shall plan, design, and construct all Stations with provisions for installation of a fare control system including but not limited to fare control gates and Ticket Machines to be installed by the City.

A. Fare control equipment provisions and requirements shall not apply to existing Stations (Blair and Tunney's Pasture) with existing equipment previously installed if not modified by DB Co.

B. Each entry shall be provided with a minimum of two standard fare gates, two wide gates, and two Ticket Machines. The designated accessible gate shall always be placed furthest to the left when entering the Fare Paid Zone with the second wide gate at the other end of the array.

i. The fare paid entrance serving the pedestrian Bridge at Baseline Station to the **[REDACTED]** does not require Ticket Machines.

C. Each fare gate array shall be contiguous and not broken or obstructed by any other elements, including structural supports within the fare array or surge space.

D. DB Co shall provide the minimum clear working distances from the fare gate pedestals as follows:

i. When approaching the fare array from the non-fare paid side provide a minimum of 130 mm on the left side of the fare array to a wall, barrier or obstruction of any kind.

ii. When approaching the fare array from the non-fare paid side provide a minimum of 475mm on the right side of the fare array to a wall, barrier, or obstruction of any kind.

iii. Barriers to delimit the Fare Paid Zone at the gate array shall be located in the center of the length of a gate array and installed perpendicular to the gate arrays.

iv. In addition to the clearance requirements above, DB Co shall provide space in the array for the addition of one 1 fare gate in the future to the right of the gate array. This space shall be protected for by providing a 1.5m high glass barrier centred on the fare gate pedestal.

E. The following Tables indicate the minimum quantities of fare collection and control equipment required at each Station subject to revision based on DB Co's Station designs and Passenger modelling and approved by the City:

Confederation Line West					
Station	No. of Station Entries *	Ticket Machine	Smartcard Enable Fare Gate		
			Standard Gate	Wide Gate	Total Fare Gates
Westboro	2	4	6	4	10
Dominion	1	2	3	2	5
Cleary	1	2	3	2	5
New Orchard	1	2	3	2	5
Lincoln Fields	3	6	6	6	12
Iris	2	4	4	4	8
Baseline	3	4	9	7	16
Queensview	1	2	2	2	4

Pincrest	1	2	2	2	4
Bayshore	2	4	4	4	8
Moodie	1	2	2	2	4

* In the event that DB Co's Station design varies the number of entrances from the quantity indicated in the table above, the quantities of fare control equipment shall be modified and approved by the City.

Confederation Line East					
Station	No. of Station Entries *	Ticket Machine	Smartcard Enable Fare Gate		
			Standard Gate	Wide Gate	Total Fare Gates
Montreal	2	4	4	4	8
Jeanne d'Arc	2	4	4	4	8
Orléans	2	4	4	4	8
Place d'Orléans	4	8	8	8	16
Trim	1	2	4	2	6

* In the event that DB Co's Station design varies the number of entrances from the quantity indicated in the table above, the quantity of fare control equipment shall be modified and approved by the City.

(ii) DB Co shall ensure that all building services and feeds are sized appropriately to accommodate the fare collection equipment.

(iii) DB Co shall provide a 1.5m-high minimum glass barrier adjacent to the fare gate equipment and extending to a wall or other building element to provide protection of the Fare Paid Zone.

(iv) DB Co shall plan and design the location of equipment so as to ensure the year round operation of the fare equipment, by ensuring protection of the fare collection equipment from direct precipitation, including but not limited to wind-driven rain, snow, and sleet, and drifting snow, in accordance with Clause 2.7(b)(iii)B,i Fare vending equipment placement shall mitigate glare from sunlight on the screen.

(v) DB Co shall ensure the integrity of the Fare Paid Zone at all Transfer Stations.

(vi) DB Co shall ensure consistent location of fare collection devices at Stations and in keeping with Existing Confederation Line Stations and weather protection requirements.

(vii) All Ticket Machines located in public spaces shall be recessed, with overhead canopies extending to the required queuing space. Ticket Machine placement shall also mitigate glare from sunlight on the screen.

(viii) DB Co shall design Stations' fare collection equipment to be flush, fixed, and integrated with Station infrastructure, unless otherwise noted, to avoid removal by unauthorized persons.

A. DB Co shall construct all surfaces for design and installation of the fare collection equipment and system elements by the City's fare collection system provider.

B. Ticket Machines shall be located and installed to allow Ticket Machine doors to open 180 degrees for servicing. While in the open position the Ticket Machine door shall not preclude customers from using the adjacent machines.

C. Free standing equipment shall be permitted provided DB Co provides sufficient queuing and circulation space as well as space required for maintenance and re-stocking activities, without compromising Passenger movement through the Station.

D. All conduit and cable ducts shall be concealed within walls, under slabs, within chases, etc., the use of exposed conduit and cable duct shall not be permitted in public spaces.

E. Within existing City structures, if the use of exposed conduit is required in public spaces for the installation of fare equipment, DB Co shall conceal conduits, and other surface mounted items by painting, enclosing in chases or otherwise treating the conduits, junction boxes, cable ducts, blend in with the surface to which the item is attached.

(ix) DB Co shall provide CCTV coverage of the fare control equipment as follows:

A. Full CCTV coverage for inbound and outbound Passenger flows at the fare control line.

B. Full CCTV coverage of Ticket Machines with view of interaction with machine, without compromising privacy.

(x) DB Co shall work in coordination with the City to ensure all supporting infrastructure and systems have been accommodated and to ensure schedule coordination for equipment installation, testing and Commissioning.

(xi) Exposed conduit and cable duct shall be avoided within public spaces.

(xii) DB Co shall paint or otherwise treat the conduit to blend in with the surface to which the conduit is attached where the use of exposed conduit cannot be avoided in public spaces.

(xiii) Fare gates and ticket machines post installed anchor system require concrete embedment of 150mm. DB Co shall ensure location and or depth of concrete

reinforcing is coordinated with the mounting requirements of the equipment avoiding the possibility of a conflict between the anchor and reinforcing steel.

(xiv) DB Co shall provide concrete mounting and walking surface at the fare control line between the floor grille assemblies, level with surrounding floor finish.

(e) DB Co shall provide Fare Paid Zone of Stations in accordance with the following:

(i) DB Co shall plan, design and construct all Stations with segregated Fare Paid Zones and non-Fare Paid Zones.

(ii) The Fare Paid Zone of the Station and all fare paid transfer areas shall be segregated from non-Fare Paid Zones by continuous 1.8m fencing or barrier.

(iii) Fare Paid Zones at Lincoln Fields, Bayshore, Moodie, Baseline, Place d'Orléans, and Trim Stations shall be planned, designed and constructed to allow Passengers to transfer between bus and Train within the Fare Paid Zone of the Station.

A. DB Co shall maintain the integrity of the Fare Paid Zones in the design and construction of bus terminal modifications at existing Tunney's Pasture and Blair Stations.

(iv) The following additional requirements shall apply for bus Transfer Stations:

A. Fare paid transfer area of Stations shall be designed to prohibit transferring Passengers from crossing bus traffic with the exception of Place d'Orléans.

B. All islands provided within a bus transfer area shall contain a combination of barriers including fencing, landscaping, or other physical barrier elements to prevent Passengers from traversing bus traffic to access the Station and bus Platforms or other Passenger destinations.

C. Where a dedicated fare controlled entrance to a bus terminal is not required, DB Co shall provide an entrance to allow Passenger access to the bus Station area when the Train Station is secure during non-operational hours, including CCTV and lighting.

i. The entrance shall be designed and constructed to be consistent with the architectural design requirements of the adjacent Train Station;

ii. DB Co shall provide signage and wayfinding for the entrance within the bus Station and from the public side;

iii. The entrance shall be secured with an overhead coiling grill or other means, and monitored outside Train operational hours; and,

iv. Notwithstanding requirements to secure the Train operations, Passengers shall have access to Ticket Machines outside Train operational hours.

D. DB Co shall provide a minimum of three bicycle racks within the Paid Fare Zone of all Transfer Stations. As per Schedule 15-2, Part 6, Clause 2.7(b)(v), there shall be sufficient space to double the quantity of bicycle racks without modification to the built design.

(f) Weather protection:

(i) Roof design features shall include the following:

A. The roof and Station design shall allow an illumination level of 25fc to be achieved via natural daylighting to reach over 75% of the entire Platform surface by incorporation of skylights or other design features. This requirement shall not be applicable to Underground Stations.

B. Roof accessibility systems such as hatches and retractable ladders, for cleaning and maintenance if required.

C. Fall protection measures that form a permanent part of the roof Structure.

D. Heat traced gutters and downspouts for roof drainage tied directly into a SWM system.

E. Snow guards shall be provided on all roofs where roof design contributes to possibility of falling snow and ice.

i. Particular attention shall be paid to the design and placement of snow guards on areas of roof above Station entrances and areas of roof adjacent to spaces of public circulation or gathering such as sidewalks and bus Platforms and adjacent Roadways to ensure the protection of the public from falling snow and ice.

A. The underside of all roofs within public spaces shall have soffits to conceal all mechanical, electrical, and communications equipment, conduits, etc. in accordance with the following:

i. For Federally Mandated Stations, BD Co shall provide soffit materials consistent with the Existing Confederation Line Stations, including composite metal panels and wood slats; and,

ii. For Stations other than Federally Mandated Stations DB Co shall provide soffit materials/systems that provide access to concealed building systems and equipment satisfying the Design Life requirements per Schedule 15-2, Part 1, Article 4 – Design and Construction.

(g) Transecure Areas:

(i) DB Co shall provide one TSA at all individual Station Platforms.

(ii) On LRT Platforms, the TSA shall be located close to the centre of the Platform length to align with the door of the first car in a two consist Train operation.

(iii) DB Co shall provide one TSA per Direction for center Platform configuration.

(iv) DB Co shall provide one TSA within in the bus Facility at Transfer Stations.

(v) The design of the TSA shall be consistent with the design of the Existing Confederation Line TSA/designated waiting area, including but not limited to:

i. Configuration & Material usage;

ii. For Stations other than Federally Mandated Stations, glazing and glazing support systems shall be consistent with glazing system for the Station as selected by DB Co in accordance with other requirements of this Part 4.

iii. Seating design;

iv. Size & Location of features;

v. Provide clear sightline of oncoming buses or Trains; and,

vi. Design of utility cabinet.

(vi) TSA's shall be provided with the following features:

A. Signage indicating location of TSAs and indicating the amenities available in the TSA, which shall be consistent at all Stations;

B. Fixed CCTV security coverage, PTZ cameras shall not be used for TSA;

i. Each TSA shall have a minimum of two CCTV cameras.

C. Enhanced lighting level of 220 lux;

D. Transit information panels that show scheduled times, maps, and other relevant information shall be included;

E. A clock integrated with the TIPs shall be viewable from the TSA;

F. Companion seating;

G. Emergency phones at accessible height with handles, braille, and user-friendly directions;

H. Emergency cabinet with fire extinguisher for Train TSA only;

I. Infrastructure to support a pay phone;

J. Accessible seating for four including seating with handles and backs;

K. Tinted glass or anything that compromises Safety or sightlines shall be prohibited from use in the TSAs;

L. Garbage and recycling receptacles shall be provided adjacent to the TSA;

M. All TSAs located on Platforms, with the exception of Underground Stations, shall be equipped with timed, Passenger activated heating;

N. An electrical outlet to provide ability for customers to charge cell phones at Train TSA only;

O. Timed, Passenger activated heating at TSA on bus Platform all bus Transfer Stations; and,

P. Indication of location of TSA on the Platform floor surface and directional TWSI. Platform markings for all TSAs shall extend to the Platform edge at Train TSA only.

(h) Advertising:

(i) DB Co shall provide all Infrastructure to support advertising in the Stations, including power data and communications to support digital advertising;

(ii) Each advertising location shall be provided with lighting in accordance with IESNA standards to illuminate static advertising;

(iii) Each Station shall have a minimum of three locations for advertising within the Fare Paid Zone, with dedicated wall areas of 1.5m x 2.5m minimum; and

(iv) Location and type of advertising shall be coordinated with the City during design;

A. For Federally Mandated Stations, advertising shall not be visible from the exterior of the Station.

(v) DB Co shall comply with MTO signage and advertisement requirements for all stations adjacent to Highway 417, and obtain MTO approvals.

(i) Public washroom features shall be provided as follows:

(i) Fixed CCTV coverage of the exterior of the washroom entrance doorway of each washroom.

(ii) Infant changing facilities.

(iii) Toilet partitioning shall be ceiling hung embossed stainless steel panels.

(iv) Toilet stall latch shall be surface mounted dead bolt type.

(v) Coat hooks on the stall door above head level.

(vi) Graffiti resistant mirrors at each wash basin.

(vii) Soap dispensers, toilet tissue dispensers, towel dispensers and disposal units.

(viii) Wash basins shall be built into a counter or vanity.

(ix) Washrooms shall be heated and ventilated.

A. DB Co shall heat and ventilate public washrooms in accordance with Good Industry Practice, without doors or with doors in the open position during operating hours and winter conditions.

(x) All fixtures shall be vandal-proof and be equipped with automatic water controls.

(xi) Toilet compartment, cubicles door and partition thickness shall be a minimum of 25mm. Pilaster thickness shall be a minimum of 32mm.

A. No system shall contain material capable of supporting growth of bacteria, fungi, mould, etc. or encourage the harbourage of insects or mites. No system shall develop or shed electrostatic charges.

B. All fasteners shall be concealed or tamper proof.

C. Partition shall be ceiling mounted embossed stainless steel.

(xii) Entrances to washrooms shall be designed and constructed according to CPTED principles with a labyrinth style access.

(j) CCTV

(i) DB Co shall provide 100% CCTV camera coverage for Stations and Facilities as follows:

A. As indicated elsewhere in this Part 4;

B. All public spaces shall have CCTV coverage, excluding washrooms;

C. Entrances to maintenance access areas;

D. All stair runs with full coverage from landing to landing;

E. All Escalators with full coverage from landing to landing;

F. Station Plazas and Station sites;

G. Bus Facilities at Transfer Stations;

H. Park and Rides;

(k) Emergency phones:

(i) DB Co shall provide Emergency phones providing direct audio connection to the TOCC as follows.

A. One Emergency phone at each entrance on the non-fare paid side, concourses and in general passenger circulation areas;

B. Two Emergency phones on each Train Platform spaced no more than 30m apart;

C. In addition to the Emergency phones required on Platforms, each TSA shall have an Emergency phone;

D. Provide Emergency phones spaced not more than 100m in any direction in surface Park and Ride facilities;

E. Provide Emergency phones with no more than 30 m in between at each bus Platform in addition to the Emergency phone at the TSA; and

F. Provide Emergency phones at new PPUDO's;

(ii) Emergency phones at outdoor locations shall be identified with a blue light.

(l) Payphones:

(i) DB Co shall provide provisions for public pay phones (Type TTY) in accordance with the following:

A. Provide conduit and space for 1 pay phone at every bus and Train Platform;

B. Provide conduit and space for 1 payphone in each TSA.

C. Provide conduit and space for pay phones at new PPDUO's;

D. All designated space and public pay phones shall be fully accessible; and

E. The City will arrange with a Third Party Contractor for payphone installation and maintenance of public payphones.

(m) Transit Information Panels:

(i) DB Co shall provide TIPs as follows:

A. Provide 2 TIPs on each Train Platform for side Platform configurations, excluding TIPs located within the TSAs;

B. Provide 4 TIPs on each Train Platform for centre Platform configurations, excluding TIPs located within the TSAs;

C. Provide 2 TIPs at each Station entry prior to the fare barrier, located outside of the fare paid area;

i. TIPs shall be accessible 24/7 when Station is closed.

D. Provide a minimum of 1 TIP, located after the fare barrier, inside the Fare Paid Zone, in addition to TIPs located on Platforms and at the TSAs. Where a Station has two or more entrances, and where Passenger traffic does not converge before accessing the Platform Level, provide TIPs inside the Fare Paid Zone at each entry;

E. Provide a minimum of 1 TIP in each bus shelter located on bus Platforms within Transfer Stations;

F. Provide 1 TIP in each TSA located on bus and Train Platforms;

G. TIP panel size (1.2m x 1.3m) shall be confirmed during design phase; and,

H. All TIPS shall be backlit.

(n) DB Co shall provide clocks connected to the NTP server displaying time of day, with a minimum of one clock per Platform, including bus Platforms at Terminal/Transfer Stations.

(i) DB Co shall provide clocks meeting the following minimum requirements:

A. Including digital LED display;

B. Capable of full operation in an outdoor environment, exposed to the elements in a dry bulb temperature range of -40°C to 40°C;

C. Capable of displaying both time and date simultaneously as follows:

i. Shall be capable of displaying 12:00 or 24:00 hour time in hours minutes and seconds, with the option to configure with or without seconds being displayed;

ii. Shall be capable of displaying date in varying formats and sizes. Maximum character height shall be no greater than that of the time display;

iii. Shall have the ability to display time independently with or without date being displayed;

D. Minimum cap character height for time display of 150mm;

E. Have amber character colour and background with a minimum colour contrast of 70%. Amber colour shall be consistent with amber colour utilized in the PIDS; and,

F. Clock display shall meet or exceed all accessibility requirements referenced in this Part.

(o) Trash and recycling receptacles:

(i) DB Co shall provide trash and recycling receptacles in the following locations and minimum quantities:

A. three on each Platform including one located at the TSA;

B. one located on each mezzanine or Concourse Level of the Station;

C. Receptacles shall be integrated into cabinets with other customer amenities such as TIPS or emergency phones;

D. All receptacles provided in public spaces shall be transparent to allow visual identification of their contents;

E. All receptacles shall be 4 stream receptacles to separate at source; organics, paper, glass, metal and other refuse; and,

F. All receptacles shall have hard containers to support removal bag.

(p) DB Co shall design and construct Platform seating in accordance with the following:

(i) DB Co shall provide three benches that can accommodate three Passengers per bench seating on each Train Platform per direction in addition to seating within the TSA;

(ii) DB Co shall provide seating for three on each bus Platform for every two bus bays at Terminal/Transfer Stations. Bench locations to be coordinated with the City, and must not impede snow removal equipment movement/pedestrian flow;

(iii) Armrests and backrests shall be provided on all benches in accordance with AODA and COADS;

(iv) The location of Platform seating shall not interfere with access to overhead lighting and equipment.

(q) Outdoor shelters:

(i) DB Co shall provide one bus shelter for each bus stop located within the Fare Paid Zone at Transfer Stations and each stop located in an off-street non Fare Paid Zone;

A. Shelters shall be sized according to accommodate passenger activity and be approved by the City.

B. All shelters design and capacity shall be consistent with shelters at Existing Confederation Line Stations;

C. DB Co shall provide power and communications to all shelters in accordance with OC Transpo Transitway and Station Design Guidelines;

D. Requirements of shelters within the fare Paid Zone of Transfer Stations:

i. All shelters located within the bus Fare Paid Zone of Transfer Stations shall be fitted with a minimum of 2 doors with power door actuators;

ii. On demand Passenger heating shall be provided in the TSA shelters within the bus Fare Paid Zone of Transfer Stations. Provision for on-demand heating shall be included for all remaining shelters within the Fare Paid Zone;

iii. Lighting according the Transitway and Stations Design Manual;

iv. AODA compliant benches;

v. Transit Information Panel;

vi. DB Co shall provide power and Communications for PIDS; and,

vii. All shelters shall not be required to have radiant heaters installed but shall be provided with rough in and provisions for future installation of radiant heaters.

(ii) DB Co shall provide on street bus Facilities in accordance with Appendix E to this Part 4.

(r) **[REDACTED]** wayfinding wheel

(i) At each Station, directional signage shall be installed at either the entry, concourse, Platform or Station entry Plaza;

A. The City will be responsible for the production of the wayfinding wheel for each Station;

B. DB Co shall incorporate the wayfinding wheel into the design and shall be responsible for the installation and placement of this element in accordance with guidelines and standards provided by the City;

C. The location of the wayfinding wheel at each Station shall be co-ordinated with the City through the design review process; and,

D. The City will undertake consultation with the appropriate Aboriginal representatives, (including the **[REDACTED]**) during the design stage to ensure cultural appropriateness of the location of the **[REDACTED]** wayfinding wheel and provide this input to DB Co for incorporation into DB Co's design.

(s) DB Co shall provide PIDS in accordance with the following:

(i) DB Co shall provide Train Platform/Concourse PIDS in accordance with the following:

A. DB Co shall design and construct architectural, electrical, mechanical and structural infrastructure to support PID installation.

B. Each Station shall be equipped with PIDS signs to provide up-to-date, specific, real time, location-based, visual operational, and Safety-related messages for customer awareness.

C. DB Co shall provide PIDS at new Stations consistent with the locations of Existing Confederation Line, including, but not limited to:

i. Three PIDS at Underground Station Platforms, and two PIDS at all other Station Platforms;

ii. One PID at each fare line. PIDS shall be visible and readable from both paid and unpaid side of the fare line and as required at end of Line Stations; and,

iii. At Terminal Stations with a side Platform configuration, DB Co shall provide additional PIDS at key decision points in order to direct Passengers to the correct Platform.

iv. All PIDS shall be double sided except where mounted on a wall parallel with the same.

D. PIDS shall be individually addressable and shall be accessed from the existing PA/PIDS console located in the TOCC. Under normal operating conditions, information presented on the PIDS shall include, but not be

limited to: date, time, minimum next three arrival time and destination of the next Train (one arrival time per line), Safety messages, Train delays, holiday schedules, and other ad-hoc messaging. In an Emergency condition, the PIDS shall display both pre-programmed Emergency announcements and simultaneous visual display of the PA system Emergency announcements. Refer to Schedule 15-2, Part 3, Article 4 - PA System/Passenger Information Display System, for additional requirements.

(ii) DB Co shall coordinate and install the City supplied Nexus/directory/entrance PIDS in accordance with the following:

A. DB Co shall coordinate, design, construct and equip each Station with the structural, mechanical, electrical, and communications infrastructure provisions to support the installation of City supplied PIDS and enclosures. DB Co shall identify designated locations including; but not limited to: one PID at the concourse level of each Underground Station, at the nexus points between modes at Transfer Stations, outside each fare gate, each bus Platform entrance, and one PID at each after hours entrance.

B. The locations shall be incorporated into the Station designs considering: mounting surfaces, sightlines, wayfinding, accessibility, vandalism, to allow viewing from either side of PIDS and security.

C. DB Co shall coordinate and supply required infrastructure at these locations including: power and communications requirements, blocking within walls, ceiling structure, or posts as required and identified by the City.

D. The City will provide and install the required PID components including enclosures and mounting hardware.

E. PIDS at these locations will be operated using a City supplied application and software controlled through the City network.

F. PIDS at these locations will be maintained by the City.

(iii) DB Co shall coordinate and install the City supplied bus terminal PIDS in accordance with the following:

A. DB Co shall equip each bus terminal with provisions to support the installation of City supplied PIDS and enclosures. DB Co shall identify designated locations including; one PID for each shelter, one PID at each bus stop Platform, one PID on each bus Platform centrally located at the entrance to the Train portion of the Station and shall allow for viewing from either side of PID.

B. Locations shall be incorporated into the Station designs considering: mounting surfaces, sightlines, wayfinding, accessibility, vandalism, and security.

C. DB Co shall coordinate and supply required infrastructure at these locations including: power and communications requirements, blocking within walls, ceiling structure, or posts as required and identified by the City.

D. The City will provide and install the required PID components including enclosures and mounting hardware.

E. PIDs at these locations will be operated using a City supplied application and software through the City network.

F. PIDS at these locations will be maintained by the City.

(t) Enclosed pedestrian Bridges

(i) Enclosed pedestrian Bridges, where included as a requirement in this Part 4 shall be designed and constructed in accordance with the following;

A. DB Co shall provide enclosed pedestrian Bridge designs to limit snow and ice from falling onto surfaces below the Structure;

B. DB Co shall provide a system that allows for glazing to be replaced from the inside of the Bridge; and,

C. DB Co shall ventilate enclosed pedestrian Bridges in accordance with OBC where applicable. Where OBC is not applicable, DB Co shall provide ventilation in accordance with ASHRAE 62.1.

(u) Traction Power Substation Locations:

(i) DB Co shall locate TPSS and associated electrical service in accordance with the following:

A. DB Co shall be permitted to install a TPSS within any Station Structure, provided the TPSS is fully enclosed within the Station Structure, constructed with the same materials and detailing utilized for the Station design and is constructed within the Lands.

B. Specific requirements of Confederation Line East Extension;

i. TPSS shall be at each Station or in the vicinity of each Station located within the Lands in accordance with Schedule 20 - Lands.

C. Specific requirements of Confederation Line West Extension:

i. From Tunney's Pasture Station to the east end of Dominion Station Platform, DB Co shall be permitted to locate a TPSS at Track level only within the Lands. Access to the TPSS shall be via Track level from a Station as described in Schedule 15-2, Part 3, Clause 13.4. **[REDACTED]** owned transformers and switchgear supporting the TPSS shall be located at street level within the Lands;

ii. DB Co shall be permitted to locate a TPSS at Track level on the north side of the alignment at Dominion Station within the Lands, provided the western end of the TPSS is located no further the 35m from the western face of the Station entrance plaza crossing the alignment. Access to the TPSS shall be via Track level from Dominion Station as described in Schedule 15-2, Part 3, Clause 13.4. **[REDACTED]** owned transformers and switchgear serving the TPSS shall be located at grade;

iii. DB Co shall be permitted to locate a TPSS at Track level within the Parkway Tunnel from Cleary Station to New Orchard Station provided the structure is entirely below the level of Byron Linear Park. At this location, electrical service entry, transformers and switchgear shall be permitted to be located at grade level provided the equipment is housed within the Station Structure, constructed of materials consistent with the Station design and combined with Station Emergency egress facilities;

iv. TPSS located at Lincoln Fields Station shall be constructed within the Station Structure;

v. TPSS located at Baseline Station shall be constructed within the Station Structure or within the Baseline Tunnel;

vi. DB Co shall be prohibited from constructing TPSS in the following locations:

1 From the Dominion Station location identified above to the East Portal of the Parkway Tunnel;

2 Within the Parkway Tunnel from the East Portal to the crossing of the Tunnel under Richmond Road;

3 From New Orchard Station to Lincoln Fields Station;

4 From Lincoln Fields Station to the portal of Baseline Tunnel; and,

5 From Lincoln Fields Station to the west portal of the Connaught Tunnel.

vii. The TPSS at Moodie Station shall be constructed within the Station Structure, or constructed as a standalone Ancillary Facility. If constructed as a standalone Ancillary Facility, DB Co shall construct the TPSS to be aesthetically compatible with the architecture and materials of the LRT Station.

2.8 Materials

(a) Materials used for the construction of Stations shall be low VOC and contain recycled content to the maximum extent possible where not specified below:

(i) Cast in Place Concrete:

A. Provide steel materials with postconsumer recycled content of not less than 60%.

(ii) Precast Concrete:

A. Provide steel materials with postconsumer recycled content of not less than 60%.

(iii) Architecturally exposed structural steel:

A. Provide steel materials with postconsumer recycled content of not less than 25%.

(iv) Painted metal fabrications:

A. Provide steel materials with postconsumer recycled content of not less than 25%.

(v) Stainless steel fabrications:

A. Provide steel materials with postconsumer recycled content of not less than 25%.

B. Provide materials with the maximum postconsumer recycled content recommended by the selected manufacturer, where finish quality may be compromised by the percentage of postconsumer recycled content.

(vi) Aluminum materials:

A. Aluminum curtainwall and skylights systems:

i. Provide aluminum materials with postconsumer recycled content of not less than 50%.

B. Aluminum extrusions fabrications, etc.:

i. Provide aluminum materials with postconsumer recycled content of not less than 25%.

(vii) Glazing:

i. Provide glass products with postconsumer recycled content of not less than 25%.

ii. Sealants used inside of the weatherproofing system protecting interior spaces shall have a VOC content of not more than 100 g/L.

(b) Architectural cast in place concrete (applicable to all Stations)

(i) Where concrete is left exposed as the final finish outside and within Stations, exposed concrete in the public realm shall be architectural cast in place concrete. DB Co shall provide architectural concrete as per the following:

A. Provide architectural cast in place concrete in accordance with CSA-A23.1/A23.2, 8.3 Architectural Concrete and ACI 347.3 Guide to Formed Concrete Surfaces, including proposed reference samples and mock-up field samples.

B. Architectural Cast in Place Concrete Finishes:

i. Finish : Smooth

ii. Formed Concrete Surface: CSC3 as defined in ACI 347.3R, Table 3.1a – Description of formed concrete surfaces

iii. Colour: Light grey.

C. Limit of Concrete Surface Irregularities:

i. Consistent with CSC3 concrete surfaces per ACI 347.3R.

D. Tie Holes: Uniform profile and diameter, in symmetrical layout, filled with plugs matching appearance of adjacent concrete.

(ii) Related Unformed Surfaces: Strike off smooth and finish with a texture matching adjacent formed surfaces, at tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces.

(iii) Mock-up field samples: Preconstruction mock-up field samples shall be made for each finish or shall incorporate all finishes proposed to be utilized, using equipment, materials, and procedures planned for the actual construction. The City shall examine the mock-up field samples and compare them with the reference samples prepared in accordance with CSA-A23.1/A23.2, Clause 8.3.2 for approval prior to ordering formwork. The panels should be full-size to match the actual work as closely as possible. Additional samples shall be cast by DB Co to the satisfaction of the Design Architect and the City to achieve the required matching. Mock-up panels shall be standalone elements and are prohibited from forming permanent construction of any facility. The sample(s) shall serve as the standard for acceptance of the finished construction.

A. Construct field mock-ups using same procedures, equipment, and materials that will be used for production of architectural concrete. Accepted field mock-up shall serve as the reference to which architectural concrete will be compared for periodic and final acceptance. Construct field mock-ups at an acceptable location on Site.

B. Provide a simulated repair area to demonstrate an acceptable repair procedure. Repair procedure shall provide an acceptable color and texture match. Protect from physical damage and retain mock-ups until final acceptance of architectural concrete.

C. Construct a minimum 3m x 3m mock-up for Platforms, for review and acceptance using procedures detailed.

D. All mock-up panels shall be reviewed and approved by the Design Architect.

(iv) Periodic acceptance

A. DB Co's Lead Architect shall periodically observe completed portions of architectural concrete for conformance with accepted field mock-up. The frequency of periodic acceptance and acceptance criteria shall include at a minimum, including but not limited to:

i. At a minimum, the Lead Architect shall conduct 1 review of in place formwork prior to first placement of architectural concrete for a Station;

ii. At a minimum the Lead Architect shall witness the first placement of architectural concrete in a Station; and

iii. At a minimum, the Lead Architect shall be present for the removal of the formwork of the first architectural concrete pour and assessment of finish for a Station.

(v) Patching and repair procedures:

A. Surface sacking or abrasive blasting to conceal surface imperfections shall not be permitted without prior approval from the Lead Architect.

B. Patching and repair procedures shall be prepared and submitted to the Lead Architect for review and approval, prior to submission to the City for the same.

(c) Precast concrete (applicable to all Stations)

(i) Where precast concrete is proposed, provide precast concrete in accordance with CSA-A23.4, Precast concrete - Materials and construction Surfaces.

(ii) Where precast concrete is left exposed as the final finish outside and within Stations, exposed precast concrete in the public realm shall be architecturally finished. DB Co shall provide architectural precast concrete per the following:

A. Category for precast forming part of the Stations shall be:

i. Group A1;

ii. Group BA1 – BA4;

iii. Group CA1 – CA4.

B. All precast shall be finish grade A.

C. Acceptance criteria;

i. Precast located between floor level to 2.8m above floor level or walking surface shall be viewed at a distance of 2m for acceptability defects such as chips, bug holes, and forming defects. Precast installed in other locations shall be viewed at a distance of 6m for acceptability defects.

ii. Finishes on vertical surfaces compared to finishes on horizontal surfaces such as returns shall be similar.

iii. Panel colour shall be uniform.

iv. Textures shall be uniform.

v. Prior to commencement of construction, DB Co shall provide 300mm x 300mm samples of each type of precast to be used on the Project. Samples shall be used to demonstrate the mix, colour and type of finish.

vi. DB Co shall provide a 1200mm x 1200mm mock-up panel of each type of precast concrete to be used on the Project, located on site to be used as the model to judge acceptance.

(d) Architecturally exposed structural steel (applicable to all Stations):

(i) Where left exposed to public view, all structural steel shall be AESS conforming to CISC Code of Standard Practice for Structural Steel, APPENDIX I, as supplemented by CISC Guide for Specifying Architecturally Exposed Structural Steel.

(ii) All structural steel exposed to public view shall be AESS as follows:

A. Exposed structural steel that is 6m or greater measured vertically or horizontally from a walking surface and is visible to a person standing on that walking surface shall be Category 2 AESS; and

B. Exposed structural steel that is less than 6m measured vertically or horizontally from a walking surface and is visible to a person standing on that walking surface shall be Category 3 AESS.

(iii) All Exposed structural steel shall be finished with a high performance coating.

(e) Overhead coiling grilles (applicable to all Stations):

(i) Where used to secure Station entrances and to secure bus Platforms from Train Platforms, coiling grills shall be as follows:

A. Curtain Material: Stainless steel, ASTM A666, Type 316.

B. Curtain consisting of a network of minimum, 8mm diameter horizontal rods, or rods covered with tube spacers.

C. Bottom Bar: Stainless Steel tube, finished to match grille.

D. Grille Curtain Jamb Guides: Stainless steel angles with stainless steel mounting brackets.

E. Equipped with an electric operator.

i. Operator shall be controlled both locally and remotely from the TOCC.

F. Shall have manual operation device for use in the event of motor failure or power outage.

G. Connection for off-site remote control by the TOCC.

H. Overhead coiling doors shall be equipped with IAC.

I. Safety Edge: Located at grille bottom bar, full width, electro mechanical pneumatic sensitized type, wired to immediately stop grille upon striking object, and reverse downward grille travel; hollow covered seal.

(f) Graffiti-resistant Coating (applicable to all Stations)

(i) Graffiti-Resistant Coating shall be applied to all porous opaque surfaces including but not limited to concrete masonry and stone up to a minimum of 2.5 m above adjacent floor/ ground or where surfaces are reachable to tag.

(g) Bird protection devices (applicable to all Stations)

(i) Provide a system of bird control using devices to prevent pest birds from landing, roosting, nesting, or climbing on horizontal surfaces at Stations, except for the roof exterior, tops of windscreens, light fixtures, security fences, handrails, guardrails, stone, and architectural concrete.

(h) Wood soffit (applicable to Federally Mandated Stations)

(i) Wood soffits shall be a suspended wood slat ceiling system with eight blades per foot and four blades per foot with scrim above consistent with the material and design utilized in the Existing Confederation Line Stations as follows:

A. Material shall be:

i. Manufactured for exterior use, with ACGI WeatherResist Cores, or equal;

ii. System shall be ACGI Backer Series 1, or equal; and,

iii. Mixed grain Douglas Fir, pressure treated and stained to match Existing Confederation Line Station material.

(i) Floor grilles (applicable to all Stations)

(i) Provide floor grilles consistent with those provided for the Existing Confederation Line Stations.

(ii) Provide manufacturer's aluminum floor-grille assemblies modified to comply with heavy load product line, consisting of treads joined together by cross members, and with support legs and other components needed to produce a complete installation. Include locking device for each panel and lifting hooks.

(iii) Floor grille:

A. Tread Rails: 4.7mm wide x 50mm deep ‘T’ profile, 3mm thickness.

B. Maximum Span: 610mm, or as recommended by the manufacturer.

C. Maximum Individual Panel Size: 1200 x 1200mm.

D. Finish: Mill finish.

E. Frames: Manufacturer's standard frames, including perimeter frames, of size and style for grille type, for permanent recessed installation in floor, complete with installation anchorages and accessories, same material and finish as grilles. Provide concealed frameless supports except at perimeter frame.

(iv) Support system:

A. Manufacturer's special deep-pit frame and support system with intermediate support beams, sized and spaced as recommended by manufacturer and equipped with vinyl support cushions.

(v) Drain pan:

A. Aluminum sheet, 1.5mm minimum thickness, welded construction, bottom surface with positive slope to drain; holes cut for drain and equipped with adaptors for connection to drain lines; bottom of pan with protective coating as recommended by manufacturer; provision for heat-traced drainage.

(j) Refer to Appendix C to this Part 4 for additional material and equipment specification requirements applicable to Federally Mandated Stations and where applicable to all Stations where consistency is required by this Part 4.

ARTICLE 3 STATION SPECIFIC ARCHITECTURAL DESIGN CRITERIA

3.1 Tunney's Pasture Station

(a) Tunney's Pasture is an existing Station serving as the interim western terminus of the Existing Confederation Line. DB Co shall modify the existing bus terminal to satisfy the reduced bus terminal requirements.

(b) The Station is a Federally Mandated Station.

(c) DB Co scope within the existing Station is limited to modifications required to services related to the site modifications.

3.2 Westboro Station

(a) DB Co shall design and construct the Station in accordance with this Article 3:

(b) Westboro Station is an existing Transitway station. The new Westboro Station shall be located on Scott Street between Tweedsmuir and Athlone Avenues.

(c) The Station Platform shall be located within the existing Transitway trench.

(d) There shall be a minimum of two fare controlled entrances. One entrance shall be located on Scott Street and one entrance shall be located on the north side of the existing Transitway trench to facilitate the transfer of Passengers from the bus drop off area to the LRT Platform through fare gates.

(e) Bus access to the Station shall be via the existing bus access drives to the east and west of the Station. Curb to curb dimension of the bus driveways on the east and west Bridges shall not be reduced from existing. The bus boarding Platform shall be located on the north side of the existing Transitway trench. A dedicated bus drop off Platform with a minimum of 4.0m shall be provided on the west bus access drive to allow buses to unload all customers before entering the layby facility located to the west of the Station. DB Co shall provide a fare paid entrance to the Station from the north bus Platform. Bus lay-by area shall be located to the west of the Station on the north side of the existing Transitway trench.

(f) Public access across the Guideway to destinations north of the Station shall be provided on the east and west bus access drives.

(g) DB Co shall be responsible to determine the extent of reuse of existing structure, and selective or complete demolition of the existing structures, based on required Design Life outlined in Schedule 15-2, Part 1, Article 4 – Design and Construction.

3.3 Dominion Station

(a) DB Co shall design and construct the Station in accordance with this Article 3:

(b) Dominion Station is an existing Transitway station. The new Dominion Station shall be located within the existing Transitway trench between Dominion and Berkley Avenues.

(c) There shall be a minimum of one fare controlled entrance between Dominion Avenue and Berkley Avenue. The Station public entrance plaza shall be designed to provide a public access across the Guideway linking pedestrians and cyclists from Dominion Avenue to Workman Avenue.

(d) Passengers shall have direct visual and physical access to the existing and new cycling and pedestrian pathways along the Guideway.

(e) DB Co shall be responsible for the complete demolition and removal of foundations, and all elements of the existing Dominion station.

3.4 Cleary Station

(a) DB Co shall design and construct the Station in accordance with this Article 3:

(b) The new Cleary Station shall be located within Byron Linear Park at Sherbourne Road.

(c) A minimum of one fare paid Station entrance shall be provided. DB Co shall locate one Station entrance east of the intersection of Bryon Avenue and Sherbourne Road and no less than 25m east of the east curb line of Sherbourne Road.

(d) The above grade portions of this Station shall be minimized to reduce visual impact on Byron Park, and be configured as such to maintain sidewalks and MUPs as required by Schedule 15-2, Part 6 - Urban Design, Landscape Architecture and Connectivity Requirements.

(e) All Station Facilities and system support spaces, shall be completely below grade with the exception of the fare paid entrance building.

(i) DB shall be permitted to construct a hydro room(s) to house **[REDACTED]** transformer and switch gear above grade, provided the utility spaces are housed with the Station emergency egress facilities as “one” structure.

(f) The Station shall have three PPUDO spaces in each direction of travel on Byron Avenue.

(g) The Station Platform shall be located below the level of existing grade, and DB Co shall design and construct the Station so that it shall be an open Station as defined by OBC and NFPA.

(h) DB Co shall provide a 2m x 3m storage room located at Platform Level for the exclusive use of ESP.

3.5 New Orchard Station

(a) DB Co shall design and construct the Station in accordance with this Article 3:

(b) New Orchard Station shall be located between Richmond Road and Byron Avenue, immediately east of New Orchard Ave within Byron Park.

(c) The eastern end of Station Platform shall be no less than 700m from the western end of the Cleary Station Platforms.

(d) A minimum of one fare paid entrance shall be provided. The entrance shall be located no further east than the western curb line of Woodland Avenue.

(e) The above grade portions of this Station shall be minimized to reduce visual impact on Byron Park. And be configured as such to maintain sidewalks and MUPs as required by Schedule 15-2, Part 6 - Urban Design, Landscape Architecture and Connectivity Requirements.

(f) The Station Platform shall be located below the level of existing grade, and DB Co shall design and construct the Station so that it shall be an open Station as defined by OBC and NFPA.

(g) DB Co shall design and construct the bus stop with shelter adjacent to New Orchard Station and provide the bus shelter and other customer amenities as required by the City.

(h) DB Co shall provide a 2m x 3m storage room located at Platform Level for the exclusive use of ESP.

(i) All Station Facilities and system support spaces, shall be completely below grade with the exception of the fare paid entrance.

(i) DB shall be permitted to construct a hydro room(s) to house **[REDACTED]** transformer and switch gear above grade, provided the utility spaces are housed with the Station Emergency egress facilities as "one" Structure.

3.6 Lincoln Fields Station

(a) DB Co shall design and construct the Station in accordance with this Article 3:

(b) Lincoln Fields Station is an existing Transitway Station. The new Transfer Station shall be in the location of the existing Transitway Facility.

(c) The Transfer Station shall be a three Track Station with 2 centre Platforms or one centre Platform and one side Platform and an integrated fare paid bus terminal. All three Tracks shall be utilized for the loading and unloading of Passengers.

(d) Station is a Federally Mandated Station and shall be subject to FLUDTA.

(e) The Station Train Platform shall be located north of Carling Avenue and east of the existing Transitway.

(f) There shall be a minimum of three fare controlled entrances. A Station entrance shall be provided from Carling Avenue; an entrance shall provide access from the west side of the Guideway at grade, and an entrance shall be provided at the bus loop to allow 24/7 access to the bus loop and access to and from the PPUDO.

(g) DB Co shall provide an entrance to the Train Platform via the fare paid bus terminal. Bus Platforms, lay-by area, and bus operator facility shall be located of the east of the Guideway. Buses shall access the terminal from the existing access from Carling Avenue.

(h) The PPUDO shall be outside of the Fare Paid Zone separated by fencing accessible by vehicles from the existing Carling Avenue access drive.

(i) DB Co shall be responsible for the complete demolition and removal of foundations, and all elements of the existing Transitway Structures including existing pedestrian Bridges.

3.7 Iris Station

(a) DB Co shall design and construct the Station in accordance with this Article 3:

(b) Iris Station is an existing Transitway station.

(c) Station is a Federally Mandated Station and shall be subject to FLUDTA.

(d) DB Co shall provide a grade separation between the Guideway and Iris Street.

(e) DB Co shall design and construct two bus stops with shelters on Iris Street, one in each direction of travel.

(f) The Station Platform shall be located below the level of Iris Street. DB Co shall provide vertical circulation elements for Passengers to access the Station from the sidewalk, PPUDO and bus stops located on Iris Street.

(g) DB Co shall design and construct on street bus Facilities to support transfer of customers.

(h) Station entrance plazas on the east and west side of the Guideway shall be large and generous to safely accommodate both pedestrian and cycling traffic.

3.8 Baseline Station

(a) DB Co shall design and construct the Station in accordance with this Article 3:

(b) Baseline Station is an existing Transitway Station. The current on street surface bus facilities shall be decommissioned and relocated as part of this Project. Baseline Station will serve as the southernmost terminus of the Confederation Line.

(c) The new Terminal/ Station shall be located between College Avenue and Navaho Drive beneath the landscaped plaza just west of **[REDACTED]**.

(d) The Station shall be centre Platform configuration, with the Platform being located within the center cell of the existing below grade Structure.

(e) The Station shall have three fare controlled entrances. One entrance building shall front the south side of College Avenue, a second entrance building shall be provided at the north end of the Platform, within the existing plaza and a third entry from the pedestrian Bridge connecting to the **[REDACTED]**.

(f) The south entrance building fronting the south side of College Avenue, shall be designed and constructed to permit Passengers to transfer between bus service and Train service without passing through fare control gates and/or revalidating fare payment.

(g) DB Co shall design and construct the bus access from Woodroffe Avenue so that it is restricted to College Avenue and the current transit vehicle only access south of Parkglen Drive. A secondary bus access shall be provided from the west terminus of College Avenue via the future Baseline bus facility with interim access via the current Transitway road,

(h) DB Co's design and construction of the Station shall maximize the number of parking spaces located in the Park and Ride Facility between the Station Facilities and Woodroffe Avenue.

(i) DB Co shall provide at a minimum 202 parking spaces within the existing Park and Ride Facility, with 5% being for compact vehicles.

A. A minimum of 182 of the parking spaces shall be dedicated to Park and Ride spaces; and

B. A minimum of 20 parking spaces shall be designated for system operational staff and signed appropriately.

(i) The Train Platform shall be underground within an existing Structure. DB Co shall utilize the existing structural design and framed openings where possible within the elevated floor slab in the Station design.

(j) The center cell(s) of the existing underground structure shall be utilized for the Train Platform, operations, support spaces and vertical circulation.

(k) The north entrance building shall be designed and constructed to accommodate future overhead connections to adjacent developments: east to **[REDACTED]**, and to future development to the west including:

(i) Protecting for a second floor level:

(ii) Elevators designed for extension to second floor level;

(iii) Design for additional stairs and escalator to access second floor level; and,

(iv) Finished floor elevation of the future second floor of the north entrance shall be at elevation 92.00m.

(l) The south entrance building shall be designed and constructed with an overhead connection to **[REDACTED]**, and to future developments as follows:

(i) DB Co shall design and construct the south entry to allow 24 hour access between the bus terminal, the College Avenue entry and the pedestrian Bridge access, while securing the Station Platform at grade level during Train non-Operating hours.

A. The second floor shall be served by elevators, stairs and escalators;

B. The second floor shall allow for a future pedestrian Bridge connection to the west; and,

C. Finished floor elevation of the second floor of the south entrance shall have a minimum floor elevation 92.65m.

(ii) DB Co shall design and construct the new pedestrian Bridge as follows:

A. The Bridge shall be fully enclosed with floor to ceiling glazed walls;

B. The Bridge shall be mechanically ventilated;

C. The Bridge shall have a minimum clear width between Structure or handrails of 4.0m;

D. DB Co shall provide fire separations as required by the OBC;

E. DB Co shall include provisions to maintain the integrity of the existing building's HVAC systems;

F. DB Co shall design and construct the Bridge to allow for connection to future development along Woodroffe at College Ave;

G. DB Co shall be responsible for the integration of fire alarm systems between the Station, pedestrian Bridge and the **[REDACTED]** as required by applicable codes and standards;

H. The Bridge shall have full CCTV coverage from fare gates to the **[REDACTED]** connection. The CCTV system shall have the ability to be controlled and transmit images to multiple locations including the TOCC and the **[REDACTED]** security centre; and,

I. The roof of the Bridge shall be equipped with electric snow melting system to prevent the accumulation of snow and ice.

(m) Storage of Revenue Vehicles:

(i) The Facility and Trackwork design and construction of the centre cell shall accommodate a total of four Tracks (inclusive of the Revenue Service Tracks) and Revenue Vehicle storage for eight Trains during non-revenue service hours.

(ii) The outer cells shall be protected for the future installation of one Track to accommodate an additional three Trains on each Track.

(n) DB Co shall provide a 2m x 3m storage room located at Platform Level for the exclusive use of ESP.

(o) DB Co shall design and construct the Platform level to be visually distinct from all other Underground Stations to be easily identified by customers.

(p) DB Co shall design and construct the Station so as to not preclude the extension of the Confederation Line to points further south as outlined in Schedule 15-2, Part 1, Article 2 – Physical Layout.

3.9 Queensview Station

(a) DB Co shall design and construct the Station in accordance with this Article 3:

(b) Queensview Station is a new Station located to the north of Highway 417.

(c) The western end of the Station Platform(s) shall be no less than 650m from the eastern end of Pinecrest Station Platform(s).

(d) The Station is to be served by a minimum of one fare controlled entrance.

(e) DB Co shall design and construct a north entrance building and entry plaza which shall also serve a new pedestrian Bridge spanning Highway 417. The Station and Bridge shall be accessed via a combination of sloped pathway, stairs and elevators on the north side of Highway 417 and by stairs and two elevators on the south side of Highway 417 north of Baxter Road.

(f) The north elevator and stairs outside of the Fare Paid Zone shall extend to a Station access point at grade.

(i) The north elevators shall extend to the plaza bordering the parking lot, providing direct access the adjacent business and sidewalk to Queensview Drive.

(g) The new fully enclosed glazed pedestrian Bridge shall be naturally ventilated. Where natural ventilation is inadequate, mechanical ventilation shall be provided. Adequacy of natural ventilation shall be confirmed by calculation or simulation modeling.

(i) Access to the pedestrian overpass shall be outside of the Fare Paid Zone of the Station.

(ii) Pedestrian access to the Bridge overpass at the north and south sides of Highway 417 shall be accessible. Redundant elevators shall be provided at both access points.

(iii) The pedestrian Bridge and supporting Structure shall be located to accommodate the future expansion of Highway 417.

(iv) Pedestrian Bridge shall be designed and constructed with minimal camber to provide a line of sight from end to end.

(v) Pedestrian Bridge shall be designed to allow the Bridge to remain accessible to the public while securing the Train Station during Train non-Operating hours.

3.10 Pinecrest Station

(a) DB Co shall design and construct the Station in accordance with this Article 3.

(b) Pinecrest Station is an existing Transitway Station. DB Co shall be responsible for the complete demolition and removal of foundations, and all elements of the existing Station, and shall make good the finished grades and landscaping. The new Pinecrest Station shall be located on the north side Highway 417 west of Pinecrest Road.

(c) The eastern end of the Station Platform(s) shall be no less than 650m from the western end of Queensview Station Platform(s).

(d) Pedestrian access shall be via MUPs, from the southbound lanes of Pinecrest Road and a MUP from Dumaurier Avenue.

(e) DB Co shall design and construct off street bus Facilities to support transfer of customers from bus stops located adjacent to the Station. DB Co shall provide a bidirectional route from Pinecrest Road to the Station bus stop location and a bus turnaround after the bus stop to return buses to Pinecrest Road. The transfer of customers at this Station shall not be required to be within a Fare Paid Zone.

(f) The Station shall be served by a minimum of one fare controlled entrance.

(g) ESP access shall be via the existing Transitway access roadway.

3.11 Bayshore Station

(a) DB Co shall design and construct the Station in accordance with this Article 3:

(b) Bayshore Station is an existing Transitway Station that is currently located adjacent to Bayshore Shopping Centre and Highway 417. The Station shall be converted to serve as a Transfer Station of the Confederation Line.

(c) The Station Platform shall be located to provide convenient access to Bayshore Shopping Centre at the southwest corner of the existing shopping centre building.

(d) The Station shall facilitate direct and rapid movement of Passengers between local buses, Trains, and the adjacent commercial development.

(e) The Station shall be served by a minimum of two fare controlled entrances. One shall be an at grade entrance from the MUP and shopping centre driveway and one serving the existing connecting Bridge entrance.

(f) Entrances allowing Passengers to transfer between bus service and Train service without passing through fare control gates and/or revalidating fare payment shall be provided from all bus Platforms.

(g) The Station shall be designed to allow the bus terminal to remain accessible to the public while securing the Train Station during Train non-Operating hours.

(h) DB Co shall design and construct the Station so Passengers are not permitted to cross bus lanes within the Station to exit or transfer between bus services to Train service.

(i) DB Shall provide knockout panels as follows:

(i) A total of two knockout panels shall be provided at the new entrance building serving the future development to the north of the bus terminal;

(ii) DB Co shall provide one knockout panel on each level of the new entrance building: one at bus terminal entrance level and one at the pedestrian bridge level;

(iii) Knockout panels shall be 4.0m wide x 3.0m high clear opening; and,

(iv) The final location of knockout panels shall be determined during the design phase in consultation with the City and developer.

(j) Existing bus Platform widths are considered acceptable provided DB Co's design solution does not reduce the current width.

(k) Existing bus layby configuration is acceptable provided turning radii for all design vehicles are accommodated.

3.12 Moodie Station

(a) DB Co shall design and construct the Station in accordance with this Article 3.

(b) Moodie Station is an existing Transitway Station that is currently located southeast of the intersection of Moodie Drive and Corkstown Road. The existing Station shall be converted to a Terminal Station serving as the western terminus of the Confederation Line.

(c) The Station Platform shall be located between Corkstown Road and the eastbound off ramp of Highway 417, east of Moodie Drive.

(d) The Station shall facilitate direct and rapid movement of Passengers between local buses, Trains, and the adjacent development.

(e) The Station shall be served by a minimum of one fare controlled entrance.

(f) Entrances allowing Passengers to transfer between bus service and Train service without passing through fare control gates and/or revalidating fare payment shall be provided from all bus Platforms.

(g) Two PPUDOs shall be provided. One PPUDO with four paces shall be accessed from Corkstown Road at the west end of the site and one PPUDO with two spaces shall be located on Corkstown Road at the east end of the site.

(h) The Station shall be designed to allow the bus terminal to remain accessible to the public while securing the Train Station during Train non-Operating hours.

(i) The bus terminal shall have a secondary entrance from the existing Moodie Drive free flow bus ramp as follows:

(i) The access shall be secured with a lockable manual gate forming part of the fare paid zone perimeter; and,

(ii) The access shall be permitted to cross a bus Platform, provided DB Co's design includes a depressed area of the Platform; the Platform is free and clear of lighting fixtures, shelters etc., and the Platform is designed to accommodate the vehicular load of the buses.

3.13 Blair Station

(a) DB Co shall design and construct the Station in accordance with this Article 3:

(b) Blair Station is an Existing Confederation Line Station serving as the interim eastern terminus of the Existing Confederation Line. DB Co shall modify the existing bus terminal to satisfy the bus Facility requirements.

(c) DB Co scope within the existing Station and Bus Operator building shall be limited to modifications required for the site modifications, unless required elsewhere in this Schedule 15-2 – Design and Construction Requirements.

(d) The extension of the Trackwork to the east shall maintain protection for the future Platform extension to the east.

3.14 Montreal Road Station

(a) DB Co shall design and construct the Station in accordance with this Article 3:

(b) Montreal Road Station shall be a new Line Station located at the crossing of OR 174 and Montreal Road.

(c) The Station shall be served by two fare controlled entrances located on Montreal Road. One entrance shall serve the eastbound lane and one shall serve the westbound lane.

(d) The Platform shall be located in the median of OR174, above Montreal Road and shall be located so that the Platform spans Montreal Road.

(e) Bus stops and shelters shall be provided in each direction of travel on Montreal Road.

(f) Sidewalks and Station entry plazas shall be sized appropriately to serve movement of and the volume of pedestrians and cyclist along Montreal Road, bus stops, and Passengers transferring from bus to Train.

(g) DB Co shall provide off street parking for two service vehicles within the highway interchange, north of the Station with access from Montreal Road.

3.15 Jeanne d'Arc Station

(a) DB Co shall design and construct the Station in accordance with this Article 3:

(b) Jeanne d'Arc Station shall be a new Station located at the crossing of OR 174 and Jeanne d'Arc Boulevard.

(c) The Station shall be served by two fare controlled entrances located on Jeanne d'Arc Boulevard. One entrance shall serve the north-bound lane and one shall serve the southbound lane.

(d) The Platform shall be located below Jeanne d'Arc Boulevard in the median of OR 174.

(e) The Station Structure, vertical circulation elements, Station entry and Station entry plaza shall be designed and constructed to permit the widening of Jeanne d'Arc Boulevard to an ultimate ROW width of 37.5m without the relocation of fare gates, vertical circulation elements, etc. and without modifications to the main roof of the Station. The future widening of the roadway shall not reduce the entrance plaza to a size where it is of an insufficient size to accommodate the number of pedestrians and cyclist, or their movement, as required.

    (i) The Station design inclusive of the main roof structure shall protect the fare gates from precipitation in accordance with this Part 4 in both the initial construction and with the future widening of Jeanne d'Arc Boulevard.

(f) In addition to the plaza space identified in Clause (e) above, DB Co shall provide a plaza space of a minimum of 200 m^2 at the entrance serving the southbound lanes of Jeanne d'Arc Boulevard. A minimum of 40% of the plaza shall have weather protection for waiting bus Passengers outside of the Fare Paid Zone.

(g) In addition to the plaza space identified in Clause (e) above, DB Co shall provide a plaza space of a minimum of 60 m^2 at the entrance serving the northbound lanes of Jeanne

d'Arc Boulevard. A minimum of 20% of the plaza shall have weather protection for waiting Passengers bus Passengers outside of the Fare Paid Zone.

(h) Plaza spaces required in Clauses (f) and (g) above shall not be required when the ultimate ROW width of 37.5m, is achieved in the future.

(i) DB Co shall provide parking for two service vehicles on the vacated portion of the exising bridge/ramp access or within the within the highway interchange, north or south of the Station.

3.16 Orléans Boulevard Station

(a) DB Co shall design and construct the Station in accordance with this Article 3:

(b) Orléans Boulevard Station is a new Line Station located at the crossing of OR 174 and Orléans Boulevard.

(c) The Station shall be served by two fare controlled entrances located on Orléans Boulevard. One entrance shall serve the northbound lane and one shall serve the southbound lane.

(d) The Platform shall be located below Orléans Boulevard in the median of OR 174.

(e) Sidewalks and Station entry plazas shall be sized to accommodate the number of pedestrians and cyclists, and their movement as required to serve the general public along Orléans Boulevard, the bus stops, and the Passengers transferring from bus to Train.

(i) DB Co shall provide a plaza space of a minimum of 60 m^2 at each entrance. A minimum of 20% of the plaza shall have weather protection for waiting bus Passengers outside of the Fare Paid Zone.

3.17 Place d'Orléans Station

(a) DB Co shall design and construct the Station in accordance with this Article 3:

(b) Place d'Orléans Station is an existing Transitway Station that is currently located adjacent to Place d'Orléans Shopping Centre and OR 174. The Station shall be converted to serve as a Transfer Station.

(c) DB Co shall ensure that a pedestrian Bridge spanning OR 174, connecting the Park and Ride Facility, the bus terminal and Place d'Orléans Shopping Center is included as a non-fare paid connection in the final configuration.

(d) The Station shall be served by four fare controlled entrances.

(i) An entrance shall provide access from the existing pedestrian Bridge to the Train Platform located in the median of OR 174.

(ii) An entrance shall provide access from the existing pedestrian Bridge to the existing bus terminal.

(iii) An entrance shall provide access from grade in the existing Place d'Orléans Shopping Centre parking lot to the bus terminal.

A. Passengers using this entrance shall be permitted to cross the bus traffic lanes.

(iv) An entrance shall provide access from the existing Champlain Street Bridge to the Train Platform located in the median of OR 174.

(e) A connection to the LRT Station, allowing Passengers to transfer between bus service and Train service without passing through fare control gates and/or revalidating fare payment shall be provided from the bus Platform area.

(i) DB Co shall provide a new, fully enclosed, ventilated, glazed Bridge corridor.

(f) The Station shall be designed to allow the bus terminal to remain accessible to the public while securing the Train Station during Train non-operating hours.

3.18 Trim Station

(a) DB Co shall design and construct the Station in accordance with this Article 3:

(b) Trim Road Station is an existing Transitway Station that is currently located southeast of the intersection of Trim Road and OR 174. The existing Station shall be converted to a Terminal Station serving as the eastern terminus of the Confederation Line.

(i) DB Co shall redesign, reconfigure, and construct the existing bus terminal and Park and Ride Facility to satisfy the bus terminal and parking capacity requirements of the Project, including:

A. The Station bus terminal, PPUDO and Park and Ride facilities shall be designed and constructed to satisfy the requirements of the relocated Trim Road and also with the future Trim Road overpass constructed;

B. The bus terminal and Park and Ride facility shall be designed to allow segregated access for public parking and bus service in both the initial configuration and in the future reconfiguration when Trim Road overpass is constructed. DB Co shall provide conceptual design illustrating both conditions in accordance with Schedule 10 – Review Procedure;

C. Bus access to the bus terminal shall be from the truncated portion of Trim Road north of the relocated E-S OR 174 ramp terminal. The truncated Trim Road, north of the ramp terminal shall be restricted access for buses and authorized vehicles only;

D. In addition to the bus access from the truncated portion of Trim Road, the bus terminal shall have a manually operated gated secondary access and exit point at the east end;

i. The secondary exit point may be routed through the Park and Ride facility provided drive widths, turning radii, etc. are adequate for all buses utilized by the City.

E. The bus terminal configuration shall be as required to accommodate the facilities in the initial and future Trim Road configurations without relocating the fencing/barrier segregating the Fare Paid Zone from the Park and Ride facility, modifying utilities and SWM features, or acquiring property to the north of the existing City property limit;

F. The bus terminal configuration shall allow Passengers transferring from bus service to have unimpeded access to the Station entry without crossing bus drive access roads, bus terminal lanes, laybys, etc.;

G. PPUDO and Park and Ride customers shall have direct access to the Station entry without crossing the bus access drive;

H. The Park and Ride facility shall have a minimum of two vehicular access points segregated from the normal bus operational access route;

I. The Park and Ride facility main drive lanes shall be designed and constructed to accommodate both the initial and future Trim Road configurations; and,

J. The Park and Ride facility shall be designed to allow for the Trim Road overpass and associated road modifications to be constructed without relocation of parking spaces or drive lanes;

(c) The Train Platform shall be in the median of OR 174. The bus terminal and Park and Ride Facilities shall be located south of OR 174 and east of existing Trim Road.

(d) The Station shall be a centre Platform configuration.

(e) The Station shall be served by one fare controlled entrance providing access from the Park and Ride area and PPUDO to the Station.

(f) An entrance allowing Passengers to transfer between bus service and Train service without passing through fare control gates and/or revalidating fare payment shall be provided from the bus Platform area.

(g) The Station shall be designed to allow the bus terminal to remain accessible to the public while securing the Train Station during Train non-Operating hours.

(h) DB Co shall design and construct the Station to accommodate the future works described below:

(i) Construction of new Trim Road overpass with a fare paid entrance from the Trim Road southbound sidewalk; and,

(ii) Construction of an entrance located north of OR 174 and east of Trim Road connected to the Station Platform with and overhead pedestrian Bridge.

(i) DB Co shall provide a total of 1,111 Park and Ride spaces on the site. Parking spaces shall be surface parking.

(j) DB Co shall provide a formal PPUDO.

(k) DB Co shall provide a new fully enclosed glazed Bridge corridor within the Fare Paid Zone, linking the bus terminal and the LRT Platform. The enclosed Bridge corridor shall be naturally ventilated. Where natural ventilation is inadequate, mechanical ventilation shall be provided. Adequacy of natural ventilation shall be confirmed by calculation or a computer program.

ARTICLE 4 STRUCTURAL DESIGN CRITERIA

4.1 Introduction

(a) DB Co shall design and construct Stations and Facilities in accordance with this Article 4. The structural design shall include design of new members, inspection and documentation of existing Structures impacted by the Station construction and corresponding rehabilitation design.

(b) In addition to the submittals required elsewhere, the structural engineering services shall include the preparation of complete calculations (appropriately indexed), coordination with other disciplines and general review of construction. Structural calculations shall be submitted in accordance with Schedule 10 – Review Procedure.

(c) In addition to the requirements set forth in this Article 4, refer to Schedule 15-2, Part 8 – Underground Structures for Underground Structure requirements and Schedule 15-2, Part 2, Article 4 – Structural Design Criteria and Requirements, for pedestrian Bridges not forming part of the Station Structure.

4.2 Reference Documents

(a) The structural design shall comply with the criteria contained in this Article 4, and all standards, regulations, policies, Applicable Law, guidelines or practices applicable to the Project, including but not limited to each of the following Reference Documents. In the event of a structural component conflict between criteria, commitments or requirements contained within one document when compared with another, the more stringent shall apply:

(i) OBC;

(ii) NBC; where applicable

(iii) User's Guide – NBC: Structural Commentaries (Part 4); where applicable

(iv) CAN/CSA S6 - CHBDC*;

A. *Note: Portions of the Station that support Vehicle loads shall be considered Train Structures. Train Structures shall be designed to satisfy the requirements of this Article 4 and the remainder of Schedule 15-2 – Design and Construction Requirements and shall meet or exceed the applicable building code(s) and the CHBDC.

(v) CAN/CSA A23.1/A23.2 - Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete;

(vi) CAN/CSA A23.3 - Design of Concrete Structures;

(vii) CAN/CSA O86 - Engineering Design in Wood;

(viii) CAN/CSA S16 - Design of Steel Structures;

(ix) CAN/CSA S304.1 - Design of Masonry Structures;

(x) CAN/CSA S136 – North American Specification for the Design of Cold-Formed Steel Structural Members;

(xi) Canadian Foundation Engineering Manual;

(xii) CAN/CSA S478 – Guideline on Durability in Buildings;

(xiii) ACI 201.2R – Guide to Durable Concrete;

(xiv) AREMA Manual for Railway Engineering hereinafter referred to as the AREMA Manual

(xv) ACI 360R – Design of Slabs on Grade;

(xvi) CSA S448.1 – Repair of Reinforced Concrete in Buildings and Parking Structures;

(xvii) AISC/CISC Steel Design Guide Series 11 – Floor Vibrations Due to Human Activity;

(xviii) Ontario Occupational Health and Safety Act;

(xix) PEO Professional Engineers Providing Services for Demolition of Buildings and Other Structures;

(xx) MTO Structure Rehabilitation Manual;

(xxi) MTO Ontario Structure Inspection Manual;

(xxii) MTO Structural Manual;

(xxiii) MTO Structural Steel Coating Manual;

(xxiv) Ontario Provincial Standards (http://www.raqsb.mto.gov.on.ca/techpubs/);

(xxv) ASTM E2018 Standard Guide for Property Condition Assessments: Baseline Property Condition Assessment Process;

(xxvi) ASCE Structural Condition Assessment of Existing Structures;

(xxvii) AASHTO LRFD Guide Specifications for the Design of Pedestrian Bridges;

(xxviii) OC Transpo Transitway and Station Design Guidelines; and,

(xxix) ISO 12944-5 Paints and varnishes - Corrosion protection of steel structures by protective paint systems - Part 5: Protective paint systems.

4.3 Federally Mandated Stations

(a) Federally Mandated Stations shall be subject to the regulations of the NCC shall meet the requirements of both the OBC and the NBC.

4.4 Durability

(a) Provide materials, details and protection systems to meet or exceed the specified requirements for Project durability.

(b) Time-dependent design calculations, including corrosion, fatigue and creep shall be based on the required Design Life as outlined in Schedule 15-2, Part 1, Article 4 – Design and Construction.

(c) At a minimum, DB Co shall provide concrete meeting exposure Class C-1 per CSA 23.1, for all concrete at or above grade.

(i) DB Co shall provide testing report for chloride penetrability for concrete of exposure class C-1 and C-XL in accordance with Schedule 10 – Review Procedure.

(d) Reinforcing steel in substructure concrete within the splash zone of adjacent roadways treated with de-icing salts shall be stainless steel. Splash zone shall be as defined in MTO Structural Manual.

(e) All structure members not within the heated space shall be capable of withstanding freeze-thaw effects without negatively impacting the design objectives.

(f) DB Co shall detail members to minimize exposed surface area and avoid pockets, crevices, recesses, re-entrant corners, and locations that collect and retain water, debris, and moisture.

(g) DB Co shall coat or galvanize all permanent iron and steel utility supports, fittings, and accessories. Design utility supports to prevent stray electrical currents between the Structure and the utility supports.

(h) DB Co shall use weldable reinforcement and suitable welding procedure where electrical continuity is required for managing stray currents.

(i) DB Co shall provide access for maintenance and inspection with conventional techniques included in MTO's Ontario Structure Inspection Manual, Structure Rehabilitation Manual and Structural Manual for all components of the Structure. Inspection and maintenance access and maintainability shall meet the requirements in Clause 1.8.3 in CSA S6-14.

4.5 Station Structural Loads

(a) Dead Loads

(i) Dead loads or permanent loads shall be as specified in OBC, NBC and CAN/CSA S6, as applicable.

(ii) Mass densities for materials shall be standard unless analysis or testing indicates that other criteria shall be used. Perform a sensitivity analysis for the actual weight where a variation might affect the adequacy of the design or in cases where the construction may vary from normal practice.

(b) Live Loads

(i) Live loads include the Revenue Vehicle design loads and highway vehicular loads specified in Schedule 15-2, Part 2, Article 4 – Structural Design Criteria and Requirements as well as all floor and roof live loads as described in the design codes and standards specified earlier in this Article 4.

(ii) Vehicle Live Load:

A. Refer to Schedule 15-2, Part 2, Article 4 – Structural Design Criteria and Requirements for Train loads.

B. Design Platforms and ramp slabs wider than 3m and accessible to Maintenance Vehicles for a concentrated vehicle load as per OBC, or the Maintenance Vehicle load as defined in CHBDC, whichever produces the more critical structural responses.

C. Design the structures supporting Sidewalks, Plazas, and other open areas wider than 3m, adjacent to road way and without permanent barrier to separate the roadway from the area for CL-625-ONT truck load as defined in CHBDC, or fire truck load as per OBC, whichever produces the more critical structural responses. Design structural members within this area for collision force defined below.

(iii) DB Co shall design and provide electrical equipment rooms, pump rooms, machinery rooms, storage rooms, service rooms, battery rooms and fan equipment rooms containing fire ventilation equipment for a specified live load of 12kPa, or the actual equipment load where greater than 12 kPa, applied uniformly over the entire area, or on any portion of the area, whichever produces the most critical effects in each member.

(c) Environmental Loads

(i) Snow, rain, ice, ice accretion, wind and earthquake loads shall be as described in the design codes outlined earlier in this Article 4 using the OBC Importance Category of “Normal”.

(ii) Include allowance for the build-up of ice on Track slabs and the build-up of compacted snow on vertical faces of barrier walls and Platform support walls adjacent to Track slabs at exposed parts of above grade Stations where the potential for such build-up exists.

(iii) Design Station Structures, partitions and affected non-structural elements to resist the piston effect wind pressures from Revenue Vehicles. DB Co shall be responsible to determine the required pressures to be resisted by all elements of the Station. DB Co shall provide data and reports supporting the determination of the design pressure based on SES modeling of the underground system. The minimum uniform design pressure for these elements shall be 1kPa in either the positive or negative direction.

(d) Fatigue Loading

(i) DB Co shall assess operational requirement in Schedule 15-2, Part 1 Article 3 – Operational Performance Requirements to determine the expected number of Trains the Structure will support during its Design Life. A service load analysis for fatigue shall be applied to affected structural elements and is generally based on the number of full loading cycles that are applied to the Structure. The loading cycles applied to each member and connection shall include the number of Revenue Vehicles, trucks or wheel load passes, whichever produces the most critical effect.

(e) Earth Loading

(i) Vertical and horizontal earth pressures acting on retaining walls and Underground Station Structures: refer to Schedule 15-2, Part 2, Article 7 – Geotechnical Design Criteria and Requirements and Schedule 15-2, Part 2, Article 4 – Structural Design Criteria and Requirements.

(ii) Design Structures which retain earth for horizontal earth pressure due to earth against the Structure and load surcharges resting on the soil above or beside the Structure.

(iii) Vertical pressure from superimposed earth load shall be based on a mass density of 22 kN/m^3 for compacted granular materials. Consider a minimum earth load assuming that 1m of fill may be removed for road or utility construction.

(f) Water/Buoyancy/Flood Loading

(i) DB Co shall consider the effects of water pressure and buoyancy whenever groundwater is present. DB Co shall establish high and low water tables for the life of the Structure with due consideration given to the possibility of future changes in groundwater elevation.

(ii) The design shall take into account the effect of water pressures during the construction sequence.

(iii) DB Co shall observe and control the elevation of the groundwater during construction and backfill operations, so that the calculated total mass of Structure and backfill shall always exceed the calculated uplift due to buoyancy by a safe margin. The backfill shall be considered as the volume contained within vertical planes defined by the outside limits of the Structure.

(iv) Design of the Structure shall make allowance for flood elevations based on 100 year flood data where it may add load to Structures.

(g) Adjacent Structure/Additional Surcharge Loading

(i) DB Co shall determine horizontal and vertical distribution of loads from foundations of existing buildings.

(ii) DB Co shall determine the minimum and maximum loads which can be transferred to the underground Structure. These loads shall be based on the actual design loads for the Adjacent Structure where this information is available. In the absence of this information, DB Co shall use the methods in the Reference Documents in Clause 4.2 of this Part 4 to evaluate probable loading of the existing Structure. The loading shall have at least the minimum level of performance on the objectives and functional statements stated or implied in Reference Documents in Clause 4.2 of this Part 4.

(iii) DB Co shall determine the need for all permanent underpinning of buildings or Structures when performing the above analyses.

(h) Thermal, Shrinkage, and Creep Loading

(i) The secondary effects due to the stresses and movements resulting from temperature changes, thermal gradients, creep and shrinkage shall be considered in the design. DB Co shall determine these loads and the appropriate design solution in accordance with the requirements of OBC, NBC, CAN/CSA S6 and AREMA, as applicable.

(i) Other Loads and Effects:

(i) as applicable to the use and occupancy for the Structure or element under consideration;

(ii) as required by the design codes, standards and references listed in this Article 4;

(iii) refer to Schedule 15-2, Part 2, Article 4 – Structural Design Criteria and Requirements for Revenue Vehicle and Vehicle loads;

(iv) Construction loads, construction staging loads and maintenance loads;

(v) loads due to fan induced airflows during operation of fire ventilation fans;

(vi) loads induced on the Structures by tolerable differential settlement;

(vii) loads to protect for future expansion where applicable; and

(viii) other loads and effects specified in Schedule 15-2, Part 2, Article 9 – Protection of Existing Adjacent Structures and Schedule 15-2, Part 2, Article 4 – Structural Design Criteria and Requirements where applicable.

4.6 Load Combinations

(a) Load factors, resistance factors and load combinations shall be in accordance with the applicable building and Bridge codes for the particular Station and structural element under consideration.

(b) Refer to Schedule 15-2, Part 2, Article 4 – Structural Design Criteria and Requirements for load factors, resistance factors and load combinations for Station Structures supporting Revenue Vehicles.

(c) Where the Station structure is subject to Revenue Vehicle load, the structure shall be designed for OBC and CHBDC.

(d) For Structures carrying more than one Track, determine the combination of Revenue Vehicle axle loads on one or more Tracks which produces the most critical effect.

4.7 Design Considerations for Retaining Walls

(a) Design considerations and factors influencing the behaviour of retaining walls shall be as per CAN/CSA S6 and OBC. The design of any retaining wall is site specific, necessitating the need for specific geotechnical input and an understanding of wall construction methods. Provide architectural enhancement of walls where specified in the architectural design.

(b) DB Co shall design retaining walls to resist the following loads:

(i) Superimposed surface and subsurface loads (adjacent vehicles and Structures);

(ii) System imposed forces (trackway vicinity);

(iii) Earth or rock pressures and hydrostatic pressures;

(iv) Earthquake lateral pressures;

(v) Wind Loads, where required;

(vi) Self-weight;

(vii) Loads during construction;

(viii) Thermal, shrinkage, and creep loads; and,

(ix) Other retaining wall loads specified in Schedule 15-2, Part 2, Article 7 – Geotechnical Design Criteria and Requirements, and Schedule 15-2, Part 2, Article 4 – Structural Design Criteria and Requirements.

(c) Retaining Walls shall be analyzed for:

(i) Stability against sliding;

(ii) Stability against bearing failure and overturning;

(iii) Settlement;

(iv) Overall stability;

(v) Structural strength;

(vi) Protect for future wall repair when locating retaining walls;

(vii) Provide Compensating Construction where existing retaining walls are impacted by the Station renovations as required by OBC and NBC, as applicable; and

(viii) Other requirements specified in Schedule 15-2, Part 2, Article 7 – Geotechnical Design Criteria and Requirements, and Schedule 15-2, Part 2, Article 4 – Structural Design Criteria and Requirements.

4.8 Other Design Considerations

(a) DB Co shall design the structural foundations, superstructures, systems, elements and connections to meet all of the requirements stipulated in the codes, standards and references listed in this Article 4.

(b) DB Co shall slope structural members to provide drainage where required.

(c) DB Co shall incorporate into their pedestrian Bridge design MTO design requirements to address snow and ice from falling on vehicles.

(d) Deflection and Vibration Control

(i) All structural members shall have adequate stiffness to limit deflections which may adversely affect the strength and serviceability of the Station Structure.

(ii) Deflections due to live load, including dynamic factors, in members supporting Train loads, shall not exceed 1/1000 of the span for interior spans and 1/300 for cantilever arm length.

(iii) The maximum total (dead and live load) long term total deflection considering creep and cracking for members supporting Train loads shall be limited to 1/500 of the interior spans and 1/180 of cantilever arm length.

(iv) Members not supporting rail loads, such as roofs, concourse and Platform slabs, shall be designed to standard acceptable engineering practices for serviceability taking into consideration the flexibility, or lack of flexibility, of the materials supported by the Structure.

(v) Members and systems supporting the system shall be proportioned so that the natural frequency of the first mode of vertical vibration is greater than 2.5 Hz.

(vi) Design floor systems susceptible to vibration in accordance with AISC/CISC Steel Design Guide Series 11 – Floor Vibrations Due to Human Activity, to meet the acceptance criteria for indoor footbridges.

(e) Foundation

(i) Settlements

A. Design foundations so that total and differential settlements do not adversely affect the strength or serviceability of the Station Structures.

B. Design structural members and systems supporting Revenue Vehicles so that total and differential settlements do not adversely affect the operation and serviceability of the Revenue Vehicles.

(ii) Pile design and detailing shall meet requirements in OBC, MTO Structural Manual, CHBDC. DB Co. shall follow the requirements in AASHTO LRFD Section 10 if requirements are not specific in the above documents.

(iii) Provide measures to prevent frost heave. The acceptable measures shall be taken from Reference Documents in Section 4.2.

(f) Seismic Design for Elements of Station Structures, Non-Structural Components and Equipment

(i) Seismic Importance Category shall be “Normal” as per OBC.

(ii) DB Co shall design elements and components of buildings, non-structural components and equipment for earthquake loads and effects as required by OBC and NBC.

(iii) The load factor for earthquake effect on Revenue Vehicle shall be in accordance with Schedule 15-2, Part 2, Article 4 – Structural Design Criteria and Requirements.

(g) Waterproofing

(i) The following areas shall be sealed to prevent water ingress:

A. Underground pits, shafts and rooms.

B. Platforms, walkways, Track structure and roadways over rooms or spaces

C. Walls and floors of buildings subject to hydrostatic pressure.

(ii) For the locations identified above, DB Co shall provide full impervious membrane protection.

A. For walls, a backup hidden drainage system within the wall shall be provided.

(iii) The material and construction of waterproofing shall follow requirements in ASTM, OPSS, and CAN/CGSB.

(h) Fire Protection

(i) Structural elements and load bearing assemblies shall be of the required type of construction and shall have fire resistance ratings as required by the code analysis and the architectural design.

(ii) DB Co shall provide concrete cover to reinforcing steel in reinforced concrete elements as required to provide the required fire resistance rating for the element or assembly.

(iii) DB Co shall provide intumescent paint where the architectural design utilizes exposed structural steel assemblies that require a fire resistance rating.

(iv) Adhesive anchors shall not be used for connections for structural assemblies required to have a fire resistance rating.

(i) DB Co shall protect for the future replacement of elevators, escalators, transformers, ventilation fans and other large/heavy equipment without strengthening and/or temporary removal and replacement of structural members.

(j) DB Co shall not locate columns in public circulation areas. When unavoidable, the column cladding and size be minimized so as to maximize sightlines and customer circulation.

4.9 Considerations of Existing Structure

(a) Conditions of existing Structures affected by new construction

(i) An existing structure is considered modified under one or more of the following situations.

A. geometries are modified,

B. material properties are modified,

C. support condition are modified,

D. loads are changed,

E. environmental condition is changed,

F. a new member is attached to an existing structural member resulting in load sharing between the new and existing members, or

G. it is within the ZOI, which shall be defined by DB Co's Geotechnical Engineer in accordance with *User 's Guide - NBC 2015, Structural Commentaries (Part 4 of Division B)*, *Commentary on CSA S6 (C6)*, and *CFEM*.

(ii) DB Co shall demonstrate that the performance of the modified existing Structure meets all the applicable standards and requirements in this Article 4, regardless of the deficiencies in the existing Structures at the time of Contract Award, where deficiencies could result from construction, material, design, normal course of deterioration, or damage prior to the Commercial Close.

(iii) DB Co shall investigate the structural soundness of the existing member affected by the construction and ensure it is capable of supporting the new member for the Design Life of the new member.

(iv) DB Co shall inspect and document the conditions of the existing structures affected by the construction. The content and the documentation of the inspection should follow the requirements in MTO Ontario Structure Inspection Manual, MTO Structure Rehabilitation Manual, ASTM E2018, or ASCE Structural Condition Assessment of Existing Structures. The requirements in the above references apply only when appropriate. Necessary additional or alternative criteria are subject to approval by the City.

(v) Refer to Schedule 15-2, Part 2, Clause 4.4 (v) (ii) for requirements for Structures within ZOI.

(b) DB Co shall perform and comply with the following for the renovation of existing Structures:

(i) OBC and NBC as applicable.

(ii) The Heritage Act as applicable.

(iii) MTO Structure Rehabilitation Manual if the structural member is exposed.

(iv) DB Co shall obtain background drawings, specifications and construction records for the affected Structures.

(v) Perform as built surveys to verify the accuracy of the background drawings.

(vi) Excavate test pits to verify the size and depth of existing foundations.

(vii) Conduct destructive investigations to verify existing conditions.

(viii) Conduct materials testing to determine and verify existing material properties.

(ix) The requirements for Basic Renovation or Extensive Renovation as determined by the code analysis at each location.

(x) Provide Compensating Construction as required by OBC and NBC, as applicable.

(xi) Perform selective demolition in accordance with OBC and NBC as applicable,

(xii) Perform Repairs on any damage caused by the Work to the satisfaction of the property owner.

(c) Interface between existing and new deck Structures supporting pedestrian and vehicular traffic:

(i) At locations where new framed floors are built adjacent to existing floor/Bridge Structures, design and construct the new Structure in a manner that minimizes the vertical differential movement at the interface between Structures so that normal serviceability of the Station is maintained under permanent and transient loads. Joints between new and existing slabs shall be flush with no vertical offsets that could create pedestrian tripping hazards or bumps under wheel loading. The design shall address: long term deflection (creep) of concrete; differential live loading; total and differential footing settlement; beam and slab camber; expansion joint cover design; and other effects where applicable.

(ii) DB Co shall pre-consult the City on any modification needed to all existing Bridge Structures.

(d) Where existing Structures are incorporated into or form part of the Station Structures, DB Co shall rehabilitate the existing Structures as required to meet the required Design Life as per Schedule 15-2, Part 1, Article 4 – Design and Construction.

(i) Estimate the remaining life of the existing structure using a method and parameters recommended in peer-reviewed publications. Submit the documents supporting the estimated remaining life to the City for review and approval.

4.10 Reinforced Concrete

(a) This Subsection applies to reinforced, prestressed, and precast concrete Structures.

(b) DB Co shall provide a nonslip surface finish in accordance with CAN/CSA A23.1 at exterior slabs subject to pedestrian traffic and at other locations as required in this Part 4.

(c) DB Co shall apply hardener at exposed concrete floors.

(d) Joints in Structures

(i) DB Co shall provide expansion joints, contraction joints and construction joints: in accordance with the all Applicable Codes and standards and in accordance with good industry practice; to control shrinkage stresses and minimize shrinkage cracking; and to meet or exceed the requirements for durability specified in Clause 4.4 of this Article 4.

(ii) DB Co shall provide waterstops in all joints below grade.

(iii) Plan construction joint locations in advance in order to minimize the number of joints while still keeping the length of individual concrete pours within standard acceptable maximum lengths. The shape of the pour as well as the amount of reinforcement in the section shall be taken into consideration when determining joint location and spacing.

(e) Field sampling and testing of concrete and acceptance criteria for quality assurance shall follow the requirements in OPSS 1350.

(f) DB Co shall design all concrete on or above grade for exposure to chlorides.

4.11 Structural Steel

(a) The Code of Standard Practice for Structural Steel published by the CISC shall govern the furnishing of structural steel.

(b) Design of structural steel Structures shall be in accordance with CAN/CSA S16 Design of Steel Structures and CAN/CSA S6 Canadian Highway Bridge Design Code, where they are applicable.

(c) Design of cold formed steel Structures shall be in accordance with CAN/CSA-S136 North American Specification for the Design of Cold-Formed Steel Structural Members.

(d) All structural steel left exposed and viewable by the public shall be architecturally exposed structural steel.

(i) DB Co shall provide architecturally exposed structural steel conforming to CISC Code of Standard Practice for Structural Steel, APPENDIX I, as supplemented by CISC Guide for Specifying Architecturally Exposed Structural as required by Clause 2.8 of this Part 4.

(e) DB Co shall provide concealed connections where required by the architectural design.

(f) Protection of Steelwork

(i) DB Co shall make all parts of a Structure accessible for inspection, cleaning, and maintenance. Where this is not possible, DB Co shall use concrete encasement of steelwork, and use of special protective coatings or the use of atmospheric corrosion resistant steel.

(g) Protective Coatings

(i) DB Co shall protect structural steel members and connections exposed to weather, high humidity or water spray against corrosion in accordance with MTO Coating Structural Manual. Minimize localized corrosion likely to occur from entrapped water, excessive condensation, or from other factors by suitable design and detail. Provide positive means of drainage to prevent standing water on steel surfaces.

(ii) Painting of interior structural steel shall meet the requirements of ISO 12944-5 for the applicable corrosive environment and desired Design Life of the coating system.

(iii) Co-ordinate the protective coating systems with the architectural design.

(iv) The minimum protection system shall be painting with a high performance coating system.

(v) The following shall apply where hot dip galvanized protection system is utilized:

A. Protection shall be restored when damage to the galvanized coating has occurred during welding or as a result of rough handling or abrasion.

B. All galvanized surfaces shall be finish painted where exposed to public view.

(h) DB Co shall not use steel deck for Structures exposed to the exterior or to deicing salts.

4.12 Masonry

(a) Design of masonry Structures shall be in accordance with CAN/CSA S304.1

(b) Horizontal joint reinforcing shall be galvanized.

(c) DB Co shall design masonry Structures to resist all applied vertical and lateral loads as required by the OBC (and the NBC where applicable). This requirement applies to load-bearing and non load-bearing masonry.

4.13 Concrete Slabs on Grade

(a) DB Co shall design Track slabs in accordance with AREMA, CAN/CSA S6 and ACI 201.2R.

(i) Refer to Schedule 15-2, Part 2, Article 3 - Trackwork for Track slab design requirements.

(ii) Transition areas such as behind end of Station end wall (or Bridge abutment) where Train transitions from at grade Track Structure to over the Station structure require special design and construction solutions. An approach slab shall be used in these areas.

(b) DB Co shall design Platform and other slabs on grade in accordance with CAN/CSA A23.3 and ACI 360R.

(c) DB Co shall remove existing fill material below slabs on grade and replace with engineered fill to a depth and extent as required to meet the limitations for settlement specified in Clause 4.8 of this Article 4. Reuse of existing excavated fill material is subject to Geotechnical Engineer's confirmation that the existing fill is suitable for re-use.

(d) DB Co shall design and construct the interface between Track slabs and Platform slabs to maintain the vertical distance between TOR elevation and finished Platform elevation as required by the Revenue Vehicle with short and long term differential settlements not to exceed the tolerance specified by the Revenue Vehicle manufacturer for vertical offset between the Track and finished Platform elevations. Refer to Schedule 15-2, Part 2, Figure 2-2.1 for vehicle dynamic envelope and Platform construction tolerance.

(e) DB Co shall provide control joints or other measures to prevent uncontrolled shrinkage cracking.

(f) DB Co shall provide connection design and detailing at the interface between slabs to address differential concrete shrinkage, where the location and spacing of transverse joints in Track slabs does not match the location and spacing of joints in the adjacent Platform slabs.

(g) DB Co shall design joints to prevent vertical differential movement between slab panels.

(h) DB Co shall provide slopes to drain slabs and prevent ponding.

(i) DB Co shall provide subdrainage systems below slabs at locations where the potential exists for the groundwater elevation to reach the underside of the slab subbase.

ARTICLE 5 MECHANICAL DESIGN CRITERIA

5.1 Introduction

(a) This Article 5 outlines mechanical systems requirements to be developed for the Stations and Ancillary Facilities of the Project.

(b) These requirements govern the functional, operational and control requirements of the HVAC, Plumbing & Drainage Systems, Fire Protection Systems, and BAS.

5.2 Reference Documents

(a) The provision of mechanical components shall comply with the criteria contained in this Article 5, and all Applicable Codes, standards, regulations, policies, applicable laws, guidelines or practices applicable to the Project requirements, including but not limited to the latest version of each of the following Documents. In the event of a conflict between criteria, commitments or requirements contained within the document and this Article 5 when compared with another, the most stringent shall apply.

(i) OBC;

(ii) OFC;

(iii) OESC;

(iv) CEC;

(v) CSA;

(vi) OHSA;

(vii) AHRI;

(viii) AMCA Standards;

(ix) ANSI Standards;

(x) ASHRAE Standards and Handbooks;

(xi) MNECB;

(xii) Green Energy Act;

(xiii) ASPE;

(xiv) ASME;

(xv) ASTM;

(xvi) NEMA;

(xvii) SMACNA;

(xviii) TIAC;

(xix) UL;

(xx) ULC;

(xxi) OC Transpo Transitway and Station Design Guidelines;

(xxii) NFPA Standards;

(xxiii) Relevant Authorities

5.3 General Requirements

(a) All mechanical systems including but not limited to equipment, ductwork, pipes, supports, accessories, and their connections to the structure, shall be designed to resist seismic force and to accommodate building seismic deflection in accordance with the OBC. Piping, ducts etc. shall be attached in a manner that accommodates the differential movement where mechanical infrastructure crosses expansion joints, or other places where differential lateral displacement may occur.

(b) DB Co shall install floor-mounted equipment on concrete housekeeping pads designed to facilitate the weight and inertia of the equipment.

(c) DB Co shall install roof-mounted equipment on supports/roof curbs provided by the equipment manufacturer.

(d) DB Co shall coordinate associated architectural and structural requirements for mechanical systems.

(e) DB Co shall provide adequate service spaces around all equipment. As a minimum, such spaces shall not be less than that indicated in the equipment specification and installation instructions.

(f) Mechanical equipment and systems shall be designed so that the maximum noise transmitted by the systems does not exceed OHSA and Regulations and ASHRAE Standards.

(g) Where new mechanical systems are connected to existing mechanical systems, the existing mechanical systems shall be modified to suit the requirements of new systems. The modifications shall be in compliance with OBC, codes, standards, and meet requirements set forth in this Article 5.

(h) DB Co shall provide technical calculations for review in accordance with Schedule 10 – Review Procedure.

(i) TAB and Commissioning shall be performed for all mechanical systems.

(j) Requirements set forth in this Article 5 for Stations shall also apply to service facilities located in Tunnels.

(k) Electric motors shall be NEMA premium efficiency. Fractional horsepower motors shall be electronically commutated motors.

(l) All mechanical systems and equipment shall be designed and installed to eliminate the transmission of vibration and noise to other part of the building and to applicable standards, regulations and codes. Provide vibration isolators for mechanical equipment and components.

5.4 HVAC

(a) DB Co shall design and construct HVAC in accordance with the following design parameters for Stations and Ancillary Facilities:

(i) System concepts shall be based on the energy conservation guideline of the MNECB, OBC, and ASHRAE 90.1.

(ii) Service equipment rooms, that require reliability, such as communication rooms, telephone rooms, signal rooms, elevator machine rooms shall be positively pressurized to mitigate infiltration of brake dust from Train movements.

(iii) Rooms containing equipment that requires condition control shall be designed to suit the equipment as per the manufacturer's recommendations or the occupancy requirements, whichever are the most stringent.

(iv) Rooms that are occupied shall be provided with outside air requirements per person as defined in ASHRAE, and, if found to be applicable, air-conditioning, and heating based on the number of occupants.

(v) Rooms that are infrequently occupied and do not require condition control for equipment shall have a minimum air change rate as determined to suit the room functions.

(vi) Rooms that contain equipment and systems that give off airborne particles, odours, or chemicals shall be exhausted to outside at grade level.

(vii) Washrooms and janitor rooms shall be exhausted to outside at grade level.

(viii) Battery rooms shall be exhausted to outside at grade level via duty and standby exhaust fans.

(ix) Air-conditioning systems serving elevator machine rooms shall be designed such that elevator equipment shall be operational during Station fire Emergency.

(x) HVAC systems serving critical rooms such as but not limited to communication rooms, signal rooms, control rooms, telephone rooms shall be designed such that those equipment shall be operational during Station fire Emergency.

(xi) Elevator shafts shall be provided with HVAC to meet requirements CSA B44 and elevator manufacturer.

(xii) Maximum room design temperatures shall be selected to suit the room function and occupancy.

(xiii) Spaces requiring heating only shall have ventilation systems (as a separate system or a combined heating and ventilating system if deemed size appropriate) that provides cooling by introducing ambient (outside) air at a rate to limit the maximum space temperature to 5.5°C above ambient (outside) temperature unless otherwise required in this Article 5.

(xiv) Systems shall be designed to be capable of providing free cooling by introducing 100% ambient (outside) air. Where the use of outside air results in unacceptable air change and flow rates, provide mechanical air conditioning.

(xv) Outside air intakes shall be located at grade level to avoid the introduction of dirt, debris, fumes, odours, noise, irritants and biological agents from traffic and other external sources.

(xvi) All occupied spaces or rooms that contain critical equipment shall have individual temperature control.

(xvii) Natural gas-fired equipment shall not be permitted inside Underground Stations.

(xviii) All equipment, dampers, fittings installed in ductwork shall have flange duct connections.

(xix) The analytical design of the ventilation systems serving the public area of the Stations shall be performed by the use of a certified applicable computer modeling program.

(xx) Where piston effect is inadequate for ventilation of the Station public areas, mechanical ventilation systems shall be provided for these areas. Adequacy of the piston effect shall be confirmed by the CFD analysis.

(xxi) Roughed in ductwork for ventilation exhaust to grade for the retail spaces.

(b) DB Co shall design and construct HVAC to the following design conditions

(i) The HVAC outdoor design conditions for both Underground Stations and At-Grade Stations shall be as per OBC.

(ii) The HVAC indoor design conditions for Station spaces shall be as detailed in Table 4-5.1 below

(iii) DB Co shall determine the indoor environmental requirements for all support spaces not included in Table 4-5.1 in accordance with Applicable Law, and within the maufacturer's operating range of equipment housed within the space.

Table 4-5.1 - HVAC Indoor Design Conditions

Space/Room	Minimum Temperature (ºC)	Maximum Temperature (ºC)	Outside Air per Occupant(l/s)	Air Filtration (MERV)	Humidity Summer / Winter (%RH)
Fare Equipment Room	22	26	12	12	50/30
Staff room/Lunch Room	22	24	17	8	50/10
Bus supervisor's office	22	24	17	8	50/10
Rail Supervisor's Office	22	24	17	8	50/10
Multi-purpose Room	22	24	17	8	50/10
Public Washrooms	22	5.5 (See Note ii)	(See Note iii)	8	-

Notes:

i. Ventilation design shall maintain space temperature design for 5.5°above outside ambient summer design temperature. Space may be included in central air handling system that provides heating and cooling as add-on to space(s) that require mechanical cooling.

ii. *Provide mechanical exhaust system at exhaust rate as required by the OBC. Provide outside air for exhaust air make-up. Recirculation of supply air to this space is not permitted.*

(c) DB Co shall design and construct HVAC equipment and systems as per the following:

(i) Select equipment to provide the highest operating efficiencies.

(ii) Mechanical equipment shall be commercial or industrial grade.

(iii) Condensing units shall be located at grade or heat from condensing units shall be rejected to outside at grade.

(iv) Condensing units shall not be located in Tunnels, shafts, or any other areas subject to brake dust and debris.

(v) Condensing air for ducted condensing units shall be taken from a location at grade, free from brake dust and debris.

(vi) Heat recovery systems as well as free cooling shall be utilized to facilitate energy conservation as per ASHRAE 90.1, OBC and local standards.

(vii) The level of fresh air supplied to occupied space shall be automatically controlled for energy conservation.

(viii) Gas-fired unit heaters shall be high efficiency with stainless steel burner.

(ix) Heating systems shall be integral with cooling systems. Heated spaces shall be heated with electric heaters where heating and cooling air-handling units are not provided for the space.

(x) For above grade buildings only, indirect high efficiency gas-fired heating equipment shall be permitted.

(xi) Provide electrical radiant heaters for each new and existing warming shelter and TSAs.

A. Heaters shall be monitored and controlled by the BAS.

B. Each unit(s) severing a shelter shall be independently controlled by a customer activated switch, controlling a rated contactor with a maximum run time of 15 minutes. Contactor shall have a hand-off-auto selector switch with pilot light.

C. The BAS shall prevent the operation of the heaters when the ambient temperature is greater the 5 degrees Celsius.

D. Heaters shall be UL/ULC listed for horizontal outdoor surface and suspended mounting.

E. Enclosures shall be a minimum 20 gauge cold rolled steel finished with powered coated paint.

F. Reflectors shall be one-piece construction and a minimum 0.030 gold anodized aluminum with the proper angle to reflect infrared heat.

G. Elements shall be double tubular infrared quartz tube with high thermal shock characteristics.

H. Each individual unit shall be rated at 4,200W minimum; and

I. Heaters shall nominally extend the full length of the shelters and TSAs.

(xii) Electric duct heaters shall be provided with SCR control.

(xiii) Electric unit heaters shall be provided with remote wired wall mounted thermostat.

(xiv) Electric force flow heater shall be provided with remote wired wall mounted thermostat.

(d) DB Co shall design and construct ductwork as per the following

(i) Ductwork shall be galvanized steel unless otherwise specified. Construction, joints, fittings and accessories shall be in accordance with the latest SMACNA standards and the OBC.

(ii) Ductwork serving shower exhaust, battery exhaust, humidifiers (two meters downstream), and other corrosive gas or high moisture air shall be stainless steel.

(iii) Flexible ducts shall be manufacturer pre-insulated.

(iv) Flexible ducts shall not be used in Stations.

(e) DB Co shall design and construct supply diffusers, registers and grilles as per the following:

(i) Diffusers shall be extruded aluminum construction with manufacturer applied finish, and opposed-blade adjustable-volume dampers.

(ii) Registers and grilles shall be extruded aluminum construction with manufacture applied finish.

(iii) Registers and grilles shall be equipped with opposed-blade, adjustable-volume dampers.

(f) DB Co shall design and construct intake and exhaust wall louvers as per the following:

(i) Wall louvers shall be weather resistant, extruded aluminum construction with insect/bird screen.

(ii) Wall louvers located in public areas shall be located at minimum 2500mm high level above floor and out of reach of Passengers.

(g) DB Co shall design and construct volume dampers in branch ducts as per the following:

(i) Adjustable volume dampers shall be provided for all branch ducts serving more than one outlet.

(h) DB Co shall design and construct backdraft dampers as per the following:

(i) Dampers shall be counter balancing type for assisted damper operation.

(ii) Silencers shall be made of not less than 22 gauge Type G90 galvanized steel or stainless steel to match material of connecting ducts.

(i) DB Co shall design and construct access doors as per the following:

(i) Duct access doors shall be provided at each damper, duct heater, and any other accessories and equipment that require maintenance.

(ii) Access doors installed in insulated ducts shall be pre-insulated.

(iii) Access doors shall be made of same material as ducts they serve.

(j) DB Co shall design and construct fire dampers as per the following:

(i) Fire dampers shall be Type B or C dynamic dampers.

(k) DB Co shall design and construct thermal insulation as per the following:

(i) Externally applied thermal insulation shall be provided for the ductwork as per ASHRAE 90.1 and OBC, and as indicated below.

(ii) Insulate exhaust air ducts and plenums 3m from the exhaust louver.

(iii) Insulate outside air ducts and plenums to air handling equipment.

(iv) Exhaust air duct from a shower area where duct is in unheated space.

(v) Insulate all supply or return air duct transporting air that is above or below the conditioned space design temperature or in an unconditioned space.

(vi) Insulation jacketing in public areas or to public view shall be minimum 0.5 mm thick rigid aluminum sheet.

(l) DB Co shall design and construct acoustic lining as per the following:

(i) Acoustic lining shall be permitted at supply and suction ducts of air handling equipment only when installation of silencer is unfeasible.

(ii) Interconnecting ductwork between men’s and women’s washrooms shall be acoustically lined to prevent cross-talk.

(m) DB Co shall design and construct humidifier as per the following:

(i) Humidifier shall be in-duct type.

(n) DB Co shall design and construct air filtration as per the following:

(i) All return air and make-up air shall be filtered.

(ii) Filters shall be standardized in type and sizes.

(iii) Differential pressure gauge shall be provided across each filter bank and monitored by BAS.

(o) DB Co shall design and construct HVAC piping as per the following:

(i) Non-metallic piping shall not be used in the Facilities.

(ii) Steel pipe shall be ASTM A53 Grade B, minimum Schedule 40; natural gas pipe shall be ASTM A53 Grade B, minimum Schedule 40, seamless.

(p) DB Co shall design and construct instrument test ports as per the following:

(i) Provide instrument test ports to recommendations of SMACNA/HVAC and in accordance with manufacturer's instructions.

(q) DB Co shall design and construct HVAC systems controls as per the following:

(i) Each item of equipment shall have an independent control panel to control the operation of the equipment.

(ii) Where interface between systems (e.g. heating/cooling) is required, a local control panel shall provide control of the equipment. Controls shall be such that simultaneous cooling & heating of the same space is not possible.

(iii) All control panels shall incorporate the ability to send a trouble alarms via the BAS or SCADA to the TOCC.

(iv) Equipment in public spaces shall have vandal/tamper resistant housing and mounting.

5.5 Plumbing and Drainage

(a) DB Co shall follow the general design requirements below:

(i) Each Station shall be serviced by one municipal water connection split prior to the property line for two service connections. Each service shall be provided with an isolation valve at the property line. One connection shall be metered for potable water and one un-metered to serve the fire protection systems.

(ii) Each Station shall be serviced by a minimum of one sanitary and one storm connection to the property line.

(iii) Piping shall not be embedded in concrete structure.

(iv) Piping shall not be routed through critical equipment rooms.

(v) Equipment requiring drainage shall not be located directly over critical equipment rooms.

(vi) All domestic cold water and domestic hot water pipes shall be insulated as per ASHRAE 90.1 and OBC with a minimum of 25mm thickness insulation.

(vii) All horizontal sanitary pipes and pipes subject to exterior surface condensation shall be insulated with 25mm thickness insulation.

(viii) All storm pipes shall be insulated with 25mm thick insulation.

(ix) Insulation jacketing in public areas or to public view shall be 0.5 mm thick rigid aluminum sheet.

(x) The incoming domestic water pipes, main sanitary and storm pipes shall be one nominal size oversized to accommodate future expansion. Where new plumbing and drainage systems are connected to existing systems of the existing Station, the existing incoming domestic water pipe, main sanitary and storm pipes shall be replaced with new.

(xi) Domestic cold and hot water pipes, hot water recirculation pipes within the Stations or Facilities shall be copper as per OBC.

(xii) Isolation valve shall be provided at each domestic cold water and domestic hot water main branches and branches that service a group of fixtures, area, floor, and equipment.

(xiii) Storm, sanitary and vent pipes within the Stations or Facilities shall be copper (less than 100 mm in diameter) or cast iron (100 mm or greater in diameter).

(xiv) Non-metallic pipes shall not be permitted within the Stations or Facilities, with the exception of buried pipes that are permitted by codes and Relevant Authorities.

(xv) Buried non-metallic pipes shall be provided with tracer wires.

(xvi) Metered cold water shall be provided for the retail area.

(xvii) Sanitary and vent pipes rough-in shall be provided for the retail area.

(b) DB Co shall design and construct piping systems as per the following:

(i) Pipes and fittings

A. Pipes and fittings shall be selected to suit the fluids they are to convey.

B. Corrosion control measures shall be provided for buried pipes where required.

C. Piping exposed to freezing temperatures shall be heat traced and insulated.

(ii) Cold water service

A. The domestic cold water shall be metered per the City of Ottawa requirements.

B. Each service shall have a main shut-off valve immediately inside the structure wall.

C. Pressure reducing valve assemblies shall be provided where service water pressure is above the recommended.

D. Provide pressure gauge at water incoming pipes.

E. Provide pressure gauges at pump suction and discharge pipes.

F. Provide pressure gauges at inlet and outlet pipes of pressure reducing valves, backflow preventers, and strainers.

G. Minimum fixture service requirements shall be calculated in accordance with the OBC.

(iii) Hot water service

A. Water heaters shall be commercial grade electric (or alternatively natural gas-fired for above grade buildings) meeting the requirements of ASHRAE 90.1 / OBC SB-10 and MNECB.

B. DB Co shall avoid runs of hot water supply piping that exceed 15m, if runs exceed this distance, hot water recirculation pump shall be provided.

(c) DB Co shall design and construct plumbing fixtures and specialties as per the following:

(i) Plumbing fixtures shall be water conserving type and shall meet the consumption outlined in the OBC, ASHRAE 90.1.

(ii) Shock-absorbing devices shall be provided at each pipe riser, branch, group of plumbing fixtures and other locations in accordance with standard PDI-WH201.

(iii) Emergency eye / face wash and shower stations

A. Emergency eyewash station with tempered water shall be provided as required by Applicable Law and as follows:

i. Janitorial Rooms; and,

ii. HVAC equipment rooms.

B. Emergency showers and or shower eyewash stations with tempered water shall be provided as required by Applicable Law.

(iv) Hose bibs and wall hydrants

A. Provide hose bibs or wall hydrants in HVAC rooms, pump rooms, washrooms, janitor rooms, refuse rooms, and open areas such that all open areas of the buildings and the concourses, Platforms shall be reached with a 30 m hose.

B. Provide non-freeze hose bibs or wall hydrants in locations subject to freezing.

C. Wall hydrants in public areas shall be wall recessed and lockable.

D. Shall be equipped with integral backflow preventers.

(v) Drinking Fountains

A. Drinking fountains shall be accessible, and protected from freezing.

B. Drinking fountains shall be provided in Operator's Facilities.

C. Drinking fountains shall feature bottle refill and built-in cooler.

D. Drinking fountains shall not be provided on the Platform level.

(vi) Floor drains

A. Provide floor drains in all areas, shafts or rooms where any source of water can be expected, including but not limited to: public areas, mechanical rooms, HVAC rooms, pump rooms, janitor rooms, washrooms, valve rooms, ventilation rooms, elevator/escalator rooms, electrical rooms, elevator and escalator pits, storage rooms, supervisor's rooms, ticket/information rooms, Operator Facilities, and service trenches.

B. Floor drains in elevator and escalator pits shall be equipped with backwater valves.

C. Provide floor drain at floor grilles at Station entrances.

D. Provide funnel floor drains for condensate and water disposal.

E. Floor drains, funnel floor drains and floor cleanouts shall be heavy duty.

F. Floor drains shall be provided with trap seal primers.

(vii) Trench drains

A. Provide trench drains at top and bottom of stairs at Station entrances and outdoor stairs.

B. Provide trench drains at bottom of other stairs.

C. Provide trench drains at Track level within Stations.

D. Provide trench drains at pedestrian underpasses.

E. Trench drains shall be heavy duty.

F. Trench drains shall be provided with trap seal primers.

(viii) Sump pumps & sewage ejectors

A. Sump pumps and sewage ejectors shall be duplex configuration with 100% redundancy.

B. Submersible sump pumps shall be equipped with stainless steel quick connection, installation guide bars.

C. Sump pits shall be equipped with stainless steel ladder and stainless steel gas-tight cover.

D. Large pumps weighing greater than 22kg shall be provided with permanent monorail lifting devices.

E. Provide pressure gauges at sump pump discharge pipes.

F. Sanitary pumps servicing elevator pits shall not be located in the elevator shaft.

G. Storm sump pits shall be provided with a sediment trap section.

H. Where oil or grease may be present in the sanitary waste, oil sensors shall be provided.

I. Pump control panels shall be stainless steel construction and facilitate fault or trouble signals back to TOCC via the SCADA system.

J. All pumping stations shall incorporate level controls with high level alarms that shall be sent to TOCC via the SCADA system

5.6 Fire Protection:

(a) DB Co shall design and construct fire protection as per the following:

(i) General design requirements

A. Fire protection systems shall meet the requirements of all codes.

B. Fire water service shall be provided with double check detector assembly, and installed as per requirements of the City.

C. Provide fire pumps as required to meet code requirements.

D. Provide complete automatic sprinkler system for areas of each Station including the Storage Tracks, Tail Tracks, and Ancillary Facility as required by the OBC, NFPA-130, NFPA-13, and Relevant Authorities.

E. Provide complete standpipe system for all Stations and Ancillary Facilities, and portions of Tunnels within 20m of the Platform. The standpipe system shall meet the requirements of, but not limited to, the OBC, NFPA-130, NFPA-14 and Relevant Authorities.

F. Provide NOVEC 1230 clean agent fire suppression systems for all communications, telephone equipment rooms and any other rooms of similar function, in compliance with NFPA-2001.

G. Provide portable fire extinguishers as required by the OBC, OFC, NFPA-10, and Relevant Authorities.

H. Non-metallic pipes shall not be permitted for fire protection systems unless for buried pipes and where permitted by codes.

I. Flexible pipes shall not be permitted for fire protection systems.

J. Drum drips in unheated areas for dry systems shall be heat traced and insulated.

(ii) Sprinkler systems

A. Sprinkler systems shall be wet type if not subject to freezing weather conditions; otherwise dry-pipe systems are acceptable upon approval by City authorities.

B. Pipes shall be steel pipe of minimum Schedule 40 meeting ASTM A795/A795M or ASTM A53/A53M Grade B and NFPA 13.

(iii) Standpipe systems

A. Standpipe systems shall be Class I or III, as required by the local fire department.

B. Provide standpipe systems for the Storage Tracks and Tail Tracks in the Stations.

C. Fire protection cabinets in public areas shall be wall recessed stainless steel.

D. Fire protection cabinet shall contain a portable fire extinguisher.

E. Pipes shall be steel pipe of minimum Schedule 40 meeting ASTM A795/A795M or ASTM A53A/53M Grade B and NFPA 13.

(iv) Clean agent fire suppression systems

A. Where rooms are protected by clean agent fire suppression systems, raised floor and ceiling spaces in these rooms shall be provided with fire suppression systems.

B. Audible and visual alarms shall be provided within the room as well as outside for occupied and occasionally occupied (staffed) rooms.

C. Pipes shall be seamless steel pipe of minimum Schedule 80 and as required in NFPA-2001.

(v) Portable fire extinguishers

A. Station rooms containing electrical, electronic, and signal equipment shall be provided with CO_2 fire extinguishers, in addition to dry chemical fire extinguishers.

B. A Class A fire rated water pump tank extinguisher shall be provided within all Stations.

C. Extinguishers in public areas shall be installed in wall recessed stainless steel cabinets.

(vi) Fire department connections

A. DB Co shall provide and install free standing or wall mounted connections and signage constructed of polished bronze, which shall be verified by City Authorities.

5.7 Building Automation System

(a) DB Co shall provide an open-protocol BACnet Ethernet LAN BAS system for each Station and each Ancillary Facility to control and monitor all systems, components, and equipment in this Article 5.

(i) System shall be compatible with the BAS of the Existing Confederation Line.

(ii) All Ancillary Facilities supporting bus operations shall be compatible with the existing OC Transpo BAS.

(b) DB Co shall provide an OWS at each Station and each ancillary facility, complete with a graphical user interface, printer, all computer hardware and software.

(c) DB Co shall design and construct systems, components, and equipment that are controlled by BAS and that shall also have their own local standalone controllers and monitoring.

(d) DB CO shall provide each workstation to be connected to the TOCC, BCC, BYCC and MYCC, and communicate with other control systems.

(e) DB Co shall design and construct the system to have minimum 25% spare points and be expandable for future system expansion without hardware upgrade.

ARTICLE 6 ELECTRICAL DESIGN CRITERIA

6.1 Introduction

(a) This Article 6 presents the basic electrical design guidelines, codes, and standard references that DB Co shall follow throughout the electrical design process of the Stations.

(b) DB Co shall design and construct electrical spaces that are properly located and sized to facilitate the installation and maintenance of equipment.

(c) DB Co shall design the Station electrical systems shall provide for safe, reliable, and continuous operation.

(d) DB Co shall provide accessibility to permit removal and replacement of major equipment. These requirements are intended to promote uniformity in the design approach and to standardize the type of equipment and its location throughout the system.

(e) DB Co shall provide electrical power distribution equipment to be heavy duty construction and shall provide arc flash hazard mitigation features to limit personal protective equipment to level 2 or lower.

(f) For the design of all electrical systems, sustainable design elements shall be utilized where applicable and practical as recommended by CAN/CSA 802, EnergyStar®, RoHS.

(g) DB Co shall design and construct the electrical distribution system to distribute power for Passenger Station lighting, heating, ventilation and other equipment and systems. Power and circuit requirements for signal and communication systems are subject to Schedule 15-2, Part 3 - Systems.

(h) DB Co shall ensure that all electrical equipment shall be individually identified by unique number matching equipment schedule designation. The label shape, letter size, color coding and background color shall be standardized for the Project. Project identifying labels shall be designated for: cable trays, conduits, junction boxes, cables/wires and all electrical and electronic equipment. In addition to the identification labels approval labels shall be provided as required per CSA, ULC, **[REDACTED]**, or **[REDACTED]**.

(i) Reuse of existing Station infrastructure shall be permitted in accordance with the following:

(i) DB Co shall replace all major distribution equipment with a remaining life expectancy of less than 15 years as identified in the Station Condition Audit Reports. In addition, DB Co shall replace all existing communication, security, life safety equipment that has less than 5 years of remaining life expectancy at Substantial Completion that is compatible with the new systems;

(ii) DB Co shall perform all rehabilitation, refurbishment etc., as identified in the Background Information for all existing equipment retained for use in DB Co's design.

(iii) DB Co shall limit the loading (KVA, Amps) on existing services and power distribution equipment where used for the purposes of expanding existing distribution to meet new load demand such as not to exceed 80% of existing distribution equipment rating. Where the loading of the existing distribution equipment exceeds 80% of its rating with the addition of new loads to meet Station expansion, DB Co shall replace such equipment with new equipment that shall meet the new load demand and include a minimum of 25% capacity for future expansion.

6.2 Reference Documents

(a) DB Co's design and construction shall comply with the criteria contained in this Article 6, and all standards, regulations, policies, Applicable Law, guidelines or practices applicable to the Project, including but not limited to each of the following Reference Documents. In the event of a conflict between criteria, commitments or requirements contained within one document when compared with another, the more stringent shall apply:

(i) OBC*;

(ii) NBC*;

(iii) Ontario Electrical Safety Code,;

(iv) Canadian Electrical Code, Part I: Safety Standard for Electrical Installations;

(v) ANSI;

(vi) UL/ULC;

(vii) NEMA;

(viii) CSA;

(ix) IESNA Lighting Handbook;

(x) IESNA, IES RP-20 – Lighting for Parking Facilities

(xi) ASHRAE 90.1;

(xii) City of Ottawa Standards;

(xiii) NFPA 130: Standard for Fixed Guideway Transit and Passenger Rail Systems;

(xiv) NFPA 110: Standard for Emergency and Standby Power Systems;

(xv) ASME A17.1: Safety Code for Elevators and Escalators;

(xvi) IEEE;

(xvii) IEC; and

(xviii) **[REDACTED]** Specifications.

(xix) **[REDACTED]** Specification

(xx) IDA-IES

(xxi) EEMAC

(xxii) OC Transpo Transitway & Station Design Guidelines

**Note: Federally Mandated Stations shall meet the requirements of both the OBC and the NBC.*

6.3 Basis for Design

(a) DB Co shall utilize the following electrical load classification:

(i) Normal systems include loads which, if de-energized, would have no effect on Passenger Safety or adverse effect to Facility systems. This load classification includes all non-essential Station loads and the majority of Station lighting. These loads can tolerate occasional prolonged power outages and do not require a backup power source.

(ii) Emergency systems classed per NFPA 130 and NFPA 110

A. Level 1 systems include loads such as Emergency egress lighting, communication systems (if used in Emergency response procedures) and fire alarm systems that cannot tolerate normal electrical supply outages and require an Emergency power supply.

B. Level 2 systems include loads such as fire pumps, Emergency ventilation and smoke removal systems, sewage pumps, and elevators that require a reliable power source, feeders from two separate and distinct utility substations or combination of sources as approved by the AHJ.

**Note: DB Co shall perform FMEA and vulnerability/system assurance/reliability analysis in order to determine any other Safety Critical loads that require Emergency power.*

(b) Calculations

(i) DB Co shall perform short-circuit calculations to determine the AIC rating of the electrical distribution system based upon the actual available short-circuit value or per-unit impedance values obtained from the **[REDACTED]** at the electric service entrance or point of connection.

(ii) DB Co shall base system device coordination and selectivity on calculated short-circuit values and used for selection of ratings and settings of protection devices.

(iii) DB Co shall complete voltage drop calculations for maximum loads, long run circuits and feeders, and under motor starting conditions. Motor circuit calculations shall be based on an 85% lagging power factor. Branch circuit voltage drop from service entrance distribution equipment to point of utilization shall not exceed 5%.

(iv) DB Co shall complete lighting-level calculations for all interior and exterior spaces in conjunction with architectural and/or landscaping design. The point-by-point method utilizing computer generated calculations shall be used to validate adequate illumination levels and boundaries. The software used shall be industry recognized and the calculations shall follow IESNA procedures. Calculation results shall include maximum, minimum, and average illumination levels along with the appropriate uniformity ratios. Calculations shall also include luminaire locations, mounting heights, manufacture's catalog data sheet with product selections and options indicated, lamp data sheet, wattage, lumens, color rendering index, color temperature, room surface reflectance values, light loss factors, and photometric file used. Lamp or LED fixture color rendering temperature shall be consistent throughout the Station and the Station site, complement architectural finishes and have CRI of 80 or more within the Station and a CRI of 70 or more throughout the Station site and other areas.

(v) DB Co shall complete arc flash hazard calculations for equipment that is required to be field marked for arc flash warning per CAN/CSA Z462. DB Co shall provide and perform calculations based on actual distribution system installed, actual minimum and maximum available utility short circuit current and according to IEEE 1584 and CAN/CSA Z462. Values to be calculated shall include, but not be limited to: (a) flash protection boundary in units of centimeter from equipment; (b) incident energy at 45.72cm working distance from equipment in units of calories per square centimeter (cal/cm^2). The calculated values shall be permanently displayed on equipment arc flash hazard warning labels.

(vi) DB Co shall complete computations for service, feeder and branch circuit loads based on the nominal system voltage used and applicable demand factors in accordance with the Canadian Electrical Code.

(vii) DB Co shall provide protection for future growth for all major electrical equipment and **[REDACTED]** service feeders as identified by the City plus an additional allowance of at least 25% of the total loading, rounded upwards to the

next standard rating (KVA or A). Before determining the size of service an economic analysis shall be made to determine the most feasible way of protecting for the future growth. Special consideration shall be given to requirements for load growth, for anticipated usage and life expectancy with particular attention to the possibility of adding heavy loads such as elevators and escalators, electric heating etc.

(c) DB Co shall include the following electrical safety provisions in the design:

(i) EGFP shall be provided as required by the latest Applicable Codes. Ground fault "annunciation only" shall be provided where EGFP is required by code for equipment or feeders serving Level 2 Emergency Systems.

(ii) PGFP shall be provided on branch circuits that have equipment or outlets for which personnel protection is required by either the latest Applicable Codes or Good Industry Practice.

(iii) Arc flash hazard warning labels shall be provided on the equipment as per required code. Flash boundary and incident energy values shall be displayed.

6.4 Functional Requirements

(a) Identification of Stations for TPSS and ventilation requirements:

(i) At Grade Stations with no TPSS, no ventilation loads, no provision for backup of ventilation loads of adjacent Station: Westboro, Iris.

(ii) At Grade Stations with no TPSS, no ventilation loads, provision for backup of ventilation loads of adjacent Station: Pinecrest.

(iii) At Grade Stations with TPSS, no ventilation loads, no provision for backup of ventilation loads of adjacent Station: Bayshore, Lincoln Fields, Dominion, Moodie, Montreal, Orleans Boulevard, Place d'Orleans, Jeanne D'Arc, Trim.

(iv) Underground or Below Grade Stations with TPSS, ventilation loads, no provision for backup of ventilation loads of adjacent Station: Baseline, Queensview

(v) Underground or Below Grade Stations with TPSS, ventilation loads, provision for backup of ventilation loads of adjacent Station: Cleary.

(vi) Below Grade Stations with no TPSS, ventilation loads, provision for backup of ventilation loads of adjacent Station: New Orchard.

(b) DB Co shall design and construct the electrical service as per the following:

(i) The secondary voltages described herein are the basis of the Reference Concept electrical distribution design. DB Co may select alternative voltages for secondary distribution system.

(ii) The **[REDACTED]** supply strategy for Stations including supply points, responsibilities and associated costs is discussed in "**[REDACTED]**" report.

(iii) At At-Grade Stations not served by TPSS, and not providing backup for ventilation loads of an adjacent Station, the primary switchgear and transformers shall be owned by **[REDACTED]**.

(iv) At At-grade, Underground or Below-grade Stations with a TPSS and/or level 2 (including ventilation) loads and/or provision for backup of level 2 (including ventilation) loads of an adjacent Station, the Primary switchgear will be owned by **[REDACTED]** and the downstream distribution including two metal clad MV switchgears (except where the Station has no ventilation loads, DB Co shall provide one metal clad MV switchgear), transformers and associated cabling shall be customer owned. DB Co shall provide separate and dedicated breaker for the TPSS, level 2 Emergency and non-level 2 loads (normal and level 1 Emergency) with customer owned revenue class metering. **[REDACTED]** metering shall be required immediately downstream of the primary service main breaker. Downstream 0.6KV distribution for At-Grade Stations with a TPSS and/or provision for backup of level 2 (including ventilation) loads of an adjacent Station shall follow Clauses 6.4(c)(i), (ii) and (iii) of this Part 4.

A. Additionally, at Moodie LMSF, the main substation including but not limited to the 44KV switchgear, 44KV/13.2KV transformers and all associated cabling shall be provided by DB Co and owned by the City. The demarcation point and metering requirement shall be coordinated and confirmed with **[REDACTED]**. DB Co shall provide cubicles in the customer owned switchgear for **[REDACTED]** revenue metering. DB Co shall provide 13.2 KV switchgears to feed the LMSF, Station and associated TPSS's. Moodie Station shall receive a single 13.2KV feed that shall have customer owned revenue class metering on the load side of the feeder breaker in the TPSS supplying the Station loads. DB Co shall provide 13.2/0.6KV transformer and associated cabling to the 600V AC main switchboard at Moodie Station.

B. At Trim Station, the primary MV switchgear, transformers and all associated cabling shall be provided by DB Co and owned by the City. The demarcation point and metering requirement shall be coordinated and confirmed with **[REDACTED]**.

(v) Electrical protection devices shall be automatically coordinated with upstream/downstream distribution system in order to minimize disruption to the operations.

(vi) Provide electric heat tracing where required by the mechanical and architectural design.

(vii) All Emergency service raceways/feeders shall be fire rated in accordance with Applicable Codes requirements. Main feeder raceways shall be embedded in concrete slabs/walls and shall be rated for at least two hours.

(viii) The superstructure and substructure shall accommodate all required embedded ducts for interior and exterior electrical services as applicable.

(c) At-Grade Stations without a TPSS or no requirement for ventilation loads, where redundancy supplies are not required by NFPA requirements, shall be provided with a single underground service feeder from **[REDACTED]** at 600VAC, 3phase, 60Hz with the exception of Moodie Station where the feeder will originate from the LMSF. DB Co shall coordinate with **[REDACTED]**, as referenced in the **[REDACTED]** Planning Reports, all requirements related to the installation of the on-site transformer and underground duct-banks.

(i) At-Grade Stations shall be provided with 600VAC main switchboard, **[REDACTED]** metering immediately after the main service breaker, customer owned revenue class metering, associated downstream power distribution panels, feeders to 600VAC and 208/120VAC equipment and (if applicable) transfer switch for the Emergency power distribution, and UPS, batteries, etc. Main electrical room will contain, in addition LV transformers, UPS (if applicable), LV lighting control cabinet, heating controls, etc.

(ii) Emergency lighting, fire alarm and other Emergency equipment loads shall be connected to UPS or batteries and with capacity as required by applicable code and AHJ requirement.

(iii) Connection for a mobile generator shall be provided in all At-Grade Stations. The portable generator system shall be used only for stand-by operation during prolonged Utility outages and is independent of the required Emergency (UPS or battery) power supply systems.

(d) At Underground and At-Grade Stations, where pad-mounted primary equipment cannot be installed at grade, DB Co shall provide a primary switching room for incoming service and shall be:

(i) Designed in accordance to **[REDACTED]** Specification GCS0002: Primary Voltage Service Specification and coordinated with **[REDACTED]**;

(ii) at grade or within 5m below grade with two walls on the outside to allow ease of access for **[REDACTED]** incoming feeders and designed for a three (3) hour fire envelope;

(iii) dimensions as outlined in the **[REDACTED]** or as specified by **[REDACTED]**; and,

(iv) coordinated with **[REDACTED]** in terms of room locations, switchgear location and placement within the rooms.

(e) At Underground or Below Grade Stations with requirements for level 2 loads, where redundant supplies are required by NFPA requirements, DB Co shall utilize an ATS and reserve capacity for only level 2 loads from adjacent Stations (except at Baseline Station where two redundant radial feeds shall be provided) as per the **[REDACTED]** planning report. DB Co shall coordinate the design for the ATS with **[REDACTED]** and shall provide remote monitoring and blocking of transfer switches for **[REDACTED]**.

(i) Provide feeders from two separate and distinct Utility substations or combination of sources as approved by the AHJ to serve Emergency systems only classified as "Level 2" and used for Emergency ventilation or fire suppression equipment. Provide two incoming service feeders at a supply voltage no less than specified in the **[REDACTED]** planning report, 3-Phase, 60 Hz from the Utility. Circuit each incoming service feeder from a separate and independent Utility source or TPSS that is electrically and physically isolated from each other. All power sources shall be as approved by the AHJ and in conformance with the Applicable Code. **[REDACTED]** metering shall be immediately downstream of the Station's main primary service breaker.

(ii) The service feeders shall be electrically and physically separated and approved by the AHJ for use as an Emergency power source.

(iii) At New Orchard, Cleary and Queensview Stations:

A. Upstream distribution will comprise of a single underground service feeder from **[REDACTED]** owned switchgear at 13.2KVAC, 3phase, 60Hz to be terminated in a customer owned primary 13.2KVAC switchgear. The demarcation point between **[REDACTED]** and DB Co responsibility shall be the customer termination point of the **[REDACTED]** switchgear. Provide feeders and customer owned revenue class metering from the customer owned primary MV switchgear to downstream station normal and Emergency (non-level 2) loads, a second MV switchgear as noted in Clause 6.4 (b)(iv) of this Part 4, feeding downstream Station level 2 loads, TPSS and where applicable, adjacent Station's level 2 loads.

B. DB Co shall provide a second 13.2KVAC switchgear that shall be double ended with main/tie/tie/main breakers in the MV electrical room at each Station feeding only level 2 loads where redundant supplies for level 2 systems are required per code. This switchgear shall be interconnected to the customer owned primary 13.2KVAC switchgear of the adjacent Station with 13.2 KV or 27.6 KV tie cables running between these stations designated for providing backup power for level 2 loads. Provide tie cables, complete with routing, between the pad mounted switchgears at these stations. Routing shall be coordinated with and approved by the AHJ

and in conformance with the Applicable Code. Provide interlocks between these switchgears to close the redundant feeder breaker in the adjacent Station in the event the primary source for the level 2 loads in the station fails

C. An ATS connected to both bus "A" and bus "B" of the second MV switchgear shall provide power to the Station downstream distribution system for all level 2 loads at each Station.

D. Downstream distribution for each Station's level 2 loads shall also include two 13.2kV/600VAC or 27.6kV/600VAC redundant dry type transformers feeding double ended 600VAC switchgear located in 600VAC electrical room that shall feed all 600/347V level 2 loads including additional two 600/208/120VAC redundant dry type transformers that shall feed double ended 208VAC switchgear located in the 208VAC Room that shall feed all 208/120V level 2 loads. Redundant circuit feeders shall be in physically separated raceways. ATSs connected to both buses shall be provided in the double ended 600VAC and 208VAC switchgears.

E. Downstream distribution for each Station's normal and Emergency (non-level 2) (excluding TPSS) loads shall include a single 13.2kV/600VAC or 27.6kV/600VAC dry type transformer feeding a 600VAC main switchboard that shall feed all 600V loads including but not limited to 600-208/120V dry type transformers, power distribution panels, feeders to 600VAC and 208/120VAC equipment and transfer switch for the Emergency power distribution, UPS, batteries, etc.

F. Emergency lighting, fire alarm and other Emergency loads (non-level 2) shall be connected to UPS or batteries and with capacity as required by applicable code and AHJ.

(iv) At Baseline station:

A. Upstream distribution shall comprise of two underground service feeders from separate **[REDACTED]** owned switchgears at 13.2KVAC, 3phase, 60Hz to be terminated in a customer owned double ended 13.2KVAC switchgear with main/tie/tie/main arrangement in the MV electrical room. The demarcation point between **[REDACTED]** and DB Co responsibility shall be the customer termination point of the **[REDACTED]** switchgear. Provide feeders and customer owned revenue class metering from the customer owned primary MV switchgear to downstream Station normal and Emergency loads, and TPSS.

B. An ATS connected to bus "A" and bus "B" shall provide power to the Station downstream distribution system for all loads.

C. Downstream distribution shall also include two 13.2kV/600VAC redundant dry type transformers feeding double ended 600VAC switchgear located in 600VAC electrical room that shall feed all 600/347V loads including but not limited to 600VAC distribution panels and, additional two 600/208/120VAC redundant dry type transformers that shall feed double ended 208VAC switchgear that shall feed all 208/120V loads including but not limited to distribution panels, UPS, batteries, etc. located in the 208VAC Room. Redundant circuit feeders shall be in physically separated raceways. ATSs connected to both buses shall be provided in the double ended 600VAC and 208VAC switchgears.

D. Emergency lighting, fire alarm and other Emergency equipment loads shall be connected to UPS or batteries and with capacity as required by applicable code and AHJ requirement.

(f) The electrical service for Moodie Station and associated TPSS (located at Moodie Station) shall be provided by DB Co. Refer to Schedule 15-2, Part 5 –LMSF for additional information related to the incoming service. The feeders shall originate from the customer demarcation point at the LMSF. DB Co shall be responsible for the design, construction and supply of service feeders, all ductbanks, cabling, equipment, etc. from the customer demarcation point at the LMSF to the Moodie Station site main step down transformer.

(g) Metering and Monitoring

(i) Utility revenue metering shall be provided as required by **[REDACTED]** as per **[REDACTED]** standard GCS0008.

A. For 600V services from an **[REDACTED]** owned transformer, provisions shall be made at the main 600V switchboard as required by **[REDACTED]**.

B. For a primary service (13.2kV, 27.6kV or 44kV), provisions shall be made in the customer owned metalclad switchgear in the MV electrical room as required by **[REDACTED]**.

(ii) DB Co shall provide remote monitoring system for:

A. Station main switchboard breakers position;

B. Voltage availability at the main buses; and,

C. Fire alarm per CAN/ULC S561.

(h) DB Co shall design and construct duct banks, manholes and handholes as per the following:

(i) Duct banks and manholes shall be designed in accordance with the seismic criteria defined for the Project. Duct banks shall be designed to include at least 25% spare capacity to protect for future growth and expansion. Requirements for the installation of additional fibre along the Confederation Line for the use of the City is included in Schedule 15-2, Part 3 – Systems.

(ii) Underground ducts shall be sloped to manholes to provide adequate drainage. Provide concrete encasement where required by Applicable Code.

(iii) Manholes and/or handholes shall be designed as per City Standards.

(i) Electrical rooms

(i) DB Co shall size electrical rooms to have sufficient space to house all required equipment. Adequate space shall achieve minimum working clearances, conduit entry points and routing, equipment removal / replacement, building repair, and ventilation requirements.

(ii) DB Co shall size with additional 20% space for future growth.

(j) DB Co shall design and construct grounding and bonding as per the following:

(i) The Station grounding system shall be designed to meet applicable codes and standards.

(ii) The grounding electrode system shall be supplemented and bonded together with an embedded ground grid on each side of the Tracks for side Station Platforms. The Station grounding grid shall not be interconnected with any Traction Power (DC) grounding system. DB Co shall coordinate interconnection grounding points with signal and communication systems to avoid noise propagation.

(iii) A separate grounding system for signalling and communication shall be provided. All signal and communication equipment including cables shall be properly grounded.

(iv) All non-current-carrying metal enclosures and all alternating current equipment shall be securely connected/bonded to the Station grounding system.

(v) Each metallic equipment housing shall provide a welded boss for attaching a protective ground connection and shall be sized for expected trip currents.

(vi) Grounding of the future Platform edge doors for Underground Stations and other metal surfaces within 2 m of the Revenue Vehicle stopped at the Platform shall be coordinated with Traction Power design in order to prevent or limit possible excessive touch potential in tolerable values as specified in OESC.

(vii) Avoid natural gas piping and pipe connected to an active cathodic protection system with the exception where required by the corrosion protection

(k) DB Co shall design and construct emergency and standby power sources as per the following:

(i) Power sources shall be selected based on efficiency, reliability and most economic life cycle cost as per CAN/CSA and NFPA requirements.

(ii) Emergency and standby power sources are identified as follows:

A. Standby on-site internal combustion engine generator;

B. *Mobile generator;

C. UPS system;

D. Central battery system or battery packs for unit equipment; and

E. **Second utility power source – Dual/redundant utility power source for loads classified emergency Level 2.

**Note: Provisions for quick connection for a mobile generator shall be provided in At-Grade Stations and where practical for underground Stations. The mobile generator system will be used only for stand-by operation during prolonged utility outages and is independent of the required Emergency power supply systems.*

***Note: AHJ shall review the design and approve the dual redundant utility service feeders as Emergency power supply source.*

(iii) When standby fixed mounted engine generators are to be installed outdoors, a completely enclosed weatherproof/sound attenuated housing to protect the generator from adverse weather conditions and reduce sound levels for surrounding residential neighbourhoods shall be provided. Enclosure shall have critical grade silencing suitable for residential installation. DB Co design shall follow NEMA/IEC/EEMAC enclosure/environmental protection standards.

(iv) When second Utility power source is selected, Emergency lighting, fire alarm and other Emergency equipment loads shall be connected to a UPS or battery system as required for loads classified as “emergency level 1”. Automatic transfer switches serving life safety loads shall be equipped with means of bypass to both sources.

(v) DB Co shall design and construct all UPS sytems with bypass switches to allow the UPS to be taken off line for maintenance without disruption to downstream loads.

(l) DB Co shall design and construct general purpose receptacles as per the following:

(i) In public areas, general purpose receptacles shall be GFI and provided at 20m distance, and shall have lockable covers. No more than six outlets shall be connected to a branch circuit.

(ii) GFI receptacles shall be provided also for Station sign boxes and art elements where required.

(iii) In non-public areas general purpose receptacles shall be provided at 7m apart and shall be supplemented where needed for fixed equipment. No more than five outlets shall be connected to a branch circuit.

(iv) A flush-mounted duplex ground fault type receptacle with weatherproof lockable cover shall be provided close to hose bibs.

(m) DB Co shall design and construct lighting as per the following:

(i) The lighting systems for Stations, Park and Ride areas, Pedestrian Walkways, trackway, Tunnels and portals shall be coordinated with architectural/landscaping and signage/wayfinding design objectives. Lighting design shall be consistent across all Stations. Standardization of lighting system components is required for perceptual unity and to simplify maintenance. Lighting design shall be consistent with the principals, philosophy and frame work for lighting design as contained in The Lighting Handbook, Tenth Edition as published by the Illuminating Engineering Society. The required illumination targets for items not listed in Table 4-6.1 and Table 4-6.2 shall be based on visual observers group 25-65 for all public spaces as recommended by IESNA, unless otherwise dictated by the building code or accessibility standards. The lighting design shall meet the illumination levels and uniformity requirements for both day and night time operations.

(ii) Lighting levels shall define and differentiate between task areas, decision and transition points, Platform edges and areas of potential hazard. In addition to quantity of light, it is essential that lighting be designed to minimize glare and provide uniform distribution. Luminaires shall be selected, located, and/or aimed to accomplish their primary purpose while producing a minimum of objectionable glare and/or interference with task accuracy, vehicular traffic, and neighbouring areas.

(iii) Luminaires that emit light above the horizontal plane shall be avoided in the exterior design, unless luminaires are located under overhangs or other architectural features shielding the sky from upward light. Luminaires shall be provided with full cut-off optics and if necessary external shielding to minimize light spill-over onto adjacent properties. L. Refer to IESNA TM-11-2000, Light Trespass for Roadway Lighting, and to IDA-IESNA MLO 2011 and addendum A for IESNA TM-07-15 for all other exterior lighting.

(iv) The lighting system shall be LED light sources and auxiliary equipment. Lighting equipment shall be vandal-resistant where accessible to the general public.

(v) The lighting system shall be designed to satisfy OBC, AODA, CPTED, IESNACAN/CSA B651, UL/ULC, CE, FCC, CB requirements.

(vi) Minimum illumination levels shall meet the criteria listed in Table 4-6.1 below:

Table 4-6.1: Facility Interior

Illuminated Area	**Illumination levels Targets**		
	E_h **lux**	E_v **lux**	Uniformity Ave: Min
Platform Edge	200 @ floor	60 @ 5'AFF	2:1
Station Rail Platform	100 @ floor	30 @ 5'AFF	2:1
Fare Vending	200 @ 3'AFF	100 @ 4'AFF	3:1
Information Kiosk	300 @ 3'-6" AFF	150 @ 5'AFF	3:1
Stair, Ramps and Escalator Landings	100 @ floor	50 @ 5'AFF	2:1
Pedestrian Tunnels and Concourse	50 @ floor	20 @ 5'AFF	3:1
Transecure Area	220 @ floor	100 @ 5'AFF	2:1
Public Washrooms (General)	150 @ 3'-5" AFF	50 @ 5'AFF	2:1
Plumbing Fixtures	300 @ Top of Plumbing Fixture	100 @ 3'-6"AFF	

Lavatory	150 @ 3'-0" AFF	200 @ 3'-5"AFF	
Building Entries Vestibules Indoor /High Activity			2:1
Day	150 @ floor	75 @ 5'AFF	
Night	100 @ floor	50 @ 5'AFF	

**Note: 1.) All lighting, including, but not limited to Normal and Emergency lighting illumination levels, shall be designed to meet or exceed OBC, accessibility requirements, and security requirements including but not limited to, AODA, COADS, CPTED, CCTV and CAN/CSA B651 requirements. 2.) Illuminated areas and values not listed in this table shall be per IESNA- Illumination Handbook, 10th Edition. 3.) Table 4-6.1: Facility Interior is applicable to all areas within the Fare Paid Zone of the Station utilized for Train operations and service; and interior spaces of enclosed Ancillary Facilities.*

(vii) Provision of Emergency lighting systems is required by code. Emergency power shall be available at stable system voltage within 10 seconds or less. All batteries shall be sized to continuously carry the rated illumination for a minimum time required for evacuation and as required by Applicable Code.

(viii) Emergency lighting fixtures shall be the same model and type as the rest of the lighting fixtures with the addition of Emergency battery pack.

(ix) Lighting system shall be designed so that the failure of any single luminaire or lighting circuit in areas accessible to the public does not leave an area in total darkness.

(x) Lighting layout shall be coordinated with other building elements so as not to affect the illumination.

(xi) BAS system shall monitor and control Station lighting system. Where Facility remote control system is not provided, the following controls shall be provided:

A. Station central key / timer control system including override switches for service areas;

B. Exterior luminaries, including luminaries in signage, shall be group controlled by photo-cell and/or the facility BAS system. Exterior light control shall include a maintenance bypass switch (Hand-Off Auto) located on external wall of the facility for night services such as snow plow and cleaning;

(xii) Exterior Lighting areas as required for Safety and comfort shall meet requirement of City Standards, IDA-IESNA MLO 2011, IESNA RP-33 and addendum A for TM-07-15, and ANSI/ASHRAE/IESNA Standards 90.1 Exterior Lighting Section;

(xiii) Adopt site lighting criteria to maintain safe light levels while avoiding off-site lighting and night sky pollution. Use computer software to model the site lighting. Technologies to reduce light pollution include full cutoff luminaires, low-reflectance surfaces and low-angle spotlights; and

(xiv) Minimum illumination levels shall meet the criteria listed below:

Table 4-6.2: Exterior Areas

Illuminated Area	Illumination Targets		
	E_h **lux**	E_v **lux**	Uniformity Ave: Min
Building Entries Canopied Outdoor-High Activity	10 to 40 @ grade according to location/ Lighting Zone	6 to 20@ 5'AFF according to location/ Lighting Zone	2:1
At-Grade Pedestrian Crossing	20 to 10 @ grade	10 to5 @ 5'AFF	4:1
Bicycle Parking Area **(Covered)**	40 to 10 @ grade	20 to 6 @ 5'AFF	2 to 4:1
Bicycle Parking Area **(Uncovered)**	20 to 10 @ grade	8 to 1 @ 5'AFF	2 to 4:1
Shelter and Ticket Information Area	20 to 6 @ grade	10 to 2 @ 5'AFF	3 to 6:1
Bus Platforms	100 @ grade	40 @ 5'AFF	2:1
Exterior Station Building (Public Area)	20 to 10 @ grade	4 to 0 @ 5'AFF	3 to 6:1
Stairwell	50 @ grade		4:1
PPUDO	20 to 10 @ grade	4 to 0 @ 5'AFF	3 to 6:1
Pedestrian Underpasses and Overpasses	Night 40 @ grade	Night 20 @ 5'AFF	3:1
Pathways in the vicinity of Busways	20 to 10 @ grade	4 to 0 @ 5'AFF	6 to 4:1
Pathways/MUPs in the vicinity Stations, as required in Schedule 15-2, Part 6 – Urban Design, Landscape Architecture and Connectivity Requirements	20 to 10 @ grade	4 to 0 @ 5'AFF	6 to 4:1

**Note: 1.) All lighting, including but not limited to Normal and Emergency lighting illumination levels, shall be designed to meet or exceed OBC requirements, accessibility requirements, and security requirements including but not limited to, AODA, COADS, CPTED, CCTV and CAN/CSA B651 requirements. 2.) Illuminated areas and values not listed in this table shall be per IESNA- Illumination Handbook, 10th Edition.*

(n) With the exception of items listed in Table 6-5.2 above, DB Co shall design and construct lighting levels for Park and Ride surface lots in accordance with IES RP-20 in conjunction with the requirements contained in the OC Transpo Transitway and Station design guidelines.

(o) DB Co shall design and construct fire detection and alarm system as per the following:

(i) All Stations shall be provided with a fire detection and alarm system in accordance with the Applicable Codes and ULC S561 Fire Alarm monitoring.

(ii) The fire detection and alarm system shall be a zoned, non-coded, addressable, microprocessor-based system with automatic alarm initiation, addressable smoke detectors, and automatic multi-detector algorithm for alarms initiated by smoke detectors.

(iii) Fire panels shall include the ability to verify alarms (2 stages) prior to evacuation. The fire alarm wiring system shall be electrically supervised. The system shall be designed such that the TOCC is notified and monitored via CCTV, to validate the event and determine if the fire department is to be dispatched when an alarm signal takes place.

(iv) The fire detection and alarm system shall be provided with an Emergency power supply, consisting of either a generator and/or battery source. The Emergency power supply shall power the supervisory function of the fire alarm system for no less than 24 hours and full function for no less than 30 minutes. Upon failure of the normal power source, immediate transfer to the Emergency power supply shall take place with no loss of information in the process.

(v) The fire detection and alarm system shall be connected to the TOCC, BCC, BYCC and MYCC, and monitored through the City's ULC listed monitoring company.

(vi) A fire alarm annunciator panel with a flush mounted vandal resistant polycarbonate shield when accessible to the public shall be provided at every Confederation Line Station in a readily accessible location to fire fighters upon entering the Station. A second annunciator shall be located where required by the City and connected to TOCC. The annunciator panels shall be monitored simultaneously through the City's ULC listed monitoring company.

(vii) Manual pull stations need not be installed in areas accessible to the public. Exceptions are doors to be released in the event of fire alarm by TOCC.

(viii) Visual signal devices shall be installed such that the signal from one device is visible throughout the floor area in which they are installed.

(p) DB Co shall design and construct power for systems and communication equipment as per the following:

(i) Provide power or conduit complete with pull wire as required.

(q) DB Co shall design and construct conduits and raceway in accordance with the following:

(i) Conduits installed in finished areas of new construction shall be concealed in walls, below or in slabs, or above suspended ceilings. Exposed conduits shall not be run on the exterior surface of buildings. Conduits shall not be run through structural members across pipe shafts or ventilation duct openings.

(ii) Conduits in concrete slabs shall be placed between the bottom and top reinforcing steel. Separate conduits to ensure proper concrete bond.

(iii) Conduits shall not be embedded in waterproofed or waterbearing walls.

(iv) Conduits penetrating exterior walls of any Structure (other than handholes, manholes, or pullboxes) below grade, at grade floors, or below grade floors shall be sealed to prevent moisture migration.

(v) Grounding-type expansion fittings shall be installed in raceways every 60m or less of linear run or wherever structural joints are crossed to allow for expansion and contraction.

(vi) DB Co shall provide the raceway system and cable pulling for equipment described and identified by facility/systems and the City. Raceways shall be designed to include at least 25% spare capacity to protect for future growth and expansion. Refer to Clause 6.3 (b) (vii) above for direction.

6.5 Incident Control Panel

(a) DB Co shall provide an ICP at each Confederation Line Station.

(i) Each ICP shall house the following equipment as a minimum:

A. A FTEL to allow for firefighters to talk with the TOCC/BCC as well as other FTELs along the alignment;

B. Activate/Silence Fire Alarm Horn/Strobes including an LED indicator; and,

C. Station/Tunnel lighting control switch.

D. A PA microphone for making public announcements at respective Stations.

(ii) In Underground Stations, and at Baseline Station, each ICP shall house the following equipment, in addition to the equipment listed in Clause 6.5 (a)(i), of this Part 4:

A. A video feed from the Station's CCTV system to allow ESP to view Station areas on a local video screen within the ICP;

B. A second telephone handset to serve as the local handset and dial pad for calls within the Station or to the area of refuge.

(iii) At each Station that has an active controllable Tunnel ventilation system, a ventilation control panel shall be provided as per Schedule 15-2, Part 8, Clause 7.3.

(b) Fire Life Safety Protocols

(i) The role of the ICPs in Stations as described in this Part 4 shall be coordinated with the overall FLS System.

(c) General

(i) All environmental performance characteristics for the ICPs including EMC are as set out in this Project Agreement. These shall be coordinated with the other systems and equipment and shall meet all other requirements of the Project Agreement.

(d) Codes, Standards and Manuals

(i) In the event of a conflict between criteria, commitments or requirements contained within one document when compared with another, the more stringent specification shall apply:

(e) Functional Requirements

(i) Physical equipment housing:

A. The ICP shall be located in a protective and locked cabinet.

B. The ICP shall permit a minimum of two people ease of access to its internal equipment.

C. The ICP shall provide a localized operating environment which supports the functioning of the internal equipment when the access panel is opened and exposed to external ambient temperatures specified.

D. The location of the ICP within a Station shall be as agreed with ESP and shall be easily accessible but out of the way of evacuating Passengers.

E. Access to the ICP shall be through the front only, unless space restrictions require double sided access.

F. The ICP shall be grounded and bonded in accordance with electrical code and CSA standards. Grounding continuity of front panels shall be maintained when opened.

G. A means of protection for the user from rain, sun, snow and ice shall be included in the design (if location is exposed to the elements) and the solution may be stowable in the unit. If permanently connected it shall not present a hazard to Passengers walking in close proximity.

H. Access to the interior shall be through a key which will be contained within an Ottawa Fire Services compliant lock box provided by DB Co.

I. When the ICP is open, all equipment shall be resistant against the ingress of climatic elements.

J. The ICP shall provide a minimum of seven 'Legal size' rigid pockets to assist with the management of maps and safety data within the ICP.

K. Space shall be provided within the ICP to permit the display of instructions and key contact telephone numbers at a viewable level for the user.

(ii) Communications

A. Telephone Access

i. The ICP shall provide a telephone handset in all Stations. This is the FTEL connected through FDAS and shall be hardwired and monitored.

ii. The second telephone handset in Underground Stations and Baseline Station shall be VOIP based.

B. PA

i. The PA microphone in Station ICPs shall permit the user of the ICP to gain access to the local PA system and broadcast voice messages through the PA microphone.

C. ICP Alarm

i. The ICP shall provide an alarm contact on the front panel access door which shall be connected to the SCADA system and displayed as an alarm to the operator at the TOCC, BCC, MYCC and BYCC when the front panel is opened.

D. Fire Alarm Annunciator Panel

i. The ICP shall contain the fire alarm annunciator panel.

E. Power Requirements

i. The ICP shall provide a duplex 110VAC 60Hz GFCI protected 15A socket for connections of ancillary AC equipment.

ii. The ICP shall be connected to the 4 hour Emergency UPS system to maintain operation during an Emergency.

iii. The addition of a supplementary 15A AC load and the ICP electrical load shall be accommodated by the UPS to provide the required 4 hour operational performance.

F. CCTV video feed in Underground Stations

i. The local video screen for viewing CCTV video feeds in the ICP shall be located at standing eye level for the user.

ii. The local video screen shall be a minimum of 19" diagonal.

iii. The video screen shall be able to view the details of a single view or a view of four camera images.

iv. CCTV camera images shall be transmitted to the ICP by the TOCC & BCC personnel when requested via radio or telephone communication

v. The TOCC & BCC personnel shall be able to select the CCTV camera image and the ICP to which the image will be transmitted.

vi. No local storage or recording of the video at the ICP shall be required.

6.6 Incident Control Location

(a) DB Co shall provide signage at each Tunnel portal in a location as agreed with ESP to indicate the meeting point for incident control.

ARTICLE 7 WAYFINDING AND SIGNAGE

7.1 Introduction

(a) This Article 7 describes wayfinding and signage performance requirements for the Project including performance criteria for wayfinding and signage design.

(b) The performance specifications will provide brand neutral examples for the application and integration of a comprehensive wayfinding and signage system with the specific architectural and art finishes and features of the Project.

7.2 Goals & Objectives

(a) The overall goal of this Article 7 is to provide a standard signage and wayfinding system that makes transit Facilities easy to identify and navigate system wide, that utilize language and visual techniques that people understand, comply with accessibility guidelines, integrate with the design approach of other design disciplines and assist in delivering a successful journey for Passengers.

(b) The objectives for the wayfinding and signage program are as follows:

(i) To improve the overall function and aesthetics of the Project by providing accessible, attractive, identifiable and understandable signage;

(ii) To improve wayfinding for Passengers by providing map, text and or pictograph signage for important Station destinations and features;

(iii) To provide plain language signage and not ‘over sign’ Stations;

(iv) To develop Project outcomes that inform and meet the timing of the design requirements for Station pre-engineering and final designs; and

(v) To achieve the above goals sustainably.

7.3 Scope

(a) This Article 7 includes requirements for the design, manufacture, supply, delivery, storage, assembly, installation, protection, inspection and testing of all components as described herein, necessary to achieve and deliver a successful, comprehensive and integrated wayfinding and signage system for the Project.

(b) The wayfinding and signage system shall be consistent with the Existing Confederation Line signage and wayfinding system. Refer to Appendix D to this Part 4 for exemplary Station signage and way finding drawings.

(i) Appendix D represents the signage and wayfinding system for the Stage 1 Confederation Line Project

(ii) DB Co shall apply the design principles, materials, details colors, location etc. contained in Appendix D to inform the design of the signage and way finding systems for the Project;

(iii) Appendix D does not relieve DB Co of any requirements of the Project agreement; and

(iv) DB Co shall retain all professional and design responsibilities for the signage and way finding system.

(c) The wayfinding and signage system includes but is not limited to providing signage that addresses the following areas and uses:

(i) Station identification signage - Signage that identifies a Station and is visible whether approaching a Station by foot, bicycle, transit vehicle, taxi or private vehicle;

(ii) Community orientated wayfinding signage - Signage that identifies and provides a link to other modes of transport, public services, landmarks, pedestrian and bicycle routes or significant destinations in the general vicinity of each Station;

(iii) Station located wayfinding signage - Signage that assists the movement of Passengers through a Station or to facilities located within the Station. This includes signage that identifies and or directs users to and from Platforms, exits, ticketing and fare payment facilities, information services, elevators, escalators, accessible pathways, bicycle routes through each Station, taxi and connecting bus services;

(iv) Navigation signage - Signage that works in conjunction with (iii) and provides wayfinding through the available multi modal forms of transportation by identifying directions, major destinations, adjacent Stations and confirms the appropriate transport service.

(v) Schedule and service status signage - Signage that displays real time information on the status of transport services communicated through the use of dynamic visual displays, panels, electronic updates and audio announcements when a service is operating, due to arrive, delayed or cancelled and provides information and notices for hours of operation, trip schedules and timetables; and

(vi) Regulatory and utility signs - Signage used within a Station that provides users and staff with regulatory notifications such as no smoking, hazards, no littering, Emergency exit, Emergency phones, fire alarms, elevator buttons, rules of use, disclaimers, etc. Standard traffic signage is also required for private vehicles and for buses circulating through or around a Station.

7.4 General Responsibilities

(a) DB Co shall design, fabricate, install, and maintain all wayfinding equipment.

(b) The City will confirm content of all wayfinding including signage (directional, orientation, information, regulatory, commemorative), electronic displays, transit information panels, and maps, and will provide such content to DB Co at the appropriate stage of design.

(c) Proposed wayfinding equipment shall be coordinated and compatible with existing wayfinding equipment as per Existing Confederation Line.

(d) Wayfinding equipment shall support and contribute to the transit customer experience on the system and overall transit network as per Existing Confederation Line, in Appendix D.

7.5 General Requirements

(a) Reference Documents

(i) The design and construction of wayfinding and signage shall comply with the criteria contained in this Article 7, and all standards, regulations, policies, Applicable Law, guidelines or practices applicable to the Project, including but not limited to each of the following Reference Documents. In the event of a conflict between criteria, commitments or requirements contained within one document when compared with another, the more stringent shall apply:

A. OBC;

B. AODA;

C. COADS;

D. OC Transpo Transitway and Station Design Guidelines;

E. OC Transpo Signage and Wayfinding Manual;

F. Appendix D Exemplary Station Signage and Wayfinding Drawings – Existing Confederation Line, of this Part 4.

G. Canadian Transportation Agency, Code of Practice, Passenger Terminal Accessibility

H. Canadian Transportation Agency, Code of Practice, Removing Communication Barriers for Travelers with Disabilities

I. City of Ottawa Construction Specifications and Details; and

J. Ontario Traffic Manual.

(b) Signage System Design

(i) Design for the wayfinding and signage system for the Project is comprised of identification, directional, information, operational, regulatory, and temporary signage.

(ii) The City shall determine Station names for all Stations.

(iii) Identification Signage

A. The key functions of the identification signage are to identify:

i. Stations within the built environment;

ii. Station entries;

iii. Station facilities;

iv. Passenger services and amenities;

v. Elevator access; and

vi. Accessible entries.

(iv) Directional Signage

A. The key functions of the directional signage are to direct:

i. Passengers from the Station entries to fare equipment and on to the Platform and to the exits;

ii. Passengers to connecting modes and Infrastructure;

iii. Passengers to facilities within the Station; and

iv. Passengers to accessible access points.

(v) Information Signage

A. The key functions of the information signage are:

i. Provide transit network information;

ii. Notify Passengers of available services; and

iii. Notify Passengers of delays or changes to scheduled services.

(vi) Operational Signage

A. The main purposes of the operational signage are:

i. Identify doors, areas and access points for staff and facilities management; and

ii. Identify ancillary room functions.

iii. Notify Passengers of video surveillance.

(vii) Regulatory Signage

A. The key functions of the regulatory signage are:

i. Identify potential hazards to Passengers and the public; and

ii. Identify potential hazards to staff and Third Party Contractors.

(viii) Temporary Signage

A. The key function of temporary signage is to:

i. Temporarily identify changes to services, Station facilities, Station closures or hours of operations;

ii. Temporarily identify hazards to Passengers and the public; and

iii. Temporarily identify hazards to staff and Third Party Contractors.

(ix) Sign Types shall be consistent with Existing Confederation Line signage.

(x) Sign Dimensions shall be consistent with Existing Confederation Line signage.

(xi) DB Co shall use the Existing Confederation Line signage packages provided in Appendix D of this Part 4 which includes expectations for sign dimensions, sign and information hierarchy, sign types, sign content, visibility, contrast, layout, sign mass and sophistication.

(xii) Sign Quantities

A. DB Co shall be responsible for designing the wayfinding program including providing sufficient quantities of signs as deemed necessary to design and supply a clear, concise and consistent wayfinding sign system in order to meet the Project requirements.

(xiii) Sign Information

A. DB Co shall be responsible for updating and maintaining sign information content and messages to ensure that all signage is relevant and reflects relevant changes to the City transit system.

(xiv) For Stations subject to FLUDTA, the following requirements apply:

A. Signage design shall comply with the NCC commercial signage guidelines.

B. All text shall to appear in both official languages.

C. Exterior signage shall not be permitted above the ground floor level.

D. Backlit signage, with the exception of Station entrance lanterns, billboard signage and digital signage shall not be permitted outside of the Station.

(c) Design Elements and Considerations

(i) The design and implementation of the Project wayfinding and signage system requires DB Co to incorporate the following key considerations and elements into the designs.

(ii) Line & Letter Spacing

A. Line spacing where a set of messages is displayed shall be at least 75% of the cap height so messages can be quickly scanned and destinations identified.

(iii) Language

A. All signage for the Project shall feature messages in both English and French.

B. Where both languages appear on a single sign, DB Co shall follow one of the following two options:

i. English text on the left side and French text on the right; or

ii. English text on the upper portion of the sign with French text below.

C. Where pairs of signs are used the sign displaying English text shall be placed at the beginning of the viewing sequence with the second sign in French located beyond it.

D. Where the two signs are required they shall be far enough apart to ensure the messages are differentiated and not read as a single message and close enough to one another allowing users to recognize that they represent the

same message displayed in the two languages. A minimum gap of four character strokes shall be maintained between English and French messages. A minimum of two character strokes shall be permitted where a graphic device such as a vertical line or hyphen is used to visually separate the two messages.

E. Bilingual or unilingual paired signs shall employ the same size, fonts, letter heights, colours and general design principles for each language.

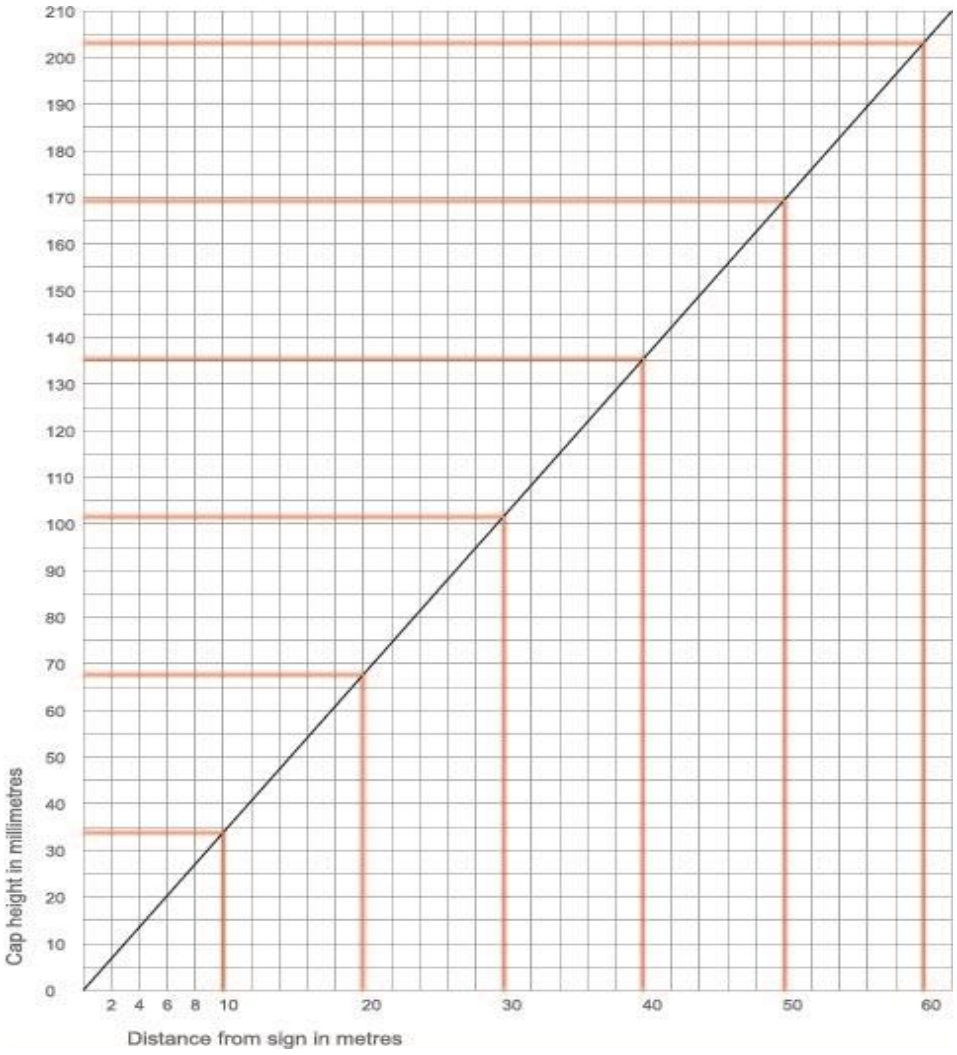
(iv) Pictograms

A. Pictograms shall be used to reinforce sign messages, aid quick recognition and clearly communicate information to all languages and cultures.

B. Pictograms shall be based on Existing Confederation Line standards approved by the City. Any additional pictograms proposed by DB Co that are not based on the existing standards shall be presented to the City for acceptance.

(v) Legibility & Viewing Distance

A. All signage shall be legible and feature letters and graphic elements of the appropriate size for the identified viewing distances. The chart below provides the viewing distances for text of a particular height. These values are based on the viewer having good vision and reading the signs in daylight whilst stationary.



B. It shall be noted that many factors negatively impact the legibility of sign text. These include angular distortion, speed of travel and low light levels. Factors such as these shall be considered when determining the height of text appearing on signs. DB Co shall increase text heights from those described in the chart as required to maintain sign legibility based on the impact of the above conditions.

(vi) Mock ups of all sign types shall be provided by DB Co to assess the legibility of the proposed design and text heights. Mock ups shall be reviewed by user groups comprised of a cross section of the community and representing people with diverse abilities.

(vii) Sign Placement

A. Signage shall be placed in visible locations, free from obstructions. Special care shall be taken to ensure that signs are not obstructed by other signs, design elements or items such as security cameras.

B. DB Co shall place signs within the accepted standard for a viewers' cone of vision, being 15° above and below the viewers' horizontal line of sight. Signs viewed outside a viewers' cone of vision are read peripherally and with much less detail. DB Co shall consider the viewers' cone of vision when selecting the height of the sign from floor level and the height of the typeface.

C. The average persons' eye level when standing is 1500mm from floor level. When seated it is approximately 1000mm from floor level and when driving eye level is approximately 1200mm from floor level. Signage shall be placed depending on how it shall be viewed and taking into account differences in eye level and a sign's audience.

D. Placement of signage shall be coordinated with the landscaping, architecture, interior design lighting and other equipment in order to standardize locations within a Station and across the system. Signage shall be applied consistently, assist users to know where to expect sign information and aid navigation.

(viii) Contrast and Colour

A. DB Co shall ensure contrast between sign backgrounds and messages are at a level considered acceptable to maintain sign legibility and deliver a successful signage system.

B. For environments with light levels between 10-70 foot candles DB Co shall provide signs with a contrast of 75% or higher between the background and message.

C. For environments with higher light levels (70 foot candles and above) DB Co shall provide signs with a lower contrast level of 65-75%. A dark background shall be used to absorb light and prevent glare.

(ix) Halation

A. When signs are backlit care shall be taken to reduce flare or halation. Halation makes backlit or reversed lettering difficult to read especially when travelling at speed or at night. DB Co shall ensure that signs are designed to minimize the effects of halation. Directional signage shall not feature designs which purposely use the effect of halation as a feature. This includes signage with halo lighting effects.

B. Internally illuminated signage shall have reversed opaque or translucent backgrounds to reduce halation and increase legibility.

C. Internally illuminated signs shall not feature light coloured illuminated backgrounds.

(x) Lighting

A. Design and implementation of internal or external signage illumination shall be coordinated by DB Co with the City to ensure compatibility with the design intent for the overall lighting scheme.

(xi) Universal Design

A. The principles of Universal Design shall be applied to designs for the wayfinding and signage system by DB Co. The signage system shall whenever possible seek to integrate accessible design features with the design as a whole. The goal is to deliver a wayfinding signage system that assists in providing an environment accessible to people with all levels of abilities. As a minimum, signage for the Stations shall be designed in accordance with the relevant accessibility codes referenced in this document. All directional signage shall be located in compliance with the stated codes.

B. The application of tactile indicators shall be coordinated with key sign locations to assist with the recognition of tactile signage locations and aid navigation by the visually impaired.

(xii) CPTED

A. The principles of CPTED shall be applied in order to ensure the design and placement of the wayfinding and signage system does not compromise the Safety of Passengers or the general public. In general, signage shall enhance public Safety by providing uninterrupted site lines in critical areas, reduce areas where people or devices may be concealed and provide sufficient information to users to instil confidence and minimize confusion. All Station, security facilities and supporting transport services shall be easily differentiated and identified whilst being recognisable as part of an organised system.

(xiii) Vandalism

A. All signage elements shall be designed and fabricated to dissuade and provide protection against vandalism and graffiti.

B. Tough, scratch and impact resistant materials shall to be utilized to resist damage, maintain appearance, increase product life spans and reduce

operational costs. Sacrificial and non-sacrificial anti-graffiti coatings are to be applied to signs where the risk of graffiti is deemed to be high.

C. All accessible mechanical fixings shall be 'security fixings' with nonstandard drives. All accessible fixings shall be tamper proof.

D. Damaged signs shall be repaired or replaced by DB Co in a timely manner and without negatively impacting Passengers, staff or the general public.

(xiv) Local Conditions

A. All signage components designed and supplied by DB Co shall be fit for purpose, able to perform in the climatic conditions outlined in Schedule 15-2, Part 1, Article 4 – Design and Construction.

B. The effects of snow, ice and the effects of methods of snow dispersal on signage shall be addressed in the design.

(d) Fabrication Materials & Finishes

(i) Sign material selections and colours are subject to final brand review by the City.

(ii) Metalwork

A. All work shall be accurately and neatly constructed and securely fitted and fixed.

B. DB Co shall use types and grades of metals suited to their required function, finish and method of fabrication, in sections of adequate strength and stiffness for their purpose.

C. Where appropriate, prefabricate and preassemble items in the workshop before delivering items to Site.

D. Care shall be taken to ensure all visible metal surfaces are free from damage, scratching or other surface degradation.

E. Fabrication techniques, surface detailing and application of finishes shall be closely controlled to ensure continuity of appearance between individual items.

F. All visible metal edges shall be cut with machine tools. No visible edges of metal shall be cut with a guillotine or break press. No radius to edges unless specified.

(iii) Stainless Steel

A. All stainless steel used externally; in basement levels and non-air conditioned areas shall be marine alloy, AISI grade 316. In internal areas all stainless steel shall be grade AISI grade 304 unless otherwise specified.

B. All stainless steel surface finishes shall be factory or machine finishes. Stainless steel products with a standard mill or 2B finish shall not be hand linished or polished, by the contractor to match factory finishes.

C. All brushed or linish stainless steel shall be No.4 finish unless otherwise specified. Grain of finish is to run with long dimension of each sign unless otherwise specified.

D. All polished or mirror stainless steel shall be No.8 mirror finish, unless otherwise specified.

E. All surfaces shall be ground and polished to produce uniform, directionally textured, polished finishes free of cross scratches.

F. All corners shall be 90^{o} and mitred, with a hairline joint and with surface finishes meeting at mitre. No visible welds.

(iv) Aluminium

A. All aluminium shall be of an alloy suitable for purpose. For signage applications where sheet and plate is required, alloy 5005 shall be used.

B. All welding shall be carried out in accordance with international standards, using techniques to avoid buckling and discolouration.

C. All exposed welds shall be ground smooth and where aluminium is to be painted all surfaces shall be suitably sanded, primed, filled and smoothed prior to final paint treatment.

(v) Mild Steel

A. Steel components shall be of quality mild steel of a gauge and alloy appropriate for location and use.

B. Method of welding used shall provide the maximum strength along joints, fill all gaps and run to a clean and regular finish. All welds shall be continuous along joints with no raw or exposed edges.

C. Irregular welds shall be ground smooth with particular attention to visible areas.

D. After fabrication and prior to pre-treatment and finishing processes, all rust, scale, burrs, weld slag and splatter shall be removed from the weld and surrounding areas.

E. Steel work shall be free of grind and machine marks by way of linishing or sandblasting without causing damage to the designed form or creating surface irregularities.

F. All mild steel framing and signage support Structure, located in external areas shall be hot dipped galvanised regardless of the application of paint finishes unless otherwise specified.

(vi) Glass

A. All glass used in the fabrication of signage shall be toughened safety glass.

B. Where glass is used in conjunction with applied graphics for the purposes of visual display, all glass shall be low iron toughened safety glass.

C. All edges are to be ground and polished smooth. All edges shall be square without chamfered or sharp edges.

D. All glass installations located in direct contact with Passengers and staff shall be certified by a Professional Engineer.

(vii) Acrylic & Polycarbonate

A. All acrylic used shall contain 90% or more polymethyl methacrylate.

B. Where possible cast acrylic shall be used instead of extruded acrylic or polycarbonate products.

C. Cut edges shall be finished smooth and polished. No flame polished edges shall be provided.

(viii) Fastenings

A. Fastenings, including anchors, lugs, screws, rivets, and the like shall be fit for purpose and capable of transmitting the loads and stresses imposed. All fastenings shall be sufficient to ensure the assembly is secure and rigid.

B. All fastenings and associated components such as sleeves shall be finished to match the sign body treatment and colour, unless otherwise approved.

C. All exposed screw heads shall be countersunk. All screw heads shall finish flush with the adjacent exposed surface.

D. DB Co shall ensure that all fixings are protected against corrosion and will not mark or stain existing finishes.

E. Fixings shall be compatible with the types of metal they are used to secure.

(ix) Welding

A. Welded, brazed or soldered joints on exposed surfaces shall be ground, buffed or polished as applicable to the material and specified finishes. There shall be no buckling or visible surface colour variations in exposed metal finishes.

B. Welds and brazes on finished surfaces shall be indistinguishable from the parent metal.

(x) Precision Cutting

A. All cut edges shall be smooth, ground and polished. No visible cut marks, burn marks, splatter or discolouration shall be accepted.

B. All start and end cuts for laser and waterjet cutting and shall be located outside the form to be cut. All cut edges shall be de-burred. All edges shall be square. No sharp edges.

(xi) Metal Separation

A. Incompatible metals shall be separated to prevent galvanic reactions. Separation materials shall not be visible on exposed surfaces or cause discolouration to the surrounding finishes over time.

(xii) Graphic Films

A. All corners and edges of finished letterforms, numerals, arrows, pictograms, logotypes and other graphic elements shall be sharp and true to the selected typeface or artwork, with accurate even curves and serifs where applicable.

(xiii) Screen Printing

A. All screen printed graphics shall be applied according using a screen of 120 threads per inch. Registration shall be accurate.

B. Screen printing ink shall be Sericol Polyscreen 2 pac system or similar.

(xiv) Anti-Graffiti Coatings

A. All applied coatings shall be compliant with the sustainability goals for the Project and be applied to the manufacturers' instructions by qualified personnel trained in the correct use and application and/or removal of these types of products.

(e) Electrical

(i) Internal Lighting

A. DB Co shall ensure that all illumination is fit for purpose and provides even illumination. No shadows, visible wiring or hotspots shall be permitted.

B. DB Co shall fabricate all signs with internal lighting in such a way as to prevent all light leaks

C. All lighting shall be LED Type.

D. All control gear shall be compatible with the lamps used and shall be located within the sign or concealed in a remote location. In all cases DB Co shall ensure that all control gear including transformers, drivers and ballasts are installed in an accessible and safe location which does not interfere with the functioning of the lighting or the sign itself.

E. All wiring shall be encased in non-conductive, insulated, electrical conduit, fit for purpose.

F. All ballasts and control gear shall be electronic. No solid core transformers or ballasts shall be used.

G. All interior lighting fixtures located underneath skylights shall be full cutoff.

(ii) External Lighting

A. Where additional illumination is required for the purposes signage illumination, light fixtures shall match in colour temperature, lumen output and intent.

B. All exterior lighting fixtures shall be full cutoff, light trespass on to adjacent properties shall not be permitted.

C. All lighting shall be LED Type.

(iii) Activation of Signage Illumination

A. Activation for sign illumination shall be controlled by the station BAS.

(iv) LED Displays

A. DB Co shall be responsible for the design and placement for all LED displays. DB Co shall be responsible for the design and supply of all shrouds and fixing systems required to maintain a consistent design language and integrate the displays with the designs for the wayfinding

and signage system. design of the shrouds and or fixing systems shall not negatively impact the performance of the base LED displays in any way.

B. Placement of LED displays as part of the Passenger information systems shall be the responsibility of DB Co. Placement of Passenger information displays shall not obscure or interfere with the operational performance of the wayfinding and signage system.

(v) LCD Displays

A. DB Co shall be responsible for the design and placement for all LCD displays. DB Co shall be responsible for the design and supply and of all shrouds and fixing systems required to maintain a consistent design language and integrate the displays with the designs for the wayfinding and signage system. design of the shrouds and or fixing systems must not negatively impact the performance of the base LCD displays in any way.

B. Placement of LCD displays as part of the Passenger information systems shall be the responsibility of DB Co. Placement of Passenger information displays shall not obscure or interfere with the operational performance of the wayfinding and signage system.

7.6 Conditions

(a) Site

(i) Site Conditions

A. No signage shall be fabricated or finished on-site.