

Date	Subject	Description
25-Mar-19	New Standards included in the following sections: Section E: Station Buildings & Operational Facilities Section F: Electrical Section F: Communication	Requirements for Aqueous Ozone cleaning system - Pages E8, E26 & E43 Mini Hub Room Requirements - Page F19 Revised CCTV coverage - Page F42
25-Mar-19	Sections E & F	The sections have been updated to coordinate with the new set of Mechanical and Electrical Specifications and Drawings issued in august 2018.
25-Mar-19	All Sections	All sections have been updated to reflect clarifications identified by Station Facilities Engineering Office (SFEO) and Station Services.
03-Feb-17	New Standards included in the following sections: Appendix A: LEED Mandatory Credits Section F.1 Electrical Section F.5 Finishes and Materials	<u>LEED v.4 Mandatory Credit Tables</u> Appendix A Revised Backup Power Systems Requirements Page F-1 to F-7 <u>Arc Flash</u> Page F-47 <u>Bird Control language &amp; Colour, Pattern, Tonal Contrast and Texture</u> Page F-96
03-Feb-17	Corrected Text for the following Sections: Section A: Introduction Section B: Guiding Principles Section C: Wayfinding and Signage Section D: Site Program Section E: Building Program Section F: Technical Requirements Section G: Heavy Rail Appendix A: Amendment Record	Added Document ID - Cover Page Added Copyright and Preface Reformatted page numbers for consistent approach <u>How to Use the DRM Language added</u> Page A-1 <u>Drawing Standards</u> Page A-2 <u>Energy and Resource Efficiency language added</u> Page B-1 <u>Integrated Art</u> Page B-2 <u>GO Customer Journey Sections text correction &amp; Train Platform-Ideal State &amp; Bus Platform-Ideal State (Figure C-5 &amp; Figure C-6)</u> Page C-0 to C-2 <u>Signage and Wayfinding Placement and Installation, Rail &amp; Bus Platforms</u> Page C-3 <u>GO Signage Placement and Installation</u> Page C-4 <u>Designated Waiting Area (DWA)</u> Page D-2 <u>Typical Configuration of Mini-Platform reformatted</u> Page D-3 <u>Rail Platform Design Criteria Table: Centre line of track to edge of platform, Passenger and Freight Operations, and Exclusive GO Transit tracks: removed</u> Table D-1: Page D-4 <u>Typical Rail Platform Configuration reformatted</u> Figure D-8: Page D-5 <u>Rail Platform Canopies</u> Page D-6 <u>Pedestrian Tunnels reformatted &amp; Tunnel Design Criteria, clearance revised</u> Page D-7 & Table D-2: Page D-8 <u>Rail Platform Stairs and Enclosures deleted duplicate text</u> Page D-9 <u>Bus Bay Guidelines reference &amp; Linear Configuration-Linear Traffic Flow reformatted</u> Page D-11 <u>Bus Radii</u> Page D-13 <u>Kiss &amp; Ride</u> Page D-14 <u>Designated Parking-Configuration for Two or Less Parking Spots corrected figure</u> Figure D-16: Page D-16 <u>Bicycle Infrastructure corrected text</u> Page D-19 <u>EV</u> Page D-20 <u>Vehicular Parking Diagram corrected figure</u> Figure D-21: Page D-21 <u>Crosswalks in Parking Lots and Major Crosswalks on Access Routes corrected figure &amp; Park and Ride Lots corrected text</u> Figure D-26: Page D-23 <u>At Grade Pedestrian Crossing corrected text</u> Page D-25 <u>Bollards</u> Page D-28 to D-29 <u>Section D.12 revised title to Geodetic Reference &amp; Three-Dimensional Geodetic Control Points corrected text</u> Page D-31

Date	Subject	Description
		<a href="#">Public Washrooms corrected text</a> Page E-5 <a href="#">Feature elements at Station Buildings reformatted text</a> Page E-7 <a href="#">Revised title to Signage</a> Table E-4: Page E-14 <a href="#">Fixtures, TVs revised text</a> Table E-9: Page E-18 <a href="#">Duel Fuel Systems Removed</a> Page F-5 <a href="#">Surface Parking Added Reference</a> Page F-34 <a href="#">Exterior Lighting Illumination Levels, Parking Lot, revised requirements</a> Page F-41 <a href="#">Grounding and Lighting Protection, System Requirements corrected text</a> Page F-45 <a href="#">Radiant Heating and Snowmelt</a> Page F-80 <a href="#">Bus Shelter language added</a> Page F-86 <a href="#">Colour, Tonal Contrast and Texture</a> Page F-96 <a href="#">Revised Contents</a> Page G-0 <a href="#">Amendment Record Updated</a> Appendix A: Table-01
04-Apr-16	Section B.3: Guiding Principles - Sustainable Design	<a href="#">Added Guiding Principles</a> Page B-4
04-Apr-16	Section C: Wayfinding and Signage	<a href="#">Added Communication Hierarchy related to Signage</a> Pages C-6 to C-10
04-Apr-16	Section D.1: Site Planning and Organization	<a href="#">Added Site Components and Typical Schematic Layout</a> Pages D-1 to D-2
04-Apr-16	Section D.2: Rail Platform and Platform Access	<a href="#">Added Rail Platform and Platform Design</a> Pages D-5 to D-8
04-Apr-16	Section E.1: Station Buildings	<a href="#">Added Interior Station Design (includes Retail)</a> Pages E-1 to E-10
04-Apr-16	Section F: Technical Requirements	<a href="#">Added Illumination</a> Pages F-62 to F-72 <a href="#">Added Fixtures and Furnishings Table</a> Table F-30 <a href="#">Added Digital Signage</a> Pages F-121 to F-126 <a href="#">Added Fare Systems Placement</a> Page F-126 <a href="#">Added Two-Way Communication and Device Guidance</a> Pages F-127 to F-129
04-Apr-16	Union Pearson Express (UPE) Formerly CI-0410 (Pages 342-349)	<a href="#">Removed Contents</a>
04-Apr-16	Station ID Signage Suite Formerly CI-0601 (Pages 417-429)	<a href="#">Removed Contents</a>
04-Apr-16	Drawings Standards Formerly CI-0705 (Pages 621-643)	<a href="#">Removed Contents</a>
04-Apr-16	Heavy Rail Formerly CI-0801 (Pages 644-690)	<a href="#">Removed Contents</a>
September 23 2015	CI-0601 Static Signage	<a href="#">Station ID Signage</a> Pages 412-415
September 23 2015	CI-0103 Accessibility CI-0201 Site Design and Development CI-0203 Parking Infrastructure CI-0701 Architectural	<a href="#">Elevators</a> Page 41 Page 78 Page 123 Page 153-154 Page 430-436
19-Aug-15	CI-0407 Rail Platform and Corridors	<a href="#">Platform Design Criteria</a> Page: 308 Page: 313
31-Jul-15	CI-0204 Site Infrastructure and Development	<a href="#">Pavement and Line Markings</a> Page 172
31-Jul-15	CI-0401 Station Infrastructure	<a href="#">Station Buildings</a> Pages 257-268
08-Jun-15	CI-0205 Civil Works	<a href="#">Geomatics - Section Moved</a> Pages: 179 - 183
02-Jun-15	CI-0601 Static Signage	<a href="#">Typeface</a> Page: 403
11-May-15	CI-0201 Site Design and Development	<a href="#">Geomatics</a>



Date	Subject	Description
		Pages: 81 - 84
11-May-15	CI-0203 Site Infrastructure & Development CI-0501 RAIL and BUS Operational Facilities CI-0702 Mechanical CI-0703 Electrical	<a href="#">Building Automation System</a> Pages: 111, 384, 385, 461, 477, 479, 498 Pages: 500, 501, 502, 504, 505 Pages: 506 - 511 Pages: 551, 726
07-Apr-15	CI-0203 Site Infrastructure & Development CI-0702 Technical Disciplines - Mechanical CI-0703 Technical Disciplines - Electrical CI-0704 Technical Disciplines - Communications	<a href="#">Back-Up Generators - Natural Gas Provisions</a> Page 106 Page 405 Pages 476, 477, 478, 479, 480, 481, 482, 488, 515, 516 Pages 575, 584, 585, 591, 596
March 17 2015	CI-0601 Wayfinding and Signage	<a href="#">GO Logo and Station Name Guidelines (Structures)</a> Pages 404 & 405, Updated guidelines
February 10 2015	CI-0303 Bus Infrastructure	<a href="#">Bus Platform and Design Guidelines</a> <a href="#">Pages 208-213 New Guidelines</a>
February 10 2015	CI-0807 Trackwork	<a href="#">Track Ballast Changes</a> Page 634 Updated Guidelines
December 31 2014	CI-0202 Station Sites CI-0204 Pavement and Line Markings CI-0203 Parking Infrastructure CI-0401 Station Infrastructure CI 0404 Stairs & Stair Enclosures CI-0406 Ramps CI-0702 Mechanical	<a href="#">Accessibility Changes</a> Pages 80-82, 86, 93 New Guidelines Pages 170,172, 173 New Guidelines Pages 242, 258, 269, 285 New Guidelines Pages 286, 289, 292-293, 460 New Guidelines
December 31 2014	CI-0203 Parking Infrastructure CI-0702 Mechanical CI-0703 Electrical	<a href="#">Back-up Generators</a> Pages 106,263,444-445,469-473 New Guidelines Pages 475,480,507-508, 567,576-577,583, 588 New Guidelines
October 29 2014	CI-0305 Park and Ride Lots CI-0306 Bus Terminal Buildings CI-0401 Station Infrastructure CI-0704 Communications	<a href="#">Ticket Vending Machine (TVM) Placement Guidelines</a> Page 215-216 New Guidelines Page 221 New Guidelines Page 263-264 New Guidelines Page 546-547 New Guidelines Page 572 New Guidelines
October 29 2014	CI-0203 Parking Infrastructure CI-0401 Station Infrastructure CI-0408 Pedestrian Bridges CI-0601 Wayfinding and Signage	<a href="#">GO Logo and Station Name-Building/Structure Application</a> Page 101 New Guidelines Page 240 New Guidelines Page 309 New Guidelines Page 396-398 New Guidelines
October 29 2014	CI-0107 System Safety CI-0203 Parking Infrastructure CI-0205 Civil Works CI-0403 Tunnels CI 0404 Stairs & Stair Enclosures CI-0701 Architectural	<a href="#">Anti Graffiti Coating Standard</a> Page 71 Updated Guidelines Page 100 Updated Guidelines Page 102 Updated Guidelines Page 176 Updated Guidelines Page 270 Updated Guidelines Page 271 Updated Guidelines Page 274 Updated Guidelines Page 433 Updated Guidelines Page 435 Updated Guidelines
October 7 2014	CI-0203 Parking Infrastructure	<a href="#">Carpool to GO Parking Guidelines</a> Pages 94-96, new guidelines
August 25 2014	CI-0105 Guiding Principles CI-0501 RAIL and BUS Operational Facilities CI-0701 Technical Disciplines	<a href="#">Sustainability</a> Pages 50-56, New guidelines Page 332, Updated guideline Page 423, Updated guideline
August 25 2014	CI-0203 Parking Infrastructure	<a href="#">Barrier Free Parking</a> Page 92, Updated guidelines
August 25 2014	CI-0107 System Safety CI-0203 System Safety CI-0205 Civil Works CI-0403 Tunnels CI 0404 Stairs & Stair Enclosures CI-0701 Architectural	<a href="#">Security Design Guidelines</a> Page 71, Updated guidelines Page 97, Updated guidelines Page 99, Updated guidelines Page 173, Updated guidelines Page 265, Updated guidelines Page 266, Updated guidelines Page 269, Updated guidelines Page 432, Updated guidelines Page 434, Updated guidelines
August 25 2014	CI-0201 Site Design and Development	<a href="#">Garbage and Recycling Storage Areas</a> Pages 78-79, New guidelines.
July 31 2014	CI-0407 Rail Platforms and Corridors	<a href="#">Detectable Tile Platform Edge</a> Page 280, New guidelines. Page 281, Revised platform edge figure. Page 283-284, Revised minimum dimension. Platform curb detail removed.
July 31 2014	CI-0702 Mechanical	<a href="#">Shelter Radiant Heaters</a>

Date	Subject	Description
		Page 437, Updated guidelines.
July 31 2014	CI-0203 Parking Infrastructure CI-0703 Electrical	<u>EV Charging</u> Pages 94-95, New guidelines. Page 478, New electrical guidelines.
July 31 2014	CI-0404 Stair and Stair Enclosures CI-0701 Architectural	<u>Distraction Pattern</u> Pages 262, Updated guideline. Page 420, Updated guideline.
May 2 2014	CI-0202 Station Sites	<u>Perpendicular Blade Signs</u> Pages 69-70, 79 Updated guidelines and figure.
May 2 2014	CI-0401 Station Infrastructure CI-0403 Tunnels CI-0408 Pedestrian Bridges CI-0704 Communications	<u>S4 Station Information Digital Signage</u> Pages 228-229, 231 New S4 placement guidelines-Station Buildings Page 258 New S4 placement guidelines-Tunnels Page 296 New S4 Placement guidelines-Pedestrian Bridges Pages 587-588 New S4 power and IT requirements
May 2 2014	CI-0201 Station Design Guidelines	<u>Sidewalk/Walkway</u> Pages 73, 74 and 89, updated guidelines.
May 2 2014	CI-0704 Communications	<u>PRESTO Fare Handling</u> Pages 566-586, updated PRESTO requirements.
May 2 2014	CI-0302 Bus Radii Design	<u>Bus Loop Figure</u> Page 191- Revised Bus Loop Figure
May 2 2014	CI-0202 Station Sites	<u>Scooter/Motorcycle Parking</u> Page 76,81- Revised Scooter/Motorcycle guidelines and figures
01-Apr-14	CI-0703 Electrical	<u>LED Lighting</u> Page 497 Revised LED Light colour temperature
01-Apr-14	CI-0401 Station Buildings CI-0703 Electrical	<u>New GO Service Area</u> Page 233 GO Service Area notation changes Page 494-GO Service Area notation changes.
12-Mar-14	CI-0401 Station buildings	<u>New GO Service Area</u> Pages 228-237-Revised GO Service Area Design Standards. Various Pages-GO Service Area notation changes.
04-Feb-14	CI-0702 Mechanical	<u>HVAC System Controls</u> Page 436- Added note on HVAC changeover controller.
04-Feb-14	CI-0702 Mechanical	<u>Electrical Fan Forced Heaters</u> Page435- Revised note regarding thermostats.
04-Feb-14	CI-0702 Mechanical	<u>Electrical and Communications Room</u> Page 431- revised note regarding heat pumps.
04-Feb-14	CI-0802 Trackwork CI-0804 Track Layout and Construction	<u>Timber Track Ties</u> Page 616, Page 625 Table- Revised Timber Tie type.
04-Feb-14	CI-0703 Electrical	<u>Fiber Optic Locates</u> Page 469-Added note in Wiring Methods.
04-Feb-14	CI-0703 Electrical	Service Rooms-Communications Rooms Desk Page 478- Added communications room service desk design guidelines.
December 2 2013	CI-0703 Electrical	<u>Revised Electrical Requirements</u> Page 89-Revised note-Car Counting Systems Page 466 Service Duct Banks Page 471 Switch Boards Page 472 Panel boards Page 472 Switchgear Page 473 Power Circuit Breakers Page 474 Instrument Transformers Page 503 High Resistance Grounding
October 15 2013	CI-0203 Parking Infrastructure	<u>Caged Stairwell Roof Access</u> Page 82-83
October 15 2013	CI-0206 Landscaping	<u>General Plan Specifications</u> Page 165 Deciduous Tree Caliper sizes removed Page 165 Plant Warranty
October 15 2013	CI-0202 Station Site	Standards for Accessible curbs moved to this section. Page 65
October 15 2013	CI-0705 Drawing Standards	<u>Revised Documentation standards.</u> Page 580- DVD and Windows Requirements Page 589- Contract Drawing Requirements.
October 15 2013	CI-0703 Electrical	<u>Power Distribution-Wiring Methods</u> Page 466-467 Cable Trays
October 15 2013	CI-0703 Electrical	<u>Revised service Requirements for Incoming Utility Services:</u> Page 449 Disconnect Switch
October 15 2013	CI-0703 Electrical	Revised Voltage Drop Requirements Page 452
October 15 2013	CI-0304 Bus Infrastructure	<u>Bus Infrastructure- Yellow painted Curbs</u> Page 187 Bus Loop Painted Curb Page 188 New bus loop figure Page 189 New Figure Painted Curb Detail
October 15 2013	CI-0203 Parking	<u>New Line Markings- Parking Structures</u> Page112-Revised Barrier Free Figure Page 143 New Chart

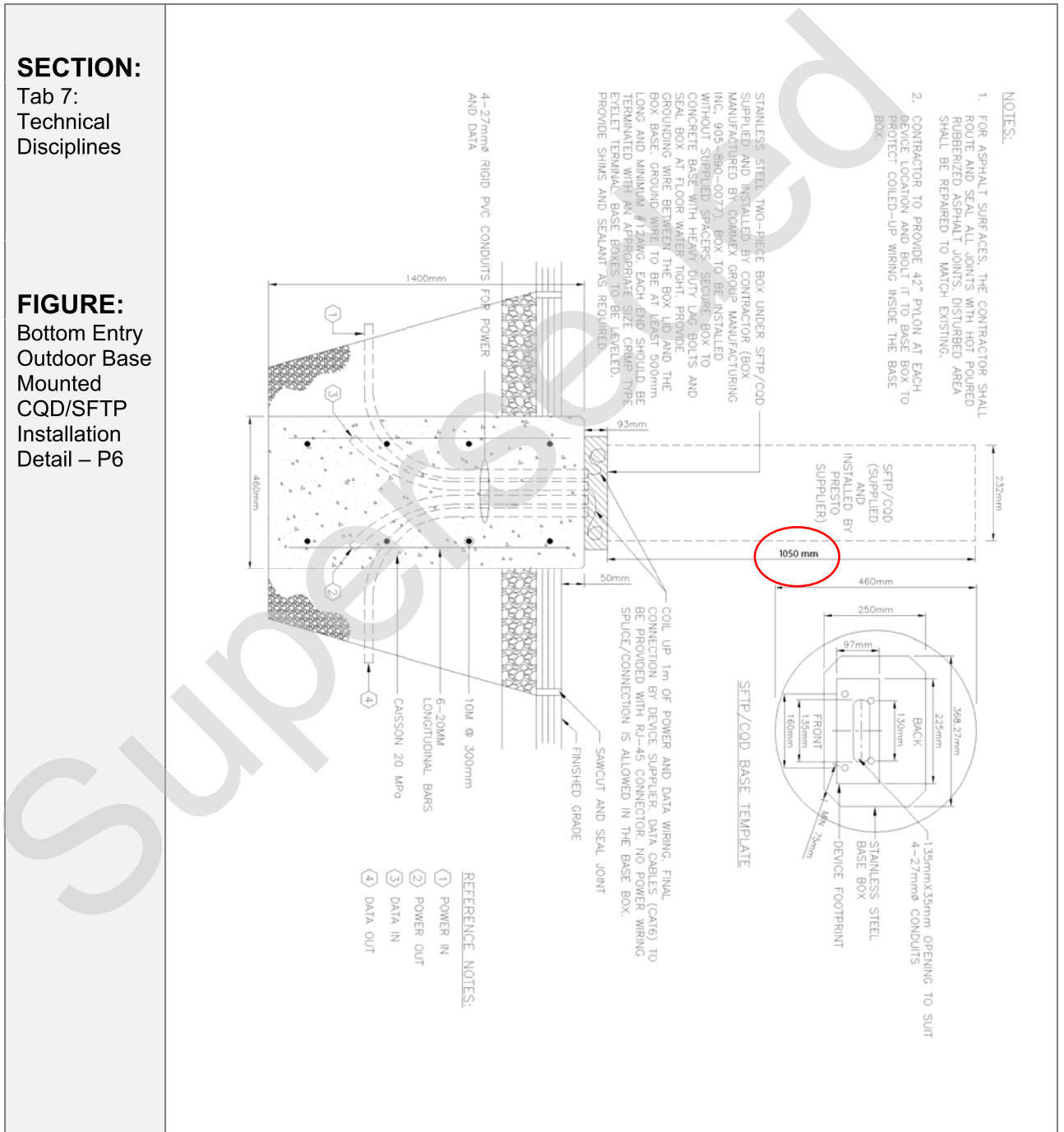
Date	Subject	Description
		Page 152-153 New Figure Barrier Free Parking Layout Figure
August 1 2013	CI-0202 Station Sites CI-0203 Parking Infrastructure CI-0204 Pavement and Line Markings CI-0208 Furnishings and Amenities CI-0401 Station Buildings CI-0406 Ramps	Revised text and figures -AODA compliance measures: Page 63-34 Barrier Free Pathways Page 71-72 Barrier Free Parking Standards Page 148-149 Revised Figures-Barrier Free Parking Page 174 Accessible Curb Standards Page 217 Accessible Rest and Waiting Area Standards Page 220 Figure-Accessible Rest and Waiting Area Standards
August 1 2013	CI-0807 Heavy Rail	Revised Figure: Vehicle service roads Pages 636-637
August 1 2013	CI-0703 Electrical	Emergency cooling Provisions for service rooms. Page 474-475
August 1 2013	CI-0703 Electrical	Revised standard for the use of occupancy sensors. Page 56,82,360,484-487
August 1 2013	CI-0703 Electrical	Revised standard for station lighting override switches. Page 490
August 1 2013	CI-0703 Communications	Updated Presto Figure P2 (corrected), P9 and P10 corrected Pages 567, 574-575
August 1 2013	CI-0701 Architectural	Corrected elevator figures Pages 401-402
June 3 2013	CI-0204 Pavement and Line Markings	Page 140 Cross walk lines changed to yellow
June 3 2013	CI-0302 Bus Infrastructure	Revised Figure page 182 Bus Bay design guidelines for D4500 bus.
June 3 2013	CI-0404 Stair and Stair Enclosures	Page 260 and 261 OBC Handrail size change
June 3 2013	CI-0501 Bus Operational Facilities	Page 349 Arc Flash Decals reference Added
June 3 2013	CI-0205 Civil Works	Page 153 Arc Flash Decals reference Added
June 3 2013	CI-0203 Parking Infrastructure	Page 83 and 87 Arc Flash Decals reference Added
June 3 2013	CI-0703 Electrical	Page 495 Arc Flash Decals Standard Added
June 3 2013	CI-0702 Mechanical	Page 437-439 Sustainable Washroom Standards added
June 3 2013	CI-0204 Line Markings	Page 148 Updated Figure-Arrow Line Markings Colour changed to Yellow.
April 9 2013	CI-0104 Mobility Hubs	Page 37-41 Updated Mobility Hub Guiding Principles
April 1 2013	CI-0703 Electrical	Page -458 Rust Free Standards
April 1 2013	CI-0702 Mechanical	Page -424-438 Rust Free Standards
April 1 2013	CI-0404-Stair and Enclosures	Page -245-259 Rust Free Standards
April 1 2013	CI-0701 Architectural Finishes	Page 401-406 Rust Free Standards
April 1 2013	CI-0101 Materials Maintenance and Cleaning	Page 27 Rust Free Standards
April 1 2013	CI-0407 Rail Platforms and Corridors	Page 272 Minimum Platform Width Page 273 Minimum Platform Widths-Figure Page 274 Minimum Platform Width-Signage
April 1 2013	CI-0703 Technical Disciplines	Page LED Lighting Pages 478-481
April 1 2013	CI-0701 Specialty Items	Page 418-419 Photoluminescent Strips
April 1 2013	CI-0404 Stairs and Stair Enclosures	Page 260 Updated Stair Section Figure-Photoluminescent Strips
April 1 2013	CI-0404 Stairs and Stair Enclosures	Page 256 to 259 Photoluminescent Strips
April 1 2013	CI-0107 System Safety	Page 52 Photoluminescent Strips
01-Feb-13	CI-0704 Communications	Page 523 Cabinets note-Revised Notes
01-Feb-13	CI-0704 Communications	Page 507, 521 Emergency Power-Revised Notes
01-Feb-13	CI-0704 Communications	Page 503-504 Remote and Local Monitoring-Revised Notes
01-Feb-13	CI-0202 Station Sites	Page 65 Revised Figure-Passenger Drop off and Pick Up layout
01-Feb-13	CI-0202 Station Sites	Page 64 Revised Figure-Access Road and Parking Interface
01-Feb-13	CI-0202 Station Sites	Page 63 Revised Figure-Shared Path Pedestrian/Cyclist
01-Feb-13	CI-0206 Landscaping	Page 157 Tree planting schedule inserted.
01-Feb-13	CI-0203 Parking Infrastructure	Page 66-landscape requirements in parking lots clarified.
01-Feb-13	CI-0410 Station Infrastructure	Pages 295-302, renamed references to Air Rail Link. Replaced with Union Pearson Express (UPE)
03-Dec-12	CI- 0704 Communications	Page 536, deleted references to Station Ticket Issuers (STIs) and Station Ticket Cancellers (STCs)
01-Oct-12	CI- 0203 Site Infrastructure and Development	Page 75, Multilevel Parking Structures, added floor finishes requirements for ramps.
01-Oct-12	CI- 0203 Site Infrastructure and Development	Page 76, Multilevel Parking Structures, Clarification on height clearance for Communications and Hub Rooms.
01-Oct-12	CI-0407 Rail Platforms and Corridors	Page 264: Cross Slope requirements for rail platforms revised to show 1 - 2% tolerance.
01-Oct-12	CI-0203 Parking Infrastructure	Page 65, Surface parking Design Requirements, Automobile Access - added statement on adjustment of aisle widths, Parking Lots - added design requirements on parking layouts, adjustments and design efficiencies.
01-Oct-12	CI-0106 Level of Service	Pages 44-45, revised Parking LOS with accurate references.as the previous Parking LOS section duplicated Rail Platform LOS requirements.
01-Oct-12	CI- 0401 Station Infrastructure	Deleted Storage room requirements from Station Building Program as it duplicates Maintenance room requirements.
01-Oct-12	CI- 0203 Site Infrastructure and Development	Page 75; MultiLevel Parking Structures: Added double leaf Hollow Metal (HM) door entrances requirements to Service Rooms.
01-Oct-12	CI - 0705 Technical Disciplines - Drawing Standards	Page 563; Naming Nomenclature for Wayfinding and Signage Drawings and Process Drawings
01-Oct-12	CI - 0704 Technical Disciplines - Communication	PRESTO Details: Page 553, Bottom Entry Outdoor Base Mounted CQD/SFTP Installation Detail - P6 height of base changed from 1070mm to 1050 mm Page 554, Side Entry Indoor Base Mounted CQD/SFTP Installation Detail - P7 Page 555, Side Entry Indoor Base Mounted CQD/SFTP Installation Detail - P8



CI-0704

TAB 7: TECHNICAL DISCIPLINES  
Communications

FIGURE: BOTTOM ENTRY OUTDOOR BASE MOUNTED CQD/SFTP INSTALLATION DETAIL – P6

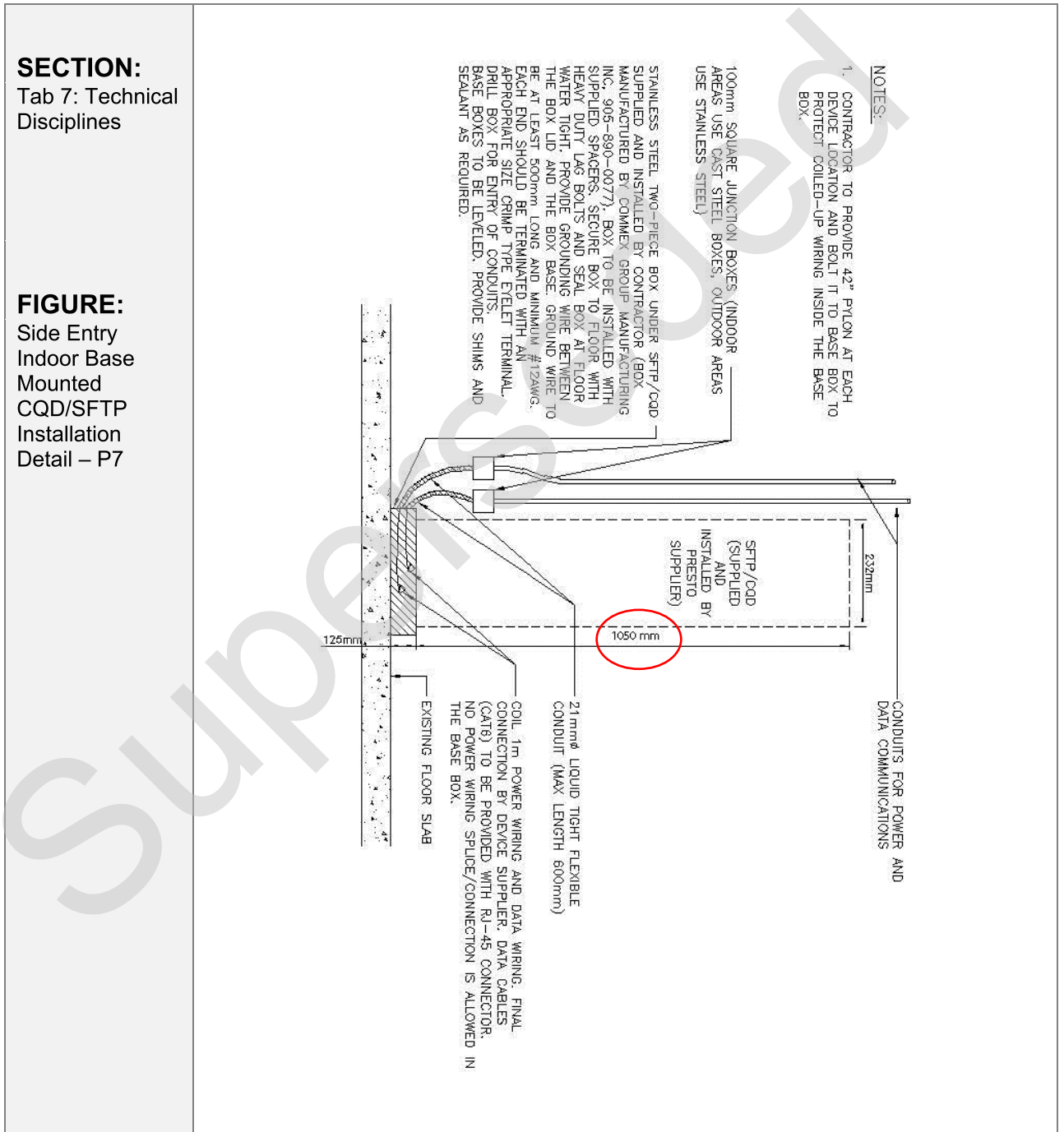




CI-0704

**TAB 7: TECHNICAL DISCIPLINES**  
Communications

FIGURE: SIDE ENTRY INDOOR BASE MOUNTED CQD/SFTP INSTALLATION DETAIL – P7

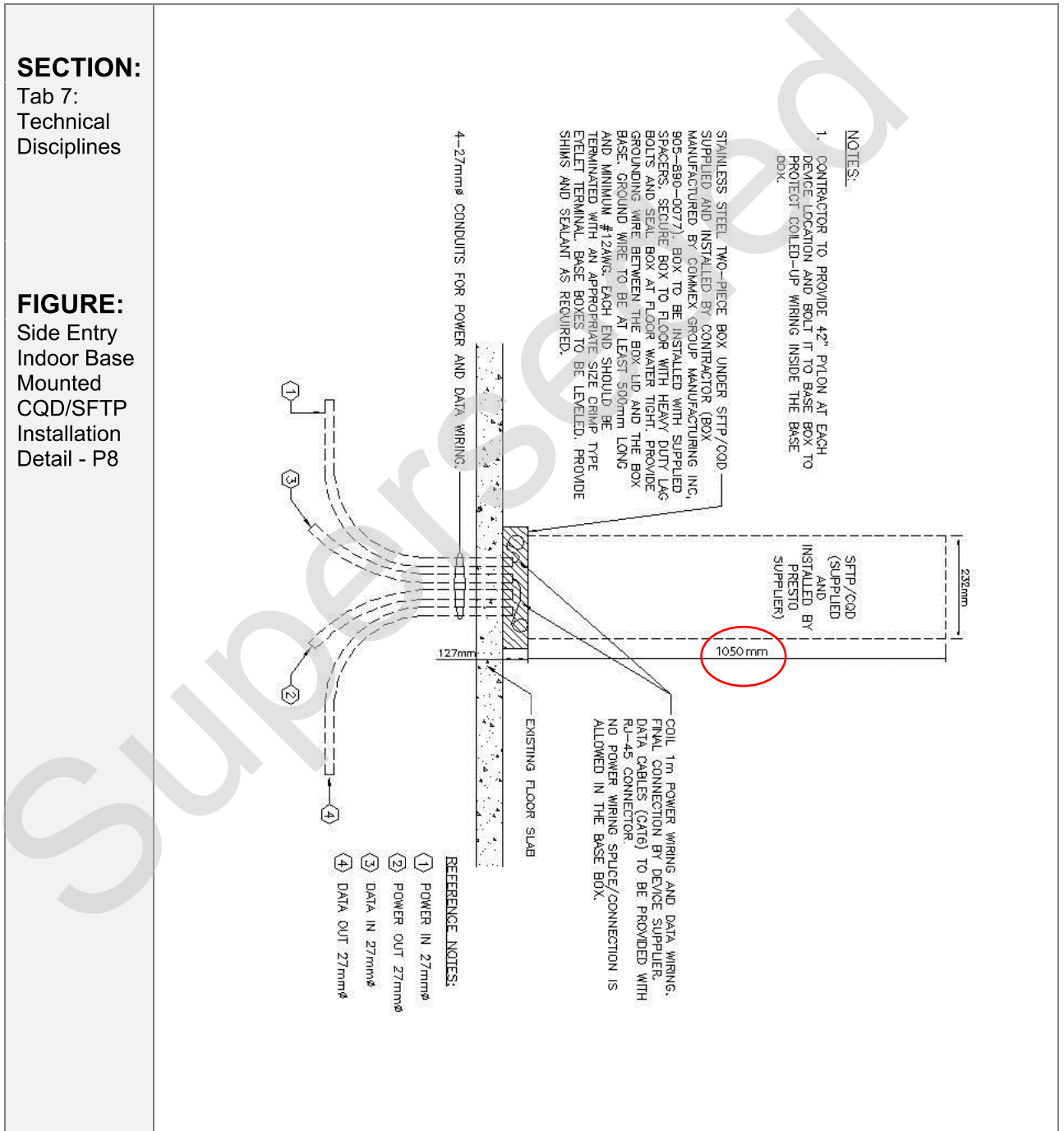




CI-0704

TAB 7: TECHNICAL DISCIPLINES  
Communications

FIGURE: SIDE ENTRY INDOOR BASE MOUNTED CQD/SFTP INSTALLATION DETAIL - P8





CI-0705

**TAB 7: TECHNICAL DISCIPLINES**  
Drawing Standards

**TYPICAL DISCIPLINE LETTERS:**

- G – General
- C – Civil
- L – Landscaping
- A – Architectural
- S – Structural
- M – Mechanical
- E – Electrical
- R – Rail

WSP – Wayfinding and Signage Drawings

D – Process Drawings

**DESCRIPTION OF TITLEBLOCK ATTRIBUTES**

Attribute Tag	Prompt	Enter Value	Examples
Facility	Enter Station Name	XXXXXXXXX STATION  *do not insert word "GO" before STATION or BUS TERMINAL.	MAPLE STATION;
			MIDDLEFIELD;
			WILLOWBROOK;
			FINCH BUS TERMINAL*;
			STEEPROCK GARAGE*;
			WHITBY WAYSIDE*;
			VARIOUS STATIONS (pertain to contract that is for more than one station in the same corridor);



CI-0203

### TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT Parking Infrastructure

- > All exposed structural steel structures will be hot dip galvanized.
- > All exposed Mechanical and Electrical systems to be painted and primed.
- > Ramps should be provided with additional texture and snow melting systems if exposed to the exterior or otherwise required.
- > Refer to the DRM for Standard Finishes in Stairwells, Elevator Lobbies, Elevators, Mechanical, Electrical, Communication and Storage/Service Rooms.

#### **ELECTRICAL ROOM**

- > Electrical rooms are not to be below grade and to be designed with adequate drainage. The service entrance distribution panel board, transformers, transfer switches, contactors and controls and branch circuit panel boards shall be located in the electrical room.
- > Access controls i.e. fob access and keypad to the electrical room shall be provided.
- > Refer to GO "Station Electrical Room Standard" in the Design Requirements Manual for detailed guidelines.

#### **COMMUNICATIONS ROOM**

- > Refer to the DRM TAB 7 for detailed guidelines.

#### **SERVICE & MAINTENANCE AREA – STORAGE/SERVICE ROOM**

- > A designated storage area in the parking structure should be provided. The room(s) can be used to accommodate service equipment; sweeper storage and tools in a secure location.
- > The room(s) shall be accessed by a double leaf Hollow Metal (HM) door and the doors shall not open onto vehicular traffic; a concrete apron shall be provided with bollards to protect egress of service personnel onto the drive aisle.
- > Service rooms shall contain sprinklers, water valves, switches and mechanisms, etc.
- > Rooms that contain temperature sensitive equipment shall be insulated and shall require special design.

#### **ELECTRICAL SERVICES AND DESIGN CRITERIA**

- > Investigate impact of parking structure on the existing electrical service because the existing service may not accommodate the additional load. Refer to the DRM for detailed requirements.






**CI-0106**      **TAB 1: GUIDING PRINCIPLES**  
Level of Service (LOS)

**PARKING**

[Per Rail Line Stations Level of Service Policy - February 2011]

- ✓ Located to provide direct and easy pedestrian access to/from the station building 
- ✓ Maximize the safety and comfort of waiting passengers
- ✓ Provide information and resources needed to support trip planning
- ✓ Allow for related operational requirements

Key Performance Indicator (KPI) (◆ The station design will include...)	KPI Measure (□Mandatory for next level) Ref. Standards documents for dimensions and details)	Level of Service (LOS)			
		A	B	C	F
Redundant parking lot access points	Minimum 2 ingress/egress points	◆	80% LOS A plus mandatory KPIs	65% LOS A plus mandatory KPIs	40% or less LOS A plus mandatory KPIs
Vehicular egress/exit times	Maximum 5 minute peak time exit time Maximum 2 minute off peak exit time	□			
Priority access points	Signalized egress at municipal roads	□			
Minimize walking distances from parking to service areas	Maximum 30m from barrier-free parking to elevator	□			
	Maximum (on average) 400m from median parking to station plaza and/or bus loop	□			
Drop off/pick up area	Minimum of 1 seating area with bench for every 10 car spaces	◆			
Segregated pedestrian and bicycle traffic flow	Minimum 3m wide, curbed, hard surfaced	□			
Accessible from municipal roads	Direct, barrier-free access from street Accessible path	□			



CI-0106

**TAB 1: GUIDING PRINCIPLES**

Level of Service (LOS)

Key Performance Indicator (KPI) (◆ The station design will include...)	KPI Measure (□Mandatory for next level) Ref. Standards documents for dimensions and details)	Level of Service (LOS)			
		A	B	C	F
	protected from elements Covered canopies and accessible				
Bicycle parking	Minimum 1 bicycle shelter or locker	◆			
Motorcycle / scooter parking	Minimum 2 motorcycle/scooter parking spaces	□			
Barrier-free parking	Minimum 1% for 1000 or more of total parking capacity.	□			
Snow removal strategy	Dedicated area for snow piling/removal	□			
Energy efficient illumination	Minimum 2 Fc (20 LUX) in parking lot, passenger drop ff and access road	◆			



CI-0203

**TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**  
Parking Infrastructure

**SURFACE PARKING**

**DESIGN REQUIREMENTS**

**Automobile Access**

- > The required number of access roads is one for approximately 300 parking spaces. Access roads shall be 4.5 m wide for single lane one-way traffic, 7.0 m wide for two-way traffic and 10.5 m wide for three-lane access roads (where a left turn lane is required). Parking lot aisles shall be 7.0 m wide.
- > Adjustments in aisle widths to increase parking efficiencies should be considered wherever possible to allow customer parking where tolerable, within acceptable typical parking lot design and traffic engineering design principles.
- > See Figures for standard aisle width layouts.

**Parking Lots**

- > These standards are intended to provide guidance on the appropriate parking layout design, however adjustments can be made to increase parking and efficiencies should be considered whenever possible with adequate space provided to allow vehicles to manoeuvre in and out without difficulty.
- > Parking layouts shall respond to property size and site geometry. Parking structures and surface parking shall be designed as an integral component of the coordinated site plan and architectural theme.
- > Parking layout configurations should look at maximizing parking while maintaining a safe environment where possible, taking into consideration typical customer vehicular travel patterns. Awkward, irregular gaps in parking layouts should be filled in wherever possible.
- > Where no parking is possible within a parking layout, adjustments to include softscape landscape items – planters etc must be considered.
- > The dimensions provided below are typical requirements, and designers should avail opportunities to maximize parking in layouts wherever possible.
- > Standard parking stalls shall be 2.5 m wide and 5.5 m long.
- > Stalls abutting curbs shall be 4.5 m long with a 1.0 m allowance for vehicle overhang.



CI-0407

**TAB 4: STATION INFRASTRUCTURE**  
Rail Platforms and Corridors

**RAIL PLATFORMS**

DESIGN REQUIREMENTS	
Feature	Description
Platforms	<ul style="list-style-type: none"> <li>&gt; Sealed passenger platforms shall conform to Railway clearances. Refer to Heavy Rail Clearance Diagram.</li> <li>&gt; Generally on tangent track, platforms shall be side platforms and/or island platforms.</li> <li>&gt; Side platform size: 3.6 m-4.9 m x 315 m. Island platform size: 7.4 m x 315 m.</li> <li>&gt; Platform ends may be tapered due to track convergence.</li> <li>&gt; Side platform shelters may be projected beyond platform paving into sodded areas.</li> <li>&gt; Generally, platform cross slopes shall be 1.0% to 2.0% max. Side platforms shall drain away from the tracks.</li> <li>&gt; Where platforms slope longitudinally with the tracks, the floor elevations of elevator, stair enclosure and shelter buildings shall be raised</li> <li>&gt; The longitudinal platform slope shall be transitionally adjusted at door locations to prevent water entry.</li> </ul>
Handwells	<ul style="list-style-type: none"> <li>&gt; Electrical handwells shall not be located at platform building doors, nor elsewhere in pedestrian circulation pathways.</li> <li>&gt; See also Drainage catch basins.</li> </ul>
Platform Sealer	<ul style="list-style-type: none"> <li>&gt; All Island platforms shall be provided with snow melt system.</li> <li>&gt; The platform shall receive a high performance; high quality, premium U-V resistant asphalt surfacing system to provide a durable; protective, maintenance free, long lasting colour and texture to the underlying pavement.</li> <li>&gt; The yellow safety line on the platform shall also be made of compatible</li> </ul>



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### TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT Parking Infrastructure

- > Refer to GO “Station Electrical Room Standard” in the Design Requirements Manual for detailed guidelines.

#### **COMMUNICATIONS/HUB ROOM**

- > In Parking Structures, careful planning is required when locating the Communications and Hub Rooms. Attention must be paid to equipment placement within these rooms in relation to the structural ceiling elements. The required vertical clearance above the racks must also be taken into account. Ideally, cable trays shall be kept level, precast openings in structural “T’s” as determined by the structural engineer, to get to the side walls of the room.
- > Cable trays may be routed around structural ceiling elements if needed, however, shall not be installed lower than 2.0m A.F.F.
- > Unless otherwise requested, the racks shall be installed in the preferred configuration shown in the Information Technology Telecommunications & Systems Document (Appendix A of the DRM)
- > For detailed Communication/Hub room guidelines in Multilevel Parking Structures, refer to DRM TAB 7.

#### **SERVICE & MAINTENANCE AREA – STORAGE/SERVICE ROOM**

- > A designated storage area in the parking structure should be provided. The room(s) can be used to accommodate service equipment; sweeper storage and tools in a secure location.
- > The room(s) shall be accessed by a double leaf Hollow Metal (HM) door and the doors shall not open onto vehicular traffic; a concrete apron shall be provided with bollards to protect egress of service personnel onto the drive aisle.
- > Service rooms shall contain sprinklers, water valves, switches and mechanisms, etc.
- > Rooms that contain temperature sensitive equipment shall be insulated and shall require special design.

#### **ELECTRICAL SERVICES AND DESIGN CRITERIA**

- > Investigate impact of parking structure on the existing electrical service because the existing service may not accommodate the additional load. Refer to the DRM for detailed requirements.
- > Energy Management System/ Smart Panels should provide the most flexible control system available: multi-level lighting, occupancy lighting changes, light harvesting, programmable



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**TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**  
Parking Infrastructure**FINISHES (GENERAL)**

- > All traffic surfaces will be capable of taking paint for pavement markings. Pavement markings are to give direction, define parking stalls, barrier-free parking spaces, and pedestrian paths. For corresponding signage requirements, see GO Signage Manual.
- > All exposed structural steel structures will be hot dip galvanized.
- > All exposed Mechanical and Electrical systems to be painted and primed.
- > Refer to the DRM for Standard Finishes in Stairwells, Elevator Lobbies, Elevators, Mechanical, Electrical, Communication and Storage/Service Rooms.

**FLOOR FINISHES FOR RAMPS IN PARKING GARAGES**

- > Ramps should be provided with additional texture and snow melting systems if exposed to the exterior or otherwise required.
- > Choose a material and surfacing technique with a higher coefficient of friction that will preserve contact between the vehicle and the inclined surface and will help prevent vehicle slippage.
- > Include a gritty material into the surface sealer with a suitable balance of micro and macro textured granules to increase the friction coefficient of vehicle tires on concrete surface.
- > It is critical to consider the effects of water, and other slick substances, on the grip relationship between a vehicle and a surface. Ramps exposed to exterior elements will require increased texture, provisions for snow melting systems, and a chevron pattern spaced maximum 30 mm apart and 5 mm deep to help with drainage.
- > Consideration should be given to applicable code requirements as a ramp incline angle is a direct function of determining an adequate friction coefficient.
- > Consideration should be given to surface applied finishes compared to embedded finishes.
- > Consideration should be for net new consideration and treatment of ramps.

**ELECTRICAL ROOM**

- > Electrical rooms are not to be below grade and to be designed with adequate drainage. The service entrance distribution panel board, transformers, transfer switches, contactors and controls and branch circuit panel boards shall be located in the electrical room.
- > Access controls i.e. fob access and keypad to the electrical room shall be provided.



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**TAB 4: STATION INFRASTRUCTURE**  
Union Pearson Express (UPE)

**OVERVIEW**

This section outlines key criteria that are intended to provide guidelines in designing the rail platforms that will accommodate the Union Pearson Express (UPE) service and associated rail vehicles at GO rail line stations. These guidelines are to be integrated into the overall design of GO and/or UPE rail line stations, where applicable. For additional details, the consultant shall refer to other relevant subjects of the DRM.

**BASIS OF CRITERIA**

The UPE service will provide a premium express rail shuttle service between Union Station and Pearson Airport (Terminal 1 or T1 station); at present two intermediate rail line station locations on the Georgetown corridor have been identified at Bloor and Weston GO stations. The design requirements and basis of criteria listed below form the basis of design at rail line stations. Detailed design will be developed at the individual project level, based on existing site conditions. The Union Station and Terminal 1 locations will have additional, site specific, infrastructure and operational requirements.

Requirement	Description
Assumptions	<ul style="list-style-type: none"> <li>&gt; Design for three (3) car length vehicles.</li> <li>&gt; Integration with existing rail platform elements of the GO Rail Station;</li> <li>&gt; Platform location at one extremity of the GO platform.</li> <li>&gt; Shared accessibility with GO platform barrier free amenities to meet or better AODA and other industry accessibility standards.</li> <li>&gt; Customer amenities that will match the Designated Waiting Area (DWA) features of the GO mini platform.</li> <li>&gt; Minimized walking distances to main access points as site conditions allow.</li> <li>&gt; Boarding height difference (at UPE platform will be different from that at the GO mini platform)</li> <li>&gt; Tangent Track conditions.</li> </ul>



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**TAB 4: STATION INFRASTRUCTURE**  
Union Pearson Express (UPE)

Requirement	Description
Exclusions	<ul style="list-style-type: none"><li>&gt; UPE Branding elements</li><li>&gt; Electronic signage (only conduit shall be provided)</li><li>&gt; Premium customer amenities, if required.</li><li>&gt; Future electrification impact.</li></ul>

Superseded





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**TAB 4: STATION INFRASTRUCTURE**  
Union Pearson Express (UPE)



**DESIGN REQUIREMENTS**

Requirement	Description
Accessibility	<ul style="list-style-type: none"> <li>&gt; Defined accessible route with related amenities and signage.</li> </ul>
Edge Protection	<ul style="list-style-type: none"> <li>&gt; Detectable tactile platform edges, handrails etc.</li> </ul>
Location	<ul style="list-style-type: none"> <li>&gt; Integration with GO platform to minimize overall walking distances.</li> </ul>
Weather protection	<ul style="list-style-type: none"> <li>&gt; Waiting area, i.e. Shelter or Canopy;</li> </ul>
Customer Amenities	<ul style="list-style-type: none"> <li>&gt; Matching DWA features of GO mini platform.</li> </ul>
Snow Melting	<ul style="list-style-type: none"> <li>&gt; The UPE Platforms shall be snowmelted, refer to the relevant DRM section for specifications.</li> </ul>
Fare Handling Systems	<ul style="list-style-type: none"> <li>&gt; Shall be either free standing or integrated weather protected fare vending machines. Access hatches “ handholes” locations shall be identified not conflicting with snowmelt or foundations.</li> </ul>
Electrical Power Supply and Distribution	<ul style="list-style-type: none"> <li>&gt; Separate subpanel for power with illumination control for shared access with GO rail stations; cable chase raceways, etc.,</li> </ul>
Communication Systems	<ul style="list-style-type: none"> <li>&gt; Zoned PA:             <ul style="list-style-type: none"> <li>• CCTV to be provided and shall be able to view UPE separately as an extension of GO services sharing and utilizing existing GO IT infrastructure.</li> </ul> </li> </ul>
Rail Clearances	<ul style="list-style-type: none"> <li>&gt; The UPE platform shall follow the clearance criteria as outlined in the Heavy Rail Tab of the DRM based on CN Rail data, applicable also to CP Rail.</li> </ul>
Horizontal Gap	<ul style="list-style-type: none"> <li>&gt; The platform shall have a 50mm horizontal gap between step from the UPE car and edge of UPE platform with a 16mm vertical and 25mm horizontal tolerance under normal passenger load</li> </ul>



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**TAB 4: STATION INFRASTRUCTURE**  
Union Pearson Express (UPE)

Requirement	Description
	<p>considerations to meet industry accessibility guidelines.</p>
Platform Height	<p>&gt; The UPE platform shall be designed at 1203mm height above top of rail with considerations for ideal conditions and future operational requirements and will include at a minimum allowances for:</p> <ul style="list-style-type: none"> <li>• Accessibility tolerances</li> <li>• Track settlement;</li> <li>• Tolerance and wear and tear of wheel;</li> <li>• Wear and tear of rail and</li> <li>• Industry tolerances for track laying</li> </ul>
Platform Refuge	<p>&gt; A refuge area shall be designed within the platform underside as a safety feature, which could also be used for running cables. Possible noise attenuation measures must be considered.</p>
Integral Platform Edge Protection	<p>&gt; Shall be provided with consideration for snowmelt heat transfer, material selection to withstand operational and environmental factors, and width should not violated the integrity of the clearance envelope requirements.</p>
Platform Width and Cross Slopes:	<p>&gt; The overall width of the UPE island platform, from clearance envelope to clearance envelope is 7158mm (23'-6"). The overall width of the UPE side platform, from clearance envelope to clearance envelope is 3479mm (11'-5). Cross and longitudinal slopes shall follow existing GO Rail platforms profile.</p>
Platform Access	<p>&gt; Passageways, shelters and stairways shall be located to encourage balanced train loading and unloading. Surge and queuing spaces shall be provided ahead of every barrier and change in circulation, direction, or mode.</p>
Platform Exiting	<p>&gt; Emergency exiting shall provide minimum access/egress from the UPE platform to meet the requirements of the Ontario Building</p>



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**TAB 4: STATION INFRASTRUCTURE**  
Union Pearson Express (UPE)

Requirement	Description
	<p>Code and occupant load of the UPE under peak conditions.</p> <ul style="list-style-type: none"> <li>&gt; Exits shall provide safe egress from trains and platforms under normal operational and emergency conditions.</li> <li>&gt; Platforms and exits shall be sized to allow passengers to completely clear the platform prior to the arrival of the next train. Secondary access or exit points should be provided in a visible location</li> </ul>
Platform Furnishings	<ul style="list-style-type: none"> <li>&gt; Benches, trash receptacles, fare collection equipment, newspaper racks, etc. shall be standardized to provide a uniform appearance within the overall station context and for ease of maintenance and replacement. (TBD per UPE Branding requirements)</li> </ul>
Holistic Wayfinding and Signage	<ul style="list-style-type: none"> <li>&gt; Shall be integrated within the existing station signage system (integrated within the accessibility route).</li> <li>&gt; Platform identification, etc. shall aim to create obvious, simple and clear signage between modes of transportation maintaining a degree of graphic continuity.</li> <li>&gt; Signage placement shall conform to all applicable clearance restrictions.</li> </ul>
Platform Lighting	<ul style="list-style-type: none"> <li>&gt; Shall be in any area that is used to load and unload a train.</li> <li>&gt; The lighting elements shall extend the entire length of the platform and shall demarcate the platform and emphasize the platform edge and vertical vehicle surfaces</li> </ul>
Operational Considerations	<ul style="list-style-type: none"> <li>&gt; Train spot marker locations and longitudinal dimension from mini platform needs identification.</li> <li>&gt; Two (2) car consist positioning (centered in position 1-2 or position 2-3) needs to be determined.</li> <li>&gt; Rail should be replaced when ballast is replaced to maintain tolerances</li> </ul>



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**TAB 4: STATION INFRASTRUCTURE**  
Union Pearson Express (UPE)

Refer to the UPE Platform Plan and Section schematic for detailed description of platform design elements.

Superseded



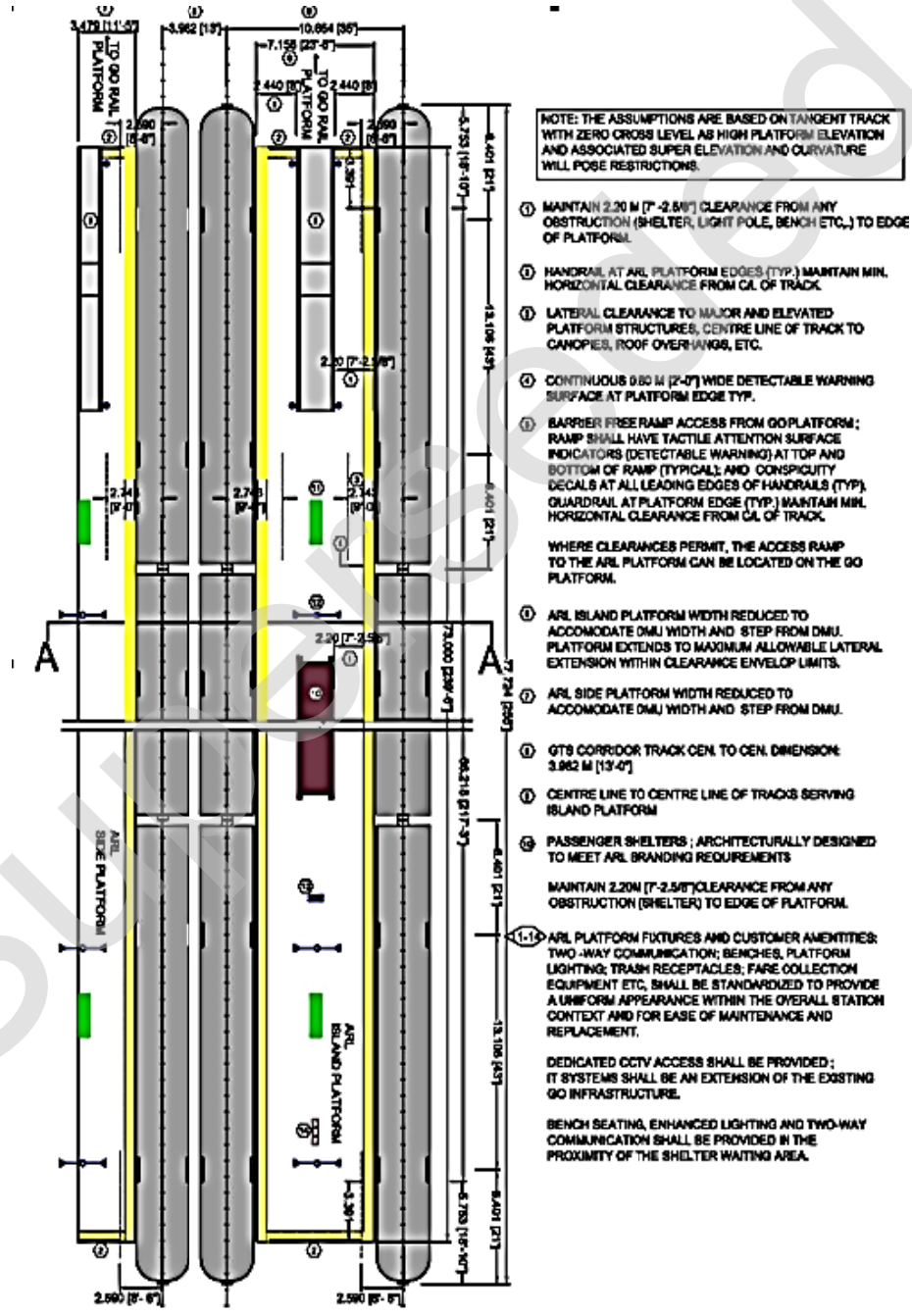
CI-0410

**TAB 4: STATION INFRASTRUCTURE**  
Union Pearson Express (UPE)

FIGURE: UPE PLATFORM PLAN

**SECTION:**  
Tab 4:  
Station  
Infrastructure

**FIGURE:**  
UPE  
Platform  
Plan





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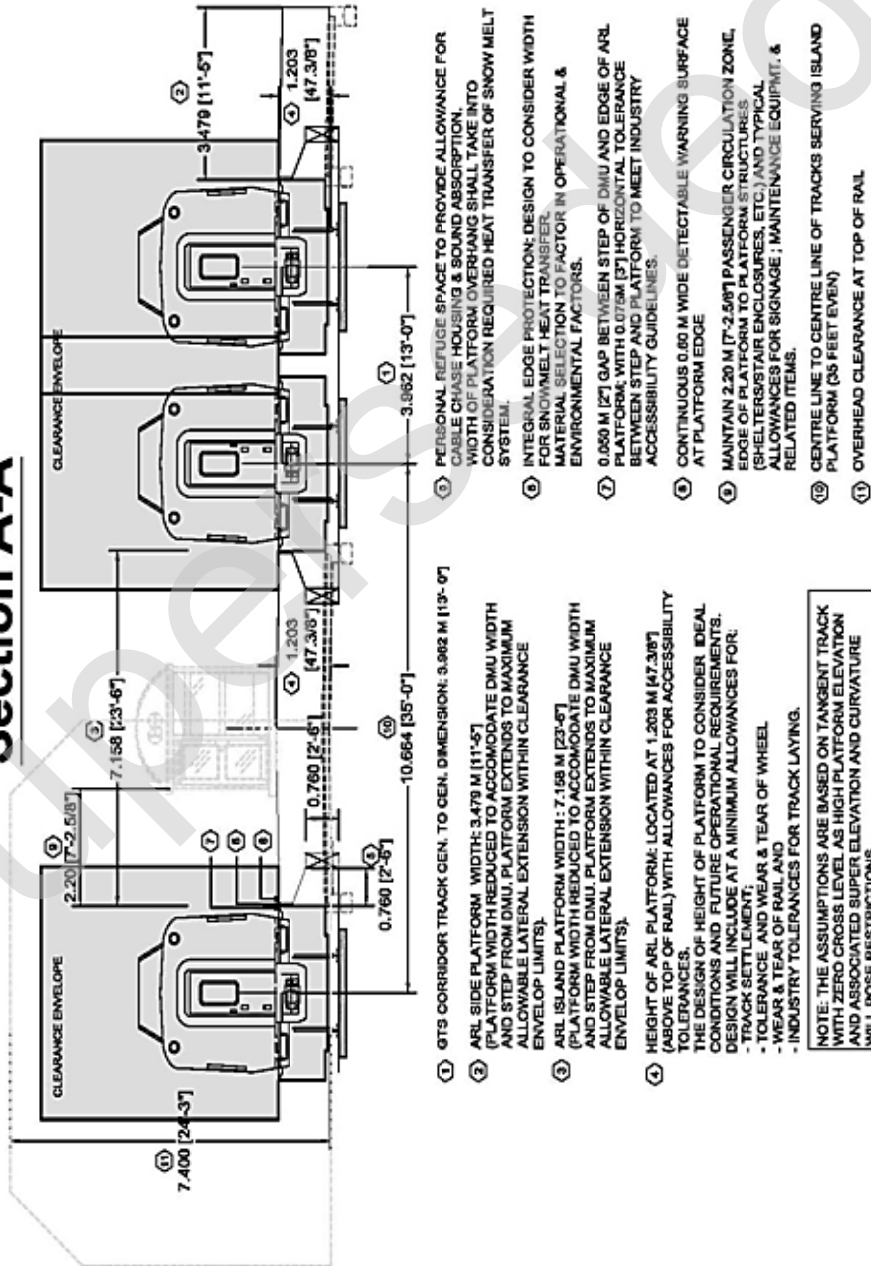
**TAB 4: STATION INFRASTRUCTURE**  
Union Pearson Express (UPE)

FIGURE: UPE PLATFORM SECTION

**SECTION:**  
Tab 4:  
Station  
Infrastructure

**FIGURE:**  
UPE  
Platform  
Section

**Section A-A**





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**TAB 7: TECHNICAL DISCIPLINES**  
Communications

**FARE HANDLING SYSTEMS**

**BASIS OF CRITERIA**

Fare handling machines are proprietary equipment and will be provided and installed by the appropriate supplier. Consultants shall meet with GO Transit staff to ensure the required facilities needed to operate these machines, e.g., power, are provided.

- > “Interac”, etc. (including data polling, Station Control Computer (SCC), Debit and Credit equipment
- > Smart Card equipment Presto
- > Ticket Vending Machines (TVMs)
- > GPS Clock



CI-0203

### TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT Parking Infrastructure

#### SURFACE PARKING

##### DESIGN REQUIREMENTS

###### Automobile Access

- > The required number of access roads is one for approximately 300 parking spaces. Access roads shall be 4.5 m wide for single lane one-way traffic, 7.0 m wide for two-way traffic and 10.5 m wide for three-lane access roads (where a left turn lane is required). Parking lot aisles shall be 7.0 m wide.
- > Adjustments in aisle widths to increase parking efficiencies should be considered wherever possible to allow customer parking where tolerable, within acceptable typical parking lot design and traffic engineering design principles.
- > See Figures for standard aisle width layouts.

###### Parking Lots

- > These standards are intended to provide guidance on the appropriate parking layout design, however adjustments can be made to increase parking and efficiencies should be considered whenever possible with adequate space provided to allow vehicles to manoeuvre in and out without difficulty.
- > Parking layouts shall respond to property size and site geometry. Parking structures and surface parking shall be designed as an integral component of the coordinated site plan and architectural theme.
- > Parking layout configurations should look at maximizing parking while maintaining a safe environment where possible, taking into consideration typical customer vehicular travel patterns. Awkward, irregular gaps in parking layouts should be filled in wherever possible.
- > Where planting is not possible within a parking layout, adjustments to include softscape landscape items like planters must be considered.
- > Signage shall be provided at end of aisle locations to indicate tow away zones (refer Static Signage Catalogue for details)
- > The dimensions provided below are typical requirements, and designers should avail opportunities to maximize parking in layouts wherever possible.
- > Standard parking stalls shall be 2.5 m wide and 5.5 m long.





CI-0206

**TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**  
Landscaping

**NATIVE TREES GUIDELINE**

Common Name	Attributes	Light	Soil	Moisture	Height
Red Maple	Orange to bright red fall colour	Full Sun, partially shade	Sand, loam	Moist-wet	25 m
Silver Maple	Fast growing, tolerant	Full Sun, partially shade	Sand, loam, clay	Moist-wet	35 m
Blue Beech	Interesting thin, smooth, slate grey bark	Shade, partially Sun	Loam, sandy-loam	Moist	8 m
Bitternut Hickory	Fast growing	Full Sun, partially shade	Sand, loam	Moist	20 m
Hackberry	Fast growing, tolerant	Full Sun, partially shade	Loam, clay	Dry-wet	15 m
Red Cedar	Provides food & shelter for wildlife, tolerant	Full Sun	Sand, loam	Dry-moist	4 m
Tulip Tree	Golden yellow fall colour	Full Sun	Loam	Moist	25 m
Black Tupelo	Salt tolerance, dark red fall colour	Full Sun	Loam	Dry-wet	15 m
White Spruce	Provides wildlife habitat, salt tolerance, year-round screening	Full Sun, partially shade	Sand, loam, clay	Moist	25 m
Sycamore	Interesting, peeling bark	Full Sun, partially shade	Sand, loam, clay	Moist-wet	30 m
Trembling Aspen	Leaves flutter in wind, fast growing, tolerant	Full Sun	Sand, loam, clay	Moist	25 m
Bur Oak	Provides food and shelter for wildlife	Full Sun, partially shade	Loam, clay	Dry-wet	15 m
Red Oak	Fast growing, wildlife value	Full Sun, partially shade	Sand to loamy-clay	Dry-moist	25 m
White Cedar	Provides wildlife habitat	Full Sun,	Sand, loam,	Dry-wet	15 m



CI-0206

**TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**  
Landscaping

		partially shade	clay		
--	--	-----------------	------	--	--

Consultants are encouraged to generate site specific solutions that enhance the site conditions and are consistent with the surrounding context.

**COMFORT AND SAFETY**

- > Planting shall not interfere with sightlines at any roadway and intersections; and
- > Landscaping shall not compromise site illumination levels.

**GENERAL PLANT SPECIFICATIONS**

Install plant material that meets or exceeds the following minimum sizes:

- > Deciduous street trees 70 mm calliper;
- > Deciduous trees 60 mm calliper;
- > Small deciduous trees 50 mm calliper;
- > Coniferous trees 1500 mm ht.;
- > Deciduous shrubs 600 mm ht.;
- > Coniferous shrubs 600 mm ht. or spread; and
- > Perennials 2 years container grown.

**SOIL QUALITY SPECIFICATIONS**

Good quality soil shall consist of a minimum 0.9 m\* depth, over and above any required drainage system and/or granular material, of sandy loam soil with the following composition:

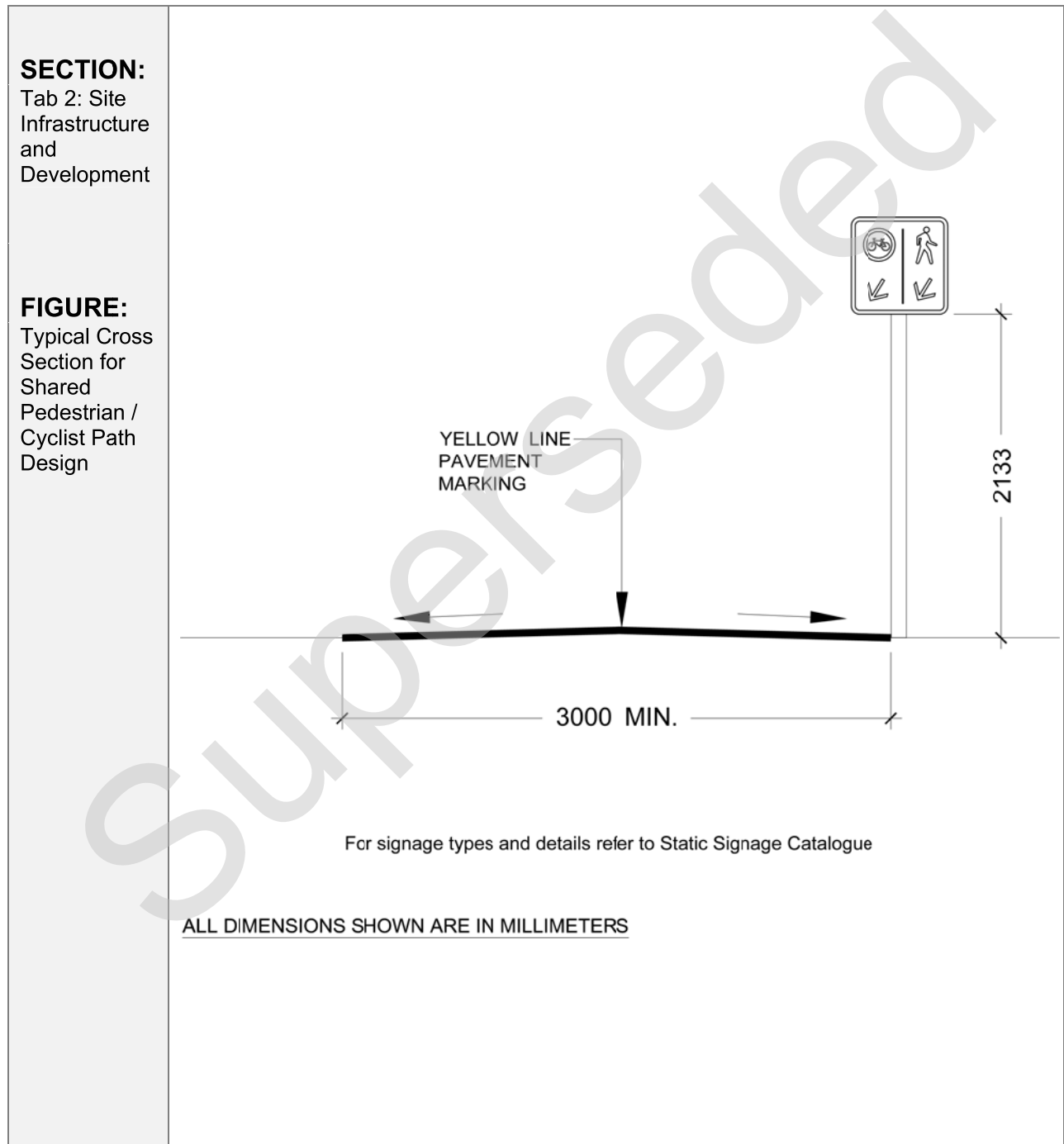
- > Sand (50%-60%);
- > Silt (20%-40%);
- > Clay (6%-10%);
- > Organic (2%-5%); and
- > pH = 7.5 or less.



CI-0202

**TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**  
Station Sites

FIGURE: TYPICAL CROSS SECTION FOR SHARED PEDESTRIAN/CYCLIST PATH DESIGN





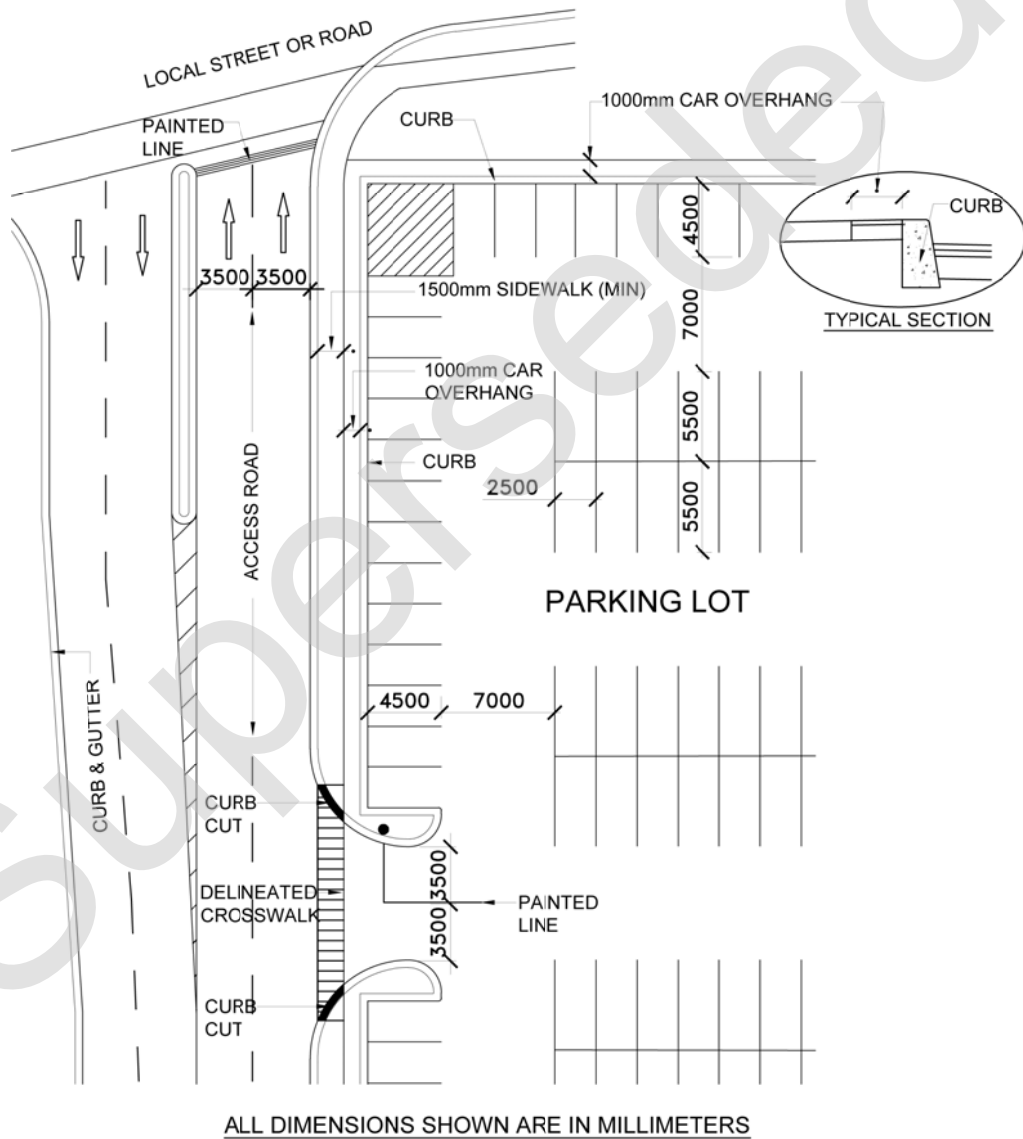
CI-0202

**TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**  
Station Sites

FIGURE: ACCESS ROAD AND PARKING INTERFACE (GUIDANCE ONLY)

**SECTION:**  
Tab 2: Site Infrastructure and Development

**FIGURE:**  
Access Road and Parking Interface (Guidance Only)

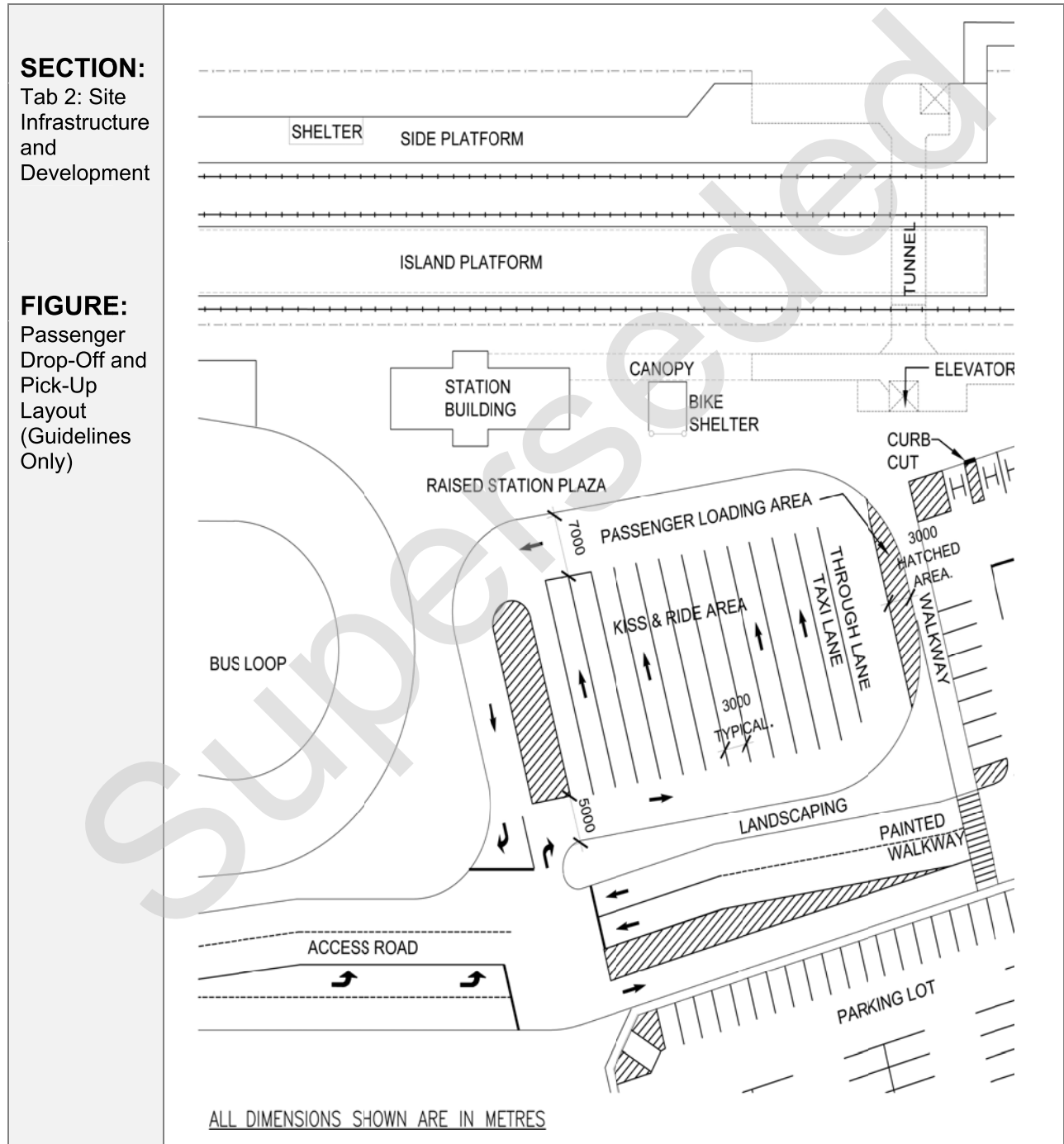




CI-0202

**TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**  
Station Sites

FIGURE: PASSENGER DROP-OFF AND PICK-UP LAYOUT (GUIDELINES ONLY)





CI-0704

**TAB 7: TECHNICAL DISCIPLINES**  
Communications

**LOCAL MONITORING**

All cameras, including pan/tilt/zoom (PTZ) at each site are viewed locally on a dedicated video monitor and manipulated by means of a keyboard, mouse, and/or joystick.

**REMOTE MONITORING**

The systems are connected via GO Transit network which allows remote and local access to all cameras on all systems

The current method of transmission of video images is operating on MPLS circuits and Metrolinx IT WAN Infrastructure.

Various CCTV system viewing and monitoring rights are granted through administrative privileges as set out by GO System Safety.

**COMPONENTS**

The equipment required for either the Operational or the Security CCTV system generally includes, but is not limited to the following:

**CI-0704****TAB 7: TECHNICAL DISCIPLINES****Communications**

- > Colour Monitors – 24" or 32" display monitor inside station ticket booth, 32" or 50" at Transit Safety Dispatch, wall or ceiling mounted each site is dependant on local requirements and conditions. This will include all hardware required for the installation.
- > Outdoor grade platform monitors to assist CSA to ensure doorways are clear of passengers. Typically used on curved platforms with obscured vision and installed on mini-platform on dedicated pole.
- > Cameras – Fixed or Pan/Tilt/Zoom, high sensitivity (0.08fc) and other new technology compatible and approved with the corporate standard system.
- > Camera Housings – weatherproof (outdoor), moisture and dust-proof, maintain the ambient temperature within the housing in the camera operating temperature range of  $-10^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$ . A sunscreen is fitted to protect the camera from direct sunlight. Indoor housings are either high impact polycarbonate or epoxy coated steel, dust-proof, with top mount assembly, suitable for cameras with fixed focal length.
- > Lenses – Fixed with auto-Iris. Aspherical lenses are used on platforms to suit lighting conditions.
- > CCTV Head End System.

**DESIGN/INSTALLATION CRITERIA**

CCTV system implementation is part of the overall facility design. The level of design and installation at each station, facility or wayside layover will depend upon the unique conditions of each site and in accordance with GO corporate needs. Monitoring and recording requirements will be determined by the user groups.



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**TAB 7: TECHNICAL DISCIPLINES**  
Communications

**INSTALLATION**

**CCTV Cabling**

- > All cables shall be run in a neat and orderly fashion in a conduit system.
- > CCTV cables shall be designated at both ends as per design requirements provided in the Electrical Section of the DRM.
- > All cables that run from cameras to terminating equipment shall be single length (splices in these cables are not allowed)
- > Sufficient slack (1 meter) shall be left in case it is necessary to re-terminate the cable.
- > Emergency power – all systems and components shall be powered via a single source from the emergency power panel within the communication room.

**CONDUITS**

- > Conduits shall be designated with “CCTV” at terminating ends.
- > Wiring shall be run in conduit. Outdoor cable shall be run in epoxy coated rigid galvanized steel; indoor cable may be R.G.S. or E.M.T. depending on the location.
- > All underground conduits shall be rigid PVC.
- > Conduit breaks prior to entry in to a building shall be incorporated in the design. For detailed design requirements refer the Electrical Section of the DRM.

**CONNECTIONS**

- > All copper connections shall be copper-to-copper compression type with insulating covers.
- > Poles with cameras shall have one metre slack cable in raceway.
- > Fish cord in all CCTV raceways shall be installed for future use.
- > Splices are not allowed.

**HANDWELLS**

- > Dedicated handwells, located away from doors and main traffic areas, shall be provided for CCTV, separate from power.





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**TAB 7: TECHNICAL DISCIPLINES**  
Communications

**EMERGENCY POWER**

P.A. System equipment shall be supplied from the emergency power panel located inside the station communication room.

**PRIORITIZED PAGING**

The P.A. system shall be user configurable to provide prioritized paging announcements when announcements are generated simultaneously from different inputs. Initial configuration shall establish to the following priority level.

Highest Priority	GO Operations 'Red' phone
↑	Local 'Red' phone
↓	Other paging telephones including ticket office
Lowest Priority	

The system shall provide for a separate 600 ohm audio input whose priority access level in the system is also user configurable.

**TIME CLOCK**

The system shall provide for volume adjustment of the P.A. announcements using an internal real time clock. Automatic adjustment of clock changes shall be provided for daylight savings time.

**GENERAL FEATURES**

1. The P.A. system shall interface with a maximum of seven and minimum of four P.A. paging phone inputs and up to three - 600 ohm audio circuits. All three audio inputs shall provide independent audio adjustment of the incoming signal. A common audio adjustment shall also be provided for the P.A. paging phone inputs. Signal levels for the local paging and remote paging shall be separate inputs requiring individual adjustments. The equipment provided shall be capable of adjusting all audio inputs over a range of -30db to +6db.
2. A solid state controller shall provide the switching and signalling required for priority calls, selective zone paging, zone "group" paging, all call, background music mute, paging alert tones and emergency override.
3. On-site user-configurable, prioritized paging access for all audio inputs shall be provided.
4. The P.A. system shall interface with the GO Transit 'RED' phone system to allow both 'RED' phone paging from Union Station and local 'RED' phone paging from the ticket office/s. The local 'RED' phone paging facility shall automatically provide ticket office/s paging speaker override whenever the local □RED□ phone system is used.



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**TAB 7: TECHNICAL DISCIPLINES**  
Communications

**COMPONENTS**

**P.A. System Controller**

**Rack**

The P.A. System Controller shall be housed in a clear width 483mm (19") 35U rack enclosure having external dimensions of (559mm W X 635mm D X 1,500mm H) (22"W x 25"D x approx. 60" H).

**Note:** The cabinet shall be floor standing with lockable front and rear doors. The enclosure shall be fully welded construction, with ventilation slots provided in both sides and front. Finish shall be textured black polyester powder coat. Wiring ducts shall be provided within the enclosure to route internal wiring between the various control assemblies. All internal wiring shall be marked with point-to-point identification using heat shrink sleeve markers. Unused enclosure U spaces shall be provided with blanking plates.

**Quick Disconnect Terminal**

All speaker cabling entering the communication enclosure shall be individually connected to a "quick" disconnect terminal.

The quick disconnect facility shall allow individual outgoing zone cables to be quickly disconnected from the controller without the use of a screwdriver. The rail shall be marked to identify each respective zone/cable and incoming cables shall be tie-wrapped to rigid internal cable bars to prevent undue movement.

The termination rail also provides individual earth (ground) terminals to allow the screen of each zone cable to be grounded. A laminated termination rail diagram, in addition to a control riser and/or single line block diagram shall be mounted on the inside of the rear door and a copy of such drawings shall also be included in the system manual.

**Surge Protection**

An independent transient voltage suppression and surge protection device shall be provided meeting UL 1449 TVSS rating power source located at the bottom of the enclosure. All required control system power supplies shall be installed on a "quick disconnect" DIN rail.



CI-0107

**TAB 1: GUIDING PRINCIPLES**  
System Safety

**SECURITY DESIGN GUIDELINES**

Design Area	Guidelines
Vertical Spaces	<p>any time.</p> <ul style="list-style-type: none"> <li>&gt; <b>Stairs and elevators:</b> shall be in close proximity to each other, for acoustical and visual continuity.</li> <li>&gt; <b>Guards and balustrades:</b> shall be glazed where sight lines are required and in order to maximize illumination to lower levels, Photoluminescent strips to be installed above stair guards as required. Refer Tab 4 and Tab 7 for details</li> <li>&gt; <b>Perimeter walls:</b> of stairs and elevator vestibules shall be fully glazed where possible;</li> <li>&gt; <b>Stairwell openings:</b> shall be extended across tunnels where possible, for day-lighting, and to reduce the apparent tunnel lengths; concrete sealed walls to be protected by clear non-sacrificial anti-graffiti coating. Photoluminescent strips to be installed above the nosing and at top, bottom and intermediate landings for entire stair run length. Refer Tab 4 and Tab 7 for details.</li> <li>&gt; <b>Stair centre handrails:</b> shall terminate at landings to permit crossover.</li> </ul>
Tunnels and Overpasses	<ul style="list-style-type: none"> <li>&gt; <b>Open overpasses:</b> shall not have solid guards. Enclosed overpasses and stairs shall have windows/skylights, including at the ends, or shall have mesh type enclosures;</li> <li>&gt; <b>Tunnel corners:</b> shall be 45° angled and internal 90° corners shall have, at a minimum, convex mirror units and concrete sealed walls to be protected by clear non-sacrificial anti-graffiti coating.</li> <li>&gt; <b>Heights of tunnels and overpasses:</b> shall be compatible with CCTV requirements.</li> <li>&gt; <b>Photoluminescent strips</b> to be installed along the entire length of tunnels. Refer Tab 4 and Tab 7 for details</li> </ul>
Shelters	<ul style="list-style-type: none"> <li>&gt; <b>Shelters:</b> shall have clear-glazed walls;</li> <li>&gt; <b>Large shelters:</b> for large shelters, doors shall be at opposite ends (one door at each end) and swing out;</li> <li>&gt; <b>Roofs:</b> shelters shall have translucent roofs and internal and external luminaires that do not reflect/glare in glazed walls. Translucent roofs also borrow illumination from platform light standards and provide sun shade; and</li> <li>&gt; <b>Platform shelters:</b> platform shelters remote from public announcement speakers shall have internal speakers.</li> </ul>
Human Scale	<ul style="list-style-type: none"> <li>&gt; <b>Entrance-waiting areas:</b> shall have indirect illumination as the main source, plus a variety of accent luminaires.</li> <li>&gt; <b>Shelters:</b> shall have illumination.</li> </ul>



CI-0404

**TAB 4: STATION & TERMINAL BUILDING INFRASTRUCTURE**  
Stairs & Stair Enclosures

**DESIGN REQUIREMENTS**

The following requirements pertain to tunnel and exterior stairs, including stairs remote from buildings):

FEATURE	DESCRIPTION
Risers & Treads	<ul style="list-style-type: none"><li>&gt; Risers: 150 mm preferred.</li><li>&gt; Treads: 305 mm preferred.</li><li>&gt; The design shall not incorporate open risers; be slip resistant; have uniform treads and risers in any one flight and shall not alter significantly in run and rise in successive flights in any stair system.</li></ul>
Nosings	<ul style="list-style-type: none"><li>&gt; Stair nosings shall project not more than 38 mm and have no abrupt undersides.</li><li>&gt; Where projecting, be sloped to the riser at an angle greater than 60° to the horizontal; and the radius of curvature at the leading edge of the tread not more than 13 mm.</li><li>&gt; Nosings shall have a cast-in safety insert on an extruded aluminum or carborundum base with epoxy or abrasive filler that is minimum 40 mm +/- 10 mm deep and which:<ul style="list-style-type: none"><li>• Is located at the leading edge of the tread;</li><li>• Is tonal contrasted with the tread and riser; and</li><li>• Extends the full width of the tread.</li></ul></li></ul>
Detectable Waning Surface	<ul style="list-style-type: none"><li>&gt; Detectable warning surfaces at the top of stairs shall be provided:<ul style="list-style-type: none"><li>• At each landing incorporating an entrance into a stair system;</li><li>• Where the regular pattern of a stairway is broken; and</li><li>• Where the run of a landing not having a continuous handrail is greater than 2100 mm.</li></ul></li><li>&gt; The detectable warning surfaces shall:</li></ul>



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**TAB 4: STATION & TERMINAL BUILDING INFRASTRUCTURE**  
Stairs & Stair Enclosures

FEATURE	DESCRIPTION
	<ul style="list-style-type: none"><li>• Extend the full width of the stair;</li><li>• Have a depth of 920 mm (36 in), commencing one tread depth from the edge of the stair; and</li><li>• The cane-detectable warnings on this surface shall be colour and texture contrasted with the adjacent surfaces. Raised ridges shall be placed perpendicular to the direction of travel.</li></ul>
Edge Drain	<ul style="list-style-type: none"><li>&gt; Tunnel stairs shall have concrete drainage side-gutters 40 mm deep by 80 mm wide, continuous with the tunnel floor gutters.</li><li>&gt; Gutter drains shall not be located at the bottom of tunnel stairs or in front of service doors or elevator doors.</li></ul>
Handrails	<ul style="list-style-type: none"><li>&gt; Handrails shall be provided on both sides of all stairs.</li><li>&gt; Exterior stair and ramp handrails shall be smooth galvanized steel pipe, minimum 38 mm, and maximum 51 mm diameter, 915 mm above nosings or ramps.</li><li>&gt; All anchorage and fittings shall also be galvanized.</li><li>&gt; Tunnel stair or bridge stair handrails to be stainless steel 38 mm diameter, be mounted not less than 865 mm and not more than 965 mm high, measured vertically from a line drawn through the outside edges of the stair nosings.</li><li>&gt; All anchorage and fittings shall also be stainless steel. Handrail ends shall extend in accordance with the OBC and the OBC Illustrated Guide, also for exterior stairs.</li><li>&gt; Handrails shall be continuous around landings less than 2100 mm in length and placed on the inside edge of stairs; and<ul style="list-style-type: none"><li>• Have the rail extension return to the post, floor or wall;</li><li>• At the top of stairs, extend at least 300 mm (12 in) parallel to the floor surface;</li><li>• At the bottom of the stairs, continue to slope for a distance equal to the depth of one tread and then extend at least 300</li></ul></li></ul>



CI-0404

**TAB 4: STATION & TERMINAL BUILDING INFRASTRUCTURE**  
Stairs & Stair Enclosures

FEATURE	DESCRIPTION
	<p>mm (12 in) parallel to the floor surface;</p> <ul style="list-style-type: none"> <li>• Have a circular cross-section with an outside diameter not less than 30 mm (1.2 in) and not more than 40 mm (1.6 in), or any non-circular shape with a graspable portion that has a perimeter not less than 100 mm (4 in) and not more than 155 mm (6 in) and whose cross-sectional dimension is not more than 57 mm (2 in);</li> <li>• Have a clearance of at least 50 mm (2 in) between the handrail and any wall to which it is attached or immediately adjacent to;</li> <li>• Be terminated in a manner that will not obstruct pedestrian travel or create a hazard;</li> <li>• Be designed and constructed such that handrails and their supports:</li> <li>• Will withstand the loading values obtained from the non-concurrent application of a concentrated load not less than 0.9 kN (202 lb.) applied at any point and in any direction; and</li> <li>• A uniform load not less than 0.7 kN/m (46.6 lb./ft.) applied in any direction to the handrail;</li> <li>• Be tonal contrasted with their surroundings and provided with a colour contrasted strip at the leading edges of the handrail at the top and bottom of the stair system;</li> <li>• Be installed with a photoluminescent strip installed on an extruded aluminium base along the stair rise; and</li> <li>• Where stairs are wider than 2400 mm, one or more intermediate continuous handrails between landings shall be provided</li> </ul>
Photoluminescent Strips	<p>&gt; Tunnel walls (both sides) shall have surface mounted photoluminescent strips at 0.3m above finished tunnel floor. Strips to be installed continuously along entire length of tunnel transitioning in a continuous manner to all stairwells. Refer Tab 4 CI-0404 Stairs and Stairwells for detail information and figures on stair/tunnel interface of</p>



CI-0404

**TAB 4: STATION & TERMINAL BUILDING INFRASTRUCTURE**  
Stairs & Stair Enclosures

FEATURE	DESCRIPTION
	photoluminescent strips.

Superseded



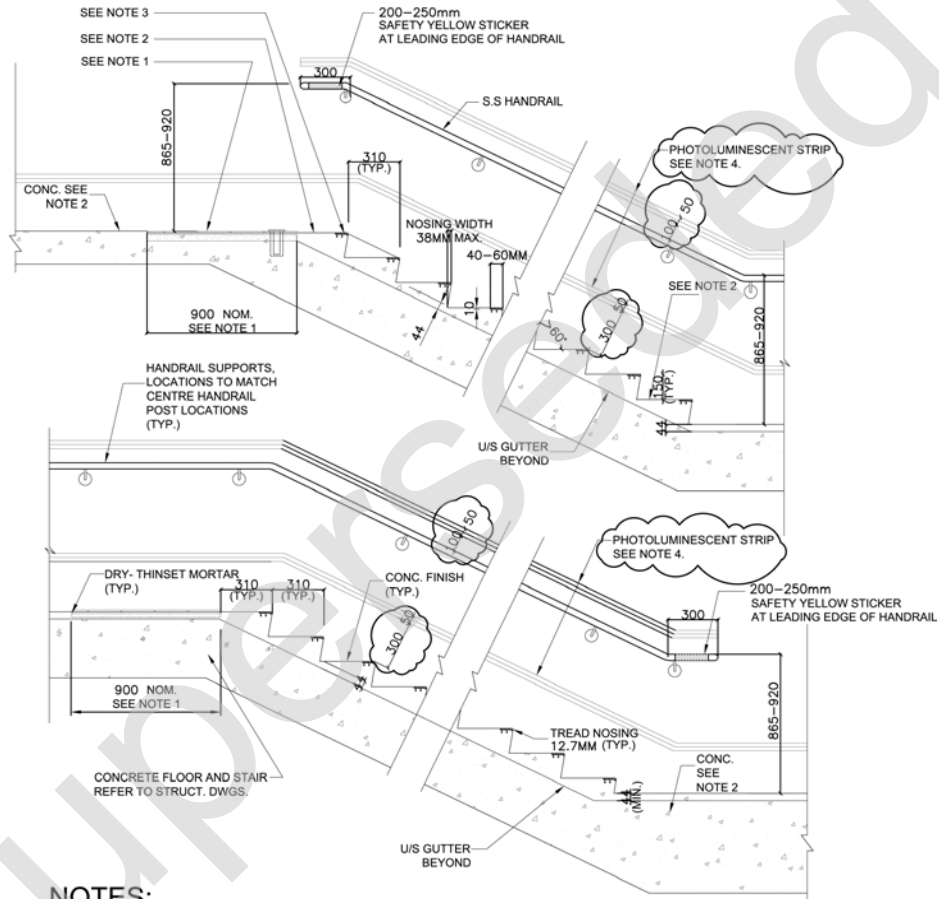
CI-0404

**TAB 4: STATION & TERMINAL BUILDING INFRASTRUCTURE**  
Stairs & Stair Enclosures

FIGURE: TILES AT RAMP / STAIR APPROACH (SECTIONS)

**SECTION:**  
Tab 4:  
Station  
Infrastructure

**FIGURE:**  
Tiles at  
Ramp / Stair  
Approach  
(Sections)



**NOTES:**

1. DETECTABLE WARNING SURFACE W/ CONTINUOUS RIDGES TO MEET CAN-CSA B651-04 ACCESSIBLE DESIGN STANDARDS. RIDGES SHALL BE INSTALLED PERPENDICULAR TO ROUTE OF TRAVEL; EXTENDING THE FULL WIDTH OF THE STAIR AND HAVE A DEPTH OF 900-920MM COMMENCING ONE TREAD DEPTH FROM THE EDGE OF THE STAIR.
2. CONCRETE - STEEL TROWEL WITH BRUSH FINISH
3. CAST IN SAFETY NOSING (50mm +/- 10mm) ON AN EXTRUDED ALUMINUM CARBORUNDUM BASE W/ EPOXY OR ABRASIVE FILLER/GRIT; EXTENDING THE FULL WIDTH OF THE TREAD REFER CSA B651-04 & CNIB STANDARDS FOR SLIP RESISTANCE & COLOUR CONTRAST REQUIREMENTS.

4. WALL MOUNTED PHOTOLUMINESCENT STRIP C/W ALUM. FRAME MADE OF CORROSION RESISTANT MATERIAL (ALUMINUM OR STAINLESS STEEL) IS TO BE SUPPLIED AND INSTALLED TO SUPPORT THE PHOTOLUMINESCENT STRIPS ALONG THE ENTIRE LENGTH (FOR BOTH STAIR AND HANDRAIL CONDITIONS). FASTENERS TO BE CORROSION RESISTANT (STAINLESS STEEL OR ALUMINUM) AND NOT VISIBLE. END CAPS TO BE VANDAL PROOF. (TYP. BOTH SIDES OF THE STAIR AND ABOVE THE HANDRAIL). ALIGN HANDRAIL PORTION TO LEADING EDGE OF HANDRAIL EXTENSION. REFER TO TAB 7 OF THE DRM FOR DETAILS.





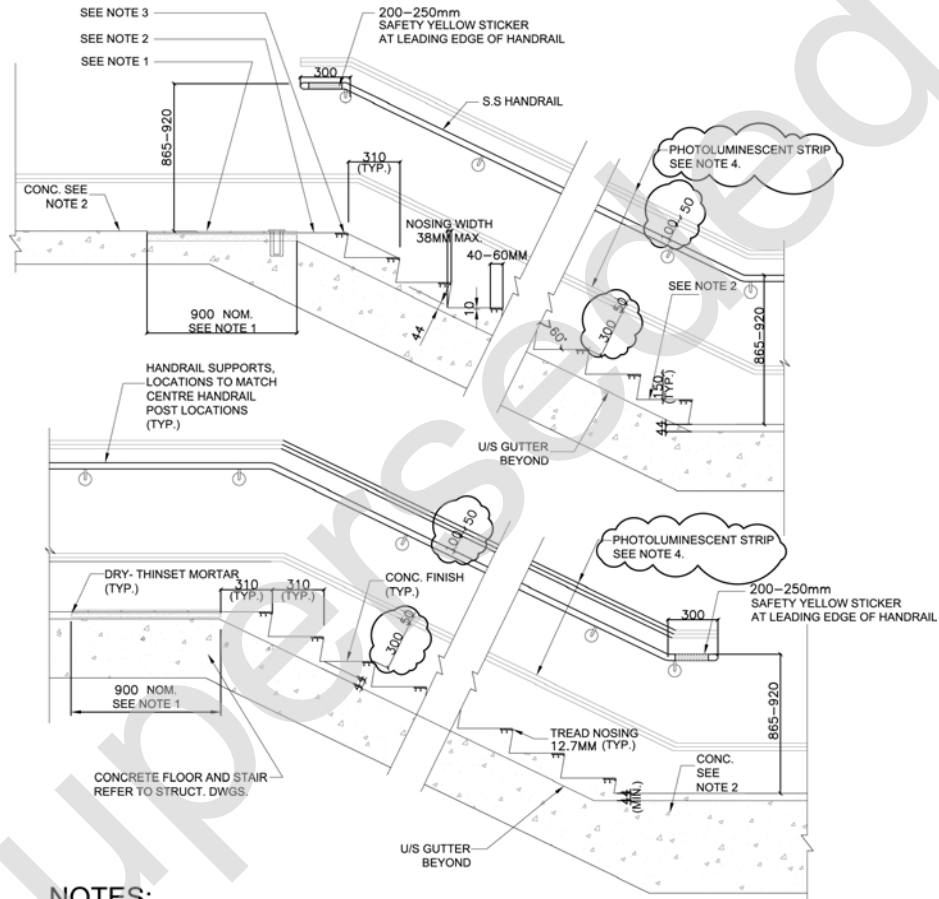
CI-0404

**TAB 4: STATION & TERMINAL BUILDING INFRASTRUCTURE**  
Stairs & Stair Enclosures

FIGURE: TILES AT RAMP / STAIR APPROACH (SECTIONS)

**SECTION:**  
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**FIGURE:**  
Tiles at  
Ramp / Stair  
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3. CAST IN SAFETY NOSING (50mm +/- 10mm) ON AN EXTRUDED ALUMINUM CARBORUNDUM BASE W/ EPOXY OR ABRASIVE FILLER/GRIT; EXTENDING THE FULL WIDTH OF THE TREAD REFER CSA B651-04 & CNIB STANDARDS FOR SLIP RESISTANCE & COLOUR CONTRAST REQUIREMENTS.

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CI-0701

**TAB 7: TECHNICAL DISCIPLINES**  
Architectural

Area	Description
	<p>storage;</p> <ul style="list-style-type: none"><li>&gt; Staff lockers may be prefabricated, pre-finished metal lockers with recesses to house padlocks (staff private padlocks)</li><li>&gt; The CCTV rack recess shall be finished with the same plastic laminate as cabinet fronts;</li><li>&gt; The Communications cabinet top part interior shall be laminate;</li><li>&gt; Pull handles shall be stainless steel bow-shaped contemporary smooth and streamlined design fastened from the inside with tamper-proof screws;</li><li>&gt; The staff washroom vanity shall have back and side-splashes and the same lower cabinet door pulls as noted above;</li><li>&gt; If a sink is located (in a large terminal station attendant kitchenette) in a cabinet, the cabinet shall have a back-splash full height to any cabinets above or a ceramic tile wall finish shall be provided behind the sink to a minimum height above the regular laminate backsplash of 600 mm (or equal, TBD); and</li><li>&gt; The 10 mm tempered glass above the ticket counter shall be set into a 6 mm deep groove in the solid surfacing polymer. The glass edge shall be polished and bull-nosed continuously. Securement of the glass shall be with clear silicone with no residue on the countertop or into the cash scoops spanned by the glass.</li></ul>
Photoluminescent Strips	<ul style="list-style-type: none"><li>&gt; Photoluminescent strips to be a minimum 50mm wide (2").</li><li>&gt; Strips to be installed in such manner that they can easily be removed and replaced</li><li>&gt; Strips to be resistant to cleaning products, slat and other chemicals, durable against wear and tear.</li><li>&gt; Strips to be mechanically fastened and must have ability to be mounted to various substrates singly or in combination and not limited to the following:<ul style="list-style-type: none"><li>-Cast in place concrete</li><li>-Precast concrete</li><li>-Concrete block</li><li>-Aluminium</li><li>-Metal/Steel</li><li>-Stainless steel</li><li>-Masonry</li><li>-Drywall</li></ul></li></ul>



CI-0701

**TAB 7: TECHNICAL DISCIPLINES**  
Architectural

Area	Description
	<ul style="list-style-type: none"><li>&gt; Fasteners to be rust and corrosion resistant. Consideration of fastener to be determined based on specific substrate conditions.</li><li>&gt; Strips to conform to the following regulatory standards:<ul style="list-style-type: none"><li>-CAN/ULC-S572-10 Standard for Photoluminescent and Self Luminous Exit Signs and Path Marking Systems.</li></ul></li></ul>

Superseded



CI-0703

**TAB 7: TECHNICAL DISCIPLINES**

Electrical

Station locations with a high probability of vandalism shall have extra bright illumination, if required and viable in terms of adjacent neighbourhoods.

**Uniformity Ratio**

Maximum to minimum: 4:1 or better

Average to minimum: 3:1 or better.

**LIGHT SOURCES AND CONTROLS**

INTERIOR LIGHTING SOURCES AND CONTROLS		
Location	Light Source	Control and Backup
Waiting	LED down lighting LED sconce lights	Time-of-day controller, 100% station open hours, 10% minimum station closed, 10% on Generator. Day light harvesting were possible.
Station Attendant	LED, continuous task lights over counters with parabolic lenses for glare-free illumination (no visible light source)	Local switches. One fixture UPS + Generator backed-up over sales counter, one over cash area and safe, or 10% minimum station closed
Staff Washroom	Mirror task light or surface mounted LED vandal resistant lenses	Occupancy sensor switch. One luminary on UPS + Generator
Public Washroom	LED, vandal resistant luminaries or valance or cove lights for large facilities	On/Off switch with occupancy sensor, one fixture on UPS + Generator
Electrical, Comms., Mechanical, Janitor, and Storage Rooms.	Linear LED 1219 mm long or surface mounted luminaries vandal resistant	On/Off switch with occupancy sensor, 50% on UPS + Generator in Mechanical, Electrical and Comms. Rooms only
Shop	Linear LED 2438 mm long, suspended. Task lights over equipment and workbenches to suit functions	Local switching or to suit particular application, 10% on UPS + Generator
Garage Maintenance Shop	LED for shops. LED Task lights where required	Panel or central switching to suit particular application. 10% on UPS + Generator or to Code requirements
Dispatch	LED, and supplementary illumination for maintenance with task lights to suit	Local switches, dimmers, 10% on UPS + Generator.
Office	Per IES	10% on UPS + Generator



CI-0703

**TAB 7: TECHNICAL DISCIPLINES**  
Electrical

**EXTERIOR LIGHTING SOURCES AND CONTROLS**

Location	Light Source	Control and Backup
Parking Lot, Passenger Drop-off and Pick-up Areas, and Bus Loop Areas including Bus Platforms and Access Roads	LED area lights or down lights on 6 or 12 m high galvanized steel poles or 30m high masts (use of LED on 30m high masts approved by GO Transit on a case by case basis). See Notes below.	Circuited for 30% in operation during station closed hours (photo-control only) and to have manual override of the photo control and time-clock (the manual override shall not be digital)
Parking Structure	LED	Day light harvesting and occupancy sensor control of two light levels and timer
Rail Platform	LED on 6 m hinged poles on 300 mm high concrete bases or in canopy. Urban platforms may require LED or Metal Halide luminaries if requested by the Municipality	Both timer and photo cell controlled, on Generator. During station closed hours 100% off. Override switch (snow removal use): 100% on
Mini-Platform	Same as Rail Platform	Controlled as part of Rail Platform
Tunnel, enclosed bridges and canopies	LED , 1219 mm long, c/w vandal resistant lenses, lights should be dimmable, when space not occupied	Breaker control, 30% on UPS + Generator
Internal Stairwell (tunnel, parking structure)	LED luminaries, semi-recessed in walls, below handrails	Breaker control, 30% on UPS + Generator
Exterior Stair and Walkway	Same as parking lot, Pole location to suit	Same as parking lot



CI-0703

**TAB 7: TECHNICAL DISCIPLINES**

Electrical

The Consultant shall examine the different alternatives of parking lot illumination design: high mast, flood lighting and area lighting. Generally, stations near residential areas shall have area lighting. (Flood lighting should be avoided where ever possible) Where floodlighting is used, upward glare shall be addressed and minimized. High mast lighting shall be considered for parking lots in industrial areas.

For ease of lighting maintenance, large areas (tunnel, bride, waiting area, boardrooms, lunch rooms, maintenance facilities, etc) lighting shall have at least two sources of light control.

**LED LIGHTING MINIMUM REQUIREMENTS**

- > LED light fixtures shall be warranted for a minimum of 5 years.
- > LED light fixtures shall work with the available power supply on site. Every fixture shall have surge suppression.
- > Fixtures' lighting efficiency shall equal the most current industry accepted standard. The lighting efficiency shall not be achieved by overdriving the LEDs.
- > The LEDs in the fixture must be of the same colour temperature. LEDs with CRI below 75 are not acceptable for indoor lighting.
- > Colour temperature of LED light fixtures shall be uniform throughout the area
- > Fixtures shall be provided with a lighting facts label. Outdoor fixtures must have an IP65 general use rating. For locations subject to high pressure washing (tunnels, platforms or parking structures) the fixtures shall have an IP 66 rating.
- > The lighting design shall be such that the specified minimum lighting levels shall be maintained for a minimum of 15 years
- > The fixture shall meet LM 79 rating and the chips shall meet LM 80 rating. LED B50 and L70 lifetime graph shall be provided.
- > The fixture must be vandal resistant and shall be modular in design for easy upgrade of the LED light engine, simple maintenance (straightforward part replacement) and installation.
- > The component connections shall be of plug-in type, tool-less removal and replacement.
- > The fixture shall be dark sky compliant, with good light control and minimum to no glare.



CI-0703

**TAB 7: TECHNICAL DISCIPLINES**

Electrical

- > Lens, if required, shall be flat tempered glass, unless otherwise noted.
- > The fixtures shall have network connectivity and be remotely dimmable.

**LIGHTING CONTROL DESIGN CRITERIA**

**EARLY MORNING PERIOD**

One half (1/2) hour before the first AM train:

- > Platform, platform canopy, platform shelter, information signs and shelters, and building canopy lighting to be 100% ON.

One half (1/2) hour before the first AM bus:

- > Bus loop and bus loop shelter lighting to be 100% ON.
- > Parking lot lighting shall be 100% ON.

Where applicable, illuminated Station ID signs to turn ON 1/2 hour before the first AM bus or train, whichever is earlier.

All lights to turn OFF once the light levels are high enough that the photocell turns the exterior lights off.

**EVENING PERIOD**

One (1) hour after the last PM train:

- > Platform, platform canopy, platform shelter, information signs and shelters, and building canopy lighting to be 100% OFF.
- > Building canopy security lighting (i.e. 30% or better, as determined by Station Services) to remain on where ON/OFF is to be controlled by photocell.
- > Parking lot lighting to drop to security lighting (i.e. 30% or better, as determined by Station Services).
- > Illuminated Station ID sign to turn OFF.

One (1) hour after the last PM bus:



CI-0407

**TAB 4: STATION INFRASTRUCTURE**  
Rail Platforms and Corridors

**DESIGN REQUIREMENTS**

Feature	Description
	UV stable pigmented asphalt surfacing system with glass beads.
Rail Platform Curbs	<ul style="list-style-type: none"> <li>&gt; Rail platform curbs at track-side, including mini-platform curbs shall be sealed pre-cast concrete, or sealed cast-in-place concrete. See Figure for Precast Rail Platform.</li> </ul>

**MINIMUM PLATFORM WIDTHS**

<b>DESIGN REQUIREMENTS</b>		
<b>Conditions</b>	<b>Minimum Acceptable Dimension</b>	<b>Criteria</b>
All new rail platform construction.	<b>2.4m (8'-0")</b> (inclusive of the 0.6m distance from the platform safety line to the edge of the rail platform curb)	<b>Preferred clearance width</b> for passenger circulation, waiting and maintenance equipment zone from edge of platform to platform structures
Where <b>2.4m (8'-0")</b> clearance is not achievable due to site constraints and existing conditions.	<b>2.1m (6'-10 ¾")</b> (inclusive of the 0.6m distance from the platform safety line to the edge of the rail platform curb)	<b>Minimum allowable clearance width</b> for passenger circulation, waiting and maintenance equipment zone from edge of platform to platform structures
Permitted for passenger circulation only areas where <b>2.1m (6'-10 ¾")</b> is not achievable due to site constraints.	<b>1.7m (5'-7")</b> (inclusive of the 0.6m distance from the platform safety line to the edge of the rail platform curb)  Note:  The 1.7m (5'-7") minimum passenger circulation zone from edge of platform to platform structures was determined	<b>Minimum passenger circulation zone</b> , edge of platform to platform structures clearance



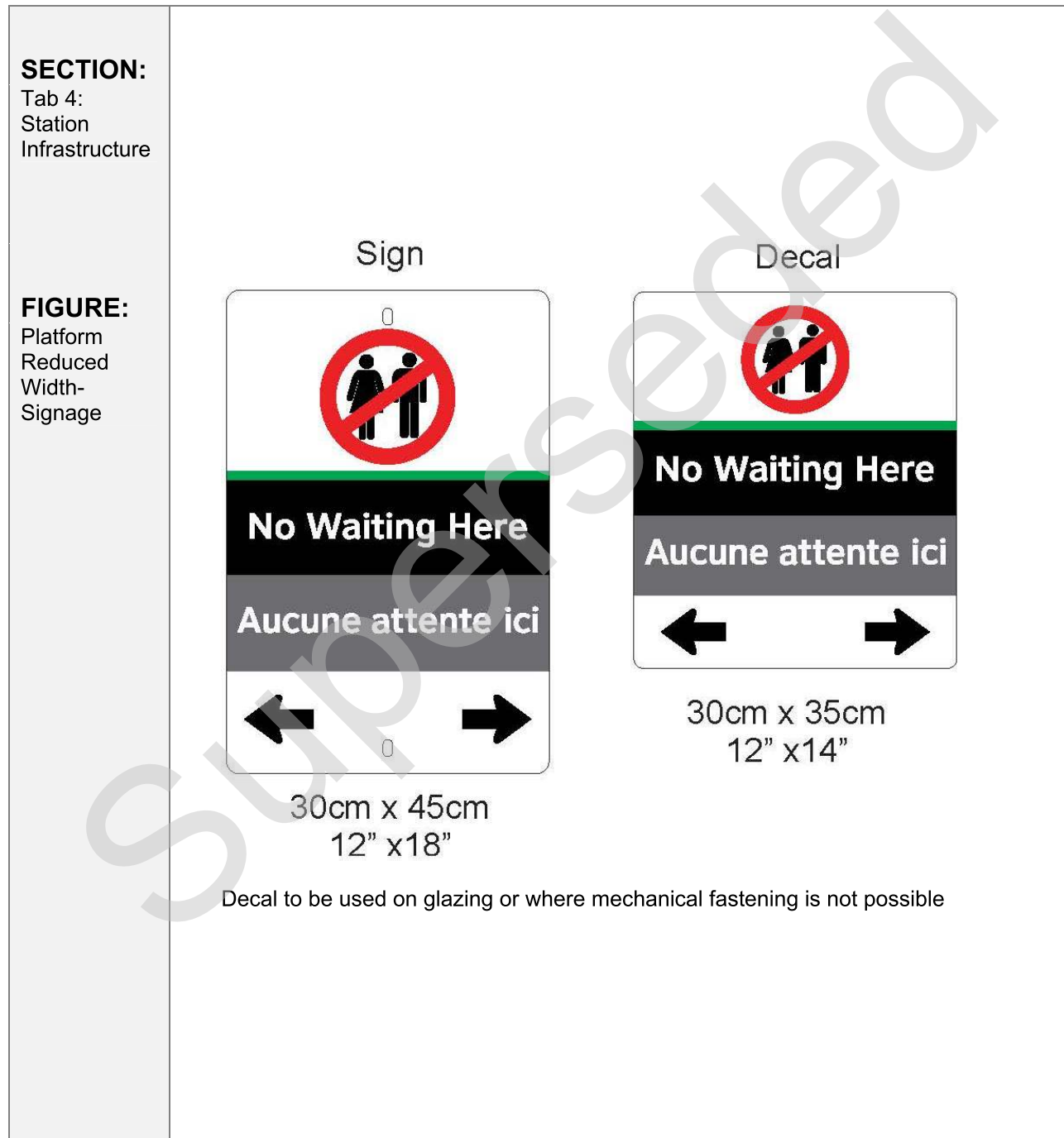


CI-0407

**TAB 4: STATION INFRASTRUCTURE**  
Rail Platforms and Corridors

	<p>by OBC requirements for minimum unobstructed width for the passage of wheelchairs by the following calculation:</p> <p>Minimum unobstructed width for the passage of wheelchairs as prescribed in the OBC + distance from the platform safety line to the edge of the rail platform curb = 1.1m +0.6m = 1.7m to the edge of the rail platform curb.</p>	
<p>When the minimum passenger circulation zone, edge of platform to platform structures clearance of <b>1.7m (5'-7")</b> cannot be met due to existing site conditions including tapered platforms..</p> <p>Augment with yellow painted hatch markings on the platform (see attached sketch) augmented by warning signage indicate the reduced clearance.<b>(See related signage and figure below)</b></p> <p>Location and orientation of signage as per site conditions. Final layout and specifications to be approved by GO Transit Signage Services and GO Transit Design Standards.</p>	<p><b>&lt; than 1.7m (5'-7")</b> (inclusive of the 0.6m distance from the platform safety line to the edge of the rail platform curb)</p>	<p><b>Reduced clearance width</b> for passenger circulation and maintenance equipment zone from edge of platform to platform structures</p>



**CI-0407****TAB 4: STATION INFRASTRUCTURE**  
Rail Platforms and Corridors**FIGURE: SIGNAGE-REDUCED PLATFORM WIDTH**



CI-0101

**TAB 1: GUIDING PRINCIPLES**  
Corporate Context and Principles

The likelihood and nature of development in the immediate vicinity of individual station sites shall be identified prior to the design of each station to ensure that integration into any development is consistent with GO Transit’s present and future interests.

**MATERIAL, MAINTENANCE AND CLEANING**

The criteria outlined herein are an indication of the minimum requirements that are to be met to satisfy both our standards, station operations and corporate identity/branding. All sites, structures, materials, equipment, etc. shall be designed and constructed based on efficiency, necessity, durability, quality, and aesthetics. As a publicly funded service, it is of utmost importance that all projects undertaken are current and innovative while ensuring safety, security, ease of use, and proper maintenance for the benefit all its users.

All materials specified for exterior weather exposure must be able to withstand sever conditions – rain, snow, de-icing chemicals, salts – and shall be of non-corrosive character. Materials and their components, such as fastening devices, shall be of the same material or be provided with a protective coating or cover to ensure corrosion and deterioration does not occur. All materials shall also take into consideration safety, such as the use of non-slip flooring and the selection of non-toxic materials. They shall, as much as possible, be locally sourced or be a certified eco-friendly product.

All built structures, such as station buildings, shelters, platforms, ramps, and exterior stairs, shall be safe, easy to navigate, and be attentive to materiality and longevity of its components. All structures and their selected materials and finishes shall be designed for the ease of on-going maintenance and cleaning programs aimed at reducing operating costs. All equipment and supplies necessary for normal on-going maintenance and cleaning operations shall be readily available on each level of each station.

**PASSENGER COMFORT AND CONVENIENCE**

The Designated Waiting Area (DWA) at GO rail line stations is to be located at the rail mini platform. It is intended to be a convenience feature where a customer can expect to avail themselves of assistance and have a reasonable sense of safety. The DWA has augmented functionality and visibility at the rail line station mini platform.

**PROVISIONS FOR PASSENGERS WITH SPECIAL NEEDS**

GO provides amenities for customers with special needs. Customers with special needs include:

- > Customers who use mobility devices
- > Customers who have hearing or sight impairment
- > Customers who are elderly or ill
- > Customers who travel with children



CI-0701

**TAB 7: TECHNICAL DISCIPLINES**  
Architectural

**FINISHES**

**BASIS OF CRITERIA**



**FINISHES**

Floor finishes shall be non slip and shall retain their slip resistance under both wet and dry conditions. Where floors are carpeted, the carpet is of firm, dense construction and easy for a wheelchair user to roll over without difficulty. Thresholds shall be bevelled to accommodate different floor materials.

Walls in busy areas, corridors, ramps or staircases shall be finished in smooth, non-glossy, non-abrasive finishes. Colour of doors or door frames in hallways shall contrast with surrounding wall colours.

Fire exit doors, fire hose cabinets and fire extinguishers shall be consistently coloured in a high contrast colour throughout the building, so that they are easily distinguishable.

**SYSTEM IMAGE**

Materials shall suit the overall GO operations context. In order to maintain a unified system image and to control capital and operating costs, all materials shall be selected from a family of materials as follows:

**AVAILABILITY OF MATERIALS**

Materials selected shall have matching replacement stock available for the expected life of the material.

**APPEARANCE OF MATERIALS**

Materials selected shall:

- > Be visually and tactilely pleasing;
- > Avoid creating floor patterns that are disorienting to patrons moving across them due to high contrast or distracting patterning;
- > Facilitate passenger guidance, information, safety, and security in a manner that contributes to overall design excellence; and
- > Be selected so the colour is consistent with system-wide identity colours, be compatible with the facility's surroundings, and of sufficient contrast and accent to attract the eye, convey feelings of warmth, and conceal minor soiling.



CI-0701

**TAB 7: TECHNICAL DISCIPLINES**  
Architectural

**SAFETY**

- > Materials shall be selected so as to reduce the risk of hazard to patrons and maintenance staff and shall have the following safety considerations:
- > Fire resistance of facilities shall be maximized, and smoke generation hazard from fire shall be reduced, by using finish materials with minimum burning rate, smoke generation, and toxicity characteristics consistent with Code requirements.
- > Proper fasteners and adequate bond strength shall be used to minimize hazards from dislodgment due to temperature change, vibration, wind, seismic forces, aging, or other causes, such as vandalism.
- > Floor materials with non-slip qualities shall be utilized to increase pedestrian safety and accommodate the needs of individuals with disabilities.
- > Stairways, walkways, platform edge strips, and areas around equipment shall have high-friction, non-slip properties. All specified floor materials shall be resistant to damage from common de-icers.

**SUSTAINABLE DEVELOPMENT**

- > Material selection, where possible, should reflect green initiatives of sustainable development. Although GO buildings are not LEED accredited, general compliance is encouraged.

**DURABILITY AND PERFORMANCE**

Following are standards and guidelines for selecting materials for durability and adaptability:

- > Materials with excellent wear, strength, and weathering qualities shall be used, and shall be generally durable and hard-wearing with due regard to both initial replacement costs and required maintenance.
- > Materials shall maintain their good appearance throughout their useful life and shall have a minimum twenty-five (25) year performance capability.
- > For ceiling and canopy finishes/systems and their application, materials shall allow for commissioning, adjustment, and future retrofitting of subsystems such as CCTV and public address systems.

Materials should also be:

- > Easily maintainable and repairable.
- > Of high quality and installed at high levels of workmanship.



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### TAB 7: TECHNICAL DISCIPLINES

#### Architectural

- > Selected with consideration to the total acoustic environment, so as to minimize reverberation while meeting other design and performance criteria.
- > Selected with respect to costs by balancing initial material costs against long-term maintenance costs.
- > Easily replaced/repared, such as by including a wear surface separate from the structural slab to facilitate replacement when a floor is in a heavy wear area.
- > Chosen, where appropriate, with reference to the potential need for access to service ducts, etc.
- > Shall be chemically inert, acid and alkali-resistant, dense, non-porous and non-staining.
- > All materials shall be able to withstand corrosion and uphold its intended use and function, and maintain its appearance (no rusting or fading in colour).

#### **MAINTENANCE AND CLEANING**

Finishes shall be selected for ease of cleaning, repair, or replacement.

The following provides further direction regarding maintenance of materials:

- > Materials shall resist soiling and be cleanable with commonly used equipment and environmentally benign cleaning agents.
- > Platform enclosures, tunnels and walking surfaces shall utilize materials that are not damaged by pressure washing.
- > Access to windows for cleaning shall not be obstructed except where absolutely necessary (required structural member, etc.). Windows above ground level should be placed such that they can be accessed from below using a lift, and accessing windows for cleaning should not require getting into traffic or onto tracks.
- > If cleaning or replacing windows or maintaining a structure requires access by rappelling down the side of the structure, then safety tie-off anchors shall be provided per code.
- > To reduce inventory and maintenance costs, materials shall be specified that are readily available and can be easily repaired or replaced without undue cost or interference with facility operations.

#### **UNIT SIZE**

- > Units shall be large enough to reduce the number of joints yet small enough to facilitate replacement if damaged.



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### TAB 7: TECHNICAL DISCIPLINES

#### Architectural

- > Standardized grids should be designed wherever possible to accommodate for standardized glazing for windscreens and vertical elements of shelters.
- > Elevator glazing shall meet dimensional standards whenever possible.

#### **APPROVED STANDARDS**

- > Selected materials shall be CSA approved and meet ULC or other appropriate standard.

#### **INSTALLATION AND APPLICATION**

- > Materials shall be detailed and specified to be installed in accordance with industry standards and manufacturers printed directions for long life, low maintenance, and compliance with warranty requirements.
- > All materials shall be installed using tested and proven methods, in accordance with established trade standards.
- > All materials, hardware and fasteners shall be able to withstand the anticipated pressures of ground-borne vibration, as well as air pressure changes generated by wind and by the passage of the GO Transit vehicle.
- > Whenever possible, wearing surfaces in public areas shall be designed and installed in unit sections separate from their structural bed, to facilitate removal for repairs and/or replacement.
- > All materials shall be secured in a manner which deters and prevents tampering and vandalism.
- > Installation of materials shall generally facilitate their removal without affecting the integrity of adjacent materials.

#### **COLOUR, PATTERN, TONAL CONTRAST AND TEXTURE**

- > Colour, pattern, tonal contrast and texture may be used in stations providing they do not conflict with other functional requirements of the station.
- > Colours shall exclude dedicated corporate and signing colours except for those purposes. They shall be sufficiently reflect to contribute to the overall lighting of the station.
- > Use noticeably different colours to distinguish the different key building elements. The recommended colour and brightness contrasts of key building elements by the Accessibility Standards Is 70% or more.
- > Some good colour contrasted combinations as recommended by the CNIB are: Black/white ; Yellow/black; Chocolate brown/ white; Dark blue/white; Dark red/white; Dark green/white; Dark purple/white; Orange/black





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### TAB 7: TECHNICAL DISCIPLINES

#### Architectural

- > Integral and applied colours shall be selected which resist undue fading in the environment in which they are used.
- > Textures shall not conflict with those used in the information and guidance system. Those subject to direct contact by passengers shall not be abrasive.
- > The effect of textured surfaces on lighting and acoustics shall be considered.
- > Materials with staining and colour shall have through-colour properties and non-fading characteristics to maintain their appearance and true colour over time.
- > Finishing of steel shall be appropriate to the location of the material, i.e. exterior vs. interior.
- > All interior finish steel (such as handrails) shall be stainless steel unless otherwise noted.
- > All exterior finish steel shall be stainless steel or galvanized. Anchors and fasteners as required shall match with fixture. Mixing of materials is not recommended.
- > Finishing of steel in the field shall be kept to a minimum by designing structures that can be shop fabricated in sections, primed, and finished in the shop, and bolted together on site. Designers shall minimize field welding and touch up galvanizing and painted wherever possible.
- > Any galvanized metals to receive a paint finish shall be factory primed and painted. Field painting on site is not acceptable.
- > Finishing of steel shall be completed with satin finish and high performance coatings wherever possible. Finishing of steel in the field shall be kept to a minimum by designing structures that can be shop fabricated in sections, primed and finished in the shop, and bolted together on site. Designers shall minimize field welding and touch up galvanizing and painting wherever possible.
- > Glare and unnecessary reflectance from building surfaces shall be avoided.

#### **PUBLIC AREAS – GENERAL CRITERIA**

- > Sound attenuating materials shall be used as required to minimize noise levels.
- > Public areas are subject to intensive use and hard wear. They shall be divided into high and low contact zones to identify those areas particularly susceptible to public contact.

#### **HIGH CONTACT ZONE**

- > This zone covers areas within normal passenger reach and extends from the floor, up to 2.5 m above the floor.
- > Ceilings less than 3.8 m shall Also be treated as High Contact Zones.



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**TAB 7: TECHNICAL DISCIPLINES**

Architectural

- > The selection of materials for use in this zone shall reflect outstanding durability, especially in and around passenger circulation routes or public amenities.
- > Finishing materials used in the lowermost 500 mm of this zone must be unaffected by salt and slush, and shall be capable of being quickly and easily cleaned.
- > Edges of finishing materials shall be reinforced where vulnerable to damage. This includes platform edges, stair nosings, outside corners and projecting sills.
- > Paint applied to walls, ceiling, etc. shall be graffiti-resistant.
- > Hardware and fastenings in this zone shall particularly discourage tampering.

**LOW CONTACT ZONE**

- > This zone is less susceptible to public contact and extends up from 2.5 m above the finished floor.
- > Materials in the Low Contact Zone are subject to less convenient service access, and are still vulnerable to vandalism, dirt and grime.



CI-0404

**TAB 4: STATION & TERMINAL BUILDING INFRASTRUCTURE**  
Stairs & Stair Enclosures



**BASIS OF CRITERIA**

Stair systems at GO installations not only provide a means of access and egress from platforms but also provide means of vertical travel and stairs form a route of travel for many people with disabilities, children, seniors, parents with strollers etc.

Poorly designed risers and nosing's can present tripping hazards, particularly to persons with prosthetic devices or those using canes. Cues to warn a person with low or no vision an upcoming set of stairs are vitally important who would benefit from colour and tonal contrasted nosing's and handrails, detectable landings and adequately illuminated stair systems.

Shall be clearly marked, located near the major circulations routes and offset from the direct route of travel so that they are not a hazard and easy to find. Stairs shall have uniform riser heights and tread depths; with nosing's, handrails, landings, etc., detectable by persons with vision loss.



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**TAB 4: STATION & TERMINAL BUILDING INFRASTRUCTURE**  
Stairs & Stair Enclosures

INTERIOR AND EXTERIOR STAIRS

(ALL INTERIOR AND EXTERIOR STAIRS SHALL COMPLY WITH THESE REQUIREMENTS)

FEATURE	DESCRIPTION
Perimeter Walls of Stairs and Elevator Vestibules	<ul style="list-style-type: none"> <li>&gt; Perimeter walls of stairs and elevator vestibules shall be fully glazed where possible.</li> <li>&gt; Stairwell walls shall have surface mounted photoluminescent strips at 0.3m above stair nosing's and landings. Strips to be installed continuously along entire length of stairwell wall transitioning in a continuous manner at tunnel level. Refer Tab 4 CI-0403 Tunnels for detailed information on stair/tunnel interface of photoluminescent strips.</li> <li>&gt; Photoluminescent strips are NOT required above stair nosing's at locations within the stairwell that are directly adjacent to open glazing areas with natural light.</li> </ul>
Stairwell Openings	<ul style="list-style-type: none"> <li>&gt; Stairwell openings shall be extended across tunnels where possible for day-lighting and to reduce the apparent tunnel lengths.</li> <li>&gt; Concrete sealed walls to be protected by clear non-sacrificial anti-graffiti coating.</li> </ul>
Handrails	<ul style="list-style-type: none"> <li>&gt; Stair centre handrails shall terminate at landings to permit crossover.</li> <li>&gt; Stairwell walls (both sides) shall have surface mounted photoluminescent strips at 0.1m above top of handrail. Strips to be installed continuously along entire length of wall above the handrail terminating at the end of the handrail extension.</li> <li>&gt; Photoluminescent strips are NOT required above the handrail at locations in within the stairwell that are directly adjacent to open glazing areas with natural light.</li> <li>&gt; Exterior stair and ramp handrails shall commonly be Stainless Steel. All anchorage and fittings shall also be stainless steel or to match materiality of handrail. Mixing of materials is not recommended. Exterior stair and ramp handrails shall be smooth galvanized or stainless steel where continuity of handrail from interior to exterior is direct (to be determined on case-by-case basis).</li> </ul>



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**TAB 4: STATION & TERMINAL BUILDING INFRASTRUCTURE**  
Stairs & Stair Enclosures

INTERIOR AND EXTERIOR STAIRS

*(ALL INTERIOR AND EXTERIOR STAIRS SHALL COMPLY WITH THESE REQUIREMENTS)*

FEATURE	DESCRIPTION
	<ul style="list-style-type: none"><li>&gt; Interior stair and ramp, tunnel stair, and bridge stair handrails and fastening shall be stainless steel.</li></ul>
Stair Enclosures	<ul style="list-style-type: none"><li>&gt; Stair enclosures can be stand alone or combined with elevator enclosures, where applicable.</li><li>&gt; Photoluminescent strips are NOT required above the stair nosing's or above the handrail at locations in within the stairwell that are directly adjacent to open glazing areas with natural light.</li><li>&gt; Island platform stair enclosure wall glazing shall extend for the full length of the stairwell, and where possible over the tunnel to provide daylight into the tunnel.</li></ul>
Trackside Glazing	<ul style="list-style-type: none"><li>&gt; On side platforms the trackside glazing shall be maximized, and the opposite side shall also be glazed, if accessible for maintenance, or it shall be a solid wall if requested by GO or the municipality (glazed walls are preferred as being graffiti resistant).</li></ul>
Floor Elevation	<ul style="list-style-type: none"><li>&gt; Floor elevation to be set to provide positive slope from the doors to the platform</li></ul>



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**TAB 4: STATION & TERMINAL BUILDING INFRASTRUCTURE**  
Stairs & Stair Enclosures

**STAIR MATERIAL**

*(ALL STAIR MATERIAL SHALL COMPLY WITH THESE REQUIREMENTS)*

<b>FEATURE</b>	<b>DESCRIPTION</b>
Floor	<ul style="list-style-type: none"><li>&gt; Concrete floor, broom finished, sealed.</li></ul>
Base	<ul style="list-style-type: none"><li>&gt; Concrete wall base, to be sandblasted finish, and sealed, no paint.</li><li>&gt; To prevent snow plough damage and salt deterioration of the superstructures, the base shall be 600 mm high (minimum) above the platform.</li><li>&gt; The top of the base shall slope on the exterior as a sill, away from the glazing.</li></ul>
Handrails	<ul style="list-style-type: none"><li>&gt; Stair centre handrails shall terminate at landings to permit crossover.</li></ul>



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**TAB 4: STATION & TERMINAL BUILDING INFRASTRUCTURE**  
Stairs & Stair Enclosures

STAIR ENCLOSURE

(ALL STAIR ENCLOSURE WINDOW WALLS SHALL COMPLY WITH THESE REQUIREMENTS)

FEATURE	DESCRIPTION
Structure	<ul style="list-style-type: none"> <li>&gt; Frameless with silicone butt-joint glazing, with top and bottom stainless steel glazing channels.</li> <li>&gt; Structural steel framing shall not be exposed to the salt-corrosive atmosphere of the rail platform and must be contained within the building envelope. Fully glazed enclosures with stainless steel framing system. All exposed structural steel framing, including all anchors and fasteners, shall be non-corrosive. Ensure all exposed members are resistant to severe weather conditions and elements, including de-icing chemicals and salts. Provide appropriate protective coatings or cover plates as required.</li> </ul>
Glazing	<ul style="list-style-type: none"> <li>&gt; Glazing shall be clear, fully-tempered, designed for local wind loads and high speed train turbulence (including door glazing).</li> <li>&gt; Glass in doors and sidelights that could be mistaken for doors shall have horizontal framing or decals and located as per CNIB guideline. Such decals shall be applied to glass surface. Decal colour to be highly visible.</li> </ul>
Cladding	<ul style="list-style-type: none"> <li>&gt; Designed to minimum 1.0 kPa Reference Wind Pressure, with appropriate gust factor and wind pressure coefficients applied to the RWP.</li> <li>&gt; Cladding material, especially for canopies, soffits and fascia's must be designed for wind turbulence generated by high-speed trains.</li> <li>&gt; Roofing shall also resist train turbulence.</li> <li>&gt; Shingled roofs shall not be used on platform buildings (unless rigid material).</li> </ul>
Guardrails	<ul style="list-style-type: none"> <li>&gt; Guardrails shall be provided behind the window walls of stair and elevator wells, for safety in the event of glass breakage.</li> <li>&gt; Guardrails that come in contact with passengers, both interior and</li> </ul>



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**TAB 4: STATION & TERMINAL BUILDING INFRASTRUCTURE**  
Stairs & Stair Enclosures

STAIR ENCLOSURE

*(ALL STAIR ENCLOSURE WINDOW WALLS SHALL COMPLY WITH THESE REQUIREMENTS)*

FEATURE	DESCRIPTION
	<p>exterior conditions, stainless steel to be used.</p> <ul style="list-style-type: none"><li>• Rectangular HSS or pipe guardrails shall be mounted on the inside face of columns.</li><li>• Where required due to column spacing, the guardrail shall be supported by intermediate stanchions fixed to the inside face of the base foundation wall.</li><li>• Height of guardrails: to code minimum above platform level;</li></ul> <p>&gt; Space for window washing shall be provided between columns/guardrails and glazing.</p>
Wiring	<p>&gt; Both vertical and horizontal wiring conduits shall be concealed and integrated with the structure.</p>
Clearance	<p>&gt; The minimum acceptable platform edge clearance for stair enclosure buildings is 2.44 m, areas which do not meet the minimum stated platform edge clearance should be marked with a conspicuous yellow painted hatch augmented by warning signage indicating the reduced clearance. Reduced platform edge clearances should be approved by GO staff prior to design.</p>





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**TAB 4: STATION & TERMINAL BUILDING INFRASTRUCTURE**  
Stairs & Stair Enclosures

ROOF DESIGN

*(ROOF DESIGN SHALL COMPLY WITH THESE REQUIREMENTS)*

FEATURE	DESCRIPTION
Live Loads	<ul style="list-style-type: none"> <li>&gt; Live loads shall be determined in accordance with Part 2 and Part 4 of the Ontario Building Code</li> </ul>
Overhanging, sloped, vaulted, or arched roofs	<ul style="list-style-type: none"> <li>&gt; Overhanging, sloped, vaulted or arched roofs shall have snow guards and built-in concealed gutters, with heat-tracing if warranted, especially over door locations</li> </ul>
Rain Water	<ul style="list-style-type: none"> <li>&gt; Rainwater leaders, both vertical and horizontal, shall be concealed or recessed to provide protection against damage due to parking, snow clearing, vandalism, and corrosion. Sheet metal covers are not acceptable. At minimum, heavy gauge galvanized cover plates or guards shall be provided as a means of protection from damage and shall be designed accordingly</li> <li>&gt; Exposed rainwater leaders shall be designed as an integrated element of the building architecture and shall be properly detailed. All exposed fasteners are to be stainless steel or galvanized to match the material the leader is to be anchored to. Mixing of materials is not recommended.</li> <li>&gt; Rain water leader shall be connected to storm drainage system, wherever possible.</li> <li>&gt; Side platform stair enclosure roof gutters can have scuppers or rainwater leaders draining to an adjacent swale or ditch. Rainwater leaders shall spill onto splash pads or grilles flush-set into pavement (over granular 'French drains').</li> <li>&gt; Sheet metal covers are not acceptable: heavy gauge galvanized metal guards shall be designed accordingly.</li> <li>&gt; Island platform rain water leaders shall be connected to the storm water drainage system.               <ul style="list-style-type: none"> <li>• Drainage onto platforms or tracks is not permitted.</li> <li>• Storm drains under-crossing tracks shall be encased</li> </ul> </li> </ul>



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**TAB 4: STATION & TERMINAL BUILDING INFRASTRUCTURE**  
Stairs & Stair Enclosures

ROOF DESIGN

*(ROOF DESIGN SHALL COMPLY WITH THESE REQUIREMENTS)*

FEATURE	DESCRIPTION
	according to Railway approval. <ul style="list-style-type: none"><li>• Roof sheet drainage is acceptable only for stand-alone pre-engineered platform shelters (GO standard platform shelters)</li></ul>
HVAC	> Roof mounted HVAC equipment to be fully screened.



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**TAB 4: STATION & TERMINAL BUILDING INFRASTRUCTURE**  
Stairs & Stair Enclosures

LIGHTING

*(LIGHTING SHALL COMPLY WITH THESE REQUIREMENTS)*

FEATURE	DESCRIPTION
Ceiling mounted luminaires	<ul style="list-style-type: none"><li>&gt; There shall be no ceiling mounted luminaires over stairwells due to maintenance access problems.</li></ul>
Ceiling Lighting	<ul style="list-style-type: none"><li>&gt; Ceiling mounted lights shall not be used where maintenance would require special equipment.</li></ul>
Stair Lighting	<ul style="list-style-type: none"><li>&gt; Stair lighting shall be recessed in the concrete walls below the handrails.</li><li>&gt; Stair lighting location shall be co-ordinated with placement of photoluminescent strip system.</li></ul>



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**TAB 4: STATION & TERMINAL BUILDING INFRASTRUCTURE**  
Stairs & Stair Enclosures

MECHANICAL REQUIREMENTS

*(MECHANICAL REQUIREMENTS SHALL COMPLY WITH THESE REQUIREMENTS)*

FEATURE	DESCRIPTION
Ventilation	<ul style="list-style-type: none"><li>&gt; Natural ventilation shall be provided, with louvers complete with fly screens, in door transoms and similarly in enclosure roof ends (gables).</li></ul>
Water Supply	<ul style="list-style-type: none"><li>&gt; Water supply to be provided to hose bibs at the platform level (see Mechanical Section for Design Requirements).</li><li>&gt; Water supply to be gravity drained for winter shut-off.</li></ul>
Pipes	<ul style="list-style-type: none"><li>&gt; Any pipes exposed in tunnels to be insulated against condensation and integrated with the tunnel structure by recessing, etc., and galvanized protective covers.</li><li>&gt; Recess all pipes where possible</li></ul>
Mirrors	<ul style="list-style-type: none"><li>&gt; Convex mirrors shall be placed at each stair landing.</li></ul>



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**TAB 4: STATION & TERMINAL BUILDING INFRASTRUCTURE**  
Stairs & Stair Enclosures

COMMUNICATION REQUIREMENTS

*(MECHANICAL REQUIREMENTS SHALL COMPLY WITH THESE REQUIREMENTS)*

FEATURE	DESCRIPTION
Communication	<ul style="list-style-type: none"><li>&gt; The architectural design shall accommodate CCTV cameras, the P/A system and related wiring conduits, including a pay telephone, if applicable.</li></ul>
Proof of Payment Equipment	<ul style="list-style-type: none"><li>&gt; Proof-of-payment fare equipment, if applicable, on 150 mm elevated bases.</li></ul>



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**TAB 4: STATION & TERMINAL BUILDING INFRASTRUCTURE**  
Stairs & Stair Enclosures

**DESIGN REQUIREMENTS**

The following requirements pertain to tunnel and exterior stairs, including stairs remote from buildings):

FEATURE	DESCRIPTION
Risers & Treads	<ul style="list-style-type: none"><li>&gt; Risers: 150 mm preferred.</li><li>&gt; Treads: 305 mm preferred.</li><li>&gt; The design shall not incorporate open risers; be slip resistant; have uniform treads and risers in any one flight and shall not alter significantly in run and rise in successive flights in any stair system.</li></ul>
Nosings	<ul style="list-style-type: none"><li>&gt; Stair nosings shall project not more than 38 mm and have no abrupt undersides.</li><li>&gt; Where projecting, be sloped to the riser at an angle greater than 60° to the horizontal; and the radius of curvature at the leading edge of the tread not more than 13 mm.</li><li>&gt; Nosings shall have a cast-in safety insert on an extruded aluminum or carborundum base with epoxy or abrasive filler that is minimum 40 mm +/- 10 mm deep and which:<ul style="list-style-type: none"><li>• Is located at the leading edge of the tread;</li><li>• Is tonal contrasted with the tread and riser; and</li><li>• Extends the full width of the tread.</li></ul></li></ul>
Detectable Waning Surface	<ul style="list-style-type: none"><li>&gt; Detectable warning surfaces at the top of stairs shall be provided:<ul style="list-style-type: none"><li>• At each landing incorporating an entrance into a stair system;</li><li>• Where the regular pattern of a stairway is broken; and</li><li>• Where the run of a landing not having a continuous handrail is greater than 2100 mm.</li></ul></li><li>&gt; The detectable warning surfaces shall:</li></ul>



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**TAB 4: STATION & TERMINAL BUILDING INFRASTRUCTURE**  
Stairs & Stair Enclosures

FEATURE	DESCRIPTION
	<ul style="list-style-type: none"><li>• Extend the full width of the stair;</li><li>• Have a depth of 920 mm (36 in), commencing one tread depth from the edge of the stair; and</li><li>• The cane-detectable warnings on this surface shall be colour and texture contrasted with the adjacent surfaces. Raised ridges shall be placed perpendicular to the direction of travel.</li></ul>
Edge Drain	<ul style="list-style-type: none"><li>&gt; Tunnel stairs shall have concrete drainage side-gutters 40 mm deep by 80 mm wide, continuous with the tunnel floor gutters.</li><li>&gt; Gutter drains shall not be located at the bottom of tunnel stairs or in front of service doors or elevator doors.</li></ul>
Handrails	<ul style="list-style-type: none"><li>&gt; Handrails shall be provided on both sides of all stairs.</li><li>&gt; Exterior stair and ramp handrails shall be smooth galvanized steel pipe, minimum 38 mm, and maximum 51 mm diameter, 915 mm above nosings or ramps.</li><li>&gt; All anchorage and fittings shall also be galvanized.</li><li>&gt; Tunnel stair or bridge stair handrails to be stainless steel 38 mm diameter, be mounted not less than 865 mm and not more than 965 mm high, measured vertically from a line drawn through the outside edges of the stair nosings.</li><li>&gt; All anchorage and fittings shall also be stainless steel. Handrail ends shall extend in accordance with the OBC and the OBC Illustrated Guide, also for exterior stairs.</li><li>&gt; Handrails shall be continuous around landings less than 2100 mm in length and placed on the inside edge of stairs; and<ul style="list-style-type: none"><li>• Have the rail extension return to the post, floor or wall;</li><li>• At the top of stairs, extend at least 300 mm (12 in) parallel to the floor surface;</li><li>• At the bottom of the stairs, continue to slope for a distance equal to the depth of one tread and then extend at least 300</li></ul></li></ul>



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**TAB 4: STATION & TERMINAL BUILDING INFRASTRUCTURE**  
Stairs & Stair Enclosures

FEATURE	DESCRIPTION
	<p>mm (12 in) parallel to the floor surface;</p> <ul style="list-style-type: none"> <li>• Have a circular cross-section with an outside diameter not less than 30 mm (1.2 in) and not more than 40 mm (1.6 in), or any non-circular shape with a graspable portion that has a perimeter not less than 100 mm (4 in) and not more than 155 mm (6 in) and whose cross-sectional dimension is not more than 57 mm (2 in);</li> <li>• Have a clearance of at least 50 mm (2 in) between the handrail and any wall to which it is attached or immediately adjacent to;</li> <li>• Be terminated in a manner that will not obstruct pedestrian travel or create a hazard;</li> <li>• Be designed and constructed such that handrails and their supports:</li> <li>• Will withstand the loading values obtained from the non-concurrent application of a concentrated load not less than 0.9 kN (202 lb.) applied at any point and in any direction; and</li> <li>• A uniform load not less than 0.7 kN/m (46.6 lb./ft.) applied in any direction to the handrail;</li> <li>• Be tonal contrasted with their surroundings and provided with a colour contrasted strip at the leading edges of the handrail at the top and bottom of the stair system;</li> <li>• Be installed with a photoluminescent strip installed on an extruded aluminium base along the stair rise; and</li> <li>• Where stairs are wider than 2400 mm, one or more intermediate continuous handrails between landings shall be provided</li> </ul>
Photoluminescent Strips	<p>&gt; Tunnel walls (both sides) shall have surface mounted photoluminescent strips at 0.3m above finished tunnel floor. Strips to be installed continuously along entire length of tunnel transitioning in a continuous manner to all stairwells. Refer Tab 4 CI-0404 Stairs and Stairwells for detail information and figures on stair/tunnel interface of</p>





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**TAB 4: STATION & TERMINAL BUILDING INFRASTRUCTURE**  
Stairs & Stair Enclosures

FEATURE	DESCRIPTION
	photoluminescent strips.

Superseded



CI-0702

**TAB 7: TECHNICAL DISCIPLINES**

Mechanical

- > Drum and tube heat exchanger with corrosion resistant steel components.
- > Location and installation of HVAC units should occur as far away as possible from Wash Bay Areas in Bus and Rail Maintenance facilities. Other high moisture areas should also be avoided when placing HVAC equipment. Hangers and fasteners should also be protected from the detergents and moisture or be fabricated of materials that are not subject to corrosion.
- > Discharge line thermostat, and phase monitor.
- > Units supplying high occupancy rooms, such as meeting rooms, shall be controlled by a carbon dioxide sensor, in order to modulate the outside air damper.

**ROOFTOP PACKAGED AIR HANDLING UNITS**

Heavy-duty industrial Air Handling Unit with the following features:

- > From a recognized manufacturer with proven product testing.
- > Double wall unit with 16 gauge steel sheet outer skin, 20 gauge steel sheet interior liner, and 50mm (2") thick insulated wall and roof panels.
- > 16 gauge chequered plate floor with reinforcement and insulation.
- > Fully hinged access doors, filter frames, and drains in every section.
- > Exterior paint shall meet ASTM B117.
- > ARI certified heating coils.
- > Heating shall be via hydronic coil when boiler plant is available.
- > Fans shall be centrifugal plenum type.
- > Non-overloading backward inclined Aluminium blades.
- > Heavy-duty weather tight and drainable stationary louvers.
- > Internal vibration isolation of the fan and motor.
- > Fully insulated and independent motorized dampers.
- > Lights in access compartments with switch on the unit exterior.
- > GFI receptacle.
- > Separate 120v for light and GFI receptacle.

**CI-0702****TAB 7: TECHNICAL DISCIPLINES**

Mechanical

**AIR CURTAINS**

Heavy-duty industrial Air Curtain with the following features:

- > From a recognized manufacturer with proven product testing.
- > Suited for blanketing the door width and minimum 50mm (2") overlap on each side.
- > Performance and air flow delivery shall be rated in accordance with AMCA Standard 211.
- > Belt drive motors shall be open drip-proof type, easily accessible for maintenance, and outside the airstream.
- > Blowers shall be centrifugal forward curved type and tested in accordance to AMCA Standard 210.
- > Minimum 14 gauge galvanized steel frame. Hangers and fasteners should also be protected from the detergents and moisture or be fabricated of materials that are not subject to corrosion.
- > Minimum 16 gauge galvanized steel casing. Hangers and fasteners should also be protected from the detergents and moisture or be fabricated of materials that are not subject to corrosion.
- > Maximum deflection of 6.35mm (0.25").
- > Inlet screens.
- > Outer air velocity pattern shall have over 90% uniformity over the entire length of the Air Curtain.
- > Complete factory-wired control panel.

**SPLIT HEAT PUMP A/C UNIT**

The split Heat Pump system shall have the following features:

- > High efficiency
- > Hyper heating at -25°C
- > Low ambient cooling at -5°C
- > R410A refrigerant
- > Variable speed compressor
- > Variable refrigerant flow



CI-0702

**TAB 7: TECHNICAL DISCIPLINES**

Mechanical

- > Auto restart after power failure
- > Hot start.

**FANS**

- > In public area and occupied spaces, low noise centrifugal fans shall be used.
- > Public area fan systems shall be provided with suitable attenuating silencers capable of maintaining space noise level no greater than NC40.
- > Airfoil or backward inclined design is preferred. Forward curved wheels may be used for low pressure applications.
- > Variable pitch axial fans should be considered for fan wheel diameters greater than 610mm and where system air volumes vary, due to control characteristics of summer/winter operation.
- > Propeller fans may be used where they serve non-public or unoccupied areas.
- > Additional ventilation with emergency power back-up may be required in large facilities, such as Willowbrook or Steeprock.

**ENERGY RECOVERY**

Energy Recovery Ventilators (ERV) shall be specified for energy conservation in all GO facilities, where practical and cost effective. In station buildings they shall be above the public washrooms or the janitor room, in the attic space, where applicable. Access by ceiling hatch.

**FILTERS**

Filters used in supply air systems shall be 50mm (2") thick throw-away type, with minimum efficiency of 30%.

**HEATERS**

Electric fan forced heaters shall be considered in the waiting area and entrances. Heaters can be wall or ceiling mounted. Heaters should be controlled by wall mounted space sensors.

Supplemental electric fan forced heater should be considered in the ticket sales area.

Electric resistance duct heaters shall have Silicon Control Rectifiers (SCR), minimum airflow switch, and two high-temperature limit sensors.

Gas fired unit heaters and infrared heaters shall be considered in large facilities.

**CI-0702****TAB 7: TECHNICAL DISCIPLINES**

Mechanical

In all shelters, CSA compliant electric infrared radiant heaters c/w factory installed protective wire cage and stainless steel or nickel chromium tubular heating element shall be suspended by chains or threaded rods at 2440 mm (8 ft.) above finish floor level and controlled by a push button and timer.

**DIFFUSERS**

Diffusers shall be aluminum. For perforated metal ceilings; diffusers to be perforated type to match the ceiling profile and colour. For high-traffic door locations, or where drafts are a problem with station attendants, linear diffuser air-curtains shall be provided at the doors.

**DUCTS**

Air ducts shall be galvanized sheet metal conforming to ASHRAE, SMACNA Duct Construction Standards, and NFPA 90A. Diffuser branch-ducts and air terminal ducts may be circular metal flex-ducts where concealed. Exposed ducts in public areas shall be aluminium spiral ducts. Hangers and fasteners should also be protected from the detergents and moisture or be fabricated of materials that are not subject to corrosion.

**FIRE DAMPERS**

Fire dampers shall be fusible link type conforming to ULC-S505. An access door shall be installed for inspection and resetting.

**CONNECTORS**

Flexible connectors shall be provided between vibrating equipment and connecting ducts.

**INSULATION**

Acoustical and thermal duct insulation shall be in accordance with the O.B.C. and ASHRAE 90.1. Acoustical insulation shall be provided to maintain a maximum room sound rating of 40dBA. Piping insulation shall be in accordance with ASHRAE 90.1, with PVC jackets.

**SYSTEM CONTROL**

HVAC systems shall be controlled using programmable thermostats to achieve night setbacks. Interlocks for fire protection to be as per OBC and NFPA.



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**TAB 7: TECHNICAL DISCIPLINES**  
Mechanical

**RADIANT HEATING AND SNOW MELTING**

**BASIS OF CRITERIA**

- > Full width snow melting systems shall be installed on all new and rehabilitated GO rail island platforms.
- > Full width snow melting systems shall be installed on new and rehabilitated GO rail side platforms as directed by GO.
- > Radiant heating shall be installed in all Bus Facilities.
- > Partial snow melting systems shall be installed in all Bus Facilities.
- > Radiant heating and partial snow melting should be considered in new Station buildings, bus terminals, on a project by project basis.

**DESIGN REQUIREMENTS**

Including but not limited to the following:

- > Gas fired boilers.
- > Pumps.
- > Expansion tank.
- > Chemical treatment.
- > Glycol make-up system.
- > Pipework inside boiler room including manifolds, piping, fittings, valves, thermometers, gauges, devices, pipe hangers & support, and accessories.
- > Pre-insulated supply and return pipes and fittings.
- > Distribution manifolds c/w valves inside platform chambers.
- > Embedded tubing and fittings.
- > Complete control system.
- > Electrical works.



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**TAB 7: TECHNICAL DISCIPLINES**

Mechanical

**BOILERS**

- > Natural gas boilers shall be approved to ANSI Z21.13 CSA 4.9-2000 with efficiency between 85% and 89%.
- > 52°C (125°F) water supply temperature with no limit on inlet water temperatures.
- > Constructed of eutectic cast iron sections in accordance with ASME requirements, with modulus of elasticity of 30% greater than other cast iron.
- > Boiler plant shall include minimum 2 boilers. If one boiler is down, the remaining boiler(s) shall be capable of handling 60-70% of the full design load.
- > Boiler warranty shall not be affected if flue gas condensation is allowed within the boiler.
- > Boiler and burner shall be listed as package. Site approval is not acceptable. Package must have proven field verified track record for a minimum period of 3 years.
- > All control circuits shall be 120v/60Hz/1Ph c/w fuse protection.
- > Burner shall be fully modulating, factory tested, and CSA listed. No CO shall be present in the products of combustion.
- > Boiler shall be fully started up and commissioned by factory trained personnel.
- > Manufacturer shall have facility in Ontario.
- > Qualified personnel and spare parts shall be available in GTA.

**PRE-INSULATED PIPING AND TUBING**

- > Tubing shall be cross-linked Polyethylene (PEX) manufactured by the Engle method, in accordance with ASTM F876 and ASTM F877, and tested for compliance by an independent third-party agency.
- > Minimum bend radius no less than six times the outside diameter.
- > Oxygen diffusion barrier not to exceed 0.10 grams per cubic meter per day at 40°C (104°F).
- > Pre-insulated piping shall be durable cross-linked polyethylene (PEX-a) manufactured by the Engle method, protected by multilayer PEX-foam insulation and covered by a corrugated seamless waterproof HDPE jacket.
- > Manifolds shall be 50mm (2") valved type L copper complete with cold expansion adaptors.



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**TAB 7: TECHNICAL DISCIPLINES**

Mechanical

- > For system compatibility, use manifolds, fittings, connectors, wall sleeves, and all accessories from the same manufacturer.
- > Use 50mm (2") Styrofoam insulation under the tubing, to maximize heat transfer upward.
- > For tubing under asphalt, the tubing shall be embedded in limestone screening.
- > Tubing shall be installed in one continuous piece and no splice shall be allowed in the slab.
- > Contractor and Supplier shall have minimum 10 years demonstrated experience on projects of similar size and complexity.
- > Contractor and Supplier shall submit as-built drawings verified by the Engineer.

**PUMPS**

- > The heating plant piping arrangement shall contain a primary/secondary loops layout, with 4-way mixing valve between the two loops.
- > Each loop shall be served by two vertical in-line centrifugal pumps.
- > steel shaft, stainless steel mechanical seals, 50 micron cartridge filter, and a sight indicator. These pumps shall be equipped with suction guides, stainless steel strainers, triple duty valves, and insulation.
- > -tight, long life Armseal mechanical seal. They shall be suitable for 107°C (225°F) and 125 psi.
- > Downstream each in-line circulator pump goes a circuit balancing valve, "Y" pattern, to provide precise flow measurement, precision flow balancing, and positive drip-tight shut-off.

**CONTROLS**

- > Complete microprocessor-based programmable control system able to interface with LONWORKS and BACNET, in order to control, monitor, and adjust the radiant heating system and/or snow melting system remotely and/or locally.
- > The control system shall include all required PCUs (Primary Control Units), PACs (Programmable Application Controllers), and ASCs (Application Specific Controllers) to interface with all equipment.
- > The control system shall also include dynamic graphics, snow sensors, outdoor air temperature sensors, immersion temperature sensors, current sensors, status relays, automatic control valves, automatic control valve actuators, local service ports, and LAN cabling.





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**TAB 7: TECHNICAL DISCIPLINES**

Mechanical

**MANIFOLD CHAMBERS**

The recessed manifold chambers on the platform shall be fully accessible with adequate maintenance clearances around the manifolds and valves. Footprint and depth to avoid classification as “confined space”. Adequate means of drainage shall be provided. Cover shall be heavy-duty Aluminium, traffic bearing, lockable, self opening with piston kit, and with recessed handles.

**GLYCOL/WATER SOLUTION**

The Glycol/Water solution shall be premixed, or site mixed with proper concentration before entering the system. Glycol shall be non-toxic, environmentally friendly, and suitable for boilers.

**WARRANTY**

All warranty periods are measured from the date the substantial completion of the system has been confirmed by the Engineer and GO:

- > The complete system shall be covered by 2-year warranty against failure due to defects in material or workmanship. During this period, the system shall be started-up and inspected in November, shut-down in April, and monitored 24/7 via central station by Contractor and/or Supplier.
- > The complete system shall be covered by 10-year limited system performance warranty. This warranty requires that the system detailed design, supervision, commissioning, and test witnessing shall be performed by the manufacturer’s authorized personnel along with the contractor’s superintendent and the Engineer.
- > All tubing and pre-insulated piping shall carry a 25-year non-prorated warranty against failure due to defects in material or workmanship.

**TESTING ADJUSTING AND BALANCING (TAB)**

The TAB agency shall be a subcontractor of the general contractor who should identify it within 10 days after the award of the contract. The TAB agency shall be a certified member of AABC.

**TRAINING**

Mechanical Contractor / Manufacturer shall provide adequate training for GO staff including advanced maintenance level training as determined by GO. Training sessions may take place on site, or any other suitable location.



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**TAB 7: TECHNICAL DISCIPLINES**

Mechanical

**IDENTIFICATION, APPEARANCE, AND NOISE VIBRATION**

**DESIGN REQUIREMENTS**

**IDENTIFICATION**

Equipment, piping and systems shall be clearly identified according to industry standards. Equipment shall include manufacturer's nameplate, CSA and/or CUL registration plates where applicable. Piping and ducting systems shall be identified using a standard identification system, ASHRAE, CGSB or similar. All labels, tags, nameplates, etc., shall be stainless steel, brass or thick laminated plastic, as appropriate to suit application.

**APPEARANCE**

All equipment, vent, access door, door grille, diffuser, return air grille, and exposed duct locations shall be coordinated by the architect/prime consultant. Roof-mounted equipment shall be screened. Where permitted, multiple exhaust ducts shall be combined to minimize building penetration. On sloping station roofs, exhaust ducts shall be directed to vertical gable vents, if applicable.

Exterior grade-level equipment (condensing units, etc.) shall be elevated 300 mm minimum above grade, and screened by fencing. Grilles, vents and diffusers shall be recessed or flush with adjoining base-building materials, as detailed by the architect/prime consultant, and shall not be surface-mounted over base-building materials.

**NOISE/VIBRATION**

Isolators and vibration control devices shall be specified as required to ensure that equipment-noise and vibration do not interfere with GO Transit operations, as well as to protect adjacent properties from noise and vibration, where necessary.



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**TAB 7: TECHNICAL DISCIPLINES**  
Mechanical

**PLUMBING AND DRAINAGE**

**BASIS OF CRITERIA**

This Section deals with cold and hot water distribution, building storm and sanitary drainage within the immediate vicinity of any building.

**TYPICAL APPLICATIONS**

- > Staff washrooms.
- > Public washrooms.
- > Tenant and vending premises.
- > Bus and rail maintenance facilities.
- > Hose bibs at buildings, tunnels and on platforms.
- > Sump pits for tunnels, elevators and buildings (if applicable).
- > Specialized installations: vehicle wash equipment, progressive maintenance bays (PMB's) for locomotive and coach water supply and sewage disposal, and wells and septic systems or holding tanks at rural sites, if required.

**DESIGN REQUIREMENTS**

**WATER PIPING**

- > Water piping shall be copper, type "L" above ground, type "K" for buried services. Copper type "M" and galvanized pipe shall not be used. Hangers and fasteners should also be protected from the detergents and moisture or be fabricated of materials that are not subject to corrosion.
- > Waterlines in unheated areas shall be protected from freezing with electric tracing, thermostatically controlled. These sections of piping shall be valved to enable isolation and drainage.
- > Insulation shall be in accordance with ASHRAE 90.1 standard.
- > Piping shall be concealed in public areas. Exposed chrome piping shall have chrome-plated anchors and hangers.
- > Pipes shall not be routed through electrical rooms, control rooms or communication rooms.



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**TAB 7: TECHNICAL DISCIPLINES**

Mechanical

- > Cathodic protection for buried pipes shall be provided if required.
- > Vending and concession areas shall have a cold water supply valved and capped connection as well as a sanitary and vent capped connections, c/w check-meter and remote reader.

**DRINKING FOUNTAINS**

Drinking fountains are not to be included in station buildings.

**HOT WATER**

The energy source shall be the most economical available.

Service hot water shall be provided tempered at 40°C at station and terminal washbasins in washrooms. Shops, maintenance and garage facilities may have higher temperatures if required. A re-circulation system normally is not required in a typical GO Station building.

Hot water heaters in stations/terminals shall be located in janitor rooms, ceiling-hung to suit space requirements. Relief valves shall be piped to floor drains with air break. A gas fired tankless type hot water system may be used where approved by GO, to minimize piping.

**HYDRANTS AND HOSE BIBS**

Wall hydrants and hose bibs shall be minimum 20 mm anti-siphon, non-freeze type in flush mounted box with locking cover and located at buildings, tunnels and on platforms to suit maintenance requirements as directed by GO. Tunnel/platform hose-bib pipe systems shall have gravity drain capability for water shut-off. Hose-bibs shall also be located in shops, maintenance facilities, loading docks, bus platforms, etc. as directed by GO, sized to suit.

**LANDSCAPE WATER**

Buried water supply piping systems shall be provided for the manual watering of landscaping only if specifically requested by GO. If requested, they shall consist of PVC piping and quick coupling hose attachments spaced so that every point in the landscaped area can be reached by a 30 m hose extended from the hose attachment. The system shall be capable of being completely drained or air-blown dry in the autumn.

**PIPE SLEEVES**

Galvanized steel pipe sleeves shall be provided in concrete structures to accommodate future piping installations, if required. Hangers and fasteners should also be protected from the detergents and moisture or be fabricated of materials that are not subject to corrosion.

**CI-0702****TAB 7: TECHNICAL DISCIPLINES**

Mechanical

**WATER METERS**

Water supply lines shall be sized for the specific requirements of the facility. The incoming service shall be metered inside with an exterior readout acceptable to the local utility. Major tenants shall have check-meters.

**VALVES**

Each fixture shall have a key operated service valve or shut-off valve. Additional shut-off valves shall be provided for each group of fixtures, e.g., a washroom. At least one shut-off valve shall be provided for each room with one or more fixtures.

**STORM DRAINAGE**

- > Drainage shall be designed to meet the requirements of local authorities, and the relevant storm water management study.
- > See Stormwater Management (section CI-0205).
- > Drainage: oil and grit interceptors and inlet control devices may be required.
- > The location of scupper drains and splash pads should be coordinated with the prime consultant.
- > Rail platform shelter roof drains where required, may be directed to Railway R.O.W. ditches, where approved by the Railway, or to a sump pit in the tunnel and then pumped to the storm system.

**SANITARY DRAINAGE**

- > Drainage shall be designed to meet the requirements of local authorities.
- > All washrooms, janitor rooms, mechanical rooms, vending and concession areas and certain maintenance areas as directed by GO, shall be provided with floor drains and strainers.
- > Strainer and sediment buckets shall be provided for heavy duty floor drains, trench drains, and tunnel floors. Tunnels shall have open shallow trench drains at the wall perimeters. See Technical Standards.
- > Food preparation areas require grease interceptors. This applies particularly to tenant premises.
- > Service stations, repair shops and garages require oil interceptors. Parking lots and elevator pits do not require oil interceptors as per O.B.C.

**SUMP PUMPS**

**CI-0702****TAB 7: TECHNICAL DISCIPLINES**

Mechanical

Where storm or sanitary drains cannot be discharged to the sewer by gravity flow, flow shall be discharged into a tightly covered and vented sump pit, from which the liquid is lifted and discharged to the sewer by an automatic duplex pump system with automatic changeover and guide bars. Each pump should be sized for 100% flow. Pumps shall be epoxy coated with two (2) totally independent seal assemblies.

A 4 float control system shall be provided (OFF – LEAD ON – LAGG ON – ALARM). Provision shall be made for dry 'C' contacts for connection to a remote alarm. Pumps shall be easily removable for maintenance without the need to enter the wet well.

- > Pit cover shall be gas tight, self-opening with piston kit and safety grid.
- > System shall be complete with lifting equipment including lifting davit, chain hoist, lifting device, and chain hook.
- > Sump pits are used for shelter, roof and tunnel drainage, and in elevator or escalator pits.
- > Special sump pumps may be required for maintenance facilities or rural stations (TBD).
- > For further details refer to GO Standards Master Specifications.

**FIXTURES: GENERAL**

All fixtures except janitor sink shall be vandal resistant vitreous china.

**CUSTODIAN SINKS**

Janitor sinks to be terrazzo, floor mounted.

**WASHBASINS**

- > Multi use public washrooms to have individual semi-countertop basins with one barrier free basin. Faucets to be two-handle centreset type for the barrier free basin.
- > Single use public washrooms to have a barrier free semi-countertop mounted basin with a two-handle centreset faucet.
- > Staff washroom basin to be countertop type with a two handle centreset faucet. There shall be a storage cabinet below.
- > Shop or maintenance facility washrooms to have a trough-type multi-station sink or circular wash basin. Faucets can have foot control, infrared control, or push button control.

**WATER CLOSETS**

**CI-0702****TAB 7: TECHNICAL DISCIPLINES**

Mechanical

- > Water closets in public washrooms shall be wall hung, with carrier elongated siphon jet flush action bowl, top spud for exposed manual flush valve with non-hold open feature. Seats shall be white, elongated, heavy duty, solid material, open front without cover.
- > Water closets in staff washrooms shall be floor mounted tank type. Seat shall be white, heavy duty, open front, solid material, oval, with cover.
- > Barrier-free (accessible) water closets shall have covers (lids) as back-rests, to code requirements.

**URINALS**

Urinals shall be wall hung with carrier, top spud for exposed manual flush valve with non-hold open feature and vacuum breaker, siphon jet flush action, integral flush spreader.

**EYE WASH FOUNTAINS**

In rail and bus maintenance facilities, eye wash fountains shall be wall recessed, stainless steel, located per Code outside battery rooms, or other areas with hazardous products. Typically found in plant facilities.

**SPECIAL REQUIREMENTS**

- > Septic systems and/or holding tanks for rural facilities.
- > Filling stations for locomotive and coach washroom water supply.
- > Coach washroom sewage removal facilities at progressive maintenance bays (PMB's) in train maintenance facilities.
- > Train and bus wash facilities including recycling of wash water.
- > Wells or water reservoirs at rural facilities to approval of authorities having jurisdiction, including filtration and purification systems. A minimum GO requirement is ultraviolet purification for coliforms and e-coli bacteria with pre-filters.
- > Thermostat controlled electric pipe heating cables shall be used on all water pipes in unheated areas, where the temperature may fall below freezing.
- > Minimum burial depth of piping shall be 1.65m or to municipal requirements.



CI-0702

**TAB 7: TECHNICAL DISCIPLINES**  
Mechanical

**FIRE PROTECTION**

**BASIS OF CRITERIA**

The Ontario Building Code, N.F.P.A. Standards, and Municipal Fire Department shall govern Fire Protection requirements.

**DESIGN REQUIREMENTS**

**SPRINKLERS**

Sprinkler systems are typically found in facilities and regional offices, not typical station buildings.

Where sprinklers are required by code, sprinkler systems shall be designed, constructed, installed, and tested in conformance with NFPA 13. Sprinkler heads in public areas shall be concealed flush type, where sprinklers are code-required for major station or terminal facilities.

**FIRE HYDRANTS**

Hydrants shall be provided at all facilities. Fire hydrants in landscaped areas or snowdrift areas shall be raised or marked with raised identification “flag” devices. Minimum burial depth of piping and pipe-marking/protection shall be to municipal requirements.

**DRY FIRE SUPPRESSION**

- > Dry Fire Suppression Systems or clean agent systems for main computer and telephone equipment rooms shall be provided where required by GO Transit.
- > Not found in Station Buildings.

**FIRE EXTINGUISHERS**

The Consultant shall specify fire extinguishers to be available during construction and identify and locate fire extinguishers that are required to be supplied and installed by GO Transit for occupancy of premises.





CI-0703

**TAB 7: TECHNICAL DISCIPLINES**

Electrical

**POWER DISTRIBUTION****SERVICE DUCT BANKS**

Service ductbanks shall conform to the local Utility's, including Bell Canada, requirements.

Spare duct cells and conduits with pull-cords shall be provided in ductbanks as deemed necessary for future use, if requested by GO Transit.

**WIRING METHODS****Raceways**

Raceways and branch circuitry shall be implemented to minimize failure of a complete system due to failure or malfunctioning of any single electrical component. Distribution minimizing conductors of different circuits sharing common raceways and pull-boxes, etc., shall be implemented. Raceways selected shall suitably resist mechanical damage and environmental deterioration effects. In particular, special attention shall be applied to corrosion inhibitors and protective coatings or treatments on surface mounted conduit in underground areas (e.g., tunnels, below grade electrical rooms, Bridges and parking structures etc.).

**Conduits**

Rigid galvanized steel conduit, or other GO Transit approved cabling methods shall be used for all exposed work in normally dry areas not likely to present corrosion problems. Rigid steel or rigid PVC conduit may be used embedded in slabs where high impact protection is required. Rigid non-metallic conduit shall be used below ground, either direct buried or concrete encased.

PVC or epoxy coated rigid galvanized steel conduit shall be used in corrosion problem areas. Conduit, having a minimum of 50mm shall be used in parking lots where deemed necessary; concrete encasement shall be provided for bus loops, road crossings, and railway Right-of-Ways.

In finished areas, all conduits shall be concealed.

**Cable Trays**

Where required, hot dip galvanized cable trays shall be of the totally enclosed, ventilated, or ladder type; steel or aluminium or non-metallic as required for the application, complete with vertical barriers to separate systems or cables as required. Class shall be selected based on conductor weight plus 50% spare capacity as a minimum. Cable trays to be cantilever supported for ease in installation of cables. Fire barriers of multi-transit type shall be provided at fire walls and fire separations, and shall be in accordance with the O.B.C. and CAN4-S115-M.



CI-0104

### TAB 1: GUIDING PRINCIPLES Mobility Hubs



CI-0104 MOBILITY HUBS

#### OVERVIEW

#### MOBILITY HUBS

The Big Move, Metrolinx's Regional Transportation Plan for the Greater Toronto and Hamilton Area (GTHA), identifies a "system of interconnected mobility hubs" at major transit stations that are to be places that provide travellers with seamless access to the regional transit system, designed for high levels of pedestrian and cyclist priority; demonstrate excellence in customer service; and support higher density, and mixed-use development. The Metrolinx Mobility Hub Guidelines are a set of multidisciplinary strategies that clearly communicate the mobility hub concept; provide guidance for mobility hub and station planning and development; and guide Metrolinx in planning efforts, infrastructure design and facilities in mobility hubs and stations.

Although focused on mobility hubs, the principles of the Mobility Hub Guidelines represent general best practices in station master planning and urban design. As such, they are to be applied to a broader spectrum of projects, at various stages of development. Strategic decision-making at the preliminary and detailed design level will determine how these principles can be applied to the project at hand, so as not to compromise safety, efficient functionality, operational costs, and customer Level of Service. The Guidelines address topics such as:

- > Priority modes of access - pedestrian / bicycle / public transit / drop-off & pick-up / parking
- > Traffic movement and vehicular circulation
- > Land use and surrounding site conditions
- > Urban design and respect of neighboring community
- > Multi-use and joint development opportunities
- > Sustainable development considerations
- > Wayfinding
- > Amenities such as heated waiting areas, seating, information centers and various services



CI-0104

**TAB 1: GUIDING PRINCIPLES**

Mobility Hubs

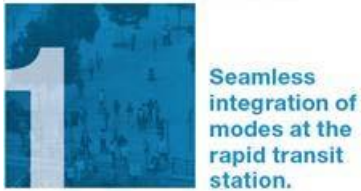


The Mobility Hub Guidelines will be translated into performance requirements and design guidelines to inform the Site Infrastructure and Development planning and detailed design of GO Station & Terminal Building Infrastructure. In the meantime, the Guidelines are available online here:

[http://www.metroinix.com/en/projectsandprograms/mobilityhubs/mobility\\_hub\\_guidelines.aspx](http://www.metroinix.com/en/projectsandprograms/mobilityhubs/mobility_hub_guidelines.aspx)

The following icon has been incorporated into the DRM as a placeholder to indicate where the Mobility Hub Guidelines also speak to the topic:



The Mobility Hub Guidelines are organized into three categories of nine key objectives. Below are some examples of where the Mobility Hub Guidelines already relate directly to existing performance requirements in the DRM are shown below:



Mobility Hub Objective	Mobility Hub Approach	Existing Related DRM Design Requirement
 <p><b>1</b> Seamless integration of modes at the rapid transit station.</p>	1.1.6 Locate clearly marked taxi and passenger pick-up areas within direct sight and at close proximity to station entrances.	CI-0201 Site Design and Development – Site Access Priorities and Vehicular Circulation:  > Passenger drop-off and pick-up facilities, including taxi and accessible accommodation, should be provided close to the station building.
 <p><b>2</b> Safe and efficient movement of people with high levels of pedestrian priority.</p>	2.4.3 Design and plan pedestrian networks to provide attractive, direct routes between the transit station and other area destinations.	CI-0202 Station Sites - Pedestrian and Bicycle Access:  > Principal pedestrian access shall provide dedicated routes for pedestrians wishing to walk to and from the station area.  > Pedestrians should not be required to cross the parking lot in order to access the station.
 <p><b>3</b> A well-designed transit station for a high quality user experience.</p>	3.3.2 Provide a minimum level of amenity to satisfy the three key needs for customer amenity: convenience, comfort and safety, and information.	CI-0401 Station Buildings – Customer Services:  >Customers approaching the station building area by each of the modes should have convenient access to:  > Direct access from parking or Kiss n Ride to platform where possible.  > An information display providing service



CI-0104

**TAB 1: GUIDING PRINCIPLES**

Mobility Hubs



Mobility Hub Objective	Mobility Hub Approach	Existing Related DRM Design Requirement
		<p>information at the approach to the station area;</p> <ul style="list-style-type: none"> <li>&gt; Ticket sales (attended and or Presto, TVM);</li> <li>&gt; Newspaper boxes and, if appropriate, concessions;</li> <li>&gt; Customer amenities including benches, pay phones and waste bins</li> </ul>
	<p>4.7.1 Provide high-quality and safe accessible parking spaces.</p>	<p>CI-0203 Parking Infrastructure – Barrier Free Parking</p> <ul style="list-style-type: none"> <li>&gt; Barrier Free Parking shall be located close to the station building entrance and/or rail/bus platform access. Parking spaces designated for persons with disabilities and accessible passenger pick-up areas that serve GO facilities should be located on the shortest possible circulation route to an accessible entrance (preferably 30m or less).</li> <li>&gt; Parking lots shall have the minimum number of designated Barrier Free Parking spaces for passengers with disabilities</li> </ul>
	<p>5.1.2 Plan for active uses at the pedestrian scale.</p>	<p>CI-0203 Parking Infrastructure – Multilevel Parking Structures</p> <ul style="list-style-type: none"> <li>&gt; Accommodation for known or potential retail opportunities and planning for any loading or unloading conditions such as future Mobility Hubs integration, so as not to interfere with the parking garage traffic.</li> </ul>



CI-0104

**TAB 1: GUIDING PRINCIPLES**

Mobility Hubs



Mobility Hub Objective	Mobility Hub Approach	Existing Related DRM Design Requirement
 <p><b>6</b> An attractive public realm.</p>	<p>6.1.1 Provide a high quality and aesthetically pleasing public realm.</p>	<p>CI-0206 Landscaping</p> <ul style="list-style-type: none"> <li>&gt; Enhance the safety and attractiveness of the public realm</li> <li>&gt; Distribute landscaping throughout the site to soften and screen facility edges, break hard surfaces, reinforce circulation routes, create pleasant pedestrian conditions and maximize shade and stormwater benefits</li> </ul>
 <p><b>7</b> A minimized ecological footprint.</p>	<p>7.1.3 Adopt measures in water management to minimize water consumption and the impact of runoff and wastewater of transit facilities, public buildings, and development.</p>	<p>CI-0205 Civil Works - Stormwater management:</p> <ul style="list-style-type: none"> <li>&gt; Manage rainwater and snowmelt on-site with designs that encourage infiltration, evapotranspiration and water re-use:</li> <li>&gt; Apply a “treatment train” approach;</li> <li>&gt; Sustainable materials paving for parking surface, drive aisles, overflow parking, snow storage areas and other hard surfaces in the parking lot;</li> <li>&gt; Plant trees, shrubs and other absorbent landscaping throughout the parking lot to provide shade and places for water uptake;</li> <li>&gt; Create bio-retention areas, such as swales, vegetated islands and overflow ponds;</li> <li>&gt; Include catchbasin restrictors and oil/grit separators as appropriate; and</li> <li>&gt; Incorporate (active or passive) opportunities to harvest rainwater from rooftops and other hard surfaces for landscape irrigation.</li> </ul>



CI-0104

**TAB 1: GUIDING PRINCIPLES**

Mobility Hubs

Mobility Hub Objective	Mobility Hub Approach	Existing Related DRM Design Requirement
<p><b>SUCCESSFUL IMPLEMENTATION</b></p> 	<p>8.1.8 Ensure transit station designs provide flexibility for change as the rapid transit network is implemented.</p>	<p>CI-0201 Site Design and Development – Site Layout</p> <p>&gt; The station building should be centrally located..., taking into account future expansion (parking growth, tunnels, etc.).</p>
	<p>9.2.3 Encourage facility sharing by institutions.</p>	<p>CI-0401 Station Buildings – Architectural Styles</p> <p>&gt; Shared Facilities: GO also has station attendant rooms and shares common facilities in a number of VIA-owned buildings. Both VIA and GO standards shall apply.</p>

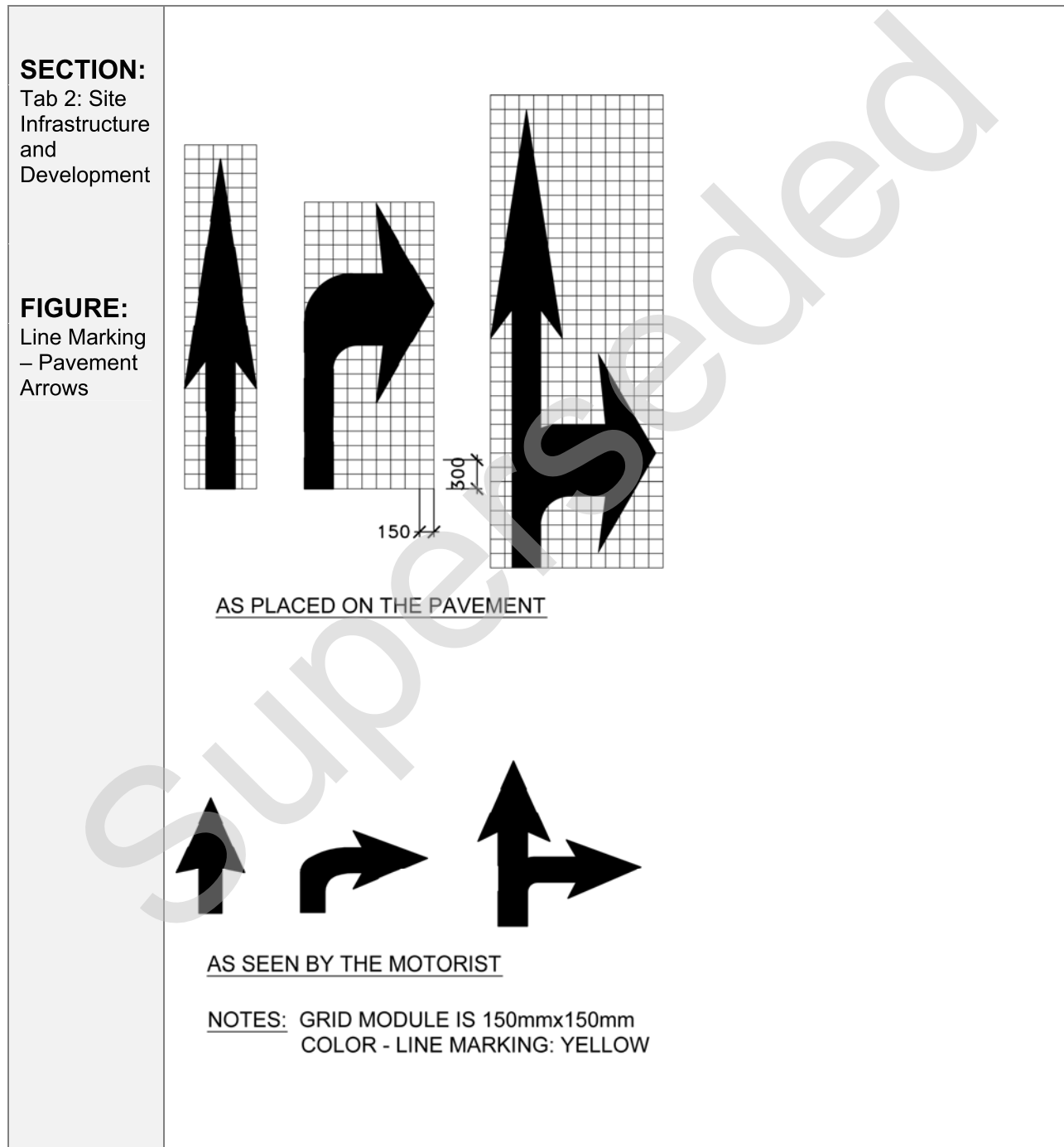
**MANDATORY LEED BUILDING REQUIREMENTS (TBD)**



CI-0204

**TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**  
Pavement and Line Markings

–FIGURE: LINE MARKING - PAVEMENT ARROWS







CI-0702

**TAB 7: TECHNICAL DISCIPLINES**

Mechanical

- > Cathodic protection for buried pipes shall be provided if required.
- > Vending and concession areas shall have a cold water supply valved and capped connection as well as a sanitary and vent capped connections, c/w check-meter and remote reader.

**WATER CONSUMPTION**

The following fixtures must meet or exceed the values listed for water consumption:

Toilets flush valves: 1.28 gallon/flush

Urinals flush valves: 0.5 gallon/flush

Public lavatories: max. flow rate of 0.5 gpm when tested as per CSA B125.1.

Staff washrooms: max. flow rate of 1.5 gpm when tested as CSA B125.1

**DRINKING FOUNTAINS**

Drinking fountains are not to be included in station buildings.

**HOT WATER**

The following Criteria will determine when and where various heating sources are to be used for domestic hot water:

- 1) Where gas is available, and tempering is not required, a standard DHW tank is to be used.
- 2) Where gas is available, and is serviced with a centralized DHW tank
- 3) Where gas is not available

Service hot water shall be provided tempered at 40°C at station and terminal washbasins in washrooms. Shops, maintenance and garage facilities may have higher temperatures if required. A re-circulation system normally is not required in a typical GO Station building.

Hot water heaters in stations/terminals shall be located in janitor rooms, ceiling-hung to suit space requirements. Relief valves shall be piped to floor drains with air break. A gas fired tankless type hot water system may be used where approved by GO, to minimize piping.

**HYDRANTS AND HOSE BIBS**

Wall hydrants and hose bibs shall be minimum 20 mm anti-siphon, non-freeze type in flush mounted box with locking cover and located at buildings, tunnels and on platforms to suit maintenance requirements as



**CI-0702****TAB 7: TECHNICAL DISCIPLINES**

Mechanical

directed by GO. Tunnel/platform hose-bib pipe systems shall have gravity drain capability for water shut-off. Hose-bibs shall also be located in shops, maintenance facilities, loading docks, bus platforms, etc. as directed by GO, sized to suit.

**LANDSCAPE WATER**

Buried water supply piping systems shall be provided for the manual watering of landscaping only if specifically requested by GO. If requested, they shall consist of PVC piping and quick coupling hose attachments spaced so that every point in the landscaped area can be reached by a 30 m hose extended from the hose attachment. The system shall be capable of being completely drained or air-blown dry in the autumn.

**PIPE SLEEVES**

Galvanized steel pipe sleeves shall be provided in concrete structures to accommodate future piping installations, if required. Hangers and fasteners should also be protected from the detergents and moisture or be fabricated of materials that are not subject to corrosion.

**WATER METERS**

Water supply lines shall be sized for the specific requirements of the facility. The incoming service shall be metered inside with an exterior readout acceptable to the local utility. Major tenants shall have check-meters.

**VALVES**

Each fixture shall have a key operated service valve or shut-off valve. Additional shut-off valves shall be provided for each group of fixtures, e.g., a washroom. At least one shut-off valve shall be provided for each room with one or more fixtures.

**STORM DRAINAGE**

- > Drainage shall be designed to meet the requirements of local authorities, and the relevant storm water management study.
- > See Stormwater Management (section CI-0205).
- > Drainage: oil and grit interceptors and inlet control devices may be required.
- > The location of scupper drains and splash pads should be coordinated with the prime consultant.
- > Rail platform shelter roof drains where required, may be directed to Railway R.O.W. ditches, where approved by the Railway, or to a sump pit in the tunnel and then pumped to the storm system.

**CI-0702****TAB 7: TECHNICAL DISCIPLINES**

Mechanical

**SANITARY DRAINAGE**

- > Drainage shall be designed to meet the requirements of local authorities.
- > All washrooms, janitor rooms, mechanical rooms, vending and concession areas and certain maintenance areas as directed by GO, shall be provided with floor drains and strainers.
- > Strainer and sediment buckets shall be provided for heavy duty floor drains, trench drains, and tunnel floors. Tunnels shall have open shallow trench drains at the wall perimeters. See Technical Standards.
- > Food preparation areas require grease interceptors. This applies particularly to tenant premises.
- > Service stations, repair shops and garages require oil interceptors. Parking lots and elevator pits do not require oil interceptors as per O.B.C.

**SUMP PUMPS**

Where storm or sanitary drains cannot be discharged to the sewer by gravity flow, flow shall be discharged into a tightly covered and vented sump pit, from which the liquid is lifted and discharged to the sewer by an automatic duplex pump system with automatic changeover and guide bars. Each pump should be sized for 100% flow. Pumps shall be epoxy coated with two (2) totally independent seal assemblies.

A 4 float control system shall be provided (OFF – LEAD ON – LAGG ON – ALARM). Provision shall be made for dry 'C' contacts for connection to a remote alarm. Pumps shall be easily removable for maintenance without the need to enter the wet well.

- > Pit cover shall be gas tight, self-opening with piston kit and safety grid.
- > System shall be complete with lifting equipment including lifting davit, chain hoist, lifting device, and chain hook.
- > Sump pits are used for shelter, roof and tunnel drainage, and in elevator or escalator pits.
- > Special sump pumps may be required for maintenance facilities or rural stations (TBD).
- > For further details refer to GO Standards Master Specifications.

**FIXTURES: GENERAL**

- > All fixtures except janitor sink shall be vandal resistant vitreous china Certified to CAN/CSA-B45.0, "General Requirements for Plumbing Fixtures"
- > All trims to be touchless, electronic, hard wired barrier free where applicable



CI-0703

### TAB 7: TECHNICAL DISCIPLINES

Electrical

- > Underground warning tapes.
- > Labelling nomenclature.
- > Electrical Rooms are to have a framed Single Line Drawing of the Electrical Distribution System which is to be updated with any addition or deletion of part of the system.

### CODES AND STANDARDS

Provide products listed and classified by CSA, ESA and acceptable to authority having jurisdiction as suitable for purpose specified and shown.

### ARC FLASH

Electrical Arc Flash hazard levels to be designed for minimum hazard risk. Preliminary Electrical Arc Flash hazard level study will indicate possible hazard. The equipment selection will be done to minimize the Hazard prior to equipment purchase. The final arc flash study will verify the Levels. At the completion of work, all equipment in the space at the site shall be labeled and floors permanently marked showing boundaries for all hazard levels above level 0.

### WIRE MARKERS

**Locations:** Each conductor in a panel board, pull boxes, outlet and junction boxes, patch panel, rack and each connection.

**Wire Identification Materials:** Use one of the following:

- > Heat shrink sleeves, blank;
- > Clear plastic tape wrap-on strips with white writing section;
- > Wrap-on strips, pre-numbered;
- > Slip-on identification bead markers or sleeves, blank or pre-numbered;
- > **Power & Lighting Circuits:** Branch circuit/feeder number indicated on drawings;
- > **Control Circuits:** Control wire number indicated on schematic & interconnection diagrams on drawings & shop drawings.

### NAMEPLATE IDENTIFICATION OF EQUIPMENT

Identify equipment with lamoid nameplates as indicated in Equipment Identification Schedule.

**CI-0203****TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**  
Parking Infrastructure

circuit control, IP addressable for future remote control, open architecture backnet/modbus compliant accessible through Microsoft windows software.

- > Emergency Backup Power Systems shall include, but not be limited, to the following:
  - Communications equipment, safety and security equipment shall be supported by a conditioned backup power source like a UPS.
  - Egress Lighting shall be on the UPS or use of battery powered light packs if a generator power source is not available.
  - Except for elevators that form part of an accessible route and elevators that serve access through tunnel level, generators are not required to back up the elevators. The backed-up elevator shall be supported on at a time in sequential order.
  - Generators, when provided under the above conditions, shall be sized to meet the current load of the parking structure and nearby station's emergency load and 50% growth.
  - The generators should be sufficiently sized to permit lighting and dynamic signage to continue to operate (both in the parking garage and throughout the Station facility).
  - The generator should be located and positioned to minimize public exposure to noise, vibration, exhaust and Arc Flash (if hazard level is greater than 0).
  - All backup power systems shall have monitoring and alarms local and remote capability, and ability to connect by modem or internet. The ability to monitor and change set point remotely.
  - Appropriately sized fuel storage tank for the size and height of the parking garage shall be provided and shall have a minimum of 24hr support or generator.
- > The Generator and fuel tank are to be TSSA certified and a fuelling number provided.
- > Convenient 20 amp 5-20RA duplex GFI receptacles shall be located at each stairway and elevator area, on each level, around equipment on roofs, in service and storage rooms, near entrances and exits and at convenient locations on each parking level.
- > All electrical components, panels, ducts are to be mounted on standoffs. No direct connections to the wall or ceilings are permitted.
- > Lightning protection and surge suppression systems shall be part of the design.
- > Provide Fire Alarm and Security Systems as applicable.



CI-0203

### TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT Parking Infrastructure

- > Provide power, communication, feeder and conduit to facilitate the installation of dynamic and/or back/top lit signage.
- > Directional signs should always be located at decision points.
- > Where possible, signs should be located perpendicular, not parallel, to the visitor's line of sight and movement.
- > Signage shall not to conflict with overall height and clear span requirements.
- > Signs have to have a breakaway feature and colour coded for each level.
- > For further details on wayfinding; signage and pavement marking requirements, refer to GO Multilevel Parking Structures Signage Manual and GO Signage & Manual.

#### **SPACE COUNTING SYSTEMS**

- > The design shall incorporate requirements for space counting systems as directed by GO staff.

#### **LANDSCAPING**

- > Landscaping around the parking garage should focus on low maintenance materials and shade trees. All trees should be located away from any building structures and out of any snow storage areas and should not provide hiding areas adjacent to paths or walkways.

#### **SNOW MANAGEMENT**

- > Entry areas for pedestrian and vehicles should be configured to allow easy snow removal and minimize any damage from its operations and chemical treatment applications.
- > Exterior ramps and stairway areas to be provided with hydronic or electric resistance snow melting embedded below the traffic surface and specific entry and exit areas.
- > Consideration may be given to the use of trench drains at entrances, grates at pedestrian entrances and constructing lower flights of stairs out of grating to catch and remove snow, slush, and water entering the buildings.
- > In all areas, floor drains and floors should be configured to prevent ponding and allow for quick and easy drainage.



CI-0205

**TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**

Civil Works

**Ditch Drainage**

Where a storm sewer system is not available, or where an “interim” type of development is desired, ditches and related culverts may be used to carry the drainage down one or both sides of the paved areas. Culverts shall have safety grilles at ends, and ditches subject to substantial ponding shall be fenced, for safety, or filled with rip-rap, and topped with geotextile fabric and granular topsoil and sod.

**Sub-Grade Drainage**

Rail platform sub-grade drainage is subject to Railway requirements. See Heavy Rail section of this manual.

Parking lot sub-grade design shall be used as required by site conditions.

**UTILITIES**

- > Current applicable codes and regulations, and requirements of Utility owners and authorities having jurisdiction.
- > Railway requirements: applicable to all utilities on the railway R.O.W. (see also Heavy Rail section).
- > Minimized construction duration on Railway R.O.W.'s (due to the cost of the Railway requirement for a full time flagman and consultant site supervision).
- > Minimized disruption of utilities to adjacent properties, vehicular traffic and GO Transit operations.
- > Restoration work necessitated by utility installations.
- > Arc flash analysis shall be included in design services. Refer to TAB 7: Electrical, for information on Arc Flash Hazards and labeling”.

**DESIGN REQUIREMENTS**

**SITE PREPARATION**

Grading:

- > Grading shall be designed to avoid excessive slopes and shall be integrated with surrounding landforms to provide slope stabilization and positive flows to the drainage system.
- > Where existing landforms or vegetation are to be preserved, appropriate protection and construction controls shall be designed.



CI-0501

**TAB 5: RAIL AND BUS OPERATIONAL FACILITIES**  
 Bus Operational Facilities

**SAFETY AND SECURING**

Feature	Design Requirements
	<ul style="list-style-type: none"> <li>&gt; Design facilities to follow basic Safety Engineering principles:</li> <li>&gt; Eliminate hazards by engineering design</li> <li>&gt; Follow FTA / APTA recommendations, guidelines for Bus Facilities</li> <li>&gt; Exceed relevant safety legislations (i.e., OHSA, TSSA, CSA, OESC, CEC etc.) as required to minimize risk(s)</li> <li>&gt; Consider potential future expansion, modifications, retrofits</li> <li>&gt; The design of the facility shall be safe and easily serviceable, maintainable and user friendly.</li> </ul>
Design Concerns	<p>Some of the typical, but not limited concerns include:</p> <ul style="list-style-type: none"> <li>&gt; Fall Hazards (adequate roof perimeter protection - parapet, guardrails if necessary, adequately load rated skylights, location and position of serviceable equipment above ground level / at height, roof access, adequate clearance from the roof edge (min. 3.0 m), etc.</li> <li>&gt; Aligning of lighting fixtures, gas lines, power lines (and other serviceable components ) with flat landing section and avoid interference with structural components for easy access.</li> <li>&gt; Avoid Confined Spaces (adequate ventilation, atmospheric condition, access, egress, rescue, etc.).</li> <li>&gt; Avoid pinch points / spots / corners (adequate walkways, clearances, visibility, access, egress, reach, etc.).</li> <li>&gt; Any sources of energy to be lockable - (CSA Z 460)</li> <li>&gt; All qualified equipment / machine to be properly safeguarded - (CSA Z 432)</li> <li>&gt; Refer to TAB 7: Electrical, for information on Arc Flash Hazards and labeling” after reference to Arc Flash.</li> </ul>



CI-0404

**TAB 4: STATION & TERMINAL BUILDING INFRASTRUCTURE**  
Stairs & Stair Enclosures

FEATURE	DESCRIPTION
	<ul style="list-style-type: none"><li>• Extend the full width of the stair;</li><li>• Have a depth of 920 mm (36 in), commencing one tread depth from the edge of the stair; and</li><li>• The cane-detectable warnings on this surface shall be colour and texture contrasted with the adjacent surfaces. Raised ridges shall be placed perpendicular to the direction of travel.</li></ul>
Edge Drain	<ul style="list-style-type: none"><li>&gt; Tunnel stairs shall have concrete drainage side-gutters 40 mm deep by 80 mm wide, continuous with the tunnel floor gutters.</li><li>&gt; Gutter drains shall not be located at the bottom of tunnel stairs or in front of service doors or elevator doors.</li></ul>
Handrails	<ul style="list-style-type: none"><li>&gt; Handrails shall be provided on both sides of all stairs.</li><li>&gt; Exterior stair and ramp handrails shall be smooth galvanized steel pipe, minimum 30 mm, and maximum 43 mm diameter, 915 mm above nosings or ramps.</li><li>&gt; All anchorage and fittings shall also be galvanized.</li><li>&gt; Tunnel stair or bridge stair handrails to be stainless steel 38 mm diameter, be mounted not less than 865 mm and not more than 965 mm high, measured vertically from a line drawn through the outside edges of the stair nosings.</li><li>&gt; All anchorage and fittings shall also be stainless steel. Handrail ends shall extend in accordance with the OBC and the OBC Illustrated Guide, also for exterior stairs.</li><li>&gt; Handrails shall be continuous around landings less than 2100 mm in length and placed on the inside edge of stairs; and<ul style="list-style-type: none"><li>• Have the rail extension return to the post, floor or wall;</li><li>• At the top of stairs, extend at least 300 mm (12 in) parallel to the floor surface;</li><li>• At the bottom of the stairs, continue to slope for a distance equal to the depth of one tread and then extend at least 300</li></ul></li></ul>





CI-0404

**TAB 4: STATION & TERMINAL BUILDING INFRASTRUCTURE**  
Stairs & Stair Enclosures

FEATURE	DESCRIPTION
	<p>mm (12 in) parallel to the floor surface;</p> <ul style="list-style-type: none"> <li>• Have a circular cross-section with an outside diameter not less than 30 mm (1.2 in) and not more than 40 mm (1.7 in), or any non-circular shape with a graspable portion that has a perimeter not less than 100 mm (4 in) and not more than 125 mm (4.9 in) and whose cross-sectional dimension is not more than 45 mm (1.8 in);</li> <li>• Where guards are required, handrails required on landings shall be not more than 1070 mm (42.12 in) in height.</li> <li>• Have a clearance of at least 50 mm (2 in) between the handrail and any wall to which it is attached or immediately adjacent to;</li> <li>• Be terminated in a manner that will not obstruct pedestrian travel or create a hazard;</li> <li>• Be designed and constructed such that handrails and their supports:</li> <li>• Will withstand the loading values obtained from the non-concurrent application of a concentrated load not less than 0.9 kN (202 lb.) applied at any point and in any direction; and</li> <li>• A uniform load not less than 0.7 kN/m (46.6 lb./ft.) applied in any direction to the handrail;</li> <li>• Be tonal contrasted with their surroundings and provided with a colour contrasted strip at the leading edges of the handrail at the top and bottom of the stair system;</li> <li>• Be installed with a photoluminescent strip installed on an extruded aluminium base along the stair rise; and</li> <li>• Where stairs are wider than 2400 mm, one or more intermediate continuous handrails between landings shall be provided</li> </ul>
Photoluminescent Strips	<ul style="list-style-type: none"> <li>&gt; Tunnel walls (both sides) shall have surface mounted photoluminescent strips at 0.3m above finished tunnel floor. Strips to be installed continuously along entire length of tunnel transitioning in a continuous</li> </ul>



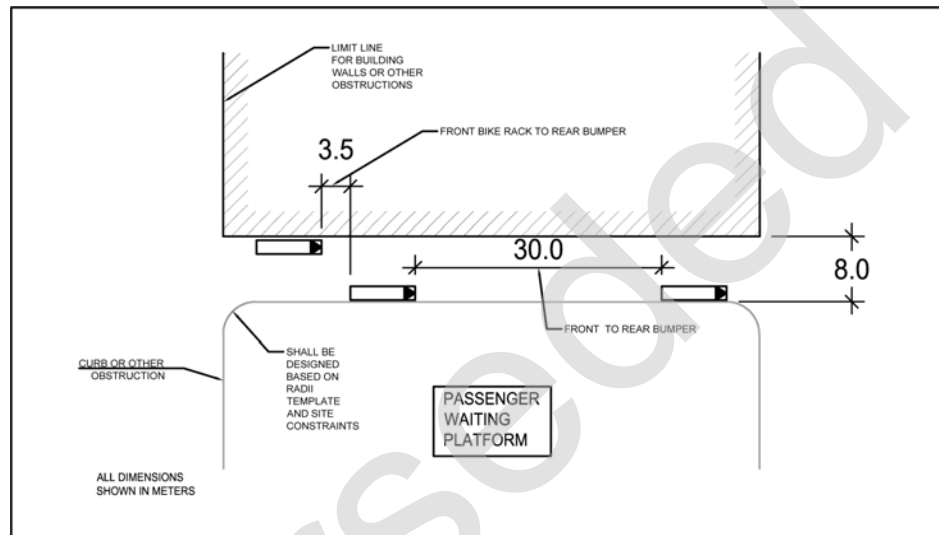
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**TAB 3: BUS INFRASTRUCTURE**  
Bus Radii Design Guidelines

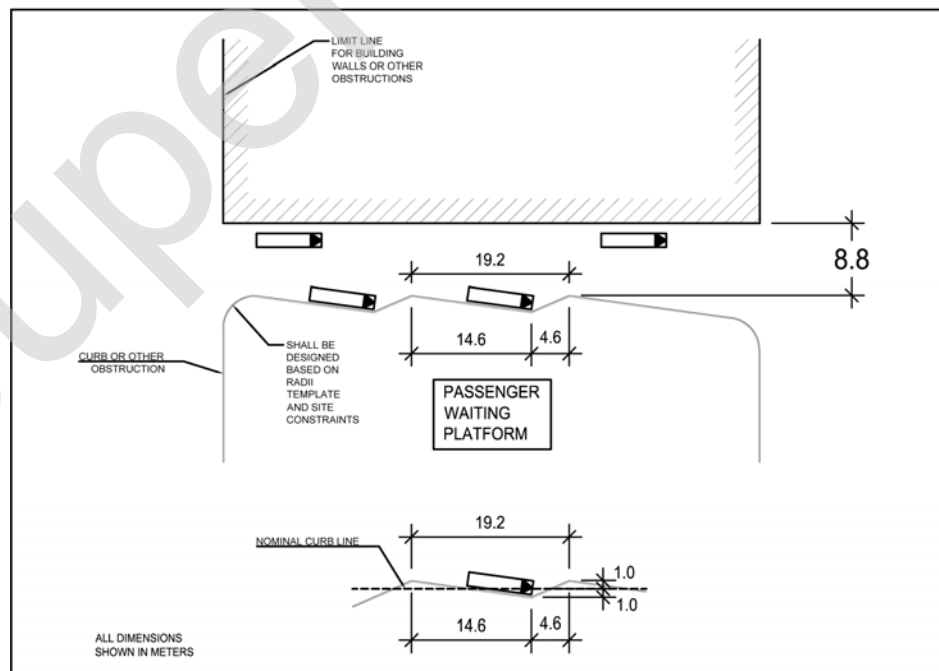
FIGURE: BUS BAY GUIDELINES FOR D4500 BUS WITH BIKE RACK DEPLOYED.

**SECTION:**  
Tab 3: Bus Infrastructure

**FIGURE:**  
Bus Bay Guidelines for D4500 bus with bike rack deployed.



**STRAIGHT PLATFORM**  
LINE MARKING ARE REQUIRED TO MARK STOPS



**SAW TOOTH PLATFORM**



CI-0204

**TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**  
Pavement and Line Markings

**SLOPES**

	Longitudinal		Cross-slopes	
	Preferred	Max	Preferred	Max
Parking Lots	1%	3%	1%	3%
Fire Access Routes	To suit OBC fire access route criteria.			
Fire Access Routes	To suit OBC fire access route criteria.			

**Note:**

Design and layout are to be in accordance with details shown on Figures.  
Material standards: OPSS 532.

For pavement areas interfacing with public thoroughfares, design shall be in accordance with the current MTO Manual of Uniform Traffic Control Devices and the Manual of Uniform Traffic Control Devices for Canada.

For Rail platform safety line, see Figure in this manual under Rail Platforms, TAB 4. Material Standards: OPSS 532, paint with reflectorizing glass beads.

**LINE MARKING**

Location	Colour
Parking stalls, parking restricted areas and islands	Yellow
Directional dividing lines	Yellow
Rail Platform safety line	Yellow (glass beads)
Lane lines, stop lines and arrows	Yellow
Pedestrian crosswalk lines	Yellow



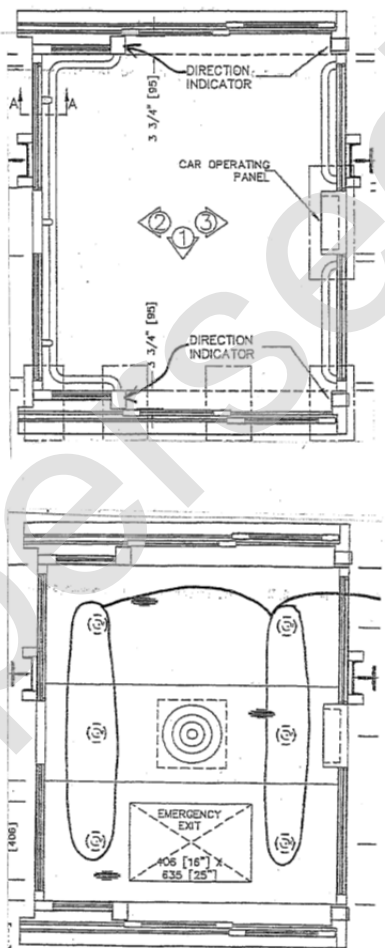
CI-0701

**TAB 7: TECHNICAL DISCIPLINES**  
Architectural

FIGURE: SAMPLE ELEVATOR CAR ENCLOSURE ARRANGEMENT

**SECTION:**  
Tab 7:  
Technical  
Disciplines

**FIGURE:**  
Sample  
Elevator Car  
Enclosure  
Arrangement





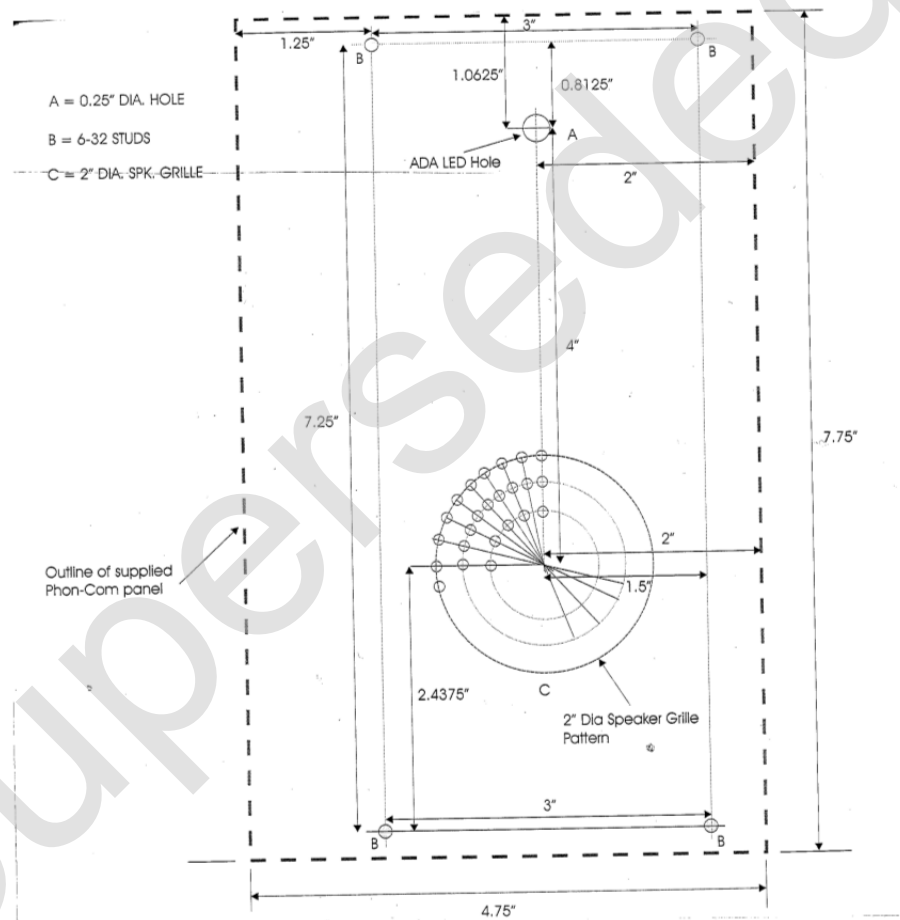
CI-0701

**TAB 7: TECHNICAL DISCIPLINES**  
Architectural

FIGURE: CUT OUT IN ELEVATOR COP PANEL FOR ELEVATOR COMM. DEVICE

**SECTION:**  
Tab 7:  
Technical  
Disciplines

**FIGURE:**  
Cut out in  
Elevator  
COP Panel  
for Elevator  
Comm.  
Device





CI-0704

**TAB 7: TECHNICAL DISCIPLINES**  
Communications

FIGURE: PRESTO SYSTEM ARCHITECTURE – P2

**SECTION:**  
Tab 7:  
Technical  
Disciplines

**FIGURE:**  
Presto  
System  
Architecture  
– P2

REFERENCE NOTES (CONTINUE):

- .6 120V, 5A CIRCUIT IN CONDUIT TO SFTP/CQD/FIBER TRANSCEIVER BY ELECTRICAL TRADE. EACH DEDICATED 120V, 5A CIRCUIT FROM UPS-2 TO FEED MAXIMUM 4 DEVICES.
- .7 CAT6 DATA CABLE IN CONDUIT BY ELECTRICAL TRADE.
- .8 6-STRAND MULTI-MODE FIBER OPTIC CABLE BY ELECTRICAL TRADE.
- .9 CAT6 PATCH CORDS BY ELECTRICAL TRADE.
- .10 MULTI-MODE FIBER OPTIC PATCH CORDS TERMINATED WITH LC CONNECTOR AT SWITCH; PROVIDED BY ELECTRICAL TRADE.
- .11 FIBER TRANSCEIVER TO SERVE DEVICES AT DISTANCES EXCEEDING 90m; SUPPLIED, INSTALLED AND CONNECTED BY PRESTO SUPPLIER. SEE DIAGRAM P5.
- .12 TRANSCEIVER ENCLOSURE BY ELECTRICAL TRADE. SEE DIAGRAM P5.
- .13 POWER JUNCTION BOX WITH FUSE HOLDER TERMINAL BLOCKS AND 5 AMP FAST BLOW FUSE FOR EACH CIRCUIT IN COMMUNICATION ROOM TO TERMINATE POWER WIRING AT CC RACK LOCATION; PROVIDED BY ELECTRICAL TRADE. SEE DIAGRAM P3.
- .14 DATA JUNCTION BOX IN COMMUNICATION ROOM TO TERMINATE DATA WIRING AT CC RACK LOCATION; PROVIDED BY ELECTRICAL TRADE. SEE DIAGRAM P4.
- .15 FIBER OPTIC DISTRIBUTION PANEL IN CC RACK BY ELECTRICAL TRADE.
- .16 CAT6 PATCH PANEL IN CC RACK BY ELECTRICAL TRADE.
- .17 SWITCH IN CC RACK; SUPPLIED, INSTALLED AND CONNECTED BY PRESTO SUPPLIER.
- .18 UPS-1 IN CC RACK TO PROTECT PRESTO NETWORK EQUIPMENT; SUPPLIED, INSTALLED AND CONNECTED BY PRESTO SUPPLIER.
- .19 UPS-2 IN CC RACK TO PROTECT THE PRODUCTION PRESTO DEVICES; SUPPLIED, INSTALLED AND CONNECTED BY PRESTO SUPPLIER.
- .20 NEMA 5-15R RECEPTACLE (WITH DEDICATED 120V, 15A CCT FROM NORMAL POWER); PROVIDED BY ELECTRICAL TRADE.
- .21 120V RECEPTACLE WITH DEDICATED CIRCUIT FROM NORMAL POWER BY ELECTRICAL TRADE. RECEPTACLE TO BE:  
NEMA 5-15R (WITH DEDICATED 120V, 15A CCT.) AT RAIL STATIONS AND BUS TERMINALS.  
NEMA L5-30R (WITH DEDICATED 120V, 30A CCT.) AT BUS DEPOTS WHEN A "WLAN" SOLUTION IS DEPLOYED.  
NEMA L6-20R (WITH DEDICATED 2P, 208V, 20A CCT.) AT BUS DEPOTS AND ENFORCEMENT OFFICES THAT HAVE SERVER.
- .22 FLOOR/WALL MOUNTED RACK TO HOUSE CONCENTRATOR COMPLEX (CC); SUPPLIED AND INSTALLED BY ELECTRICAL TRADE.
- .23 DISCONNECT SWITCH IN TRANSCEIVER ENCLOSURE BY ELECTRICAL TRADE. "OFF" POSITION TO BE LABELED CLEARLY ON SWITCH.
- .24 SOW SERVICE CORD C/W COMMERCIAL SPECIFICATION GRADE PLUG TO FEED PRESTO DEVICES FROM UPS-2; BY ELECTRICAL TRADE.

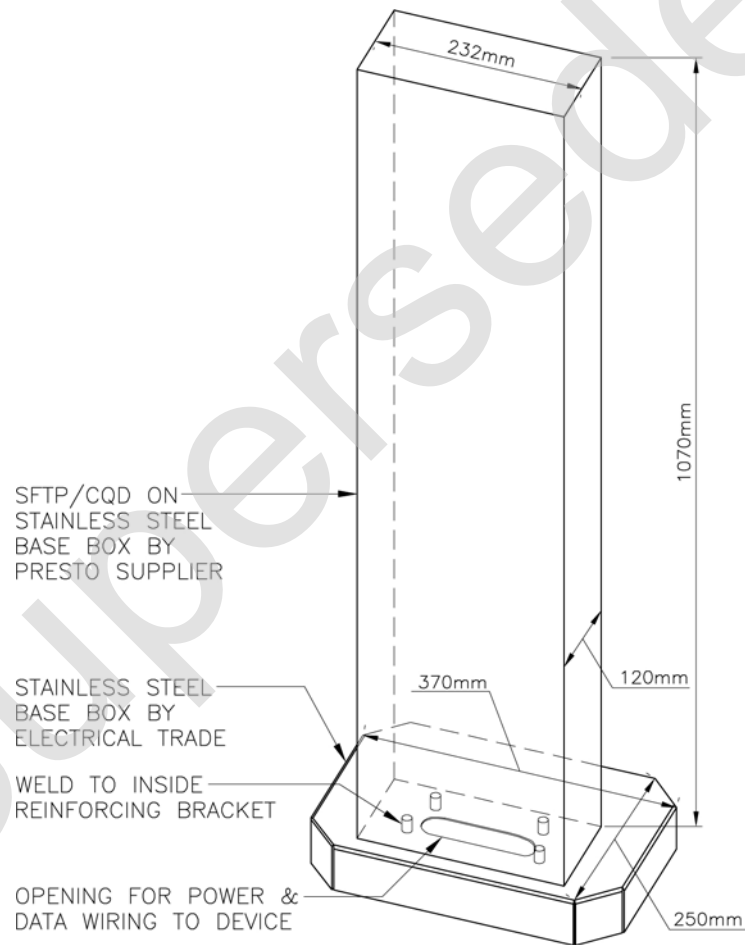


CI-0704

**TAB 7: TECHNICAL DISCIPLINES**  
Communications

FIGURE: DETAIL – SFTP/CQD ON BASE BOX FRONT VIEW (CUSTOMER FACING)- P9

**SECTION:**  
Tab 7: Technical  
Disciplines



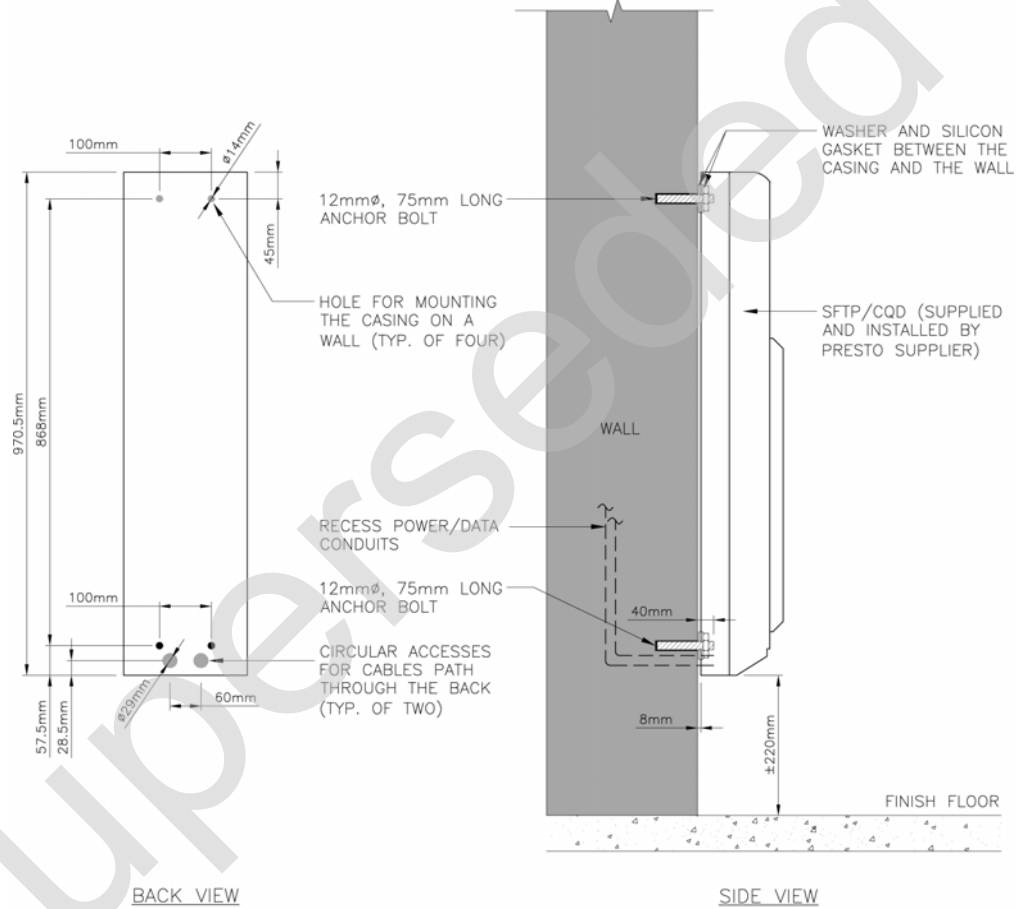


CI-0704

**TAB 7: TECHNICAL DISCIPLINES**  
Communications

FIGURE: DETAIL – BACK ENTRY WALL MOUNTED CQD/SFTP INSTALLATION DETAIL -P10

**SECTION:**  
Tab 7:  
Technical  
Disciplines



**NOTES:**

1. COIL 1m POWER WIRING AND DATA WIRING. FINAL CONNECTION BY DEVICE SUPPLIER. DATA CABLES (CAT6) TO BE PROVIDED WITH RJ-45 CONNECTOR.
2. PROVIDE TEMPORARY BOXES AT EACH DEVICE LOCATION TO PROTECT COILED-UP WIRING. COIL 1m POWER WIRING AND DATA WIRING. FINAL CONNECTION BY DEVICE SUPPLIER. DATA CABLES (CAT6) TO BE PROVIDED WITH RJ-45 CONNECTOR.





CI-0703

## TAB 7: TECHNICAL DISCIPLINES

Electrical

- > Bus loop and bus loop shelter lighting to be 100% OFF.
- > Parking lot lighting to be further reduced to 100% OFF.
- > Illuminated facility ID sign to turn OFF.

### EXTERIOR LIGHTING ON/OFF CONTROLS

The lighting controls shall be designed to provide the following functions:

- > The lighting controller (i.e. timer) shall be programmable controlled, PLC, complete with automatic daylight savings adjustment.
- > Provide a photocell control on all control designs where the default is “dusk to dawn”.
- > Sites that are being rehabilitated should have their lighting controls modified to meet these requirements.

### OVERRIDE SWITCHES

Station lighting is to be wired into separate zones and each zone shall be controlled independently by one of three master override switches. Switches shall be strategically located at the ticket booth, electrical room and exterior of the station. Override switch will be accessible to GO staff and GO approved contractors/agents.

Zones shall include Station building, surface parking, multi-level parking, bus loop, rail platform, Kiss and Ride and access road at a minimum. An overall master shut off switch is also to be provided. Switches shall be housed in a weather tight, PVC lockable box accessible to GO staff, and GO approved contractors/agents. All switches shall have the ability to control any lighting zone. All switched to be labeled with the zone it is controlling.

Remote parking shall have its own override switches following the same guidelines as above. The locations shall be inside the local power cabinet and outside the cabinet housed in a weather tight, PVC lockable box.

### EXIT LIGHTS

Exit lights shall be of the fully self-contained and low energy LED type.

### EMERGENCY LIGHTS

Emergency lighting shall be in accordance with the OBC, the Ontario Electrical Safety Code, and the latest CSA standards.



CI-0107

**TAB 1: GUIDING PRINCIPLES**  
System Safety

**SECURITY DESIGN GUIDELINES**

Design Area	Guidelines
	<ul style="list-style-type: none"> <li>&gt; <b>Tunnels:</b> shall have at least two circuits for lighting. The tunnel lighting shall have occupancy sensors to reduce the lighting levels when not in use.</li> <li>&gt; <b>Tunnel concrete walls:</b> Shall have painted or stainless steel metal panel raceways that house electrical and communication services. It is to provide a detail accent, to facilitate orientation with a diagonal striping extending up stairwell walls; this metal duct shall be provided with sound deadening insulation.</li> <li>&gt; <b>Long walls:</b> shall be articulated by material or colour accents, textures, or patterns and by pre-located advertising signs.</li> <li>&gt; <b>Floors and walkways:</b> (except tunnel floors) shall have patterns related to wall lines and level changes;</li> <li>&gt; <b>Ceilings:</b> shall be similarly articulated, with the use of bulkheads, skylights, and accent luminaires,</li> <li>&gt; <b>Natural grade reference level:</b> shall be enhanced by soft and hard landscaping including planter beds, flowering shrubs, patterned and coloured concrete, natural stone planter walls, etc.</li> </ul>
Communications	<ul style="list-style-type: none"> <li>&gt; <b>Signs/intercoms/CCTV:</b> shall be pre-located and not superimposed: architectural components shall be coordinated with signs and equipment. Illumination and sight-lines shall be integrated with CCTV requirements;</li> <li>&gt; <b>Security devices/monitoring devices:</b> shall be identified by signs as a deterrent: doors and windows to incorporate such signs or decals;</li> <li>&gt; <b>International symbols and colours:</b> shall be used for barrier-free, pay telephone, high voltage and other signs where applicable. Signs shall be oriented and illuminated to suit sight-lines. See GO Signage Manual; and</li> <li>&gt; <b>Advertising signs:</b> do serve to communicate a sense of place, but their location, especially when freestanding, must not conflict with directional signs or sight-lines. Consultants shall work with GO to pre-determine advertising sign locations and provide a concealed electrical supply system, to ensure no exposed conduits and no obstructed sight-lines.</li> </ul>



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### TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT Parking Infrastructure

- > Refer to GO “Station Electrical Room Standard” in the Design Requirements Manual for detailed guidelines.

#### **COMMUNICATIONS/HUB ROOM**

- > In Parking Structures, careful planning is required when locating the Communications and Hub Rooms. Attention must be paid to equipment placement within these rooms in relation to the structural ceiling elements. The required vertical clearance above the racks must also be taken into account. Ideally, cable trays shall be kept level, precast openings in structural “T’s” as determined by the structural engineer, to get to the side walls of the room.
- > Cable trays may be routed around structural ceiling elements if needed, however, shall not be installed lower than 2.0m A.F.F.
- > Unless otherwise requested, the racks shall be installed in the preferred configuration shown in the Information Technology Telecommunications & Systems Document (Appendix A of the DRM)
- > For detailed Communication/Hub room guidelines in Multilevel Parking Structures, refer to DRM TAB 7.

#### **SERVICE & MAINTENANCE AREA – STORAGE/SERVICE ROOM**

- > A designated storage area in the parking structure should be provided. The room(s) can be used to accommodate service equipment; sweeper storage and tools in a secure location.
- > The room(s) shall be accessed by a double leaf Hollow Metal (HM) door and the doors shall not open onto vehicular traffic; a concrete apron shall be provided with bollards to protect egress of service personnel onto the drive aisle.
- > Service rooms shall contain sprinklers, water valves, switches and mechanisms, etc.
- > Rooms that contain temperature sensitive equipment shall be insulated and shall require special design.

#### **ELECTRICAL SERVICES AND DESIGN CRITERIA**

- > Investigate impact of parking structure on the existing electrical service because the existing service may not accommodate the additional load. Refer to the DRM for detailed requirements.
- > Energy Management System/ Smart Panels should provide the most flexible control system available: multi-level lighting, occupancy lighting changes, light harvesting, programmable



CI-0501

**TAB 5: RAIL AND BUS OPERATIONAL FACILITIES**  
Bus Operational Facilities

**ELECTRICAL**

Feature	Design Requirements												
	<table border="1"><tr><td>Interior repair garage, general</td><td>500 lux</td></tr><tr><td>Interior repair garage, workbenches</td><td>750 lux</td></tr><tr><td>Bus garage areas</td><td>300 lux</td></tr><tr><td>Utility areas</td><td>200 lux</td></tr><tr><td>Office areas</td><td>200 lux</td></tr><tr><td>Emergency and night time lighting</td><td>20 lux</td></tr></table>	Interior repair garage, general	500 lux	Interior repair garage, workbenches	750 lux	Bus garage areas	300 lux	Utility areas	200 lux	Office areas	200 lux	Emergency and night time lighting	20 lux
Interior repair garage, general	500 lux												
Interior repair garage, workbenches	750 lux												
Bus garage areas	300 lux												
Utility areas	200 lux												
Office areas	200 lux												
Emergency and night time lighting	20 lux												
Lighting Control	<ul style="list-style-type: none"><li>&gt; Control interior lighting by local switches, occupancy sensors and the low voltage lighting control system.</li><li>&gt; Control exterior lighting by means of a photocell and contactor with a manual override; provide a computer based low voltage lighting control system to switch various lighting circuits through the building.</li></ul>												
Receptacles	<ul style="list-style-type: none"><li>&gt; All receptacles are to be duplex type spec grade to code use.</li><li>&gt; Receptacles are to be located in the following places:<ul style="list-style-type: none"><li>• Plant Areas,</li><li>• Offices,</li><li>• Control and Electrical Rooms,</li><li>• On a dedicated circuit, at each workbench,</li><li>• On the roof adjacent to each HVAC unit,</li><li>• In wet and outdoor locations,</li><li>• Distributed equally along the building perimeter;</li><li>• Pendant cord mounter single receptacles in the repair</li></ul></li></ul>												



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**TAB 7: TECHNICAL DISCIPLINES**

Electrical

**EXTERIOR LIGHTING ILLUMINATION LEVELS**

Location	Illumination Level
Exterior Stairs & Walkways Separate from Buildings	20 Fc (200 LUX)
Pedestrian Paths and Bike ways	2 Fc (20 LUX)
Layover General lighting	2 Fc (20 LUX)
Wayside cabinet and Switch area	5 Fc (50 LUX)

- > Photocells and occupancy sensors are to be used.
- > The lighting levels for inside a covered Parking Facility shall be to a minimum recommended by IESNA and as follows:

**LIGHTING LEVELS FOR INSIDE A COVERED PARKING FACILITY**

Area	Specification	Colour Temperature
General parking and pedestrian areas	50 lux or 5fc	4000 K
Ramps and corners	110 lux or 10 fc	4000 K
Entrance areas	540 lux or 50 fc	4000 K
Service rooms	500 lux or 50 fc	4000 K
Stairways and elevator lobbies	220 lux or 20fc	4000 K

- > The lighting control shall be flexible i.e. programmable controlled per circuit complete with IP addressable and remote access and control.
- > The design shall consider methods of reducing energy usage and maintenance. LED Lighting shall be continuous dimmable (0 to 10 V DC). The design shall consider occupied and a 50 % reduction in light levels when unoccupied. Light harvesting systems shall also be considered.
- > The system shall be controlled by a Programmable Logic Controller which can handle multiple lighting levels and areas complete with unique on and off, a remote override, and a



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**TAB 7: TECHNICAL DISCIPLINES**

Electrical

changeable daylight savings time. The changes to the on and off configurations shall be done either remote or local computer connections.

- > Service areas like electrical rooms are to have ceiling mounted occupancy sensors on all light switches.
- > Exterior decorative, illuminated signage and perimeter lighting shall be all part of the design.
- > Pole lighting shall be to GO standards for lighting and poles details referenced in the DRM.
- > Reduction of light pollution of flood lights and wall washers (spill off into surrounding canopies) is to be considered.

Station locations with a high probability of vandalism shall have extra bright illumination, if required and viable in terms of adjacent neighbourhoods.

**Uniformity Ratio**

Maximum to minimum: 4:1 or better

Average to minimum: 3:1 or better.

**Dimmable Illumination**

Photocells, motion and occupancy sensors are to be used within multi-level parking structures, tunnels and pedestrian bridges.

Occupancy sensors are to be placed to allow no blind spots.

Refer to Illumination Levels table on page 478 – 479 TAB 7: ELECTRICAL for minimum lighting levels within multi-level parking structures, tunnels and pedestrian bridges as recommended by IESNA:

The lighting control shall be flexible i.e. programmable controlled per circuit complete with IP addressable and remote access and control.

Methods of reducing energy usage and maintenance shall be considered in design. LED Lighting shall be continuous dimmable (0 to 10 V DC). The design shall consider occupied and a 50 % reduction in light levels when unoccupied. Light harvesting systems shall also be considered.

**LIGHT SOURCES AND CONTROLS**

**INTERIOR LIGHTING SOURCES AND CONTROLS**

Location	Light Source	Control and Backup
Waiting	LED down lighting	Time-of-day controller, 100%



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**TAB 7: TECHNICAL DISCIPLINES**  
Electrical

**INTERIOR LIGHTING SOURCES AND CONTROLS**

Location	Light Source	Control and Backup
	LED sconce lights	station open hours, 10% minimum station closed, 10% on Generator. Day light harvesting were possible.
Station Attendant	LED, continuous task lights over counters with parabolic lenses for glare-free illumination (no visible light source)	Local switches. One fixture UPS + Generator backed-up over sales counter, one over cash area and safe, or 10% minimum station closed
Staff Washroom	Mirror task light or surface mounted LED vandal resistant lenses	Occupancy sensor switch. One luminary on UPS + Generator
Public Washroom	LED, vandal resistant luminaries or valance or cove lights for large facilities	On/Off switch with occupancy sensor, one fixture on UPS + Generator
Electrical, Comms., Mechanical, Janitor, and Storage Rooms.	Linear LED 1219 mm long or surface mounted luminaries vandal resistant	On/Off switch with occupancy sensor, 50% on UPS + Generator in Mechanical, Electrical and Comms. Rooms only
Shop	Linear LED 2438 mm long, suspended. Task lights over equipment and workbenches to suit functions	Local switching or to suit particular application, 10% on UPS + Generator
Garage Maintenance Shop	LED for shops. LED Task lights where required	Panel or central switching to suit particular application. 10% on UPS + Generator or to Code requirements
Dispatch	LED, and supplementary illumination for maintenance with task lights to suit	Local switches, dimmers, 10% on UPS + Generator.
Office	Per IES	10% on UPS + Generator

**EXTERIOR LIGHTING SOURCES AND CONTROLS**

Location	Light Source	Control and Backup
Parking Lot, Passenger Drop-off and Pick-up Areas, and Bus Loop Areas including Bus Platforms and Access Roads	LED area lights or down lights on 6 or 12 m high galvanized steel poles or 30m high masts (use of LED on 30m high masts approved by GO Transit on a case by case basis). See Notes below.	Circuited for 30% in operation during station closed hours (photo-control only) and to have manual override of the photo control and time-clock (the manual override shall not be digital)



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**TAB 7: TECHNICAL DISCIPLINES**

Electrical

**EXTERIOR LIGHTING SOURCES AND CONTROLS**

Location	Light Source	Control and Backup
Parking Structure	LED	Day light harvesting and occupancy sensor control of two light levels and timer
Rail Platform	LED on 6 m hinged poles on 300 mm high concrete bases or in canopy. Urban platforms may require LED or Metal Halide luminaries if requested by the Municipality	Both timer and photo cell controlled, on Generator. During station closed hours 100% off. Override switch (snow removal use): 100% on
Mini-Platform	Same as Rail Platform	Controlled as part of Rail Platform
Tunnel, enclosed bridges and canopies	LED , 1219 mm long, c/w vandal resistant lenses, lights should be dimmable, when space not occupied	Breaker control, 30% on UPS + Generator
Internal Stairwell (tunnel, parking structure)	LED luminaries, semi-recessed in walls, below handrails	Breaker control, 30% on UPS + Generator
Exterior Stair and Walkway	Same as parking lot, Pole location to suit	Same as parking lot





CI-0703

**TAB 7: TECHNICAL DISCIPLINES**

Electrical

A wall mounted cooling thermostat (set at 22°C) shall be installed approximately 1700 mm above floor level and be marked "Heat Pump". Thermostat should be on interior wall whenever possible. Thermostat must have auto-changeover capability. If heaters are installed in same room they should be interlocked with HVAC to prevent heating and cooling at same time.

A Dual Temperature Sensor, for a high and low room temperature alarm, shall be installed for connection to The Security Monitoring System. The dual sensor shall be of the approved type that is appropriate for this specific application.

A carbon monoxide sensor shall control the ventilation system and shall be able of sending an alarm to the Security Monitoring System in case of higher CO concentrations.

All equipment shall have nameplates indicating model, capacity and electrical data. The wall mounted thermostats shall be supplied with the units (for field wiring).

The air conditioning equipment and heater shall be supplied by a reputable manufacturer. Install equipment in accordance with manufacturer's recommendation.

**Emergency Cooling**

Provisions for emergency cooling in communication and electrical rooms:

- Provide a 6" vent opening provision, secured from inside, for portable A/C unit in both electrical and communication rooms, venting to the outside.
- Provide dedicated 120V, 20A, 5-20R and 120V, 30A, 5-30R power receptacles (generator backed-up) from dedicated circuit breakers for portable A/C unit, in Electrical and Communication rooms. Receptacles to be mounted at 300mm height above finished floor. Contractor to provide Labels above receptacles stating: the respective Amps, panel and circuit numbers and "DEDICATED FOR PORTABLE A/C UNIT"
- Provide an exhaust fan controlled by a reverse acting thermostat and an override switch.
- High/low temperature alarm.

The sequence of operations should be as follows:

1. When A/C unit fails and temperature starts rising, the high temperature sensor sends an alarm to the current corporate supplier of security and monitoring services.
2. Station Operations will be notified to send a portable A/C unit and the HVAC service contractor is notified to repair the broken A/C unit.
3. The ventilation system will then kick-in to help reduce the temperature until a portable A/C unit is installed.



CI-0703

**TAB 7: TECHNICAL DISCIPLINES**

Electrical

4. Station Ops will install the portable A/C unit and switch off the ventilation system.

**Noise/Vibration**

Isolators and vibration control devices shall be specified as required to ensure that equipment-noise and vibration do not interfere with operations, as well as to protect adjacent properties from noise and vibration.

**Grounding**

A common 50 mm wide x 6 mm thick copper bus shall be connected to the door and frame and encircle the Electrical Room and Communications Room.

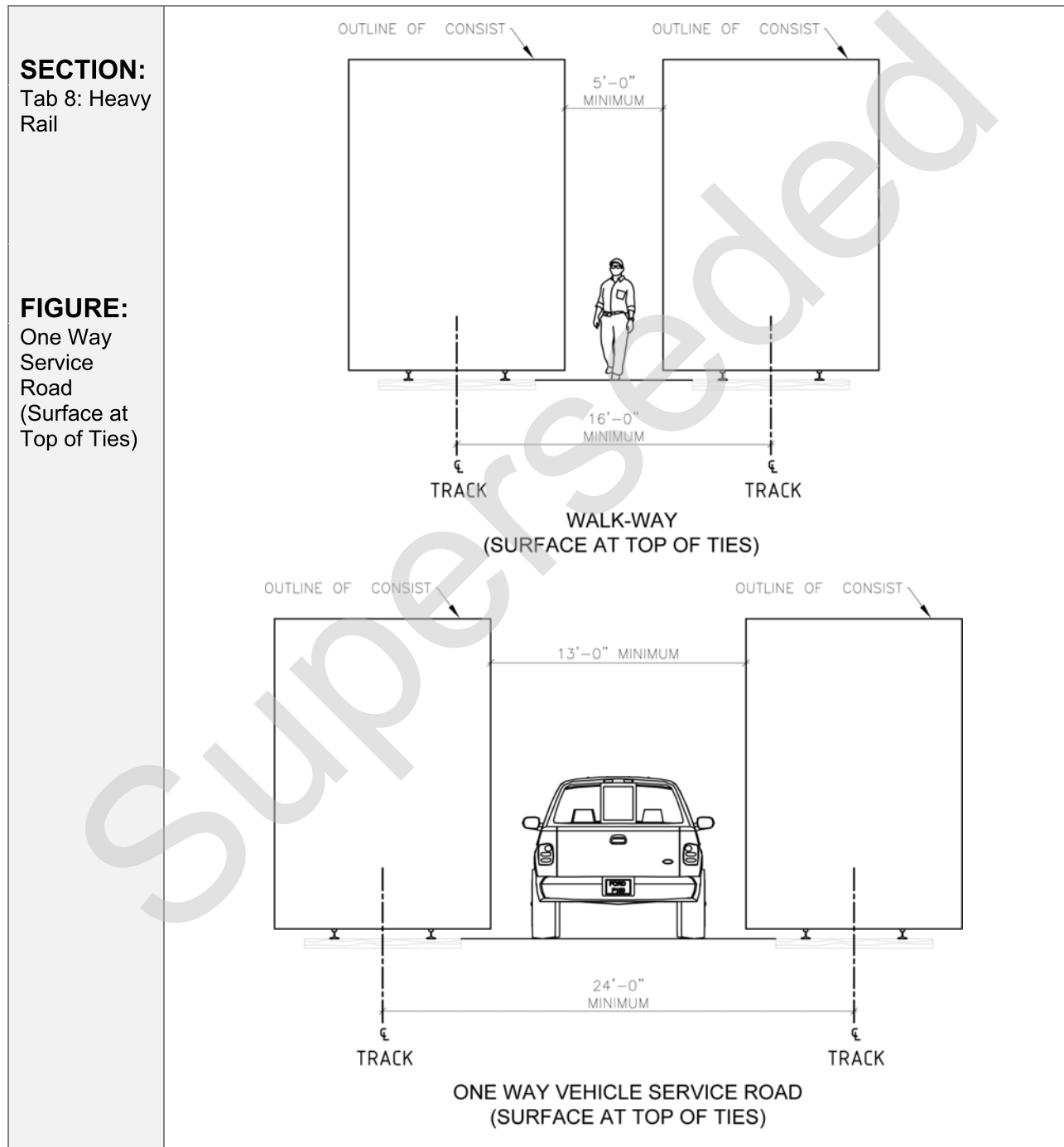
Conductors shall be securely fixed, recessed in floor grooves or niches, or fixed to walls by appropriate staples. Ground bar or loop shall be securely fixed to building wall with copper or brass saddles.



CI-0807

**TAB 8 HEAVY RAIL**  
Structure Interface

FIGURE: ONE WAY SERVICE ROAD (SURFACE AT TOP OF TIES)





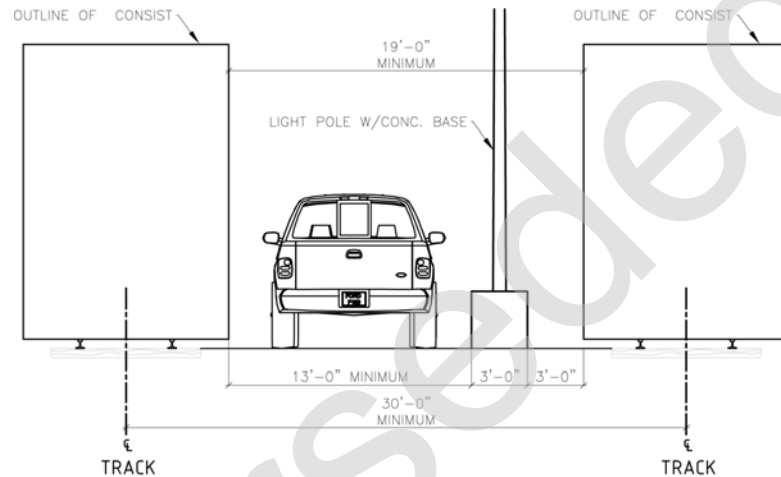
CI-0807

**TAB 8 HEAVY RAIL**  
Structure Interface

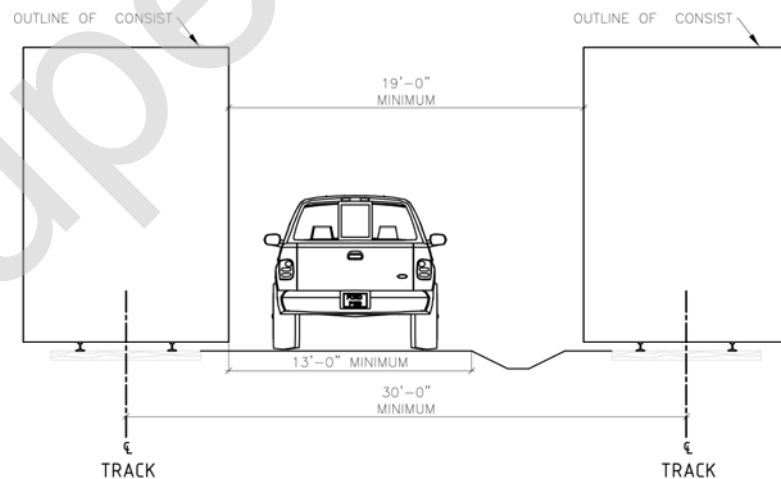
FIGURE: ONE WAY SERVICE ROAD WITH DRAINAGE DITCH (SURFACE AT TOP OF TIES)

**SECTION:**  
Tab 8: Heavy Rail

**FIGURE:**  
One Way Service Road With Drainage Ditch (Surface at Top of Ties)



ONE-WAY VEHICLE SERVICE ROAD WITH LIGHTING POLES  
76 M (250') TO 91 M (300') APART  
(SURFACE AT TOP OF TIES)



ONE-WAY VEHICLE SERVICE ROAD DRAINAGE DITCH  
(SURFACE AT TOP OF TIES)



CI-0202

**TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**  
Station Sites

**Entrances:** shall be accessible to people using wheelchairs or scooters. The following features shall form part of an accessible entrance:

- > Power assisted door operators, with guards;
- > Accessible entrances shall be clearly marked with the International Symbol of Accessibility;
- > Can be easily opened with one hand;
- > Canopies or other sheltering devices where present, shall have adequate headroom; and
- > Mats shall be level with the floor and door thresholds are bevelled so they do not create a tripping hazard.



**PEDESTRIAN AND BICYCLE PATHS**

- > Provide dedicated and continuous routes for pedestrians throughout the station and connections to surrounding areas.
- > Pedestrians should not be required to cross the parking lot in order to access the station building.
- > Ensure pedestrian pathways are separated from vehicular traffic whenever possible.
- > Walkways shall be minimum 1.6 m wide.
- > When an entrance is provided from a recreational trail, a clear opening between 850 mm to 1000 mm is required, whether the entrance includes a gate, bollard, or other barrier.
- > The exterior path must meet the following requirements:
  - o It must have a 1:2 bevel at changes in level between 6 mm and 13 mm.
  - o It must have a maximum running slope of 1:8, or be designed as a ramp, at changes in level greater than 13 mm and less than 75 mm.
  - o It must have a maximum running slope of 1:10, or be designed as a ramp, at changes in level greater than 75 mm or less than 200 mm.
  - o It must be designed as a ramp, meeting all requirements and codes pertaining to ramps at changes in level greater than 200 mm.
- > Sidewalk and walkways shall be raised and constructed of hard and sustainable level materials that are slip resistant.



CI-0202

### TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT Station Sites

- > Provide curb cuts at all crossings to enable access for people using mobility devices.
- > Provide dedicated or shared bicycle lanes along primary vehicular roads leading to and from the station. Depending on the station configuration, it may be preferable to introduce a separate bicycle entrance. The width of a dedicated bike lane shall be no less than 1.5 m.
- > The bike route shall be distinguished with specially coloured paving, line painting, or graphic.
- > Ensure bicycle access routes are free of obstacles such as curbs and signs. Provisions for bicycle ramps and gutters shall be considered where barriers are unavoidable.

#### **SHARED PEDESTRIAN/CYCLISTS PATH**

##### Design Use:

- > Shared pedestrian/cyclists paths are to be used, on a site by site case, where it is determined to promote a safe and visible alternate mode of transportation at stations.
- > Shared paths should provide connectivity from the main municipal access points, surrounding neighbourhoods and to existing recreational paths, where applicable.
- > Shared paths are to be implemented in conjunction with and leading to bicycle shelters and racks.

##### Design Intent:

- > A “shared path” is considered to be a single lane of travel, delineated for pedestrians and a single lane of travel delineated for cyclists.
- > Newly constructed shared-use paths should be built to provide access for people with disabilities and provide sufficient width to accommodate the potential condition of two wheelchairs having to pass, side by side.
- > The shared path should have a centreline pavement marking, to reduce the cyclists’ perception of freedom to manoeuvre between lanes.
- > Key features to be considered include trail access points, grade, cross-slope, street crossings, curb ramp design, railings, and signage.

##### Design Requirements:

- > The shared path width should be minimum 3 m wide.
- > Surfaces must be constructed of hard and sustainable level materials that are firm, stable, and slip-resistant.



CI-0203

**TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**  
Parking Infrastructure

- > Stalls abutting curbs shall be 4.5 m long with a 1.0 m allowance for vehicle overhang.
- > Parallel parking stalls shall be 3 m wide x 7 m long.
- > Material for 1 m overhang shall be determined by implementing progressive, sustainable and environmentally friendly design practices and solutions.
- > Refer to Line Marking Section to see appropriate Figures.



**Barrier Free Parking**

- > Barrier Free Parking shall be located close to the station building entrance and/or rail/bus platform access. Parking spaces designated for persons with disabilities and accessible passenger pick-up areas that serve GO facilities should be located on the shortest possible circulation route to an accessible entrance (preferably 30m or less).
- > The following two types of parking spaces shall be provided for the use of persons with disabilities:
  - o Type A, a wider parking space which has a **minimum width of 3.4 m by a depth of 5.5 m** and signage that identifies the space as “van accessible”. In addition a 1.5 m wide barrier free access aisle is required adjacent to the parking space. This can be shared with another parking space.
  - o Type B, a standard parking space which has a **minimum width of 2.4 m by a depth of 5.5 m**. In addition, a 1.5 m wide barrier free access aisle is required adjacent to the parking space. This can be shared with another parking space.
- > If the total number of accessible spaces is an even number, the types required are divided equally. If the total number of accessible spaces is an odd number, the one remaining ‘odd-numbered’ space may be a Type B.
- > Parking lots shall have the minimum number of designated Barrier Free Parking spaces for passengers with disabilities in accordance with the DRM standard outlines in the table below.

(Note:GO transit has issued a memo to the AODA agency in response to the increase in the number of accessible spaces required in the AODA regulation. The number of accessible parking spaces will meet the DRM standard currently in place, or whatever the ridership demands are at a specific location, which may amount to more than the DRM standard and AODA regulation)



CI-0203

**TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**  
Parking Infrastructure

Total Number of Parking Spaces	Number of Designated Spaces*		
	Percentage Formula	Minimum Number of Spaces (Type A)	Minimum Number of Spaces (Type b)
1 – 100	4%	1	1
101 – 200	3%	2	2
201 – 500	2%	3	3
501 – 1,000	1.5%	4	4
1,001 – more	1%	5	5

The accessible route shall not be located where it would require people to pass behind vehicles that may be backing out. Colour-contrasted bollards or curbs should be used to prevent parked vehicles from protruding into the accessible circulation route.

Each Barrier Free Parking space shall be clearly marked with a sign bearing the International Symbol of Accessibility. Where the location of designated accessible parking spaces is not obvious, directional signage incorporating the International Symbol of Access shall be placed along the route leading to the designated parking spaces.

If there are more than three (3) designated spaces adjacent to each other, there shall be continuous low curb with detectible surfaces along the entire length of multiple designated spaces (no curb ramp for each unloading area).

For additional guidelines regarding accessibility and Figures refer to Accessibility section, TAB 1 of this manual. For signage refer to Signage Section, TAB 6 of this manual.





CI-0204

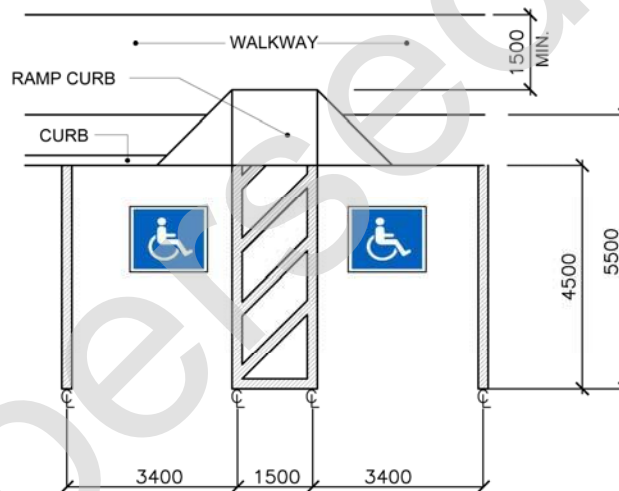
**TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**  
Pavement and Line Markings

FIGURE: DESIGNATED PARKING - CONFIGURATION FOR TWO OR LESS PARKING SPOTS

**SECTION:**  
Tab 2: Site Infrastructure and Development

**FIGURE:**  
Designated Parking – Configuration for Two or Less Parking Spots

**DESIGNATED PARKING CONFIGURATION FOR TWO OR LESS PARKING SPOTS**



**NOTES:**

- RECOMMENDED UNOBSTRUCTED ACCESSIBLE ROUTE SHALL BE MINIMUM 1500 mm WIDE
- SEE ALSO LINE MARKING FOR CROSSWALKS

COLOR : LINE MARKING : REFER TO TAB 2: SECTION C1-0204 LINE MARKINGS CHART .  
WHEELCHAIR SYMBOL: REFER TAB 2, SECTION C1-0203 BARRIER FREE PARKING STALLS FOR COLOUR SCHEME

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS



CI-0204

**TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**  
Pavement and Line Markings

FIGURE: DESIGNATED PARKING - CONFIGURATION OF MULTIPLE PARKING SPOTS (MORE THAN TWO)

**SECTION:**  
Tab 2: Site Infrastructure and Development

**FIGURE:**  
Designated parking – Configuration of Multiple Parking Spots (More than Two)



**NOTE:**

THE RECOMMENDED MAXIMUM PATH OF TRAVEL SHALL NOT EXCEED 30 m, FROM LAST ACCESSIBLE PARKING SPOT TO THE NEAREST ENTRANCE.

THE MAXIMUM NUMBER OF BARRIER FREE PARKING SPOTS IN ONE ROW SHALL NOT EXCEED 8 SPACES INCLUDING 4 HATCHED UNLOADING AREA.

COLOR : LINE MARKING : REFER TO TAB 2: SECTION C1-0204 LINE MARKINGS CHART .  
WHEELCHAIR SYMBOL: REFER TAB 2, SECTION C1-0203 BARRIER FREE PARKING STALLS FOR COLOUR SCHEME



CI-0208

**TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**  
Furnishings and Amenities



**ACCESSIBLE CURBS**

- > Accessible curbs (curb cuts) shall be provided where pedestrian paths intersect with vehicular roads, at barrier-free parking spaces, and wherever there is change in level along a barrier-free path of travel.
- > Directional grooves at 300 mm centres shall be provided, in accordance with OPSD 310.030.
- > Where an accessible curb is provided, the surface shall have tactile indicators on its surface that meet the following requirements:
  - have raised tactile profiles
  - have a high tonal contrast with the adjacent surface
  - are set back between 150 mm and 200 mm from the curb edge
  - extend the full width of the curb
  - have a minimum of 610 mm in depth
  - have a maximum running slope of 1:15

**GUIDE RAILS, GUARDRAILS AND BOLLARDS**

Steel Beam Guide Rails	Metal Pipe Guard Rails	Bollards
At hazardous grade slopes for vehicular safety	At walkways adjacent to hazardous traffic or ditches	To prevent vehicular access at transformers, gas meters, hydrants, accessible parking spots, near ancillary rooms in parking garages, vehicular traffic areas in bus and rail maintenance etc.,

**MATERIALS**

- > Steel Rail Guide Rails shall be in accordance with the applicable OPSD, Section 900.
- > Metal Pipe Guard Rails shall be galvanized pipe minimum 50 mm diameter, and 1070 mm high with mid-rail, etc. Decorative steel fencing may be used in lieu of railing.



CI-0401

**TAB 4: STATION INFRASTRUCTURE**  
Station Buildings

**DESIGN REQUIREMENTS**

The following tables (and/or figures) refer to the detailed room design program for individual rooms in a typical station building:

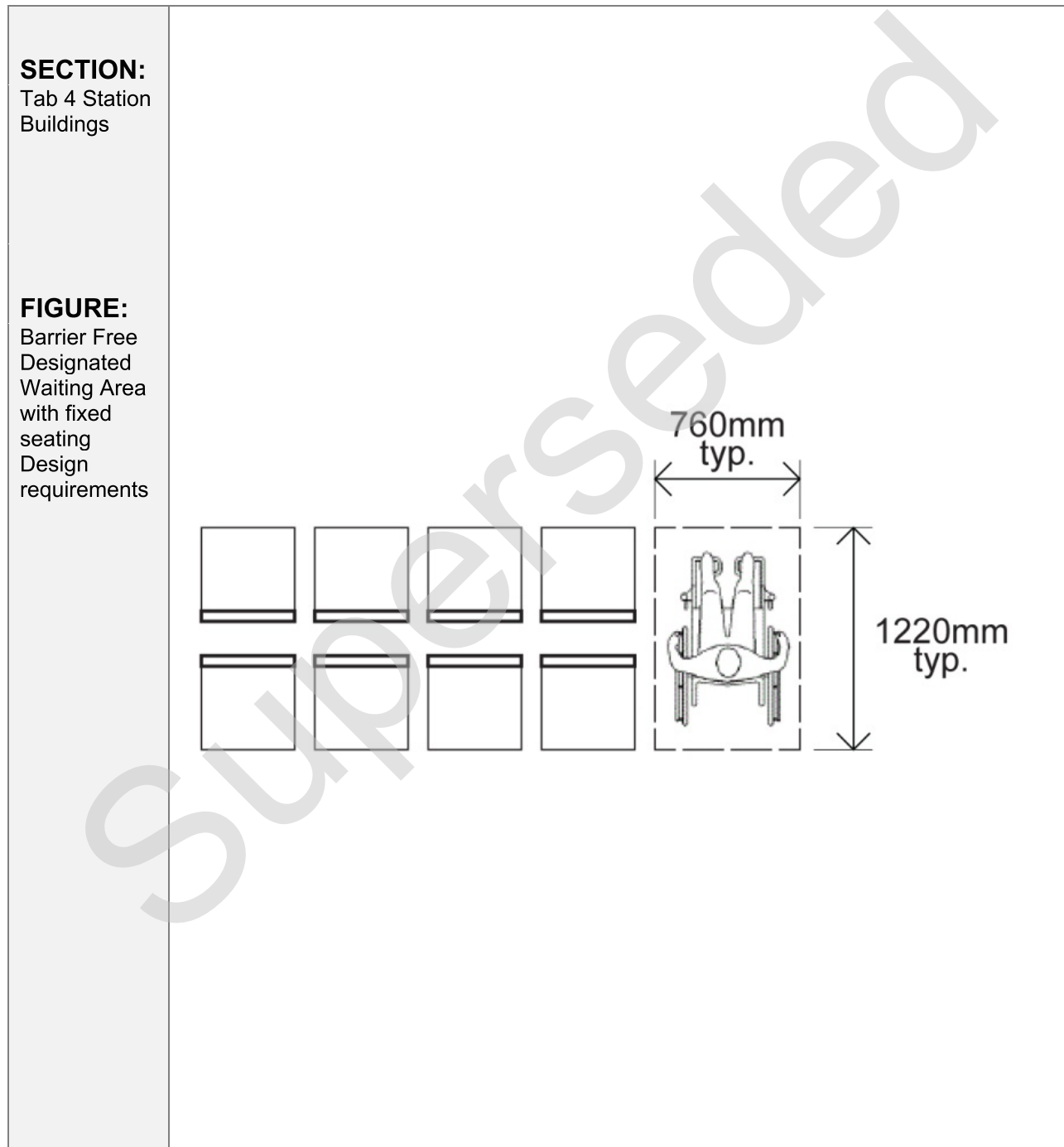
WAITING AREA	
Room Name	Description
Location	The waiting area shall project beyond the main building, with sight lines along the length of the building and maximized sight lines to the exterior.
Features	<ul style="list-style-type: none"> <li>&gt; Minimum queuing space in front of ticket sales counter shall be 5-7 passengers per attendant; queuing space shall be increased based on historical peak station demand information provided by GO staff.</li> <li>&gt; Combined circulation/waiting space shall be provided beyond the queuing space on the basis of 0.7 m<sup>2</sup> for each passenger. Concession space (staffed kiosk or vending alcove);</li> <li>&gt; High ceiling to a maximum of 4 m with daylighting (clerestory bay gable windows, or skylights); peaked or shallow arch ceiling for perimeter illumination (cove lighting);</li> <li>&gt; Station attendant ticket sales counter complete with purse shelf, with butt-joint clear glazing from the counter top to the bulkhead soffit.</li> <li>&gt; A minimum of 3% of new seating must be accessible with a minimum of one accessible space when constructing a new waiting area or are redeveloping an existing waiting area, where the seating is fixed to the floor.</li> </ul>
Doors	<ul style="list-style-type: none"> <li>&gt; Glazed aluminum frame single door entrances at right angles to the main building, to minimize drafts, protected by the roof overhang, with doors hinging to open against exterior walls.</li> <li>&gt; Two (2) adjacent doors without a post between, with a guard rails. Guardrail to have rubber doughnut bumpers. Power operated doors, where they open into a route of travel, shall have cane-detectable guardrails or other barriers at right angles to the wall containing the door.</li> </ul>



CI-0401

**TAB 4: STATION INFRASTRUCTURE**  
Station Buildings

**FIGURE: BARRIER FREE DESIGNATED WAITING AREA WITH FIXED SEATING DESIGN REQUIREMENTS**





CI-0203

**TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**  
Parking Infrastructure

**2.5 BARRIER-FREE PARKING STALLS**

**Location:** In the centre of the stall. The International Symbol of Accessibility shall be painted on the paved surface of the parking stall. Paint colour should strongly contrast with the background (paved surface), and should be repainted on a regular basis to avoid fading. They are in priority of being the closest to the elevators and stairwells.



Image 14: Signs-Painted Barrier Free Parking Sign



Image 15: Placement



CI-0204

**TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**  
Pavement and Line Markings

**LINE MARKING (PARKING STRUCTURES ONLY)**

Location	Colour
Parking stalls, parking restricted areas and islands	Yellow
Directional dividing lines	White with reflectorizing glass beads
Lane lines, stop lines and arrows	White with reflectorizing glass beads
Pedestrian crosswalk lines	White with reflectorizing glass beads
Barrier Free Parking Symbol	White and Blue (Pantone 300)



**DELINEATED CROSSWALKS**

Shall be installed in conjunction with signs and accessible. Crosswalk markings provide guidance for pedestrians and alert road users of a designated pedestrian crossing point by defining and delineating paths.



CI-0204

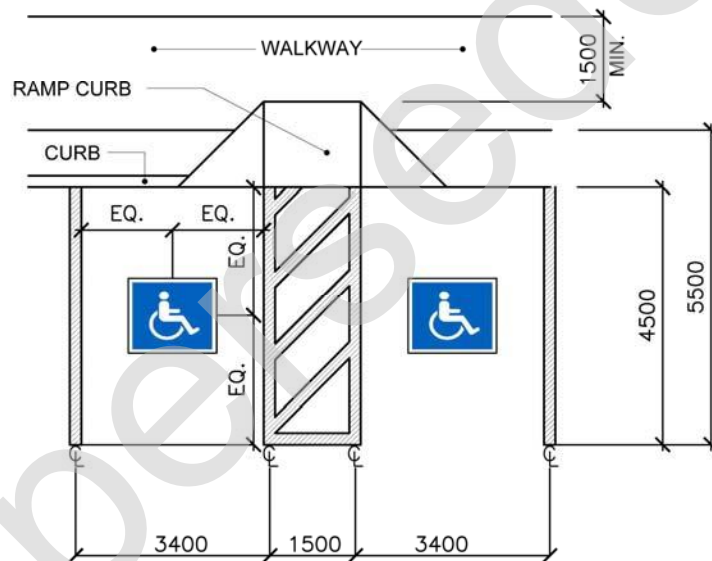
**TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**  
Pavement and Line Markings

FIGURE: DESIGNATED PARKING - CONFIGURATION FOR TWO OR LESS PARKING SPOTS

**SECTION:**  
Tab 2: Site Infrastructure and Development

**FIGURE:**  
Designated Parking – Configuration for Two or Less Parking Spots

**DESIGNATED PARKING CONFIGURATION FOR TWO OR LESS PARKING SPOTS**



**NOTES:**

- RECOMMENDED UNOBSTRUCTED ACCESSIBLE ROUTE SHALL BE MINIMUM 1500 mm WIDE
- SEE ALSO LINE MARKING FOR CROSSWALKS

COLOR : LINE MARKING : REFER TO TAB 2: SECTION C1-0204 LINE MARKINGS CHART .  
WHEELCHAIR SYMBOL: REFER TAB 2, SECTION C1-0203 BARRIER FREE PARKING STALLS FOR COLOUR SCHEME

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS





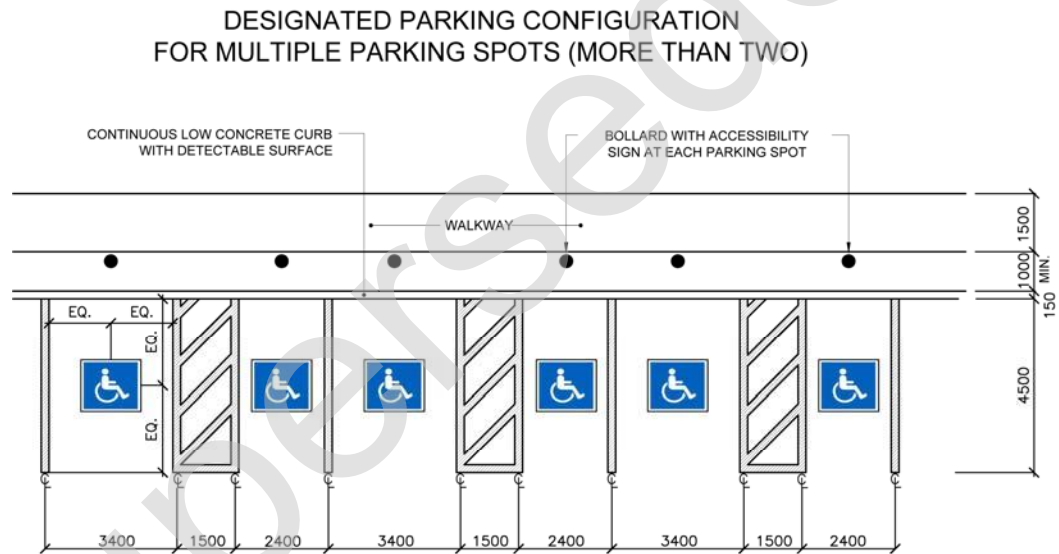
CI-0204

**TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**  
Pavement and Line Markings

FIGURE: DESIGNATED PARKING - CONFIGURATION OF MULTIPLE PARKING SPOTS (MORE THAN TWO)

**SECTION:**  
Tab 2: Site Infrastructure and Development

**FIGURE:**  
Designated parking – Configuration of Multiple Parking Spots (More than Two)



**NOTE:**

THE RECOMMENDED MAXIMUM PATH OF TRAVEL SHALL NOT EXCEED 30 m, FROM LAST ACCESSIBLE PARKING SPOT TO THE NEAREST ENTRANCE.

THE MAXIMUM NUMBER OF BARRIER FREE PARKING SPOTS IN ONE ROW SHALL NOT EXCEED 8 SPACES INCLUDING 4 HATCHED UNLOADING AREA.

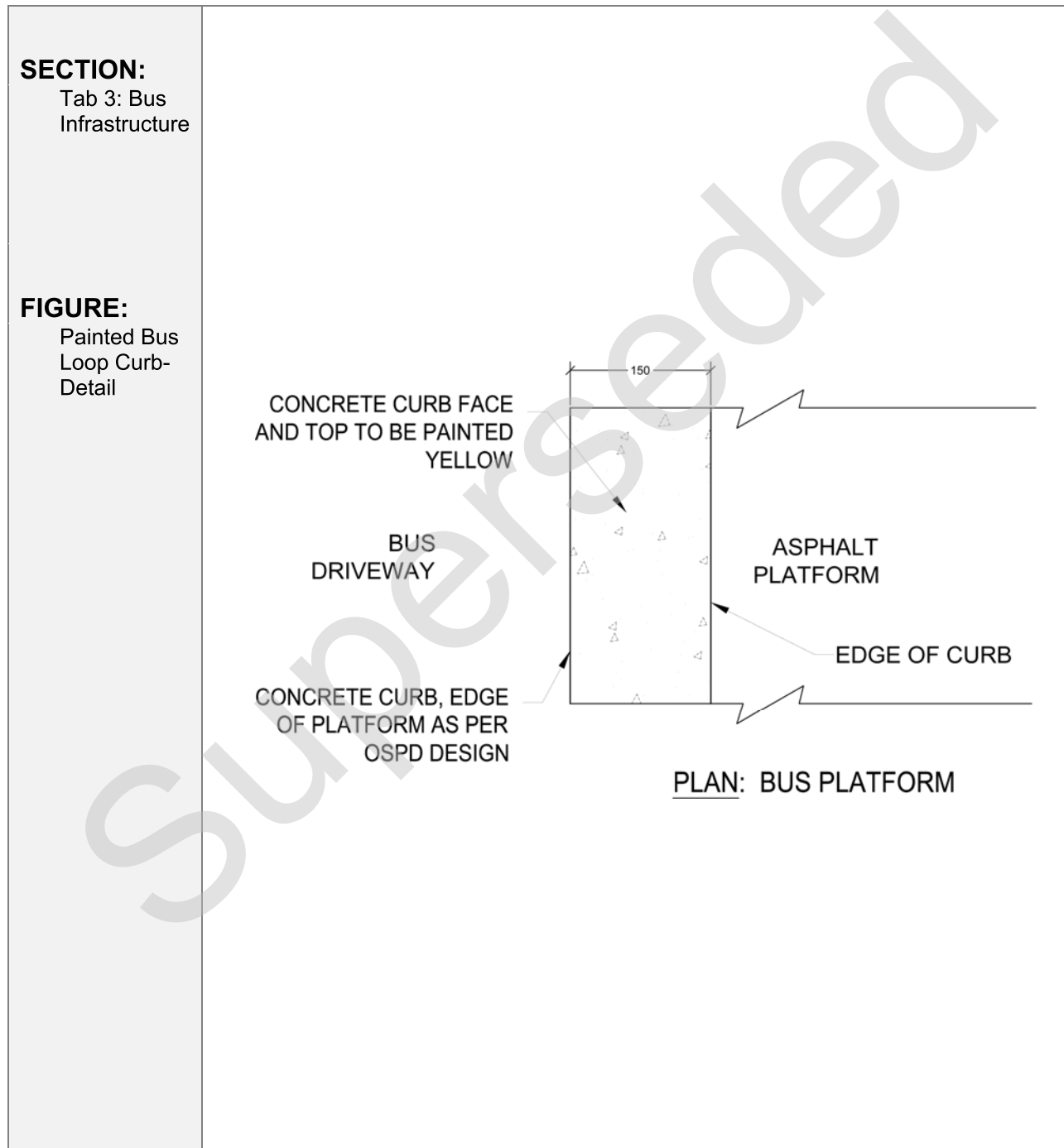
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CI-0303

**TAB 3: BUS INFRASTRUCTURE**  
Bus Platform and Design Guidelines

FIGURE: PAINTED BUS LOOP CURBS-DETAIL





CI-0703

**TAB 7: TECHNICAL DISCIPLINES**

Electrical

**BALANCING OF PHASES**

Where single phase power is taken from a 3 phase source, the loads shall be balanced among the three distribution phases. Sites that have a single phase sources are to maintain the load on the distribution panels balanced.

**VOLTAGE DROP**

Voltage drop of max 2%.

**POWER FACTOR**

The overall system power factor shall be greater than 90%. Power factor design calculations are to be 80%.

Superseded



CI-0703

**TAB 7: TECHNICAL DISCIPLINES**

Electrical

**POWER SUPPLY**

**INCOMING UTILITY SERVICES**

Utility services to a site or building will be supplied by the local Supply Authority (PUC). Services to an electrical room or kiosk shall be underground.

**SERVICE REQUIREMENTS**

- > Line Stations: 120/208 volt service or 347/600 volt; 400 amp min.
- > Maintenance, Repair, Shop and Garage facilities and facilities with elevators: 347/600 volt service.
- > Remote facilities: 120/208 volt service.
- > Incoming services, utility metering, disconnect switch, distribution breakers/switches shall be in one distribution panel.
- > Where GO Transit has tenants, check meters shall be required. One for each tenant.
- > Service size shall be based on the application of conservative engineering design principles consistent with cost effective provisions for future station/terminal or other facility expansion.
- > Temporary facilities shall have overhead service.
- > Disconnect switches shall come equipped with visual means to ensure power disconnection (LED indicator or viewing window.)



CI-0703

**TAB 7: TECHNICAL DISCIPLINES**

Electrical

**POWER DISTRIBUTION****SERVICE DUCT BANKS**

Service ductbanks shall conform to the local Utility's, including Bell Canada, requirements.

Spare duct cells and conduits with pull-cords shall be provided in ductbanks as deemed necessary for future use, if requested by GO Transit.

**WIRING METHODS****Raceways**

Raceways and branch circuitry shall be implemented to minimize failure of a complete system due to failure or malfunctioning of any single electrical component. Distribution minimizing conductors of different circuits sharing common raceways and pull-boxes, etc., shall be implemented. Raceways selected shall suitably resist mechanical damage and environmental deterioration effects. In particular, special attention shall be applied to corrosion inhibitors and protective coatings or treatments on surface mounted conduit in underground areas (e.g., tunnels, below grade electrical rooms, Bridges and parking structures etc.).

**Conduits**

Rigid galvanized steel conduit, or other GO Transit approved cabling methods shall be used for all exposed work in normally dry areas not likely to present corrosion problems. Rigid steel or rigid PVC conduit may be used embedded in slabs where high impact protection is required. Rigid non-metallic conduit shall be used below ground, either direct buried or concrete encased.

PVC or epoxy coated rigid galvanized steel conduit shall be used in corrosion problem areas. Conduit, having a minimum of 50mm shall be used in parking lots where deemed necessary; concrete encasement shall be provided for bus loops, road crossings, and railway Right-of-Ways.

In finished areas, all conduits shall be concealed.

**Cable Trays**

Where required, hot dip galvanized cable trays shall be ladder type; steel or aluminium or non-metallic as required for the application, complete with vertical barriers to separate systems or cables as required. Class shall be selected based on conductor weight plus 50% spare capacity as a minimum. Cable trays to be cantilever supported for ease in installation of cables. Fire barriers of multi-transit type shall be provided at fire walls and fire separations, and shall be in accordance with the O.B.C. and CAN4-S115-M.



CI-0703

**TAB 7: TECHNICAL DISCIPLINES**

Electrical

Types of Cable trays to be used:

- Wire Cable Trays: Used under raised floors
- Ladder Cable Trays: Used in Electrical/Communication Rooms
- Enclosed Cable Trays-Cable bus from transformers to main substation switch gear, outdoors.

**Wire and Cable**

All conductors shall be stranded copper.

Conductors smaller than No. 12 AWG shall not be permitted for lighting or motor branch circuit wiring, except that No. 14 AWG multi-strand type conductors may be used for control circuits only. Provide appropriate connection for terminating and standard wire.

Conductors shall have a minimum insulation temperature rating of 90°C. All conductor insulation shall be colour coded.

**Responsibility**

The Consultant shall specify responsibility for wiring and equipment connections. Examples: For voice-activated intercoms the type of wiring is to be as recommended by the equipment supplier, and is to be installed by the electrical contractor, but connected by the equipment supplier. For the P/A, CCTV and security systems, the electrical contractor shall provide conduit with pull-strings, and the equipment supplier shall install wiring and the equipment, making all connections, testing and commissioning.

Enclosures

Enclosures shall be selected for the environment in which they are intended to be installed. In general, enclosures for indoor, dry application shall be EEMAC sprinkler proof type 1 or type 12 where applicable. Enclosure for damp and wet areas (e.g., tunnels and escalators or elevator pits) shall be EEMAC type 4.

Where installed in public areas, all enclosures, cover-plates, outlets plates, access panels, and handwells shall be provided with method of securing doors and covers. All enclosures and panels shall have a common key and in an enclosed, protected area where possible.

Manholes and handholes shall be located remotely from doors and main road and pedestrian traffic areas.

No splices are permitted below grade!

Underground conduits entering Mechanical, Electrical and Communications Rooms from the exterior shall be sloped to ensure positive drainage away from room.

**CI-0705****TAB 7: TECHNICAL DISCIPLINES****Drawing Standards**

Revisions shall be recorded in the appropriate location in the Drawing Identification Block. All amendments or revisions to preliminary, contract or standard drawings shall be recorded in the revision column as follows.

**PRELIMINARY DRAWINGS**

All revisions to preliminary drawings and sketches shall be recorded, initialed and dated in the revision column. Each revision shall be numbered sequentially starting with number one (1). It shall not be necessary to identify the change in the drawing or to retain a record file copy of the drawing. Should a preliminary drawing become a contract drawing, all noted revisions shall be removed from the revision column.

**CONTRACT DRAWINGS**

All amendments or revisions to contract drawings shall be recorded, initialed and dated in the revision column. Amendments made during the tender period (by addendum) or revisions made afterward during construction (by change order) shall be numbered sequentially starting with number one (1) and shall be clearly marked to identify the change. The revision number shall be placed directly below the revision cloud in the bottom border to highlight the change location. Description of the change, in the revisions column shall be brief, and should include the change order number. Amendments made during the tender period need not be described, but reference to the "Addenda No" should be indicated. When a drawing is redrawn or a new drawing added, the revision column should indicate "Redrawn" or "New Drawing" respectively. If there are previous revisions on a drawing to be redrawn, then the next sequential revision number shall be used on the redrawn drawing.



CI-0202

**TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**  
Station Sites

**Building Entrance:** At least one entrance to GO facilities shall be mobility accessible and shall be located on a level that would provide access to elevators and or ramps.

**Entrances:** shall be accessible to people using wheelchairs or scooters. The following features shall form part of an accessible entrance:

- > Power assisted door operators, with guards;
- > Accessible entrances shall be clearly marked with the International Symbol of Accessibility;
- > Can be easily opened with one hand;
- > Canopies or other sheltering devices where present, shall have adequate headroom; and
- > Mats shall be level with the floor and door thresholds are bevelled so they do not create a tripping hazard.



**ACCESSIBLE CURBS**

- > Accessible curbs (curb cuts) shall be provided where pedestrian paths intersect with vehicular roads, at barrier-free parking spaces, and wherever there is change in level along a barrier-free path of travel.
- > Directional grooves at 300 mm centres shall be provided, in accordance with OPSD 310.030.
- > Where an accessible curb is provided, the surface shall have tactile indicators on its surface that meet the following requirements:
  - have raised tactile profiles
  - have a high tonal contrast with the adjacent surface
  - are set back between 150 mm and 200 mm from the curb edge
  - extend the full width of the curb
  - have a minimum of 610 mm in depth
  - have a maximum running slope of 1:15





CI-0206

**TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**  
Landscaping

Consultants are encouraged to generate site specific solutions that enhance the site conditions and are consistent with the surrounding context.

**COMFORT AND SAFETY**

- > Planting shall not interfere with sightlines at any roadway and intersections; and
- > Landscaping shall not compromise site illumination levels.

**GENERAL PLANT SPECIFICATIONS**

Install plant material that meets or exceeds the following minimum sizes:

- > Coniferous trees 1500 mm ht.;
- > Deciduous shrubs 600 mm ht.;
- > Coniferous shrubs 600 mm ht. or spread; and
- > Perennials 2 years container grown.
- > All Plants to have 2 Year Guarantee.

**SOIL QUALITY SPECIFICATIONS**

Good quality soil shall consist of a minimum 0.9 m\* depth, over and above any required drainage system and/or granular material, of sandy loam soil with the following composition:

- > Sand (50%-60%);
- > Silt (20%-40%);
- > Clay (6%-10%);
- > Organic (2%-5%); and
- > pH = 7.5 or less.

Note\*: In landscaped areas without tree planting, the minimum depth for good quality soil can be reduced to 0.6 m.

**NATIVE SPECIES PLANTING**



CI-0206

**TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**  
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**NATIVE SPECIES PLANTING**



CI-0203

### TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT Parking Infrastructure

and the like, elevator support requirements, mechanical and electrical support requirements; fall arrest system; decorative metal screens; signage; and window washing system.

- > Window washing systems and Fall Protection systems shall be designed in accordance with the Occupational Health & Safety Act and regulations, as a minimum requirement, and should consider incorporating reasonably optimal and practical safety measures beyond these requirements.
- > The window washing system shall ensure building surfaces and finishes will not be marred or otherwise damaged during normal operation of equipment.

#### **WALLS**

- > All interior and exterior walls materials selected shall depend on location and site specific elevational constraints.
- > Interior walls are to have a smooth finish to limit potential abrasion and allow easy maintenance.
- > All areas exposed to high traffic public use should be coated with non sacrificial, clear anti-graffiti coating (stairwells etc.)
- > Consideration should be given to the use of colour on walls, doors and in key locations for coding or location identification. See GO Signage Manual for detailed requirements.

#### **ROOF**

- > The design of the parking garage shall accommodate a maintenance free roof.
- > Sustainable roof construction options could be proposed such as white reflective roof; roof systems with PV roof applications with related inverter room provision in the structure as directed by GO.
- > Peripheral roof protection shall be provided by parapets as mandated by industry standards and code requirements.
- > Extend Stairwell to mitigate fall arrest and provided better serviceability to the roof. Roof access door to be locked with keyed access. Key set to be keyed to rail line master and slave system
- > A secondary metal cage door to be installed at base of final stair run leading to the roof. Door to be lockable.
- > Provide a caged metal enclosure underneath extended stair runs to prevent access and vandalism.



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### TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT Parking Infrastructure

- > Metal caged enclosures/doors to be constructed of non-corrosive material that is anti-cut and anti-climb. Enclosure to be constructed of material that resists vandalism and damage.

#### **DOORS & WINDOWS**

- > Service rooms and storage areas shall be enclosed with doors and louvered vents or windows as required.
- > All service rooms including electrical, communication and mechanical rooms shall be provided with access controls i.e. fob access and keypad
- > Application of security films should be considered for vandal and abuse resistance in glazed stairwells, and elevator lobbies.
- > Exterior window frames, doors and door frames are to be constructed of heavy duty anodized or pre-finished aluminium frames.
- > Interior doors, frames and screens are to be constructed of heavy duty hollow metal sections with appropriate fire rating.
- > Proper security and exiting hardware as appropriate for specific environmental conditions is to be provided at all doors.

#### **RAILING & GUARDRAILS**

- > Provide stainless steel handrails and façade metal elements at all stairs, stairwells, and ramps in compliance with the Ontario Building Code. All handrails/railings should be designed to meet the accessibility requirements as mandated by industry accessibility standards and code requirements.
- > Guard rails should be a minimum of 1100mm above the finished floor at all locations where required. This is to include locations along spandrel panels or exterior structures at the perimeter of the parking garage.
- > Around the interior perimeter of the parking areas or stalls, sacrificial bumper panels in wood or recycled plastics should be installed at adequate height and colour.
- > Pedestrian control guardrails should be provided at all pedestrian entrances and exits; these should be located around pedestrian doors, stairs, and at access points to rail or bus platforms.



CI-0203

### TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT Parking Infrastructure

#### **WAYFINDING & SIGNAGE**

- > All signage shall meet AODA, FLSA and Branding compliance requirements.
- > A consistent appearance or theme should be presented throughout the facility. Signage for entrances and directions should be clear and kept at appropriate driver's eye levels.
- > Coordinate with related disciplines, e.g., Architectural, Structural, Electrical, etc., for placement of signage requirements (i.e., locations).
- > Provide power, communication, feeder and conduit to facilitate the installation of dynamic and/or back/top lit signage.
- > Directional signs should always be located at decision points.
- > Where possible, signs should be located perpendicular, not parallel, to the visitor's line of sight and movement.
- > Signage shall not to conflict with overall height and clear span requirements.
- > Signs have to have a breakaway feature and colour coded for each level.
- > For further details on wayfinding; signage and pavement marking requirements, refer to GO Multilevel Parking Structures Signage Manual and GO Signage & Manual.

#### **SPACE COUNTING SYSTEMS**

- > The design shall incorporate requirements for space counting systems as directed by GO staff.
- > Provide dedicated UPS for car counting system. Refer to section CI-0703 Uninterruptable Power Supply (UPS) for battery time requirements.

#### **LANDSCAPING**

- > Landscaping around the parking garage should focus on low maintenance materials and shade trees. All trees should be located away from any building structures and out of any snow storage areas and should not provide hiding areas adjacent to paths or walkways.

#### **SNOW MANAGEMENT**

- > Entry areas for pedestrian and vehicles should be configured to allow easy snow removal and minimize any damage from its operations and chemical treatment applications.



CI-0703

**TAB 7: TECHNICAL DISCIPLINES**

Electrical

**POWER DISTRIBUTION****SERVICE DUCT BANKS**

Service duct banks shall conform to OESC (Ontario Electrical Safety Code) latest edition inside property line, or rail corridor per AREMA, CSA Standard C22.3 No. 7 Underground Systems and OESC, coordinate with local Hydro and Bell for area having jurisdiction and for utility requirements.

Provide concrete encased duct banks in heavy vehicular areas and fire routes.

Minimum 30% spare conduits with pull-cords shall be provided in duct banks for future use, coordinate with Metrolinx.

**WIRING METHODS****Raceways**

Raceways and branch circuitry shall be implemented to minimize failure of a complete system due to failure or malfunctioning of any single electrical component. Distribution minimizing conductors of different circuits sharing common raceways and pull-boxes, etc., shall be implemented. Raceways selected shall suitably resist mechanical damage and environmental deterioration effects. In particular, special attention shall be applied to corrosion inhibitors and protective coatings or treatments on surface mounted conduit in underground areas (e.g., tunnels, below grade electrical rooms, Bridges and parking structures etc.).

**Conduits**

Rigid galvanized steel conduit, or other GO Transit approved cabling methods shall be used for all exposed work in normally dry areas not likely to present corrosion problems. Rigid steel or rigid PVC conduit may be used embedded in slabs where high impact protection is required. Rigid non-metallic conduit shall be used below ground, either direct buried or concrete encased.

PVC or epoxy coated rigid galvanized steel conduit shall be used in corrosion problem areas. Conduit, having a minimum of 50mm shall be used in parking lots where deemed necessary; concrete encasement shall be provided for bus loops, road crossings, and railway Right-of-Ways.

In finished areas, all conduits shall be concealed.

**Cable Trays**

Where required, hot dip galvanized cable trays shall be ladder type; steel or aluminium or non-metallic as required for the application, complete with vertical barriers to separate systems or cables as required. Class shall be selected based on conductor weight plus 50% spare capacity as a minimum. Cable trays

**CI-0703****TAB 7: TECHNICAL DISCIPLINES**

Electrical

**SWITCH GEAR, SWITCHBOARDS AND PANEL BOARDS****GENERAL (TBD)****SWITCHBOARDS**

All components of the completed assembly shall be CSA approved and bear a CSA label.

Dimensional coordination: Verify that dimensions for switchboard do not exceed space provided.

Construction and Ratings:

Factory assembled, dead front, metal enclosed and self-supporting switchboard. Complete with line and load side terminations. Bus material to be copper, silver plated. Bus Bracing minimum 65 kA RMS.

Enclosure: CSA Type 2, Indoor use equipped with arc flash reduction protection. Control compartments to be installed on front of the board away from buses.

Future Provisions: Fully equipped spaces for future devices with bussing and bus connections suitably braced for short circuit currents. Allow for 25% spare breakers on new installations.

Service Entrance Circuit Breakers:

Provide Sensor and trip plug, solid state trip circuit breakers, 100% continuous duty rating, factory mounted.

Trip Unit Functions:

Adjustable:

- long time ampere rating;
- long time delay;
- short time pick up;
- short time delay;
- instantaneous pick up.

Ground fault protectors as per OESC requirements.

If ground fault is required on main breakers provide ground fault protections for downstream breakers as well.

**CI-0703****TAB 7: TECHNICAL DISCIPLINES**

Electrical

**PANELBOARDS**

Shall be flush or surface mounted as required, complete with hinged locking door and flush catch, and finished with corrosion-resistant primer, equipment gray. Surface mounted panelboards shall be installed on unistrut galvanized steel framing channels with 75mm clear between back of panelboard and wall. Where practical, panelboards shall be grouped in proximity.

Panelboard shall be copper bus type, with full capacity solid neutral design and sequence style bussing, composed of an assembly of bolt-in-place moulded case circuit breakers with thermal and magnetic trip and trip-free position separate from either the "ON" or "OFF" positions. Multi-pole circuit breakers shall have common simultaneous trip.

Overcurrent devices feeding emergency equipment shall be located only in electrical equipment rooms, and fitted with breaker locking devices.

Provide 30% spare breakers in panel; Allow for 30% spare Amp capacity and spaces in each panel.

Panel boards shall be provided with type-written directories indicating loads controlled by each circuit installed in metal framed clear acetate cover, affixed to the inside cover of the panel board.

**SWITCHGEAR**

All components at the completed assembly shall be CSA approved and bear a CSA label.

Dimensional Coordination: Verify that dimensions of switchgear do not exceed spaces provided.

Construction and Ratings

Use arc-resistant, metal-clad switchgear, free standing, dead-front steel structure. Vendor shall provide details describing that arc-resistant testing of equipment.

The switch gear assembly shall be suitable for bolting each cell to steel rails embedded in concrete floor of a substation building.

Sheet steel barriers shall be provided between the vertical units and between the control compartments and the power compartments.

The switchgear shall be suitable for the future additions of units at each end.

A copper ground buss shall be installed for the entire length of switchgear, affording connection to all units and equipped with solderless #2/0-4/0 cable connectors at each end. Bus material to be copper, silver plated.

For outdoor units provide waterproof and tamper proof equipment.



**CI-0703****TAB 7: TECHNICAL DISCIPLINES**

Electrical

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**CI-0703****TAB 7: TECHNICAL DISCIPLINES**

Electrical

Space heaters 240 volts, operated at 120 volts.

Meters, indicating lights, protective relays shall be mounted on the front of the switchgear panels and arranged in an approved, logical, symmetrical manner. Meters and readout devices shall be mounted at eye level (approx. 5'-6" A.F.F.).

**POWER CIRCUIT BREAKERS**

The power circuit breakers shall be 3 pole, single throw, vacuum break, draw-out type, 5 cycle operation, with self-aligning primary and secondary disconnecting devices.

the breakers shall be 100% continuous duty, 5 cycle operation maximum. Each breaker shall be equipped with "stored energy operation" type, anti-pump operating mechanism. It shall be possible to open and close all breakers manually. Remote operation of each breaker from a remote control panel. OPEN and CLOSED complete with visual verification (indicating light). breakers to have capability of lock out, tag out, locked in open position.

The draw out mechanism shall hold breaker rigidly in the fully connected, and full test/disconnect position, with the door closed. Breaker shall be capable of being locked in the test/disconnect position. Breaker cell door handle shall be capable of being locked in the door closed position.

Interlocks shall be provided that will prevent disconnecting the breaker from the bus stabs or inserting the breaker into the bus stabs unless the breaker is in the tripped (open) position. Interlocks shall be provided to only allow installation of the properly rated breakers in the appropriate rated cells.

A non-metallic barrier shall be provided that effectively closes six "bus" stab disconnect holes when the breaker is withdrawn.

Breaker shall be capable of being manually racked into or out of the connected position with the front door closed. A toggle switch shall be provided on the cell door to disconnect the breaker.

Breakers shall have digital read out capability complete with network connectivity.

Vendor shall state any requirements necessary to provide protection from transient overvoltage's that could result during operation of the breakers quoted.

**CI-0703****TAB 7: TECHNICAL DISCIPLINES**

Electrical

**INSTRUMENT TRANSFORMERS****Current Transformers (CT)**

Current Transformers shall have 5 ampere secondary's, and primary rating as specified on the attached single line diagrams. Current transformers shall not saturate (i.e. reach the knee of the saturation curve) at short circuit currents of  $K_{Aic}$  asymmetrical. Saturation curves shall be supplied.

Accuracy shall be in accordance with ANSI C37.20 and CSA C13 for the metering or relay applications for which they are being used. The manufacturer shall stake the CT accuracy in the quotation.

All taps from multi-ratio and dual-ratio CT's shall be wired out to shorting terminals

**Voltage Transformers (VT)**

Voltage transformers shall be mounted in a separate draw out compartment.

With the compartment closed, the transformers shall be completely isolated and the primary and secondary disconnect contacts engaged with their respective stationary contacts to complete the circuit. On opening the compartment, the contacts shall automatically withdraw (breaking the primary and secondary connections and grounding the primary for inspection and maintenance. PT and CPT compartments and drawers shall have ability to be padlocked in the open or drawn out position.

VT shall be protected with fuses on primary and secondary sides and shall be designed to withstand the basic impulse level of switchgear. Main switchgear requires its own control power transformer c/w fuses and terminal strip distribution. These systems must be readily accessible from front of switch board.

**SELECTION OF BREAKERS (TBD)****PANEL REQUIREMENTS (TBD)****TRANSFORMERS (TBD)****MOULDED CASE CIRCUIT BREAKERS (TBD)****POWER FACTOR CORRECTOR (TBD)****MOTOR CONTROL**

In general, circuit breaker type combination starters in Motor Control Centres shall be used for 600 volt motors. However, individually mounted circuit breaker type combination starters may be used where practicable. All starters shall be magnetic, full voltage start, single speed, non-reversing type (except when the driven equipment characteristics or power company limitations require other types), and shall



CI-0703

**TAB 7: TECHNICAL DISCIPLINES**

Electrical

**GROUNDING OF FENCES**

Metallic fences within 1.8 m of any equipment or structure above the surface of the ground, which is connected to the main grounding system, shall be bonded to the grounding system.

Ground rods shall be driven adjacent to the posts inside the fence line to a depth of not less than 3.0 m. Where no metallic posts are provided the ground rods shall be connected directly to the metal wires, mesh or other components of the fence.

**LIGHTNING PROTECTION**

Lightning protection system is designed to protect structures from damage due to lightning strikes by intercepting such strikes and safely passing their extremely high voltage and current to "ground". Such system shall be installed where there are no surrounding structures that would provide a cone of protection.

Lightning protection systems shall include a network of lightning rods, metal conductor, and ground electrodes, designed to provide a low resistant path to ground for potential strikes.

In general, grounding conductor connections to structures, connections within the lightning protection system conductors, shall be exothermic copper-weld type unless stated otherwise specified.

**HIGH RESISTANCE GROUNDING SYSTEMS**

The high resistance grounding system shall limit the ground fault through the transformer neutral.

The equipment will be located indoors in a climate controlled building.

The resistor shall be stainless steel edge wound type. The resistor shall be provided with taps for the adjustment of ground current magnitude in several steps.

Meter relay with auxiliary contacts shall sense voltage across the grounding resistor and initiate remote annunciation of a ground fault condition. The resistor to include appropriate taps to limit the ground current flow between 0.9 to 5.0 Amperes for 600V.

**ELECTRIFIED RAIL GROUNDING REQUIREMENTS**

Under development

**ELECTRICAL, COMMUNICATIONS AND MECHANICAL SERVICE ROOMS AND FIXED MACHINERY (TBD)**

**POLE GROUNDING (TBD)**



CI-0703

**TAB 7: TECHNICAL DISCIPLINES**

Electrical

**SERVICE ROOMS**

**GENERAL REQUIREMENTS**

Incoming utility services at Metrolinx facilities shall be located in the primary Substation and/or Electrical Room, kiosk, bunker, Hub and Communications Room.

All Electrical Rooms and Communications Rooms shall be dedicated and not be shared with other functions, including, but not limited to: custodial, access services, communications, electrical, mechanical and storage. Access to Electrical Rooms and Communications Rooms via (pass through) Communications, Electrical, Mechanical, Janitor's Rooms, etc., shall be avoided.

Wherever feasible, the main Electrical Room and the main Communications Room shall be located next to each other with exterior access if possible.

The Service rooms floor plan shall always be rectangular or square in shape. The room shall never be L-shaped, triangular or any other odd shape. Electrical Room, Hub and Communications Room shall always be a one level room and preferably above grade.

The room shall be sized for the known equipment with a provision for a minimum of 25% extra space to accommodate future additional equipment (on a project by project basis).

Electrical Room, Hub and Communications Room walls shall not have windows, skylights, roof access hatches/doors, etc. Locating Electrical Room and Communications Room on perimeter curtain walls where windows comprise the entire surface of walls shall be avoided.

Drawings shall indicate to scale the arrangement of allocated equipment inside Electrical Rooms, Hub and Communications Rooms, including spaces and clearances. Elevation drawings shall show to scale all related wall mounted equipment for each wall.

A minimum 1 m clear working space shall be provided in front of access points, which may occur behind equipment and patch panels, and in front of and behind racking. Racking shall not be positioned closer than 1 m from any wall.

A wall mounted, flip down work surface will be provided in each communication room. The work surface will be 1" thick, 30" wide by 24" deep, solid wood, plastic laminate on both main surfaces with a vinyl self-edge. The work surface will be mounted at a height of 36" above the finished floor. The location of the work surface will be adjacent to the main CC rack and maintain all regulatory clearances from exit and equipment as required by code when in the open position. One (1) duplex receptacle and one (1) RJ-45 data connection will be provided at the workstation and mounted above the table top in the open position. Provide heavy duty hinges, mechanism to hold the table open and blocking in the wall as required.

No liquid piping, steam piping, drainage piping and/or dry liquid piping shall pass through or within walls of any Electrical Room, Hub or Communications Room, except for refrigerant and condensate piping for



CI-0703

**TAB 7: TECHNICAL DISCIPLINES**

Electrical

**POWER DISTRIBUTION****SERVICE DUCT BANKS**

Service duct banks shall conform to OESC (Ontario Electrical Safety Code) latest edition inside property line, or rail corridor per AREMA, CSA Standard C22.3 No. 7 Underground Systems and OESC, coordinate with local Hydro and Bell for area having jurisdiction and for utility requirements.

Provide concrete encased duct banks in heavy vehicular areas and fire routes.

Minimum 30% spare conduits with pull-cords shall be provided in duct banks for future use, coordinate with Metrolinx.

**WIRING METHODS****Raceways**

Raceways and branch circuitry shall be implemented to minimize failure of a complete system due to failure or malfunctioning of any single electrical component. Distribution minimizing conductors of different circuits sharing common raceways and pull-boxes, etc., shall be implemented. Raceways selected shall suitably resist mechanical damage and environmental deterioration effects. In particular, special attention shall be applied to corrosion inhibitors and protective coatings or treatments on surface mounted conduit in underground areas (e.g., tunnels, below grade electrical rooms, Bridges and parking structures etc.).

A minimum 12 AWG stranded copper wire green insulated RWU90 below grade and RW90 above grade shall be placed inside each raceway. This wire is to be used as a tracer wire inside a buried raceway for the purpose of locates after installation.

**Conduits**

Rigid galvanized steel conduit, or other GO Transit approved cabling methods shall be used for all exposed work in normally dry areas not likely to present corrosion problems. Rigid steel or rigid PVC conduit may be used embedded in slabs where high impact protection is required. Rigid non-metallic conduit shall be used below ground, either direct buried or concrete encased.

PVC or epoxy coated rigid galvanized steel conduit shall be used in corrosion problem areas. Conduit, having a minimum of 50mm shall be used in parking lots where deemed necessary; concrete encasement shall be provided for bus loops, road crossings, and railway Right-of-Ways.

In finished areas, all conduits shall be concealed.





CI-0802

**TAB 8: HEAVY RAIL**  
Trackwork

**SWITCH STANDS**

Where hand throw turnouts are used the following switch stands shall be used:

Throw Turnout	Switch Stand
Main Line Tracks	31B switch stands only, with red reflectorized target and red & green reflectorized target tip assembly per CN Standard Plan TS-701.
Sidings and Yard Tracks	17B, 36D or 20B stand, with yellow & green reflectorized target. No. 22 semi-automatic stand with yellow & green reflectorized target may be used in yards only with permission of GO Transit.

Switch stands shall be placed on the turnout side of the main track except where the view is obstructed or clearance is restricted. The switch stand handle shall be positioned so that when the switch is in the normal position, the handle faces away from the frog and away from the track. When the switch is lined for the diverging route, the handle should move in the same direction as the points.

**TRACK TIES**

**Timber Ties**

On main line tracks, install **CN grade #1 hardwood ties**, 2.590 m (8'-6"), long at 517 mm centres, 1932 ties per kilometre, (20-3/8" centres, 3110 ties per mile). On secondary tracks or main line tracks primarily used by GO trains, install #2 hardwood or ties at 540 mm centres, 1852 ties per kilometre, (21-1/4" centres, 2980 ties per mile). Do not mix hardwood and softwood ties. See CNSPC 3300, Appendix B for information which relates tie installation to train speed and traffic volumes. See Figure for timber tie dimensions.

All new timber ties shall be 2.6 m (8'-6"), long. The longer 2.6 m ties may be intermixed with existing 2.4 m (8'-0") long ties. A set of timber transition ties must be installed between concrete ties and timber ties.

**Turnout Ties**

Turnout ties, or switch ties are a set of ties of various pre-defined lengths and spacing, supporting the entire turnout structure. The length & spacing of turnout ties may affect available access for switch heater ducts.

Turnout ties remain perpendicular to the straight route. (Some European turnouts have "fanned" turnout ties). Ties under slip switches and some crossings (diamonds) are located perpendicular to the long diagonal.



CI-0804

**TAB 8: HEAVY RAIL**  
Track Layout and Construction

**TRACK ASSEMBLY**

This section summarizes how the material described in Section 3 should be assembled

ITEM	MAIN LINE	YARD & USRC
Rail weight	115# RE	115# RE, 100# ARA-A
Track tie. All track ties 8'-6" long	#1 THW	#2 THW or TSW
Tie spacing	517 mm (20-3/8")	540 mm (21-1/4")
	3110 ties per mile	2980 ties per mile
Tie plate	14" DS	14" or 11" DS
Turnout	#20, #12	#10, #8
Ballast depth below bottom of tie	305 mm (12")	230 mm (9")
Ballast shoulder width	305 mm (12")	150 mm (6")
Tie plate-to-tie fastening	Cut spikes, screw spikes	Cut spikes
Rail-to tie plate fastening	Elastic, or cut spikes	Cut spikes
Rail anchors	Improved Fair	Improved Fair
Frog	RBM	RBM, SGM or bolted
Crossing (diamond) frog	Manganese insert	N/A

**CONTINUOUS WELDED RAIL**

The minimum length of CWR is approximately 120 metres, considering the longitudinal restraining capacity of standard rail anchors. Anything shorter is "Welded Rail". Where practical, CWR shall be used on all main line track. CWR must be laid at the preferred laying temperature, and de-stressed in accordance with CN Rail Standard Practice Circular 3205.

**WELDING OF RAILS**

Where practical rails shall be flash butt welded by the supplier and delivered by rail in CWR strings. Where rails have to be field welded a portable flash butt welding machine shall be used. Where field flash butt welding is not possible, rails can be Thermit welded.





CI-0702

**TAB 7: TECHNICAL DISCIPLINES**  
Mechanical

ROOM	° C		NOTES
	WINTER MIN.	SUMMER MAX.	
Workshop	22*	22	Ventilation
Storage	20	22	Ventilation
Station secondary entrances and tunnels	N/A	N/A	Natural Ventilation
Hydro Vaults	N/A	N/A	per Electrical Authority
Shelters	N/A	N/A	Natural Ventilation/Heating

\* Electric heating if required (supplementary) to maintain 18°C winter temperature.

Note 1: High wall, heat pump with hyper heating and low ambient cooling (no night-time set-back).

**STATIONS**

- > Radiant heating should be considered in new Station buildings on a project by project basis.
- > Otherwise, Heating and Air Conditioning of the waiting area and the ticket sales area shall be achieved by one high efficiency, premium quality furnace c/w outdoor condensing unit.
- > The ticket sales area will have a VAV box controlled by a thermostat, while the main thermostat should be located in the janitor room and interlocked with the waiting area temperature sensor.
- > Communications room and Electrical room shall have **dedicated split Heat Pump A/C unit for each room.** Refer to Communications room section for HVAC and ventilation details.
- > Depending on area, washrooms shall be ventilated by Energy Recovery Ventilators or exhaust fans, and shall be heated by radiant heating (if available in the building) or by electric baseboard heating.
- > Refer to Elevators section for Elevator hoistway HVAC.



CI-0702

**TAB 7: TECHNICAL DISCIPLINES**  
Mechanical

- > Auto restart after power failure
- > Hot start.

**FANS**

- > In public area and occupied spaces, low noise centrifugal fans shall be used.
- > Public area fan systems shall be provided with suitable attenuating silencers capable of maintaining space noise level no greater than NC40.
- > Airfoil or backward inclined design is preferred. Forward curved wheels may be used for low pressure applications.
- > Variable pitch axial fans should be considered for fan wheel diameters greater than 610mm and where system air volumes vary, due to control characteristics of summer/winter operation.
- > Propeller fans may be used where they serve non-public or unoccupied areas.
- > Additional ventilation with emergency power back-up may be required in large facilities, such as Willowbrook or Steeprock.

**ENERGY RECOVERY**

Energy Recovery Ventilators (ERV) shall be specified for energy conservation in all GO facilities, where practical and cost effective. In station buildings they shall be above the public washrooms or the janitor room, in the attic space, where applicable. Access by ceiling hatch.

**FILTERS**

Filters used in supply air systems shall be 50mm (2") thick throw-away type, with minimum efficiency of 30%.

**HEATERS**

Electric fan forced heaters shall be considered in the waiting area and entrances. Heaters can be wall or ceiling mounted. Heaters should be controlled by wall mounted space sensors. **No built-in thermostats should be allowed.**

Supplemental electric fan forced heater should be considered in the ticket sales area.

Electric resistance duct heaters shall have Silicon Control Rectifiers (SCR), minimum airflow switch, and two high-temperature limit sensors.

Gas fired unit heaters and infrared heaters shall be considered in large facilities.

**CI-0702****TAB 7: TECHNICAL DISCIPLINES**

Mechanical

In all shelters, CSA compliant electric infrared radiant heaters c/w factory installed protective wire cage and stainless steel or nickel chromium tubular heating element shall be suspended by chains or threaded rods at 2440 mm (8 ft.) above finish floor level and controlled by a push button and timer.

**DIFFUSERS**

Diffusers shall be aluminum. For perforated metal ceilings; diffusers to be perforated type to match the ceiling profile and colour. For high-traffic door locations, or where drafts are a problem with station attendants, linear diffuser air-curtains shall be provided at the doors.

**DUCTS**

Air ducts shall be galvanized sheet metal conforming to ASHRAE, SMACNA Duct Construction Standards, and NFPA 90A. Diffuser branch-ducts and air terminal ducts may be circular metal flex-ducts where concealed. Exposed ducts in public areas shall be aluminium spiral ducts. Hangers and fasteners should also be protected from the detergents and moisture or be fabricated of materials that are not subject to corrosion.

**FIRE DAMPERS**

Fire dampers shall be fusible link type conforming to ULC-S505. An access door shall be installed for inspection and resetting.

**CONNECTORS**

Flexible connectors shall be provided between vibrating equipment and connecting ducts.

**INSULATION**

Acoustical and thermal duct insulation shall be in accordance with the O.B.C. and ASHRAE 90.1. Acoustical insulation shall be provided to maintain a maximum room sound rating of 40dBA. Piping insulation shall be in accordance with ASHRAE 90.1, with PVC jackets.

**SYSTEM CONTROL**

HVAC systems shall be controlled using programmable thermostats to achieve night setbacks. Interlocks for fire protection to be as per OBC and NFPA. **If a room has 2 HVAC systems, both systems shall be controlled by a single programmable automatic heating/cooling changeover controller.**

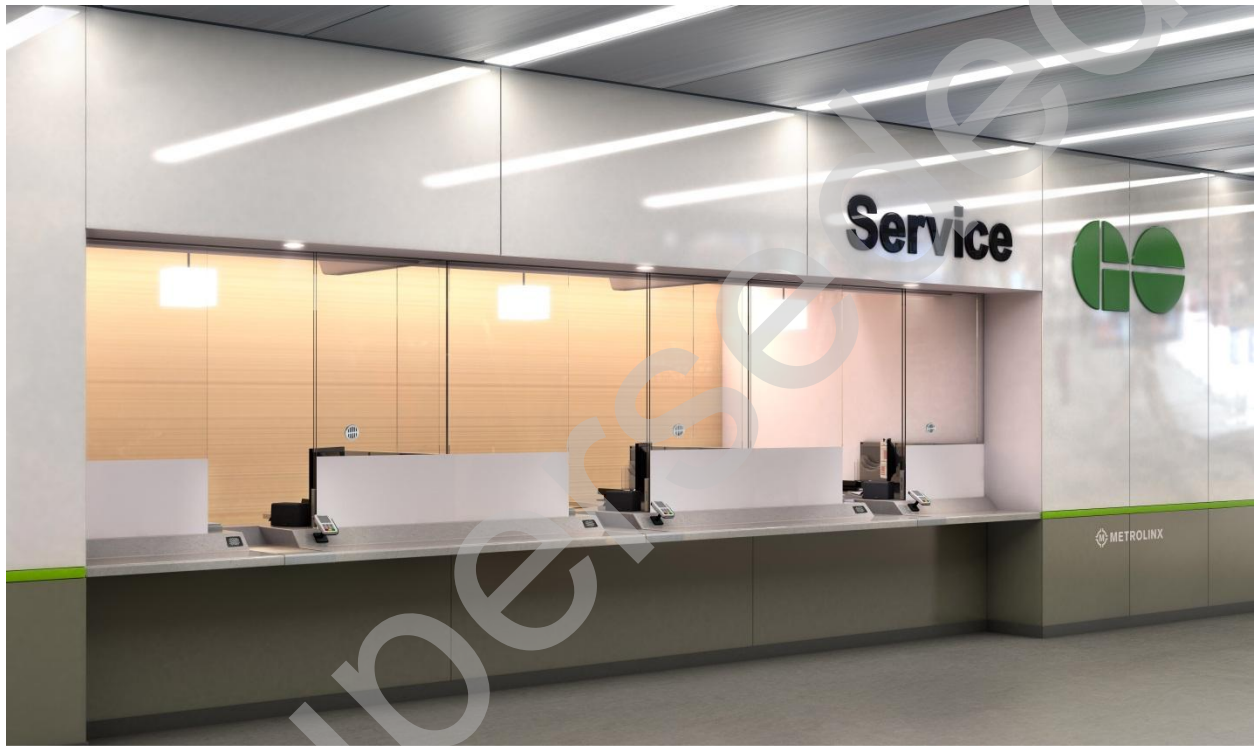


CI-0401

**TAB 4: STATION INFRASTRUCTURE**  
Station Buildings

SERVICE AREA

Feature	Description
---------	-------------



Overview	<ul style="list-style-type: none"> <li>&gt; The <i>GO Service Area</i> consists of the <i>GO Service Counter</i>, the <i>Back Storage Wall</i>, and the <i>Back of House</i> area. This Section will discuss requirements for each.</li> </ul>
Service Area Service Counters	<ul style="list-style-type: none"> <li>&gt; Refer to the <i>GO Service Counter Standard Drawings</i> for design details and equipment requirements on the modular <i>Service Counter</i> within a larger <i>GO Service Area</i> for <i>Line Stations</i> in the <i>GO Transit</i> network.</li> </ul> <p><b>Service Counter Design Intent</b></p> <ul style="list-style-type: none"> <li>&gt; The design shall bias right-hand users with the majority of <i>Customer</i> interaction and tasks at the centre and to the right; support and operational functions and variable tasks to the left.</li> </ul>



CI-0401

**TAB 4: STATION INFRASTRUCTURE**  
Station Buildings

SERVICE AREA	
Feature	Description
	<ul style="list-style-type: none"> <li>&gt; Curved desk on <i>Station Attendant</i> side for ease of rotation in movement and accessibility.</li> <li>&gt; Asymmetrical working space, bifurcated tasks: Right hand (Presto) and Left hand (Corporate PC).</li> <li>&gt; Large work surface to accommodate various working tasks.</li> <li>&gt; Centre glass opening for unassisted audible communication; lockable sliding glass panel for security.</li> <li>&gt; Provisions for combination intercom and audio loop systems to be included as alternate means of communication when glass is in closed position, as well as a passive speak through device with spit guard.</li> <li>&gt; Canted counter fascia on <i>Customer</i> side for incorporation of future electronic innovations and privacy of <i>Customer</i> transaction procedures exclusive to each booth.</li> <li>&gt; Optional variable direction and volume individually controlled airflow below <i>Station Attendants'</i> work surfaces for individual comfort control.</li> <li>&gt; The <i>Service Counters</i> have been designed for standalone or linear modular array</li> <li>&gt; <b>Special Requirement:</b> In stations with 4 or more <i>Service Counters</i>, and at the discretion of GO Transit, provide light-up counter, <i>Station Attendant</i> operated, to indicate an available service position. Number shall be mounted in front of the glass at each sales position, motion sensor, number to flash when a service position is available, remain on solid when an attendant is serving a customer, and turned off when the service position is unavailable/unmanned. Typeface to match Service counter signage, be white text on grey background.</li> </ul>
Service Area	<p><b>Back Storage Wall Design Intent</b></p> <ul style="list-style-type: none"> <li>&gt; The wall behind the <i>Service Counter</i> is to be full-height cabinetry in birch wood look, flush with adjacent walls, doors, and door frames.</li> </ul>
Back Storage Wall	



CI-0401

**TAB 4: STATION INFRASTRUCTURE**  
Station Buildings

SERVICE AREA

Feature	Description
	<ul style="list-style-type: none"> <li>&gt; Cabinetry will have discreet door hardware or hidden push-latch, typical cabinet width to store extra supplies and specific devices; locked keyed alike. It will house the following equipment:               <ul style="list-style-type: none"> <li><b>Multi-Functional Printer</b></li> <li><b>Courier Box</b> (Outgoing &amp; interoffice mail)</li> <li><b>First Aid Kit</b> (270x400x70mm)</li> <li><b>Intercom AI Phone</b> (mounted in cabinetry)</li> <li><b>Translation Phone</b> (communal storage when not in use, requires power for charge station)</li> <li><b>Flashlights</b> (communal storage for flashlights, requires power for recharging batteries)</li> <li><b>Storage Area for Lost &amp; Found</b></li> <li><b>Shelving and drawers for storage</b></li> </ul> </li> </ul>
<p>General Service Area Requirements</p>	<p><b>Service Area Requirements</b></p> <ul style="list-style-type: none"> <li>&gt; Doors into space requires 'spy hole' for entry into ticket office</li> <li>&gt; Service office access doors to be operable with security wired pin pad</li> <li>&gt; Fire Extinguisher to be installed new Service office access door</li> <li>&gt; Provide a network digital clock within direct sightlines of the Station Attendant either within the GO Service Area or in the adjacent waiting area</li> <li>&gt; One-way glass in any exterior windows to the service office other than the front glazing</li> </ul>



CI-0401

**TAB 4: STATION INFRASTRUCTURE**  
Station Buildings

SERVICE AREA

Feature	Description
Service Area Security	<ul style="list-style-type: none"> <li>&gt; Coordinate CCTV camera locations with CCTV section of DRM</li> <li>&gt; A CCTV monitor mounted within the <i>GO Service Area</i> showing live camera feeds of the station shall be in direct sightline to <i>Station Attendant</i> but not to <i>Customers</i>. Monitor need only be mounted at one end of <i>Service Counter</i> (for a <i>GO Service Area</i> containing 3 or more Service positions, 2 or more monitors are required). The following equipment must be housed in proximity to the CCTV monitor at a usable counter height:               <p><b>CPU</b> (675x400mm; cable to monitor max 3.9m)</p> <p><b>Keyboard &amp; Mouse</b></p> </li> </ul>
Back of House Count Room	<p><b>Count Room Requirements</b></p> <ul style="list-style-type: none"> <li>&gt; A coat closet with louvered doors</li> <li>&gt; Open, adjustable shelves</li> <li>&gt; Bank of drawers for storage</li> <li>&gt; Workstation for counting and populating tills, provide knee space below</li> <li>&gt; Corporate PC, monitor, keyboard, mouse</li> <li>&gt; 2 Legal size filing cabinets in back office</li> <li>&gt; 2 - Half Sized Lockable Lockers (pad lock) per service position</li> <li>&gt; Float Safe with 300mm raised base (shall not be visible to the customers)</li> <li>&gt; Space for water cooler</li> </ul>



CI-0401

**TAB 4: STATION INFRASTRUCTURE**  
Station Buildings

SERVICE AREA

Feature	Description
Back of House Kitchenette	<p><b>Kitchenette</b></p> <ul style="list-style-type: none"><li>&gt; Single stainless steel sink</li><li>&gt; Mini fridge</li><li>&gt; Microwave</li><li>&gt; Waste and recycling bins</li><li>&gt; 2 - 15 Amp GFI receptacles</li><li>&gt; Upper and lower cabinets for storage</li></ul>
Back of House Service Attendant Washroom	<p><b>Service Attendant Washroom</b></p> <ul style="list-style-type: none"><li>&gt; Shall be designed to barrier free standards</li><li>&gt; Vanity with sink</li><li>&gt; Floor mounted tank toilet</li><li>&gt; Soap Dispenser</li><li>&gt; Coat hook</li><li>&gt; Wall mounted air freshener</li><li>&gt; Single Roll toilet paper dispenser</li><li>&gt; Stainless Steel Recessed Paper towel dispenser</li><li>&gt; Waste receptacle</li></ul>





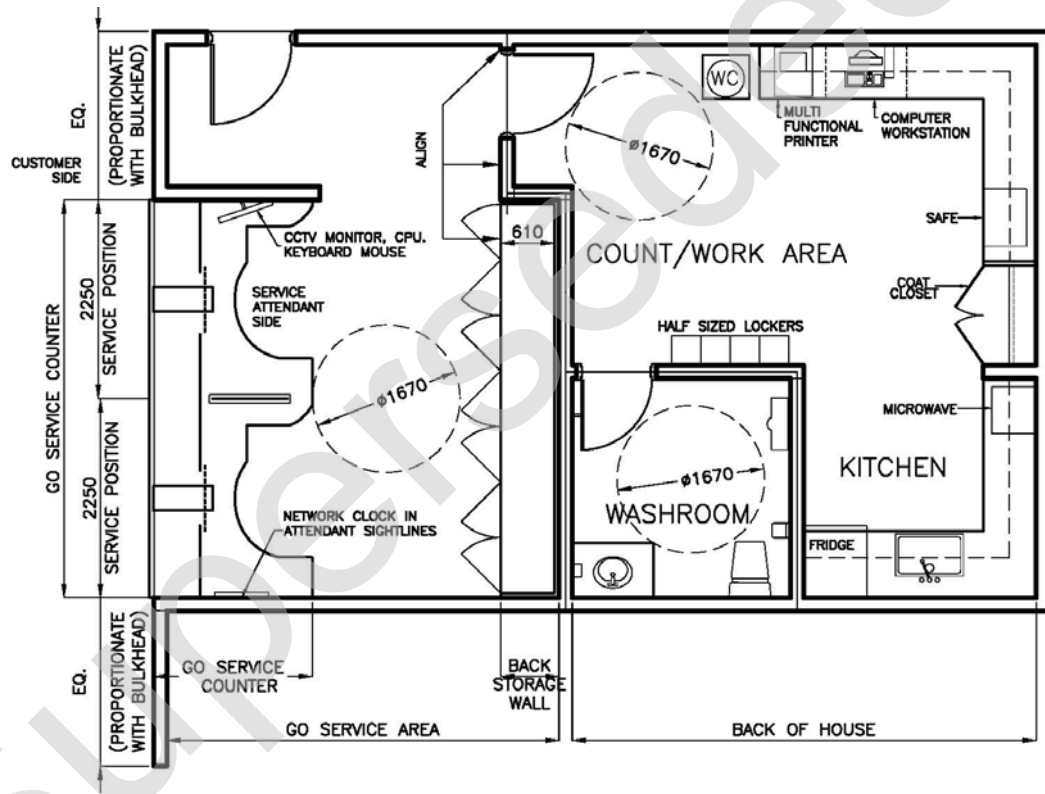
CI-0401

**TAB 4: STATION INFRASTRUCTURE**  
Station Buildings

FIGURE: OVERALL SERVICE AREA

SECTION:  
Tab 4 Station  
Buildings

FIGURE:  
Overall  
Service Area  
Plan Example



OVERALL SERVICE AREA PLAN EXAMPLE



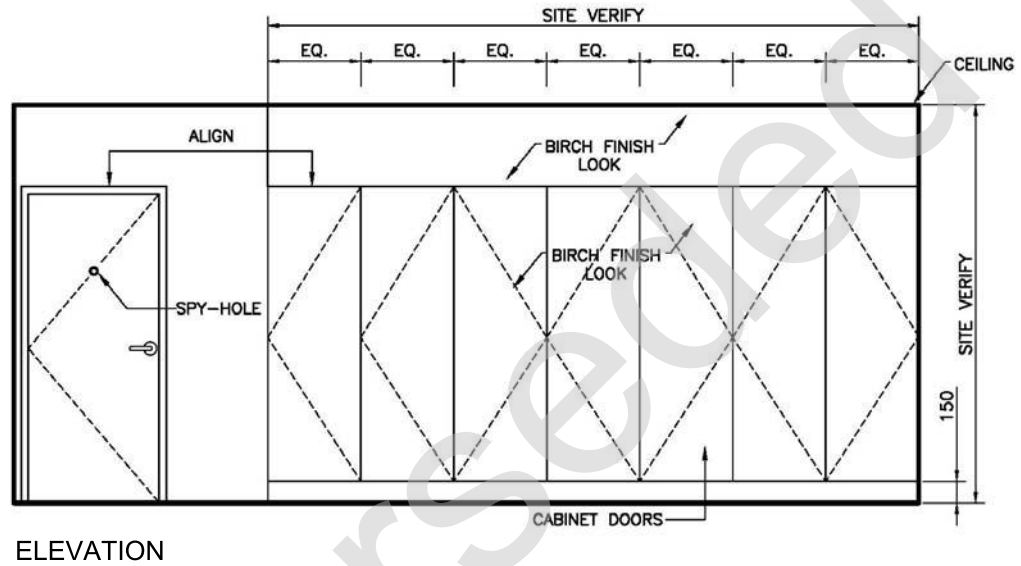
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**TAB 4: STATION INFRASTRUCTURE**  
Station Buildings

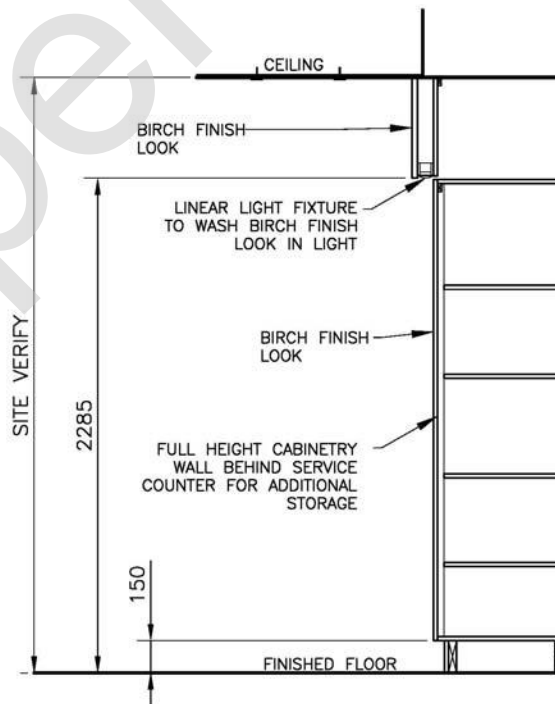
FIGURE: BACK STORAGE WALL

SECTION:  
Tab 4 Station  
Buildings

FIGURE:  
Back Storage  
Wall –  
Elevation and  
Section



ELEVATION



SECTION



CI-0401

**TAB 4: STATION INFRASTRUCTURE**  
Station Buildings

**MATERIAL PALETTE**

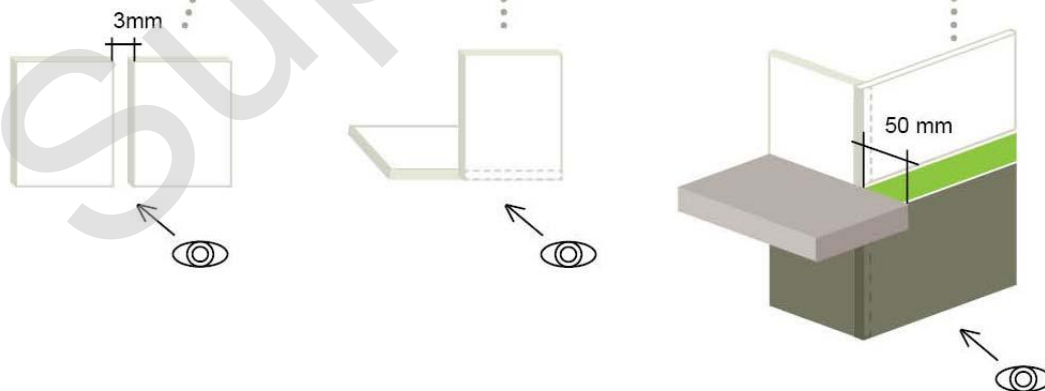
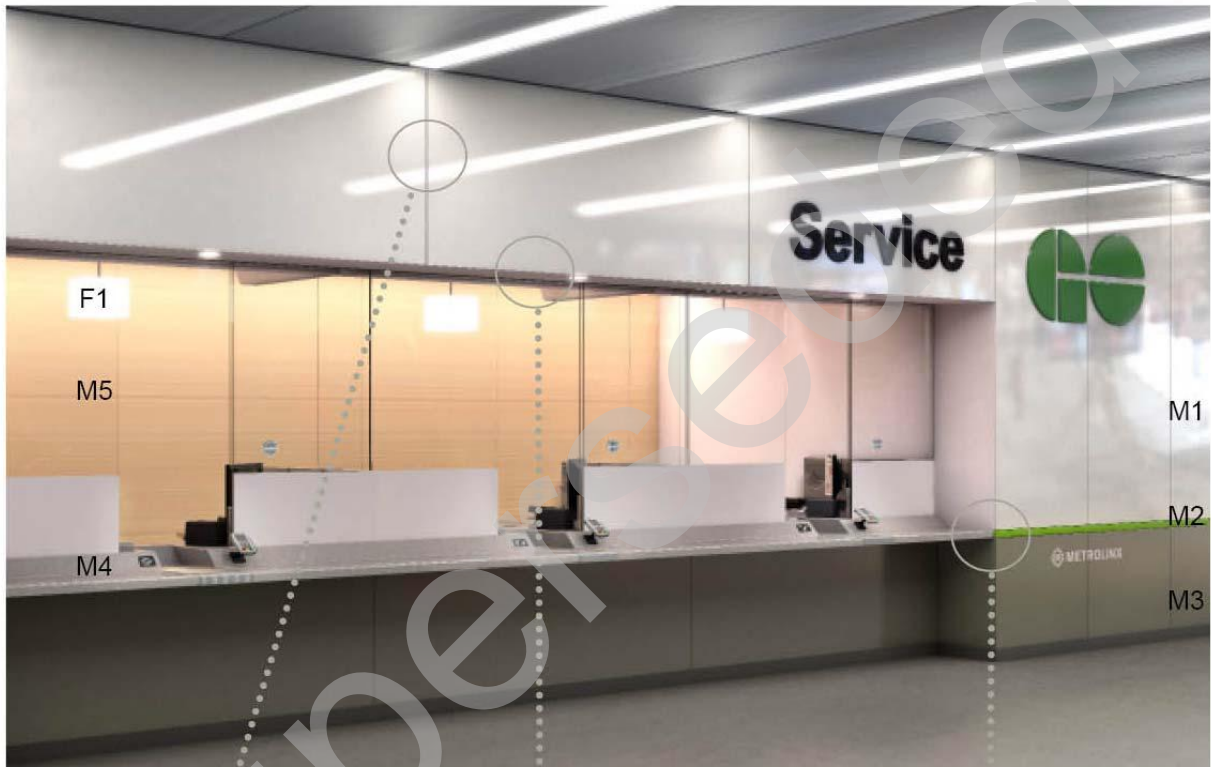
<p>M1</p> <p><b>MATERIAL</b> - large format dimensional panels</p> <p><b>FINISH &amp; COLOUR</b> - non-porous, smooth, glossy or polished finish - colour to match white RAL 9016c</p> <p><b>USE</b> - GO Service elevation above glass and flanking walls -no horizontal joints in facade</p> <p><b>FEATURES</b> - durable for public applications, easy to maintain, fire and chemical resistant, VOC free - high recycled content material (optional)</p>	<p>M2</p> <p><b>MATERIAL</b> - alternate material than adjacent materials M1 &amp; M3 - anodized metal strip</p> <p><b>FINISH &amp; COLOUR</b> - smooth, glossy or polished finish - colour to match light green Pantone 376c</p> <p><b>USE</b> - GO Service elevation between white and grey/green panels</p> <p><b>FEATURES</b> - flush with adjacent wall materials - width of strip to match thickness of countertop</p>	<p>M3</p> <p><b>MATERIAL</b> - large format dimensional panels</p> <p><b>FINISH &amp; COLOUR</b> - non-porous, smooth, glossy or polished finish - colour to match green/grey Pantone 417c</p> <p><b>USE</b> - GO Service elevation above glass and flanking walls -match joint lines of M1</p> <p><b>FEATURES</b> - durable for public applications, easy to maintain, fire and chemical resistant, VOC free - high recycled content material (optional)</p>
<p>M4</p> <p><b>MATERIAL</b> -Solid polymer surfacing</p> <p><b>FINISH &amp; COLOUR</b> -non-porous, smooth, polished finish -colour to match 'Corian Dove'</p> <p><b>USE</b> -countertop in GO Service Areas</p> <p><b>FEATURES</b> -ensure all edges or aprons are sufficiently rounded</p>	<p>M5</p> <p><b>MATERIAL</b> - wood, wood veneer</p> <p><b>FINISH &amp; COLOUR</b> - birch wood look</p> <p><b>USE</b> - back Service Wall cabinetry doors, adjacent walls, doors, and door frames -any millwork visible to the customer</p> <p><b>FEATURES</b> - door frame(s), door(s), and walls, to be flush with full-height cabinetry</p>	<p>F1</p> <p><b>FIXTURE</b> - 200mm cube, LED light fixture with closed bottom</p> <p><b>FINISH &amp; COLOUR</b> - matte - colour to match RAL 9016 - stainless steel look on rod</p> <p><b>USE</b> - above each service position</p> <p><b>FEATURES</b> - durable for public applications, easy to maintain, fire and chemical resistant, VOC free - high recycled content material (optional)</p>



CI-0401

**TAB 4: STATION INFRASTRUCTURE**  
Station Buildings

**GO SERVICE COUNTER MATERIAL INTENT**







CI-0103

**TAB 1: GUIDING PRINCIPLES**

Accessibility

7. Accessible washrooms;
8. Floor grilles compatible with the use of canes and crutches and grating located away from the main pedestrian traffic flow;
9. Barrier-free **service** counters and accessible audio communication systems;
10. Increased illumination near customer loading and waiting areas;
11. Accessible Bus Bays and platform areas;
12. Signage for Station Way finding;
13. Public Address System;
14. Elevators with accessible features, where the station or facility requires an elevator; and
15. Elevated Accessible Rail Platform (Mini-Platform).



CI-0103

TAB 1: GUIDING PRINCIPLES

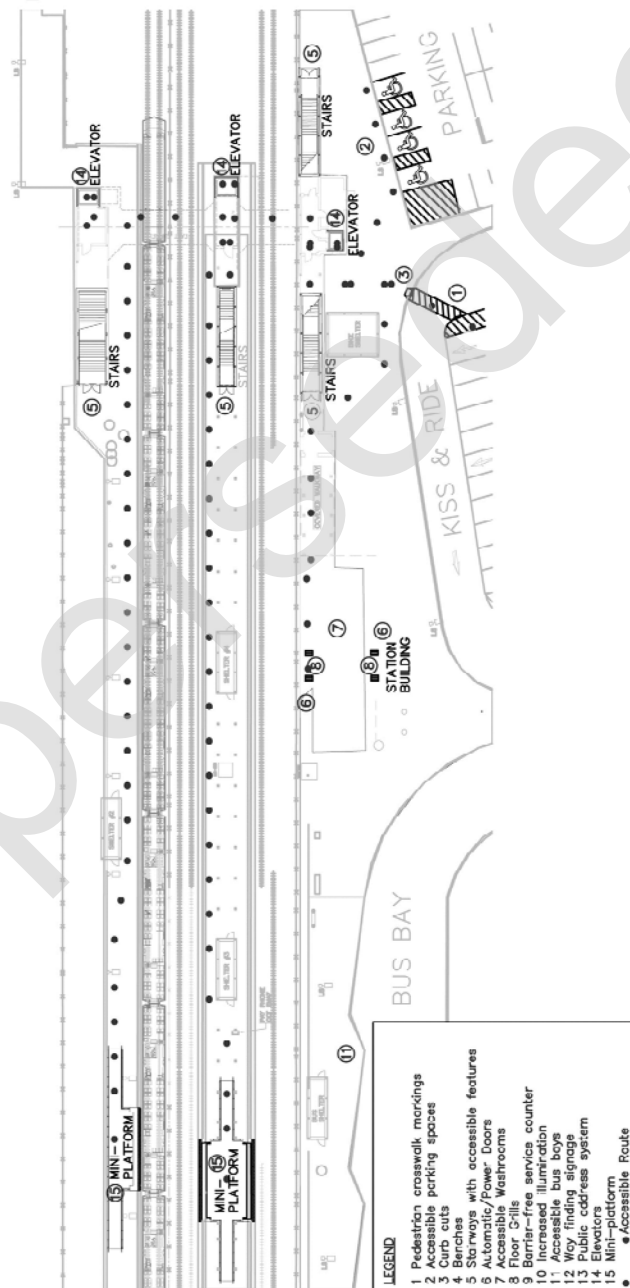
Accessibility

FIGURE: ACCESSIBLE ROUTE & EASIER ACCESS FEATURES

**SECTION:**  
Tab 1: Guiding Principles

**FIGURE:**  
Accessible Route & Easier Access Features

FIGURE: ACCESSIBLE ROUTE & EASIER ACCESS FEATURES








CI-0104

**TAB 1: GUIDING PRINCIPLES**

Mobility Hubs

Mobility Hub Objective	Mobility Hub Approach	Existing Related DRM Design Requirement
	<p>customer amenity: convenience, comfort and safety, and information.</p>	<p>station building area by each of the modes should have convenient access to:</p> <ul style="list-style-type: none"> <li>&gt; Direct access from parking or Kiss n Ride to platform where possible.</li> <li>&gt; An information display providing service information at the approach to the station area;</li> <li>&gt; <b>Service Area (attended, Presto or TVM);</b></li> <li>&gt; Newspaper boxes and, if appropriate, concessions;</li> <li>&gt; Customer amenities including benches, pay phones and waste bins</li> </ul>
	<p>4.7.1 Provide high-quality and safe accessible parking spaces.</p>	<p>CI-0203 Parking Infrastructure – Barrier Free Parking</p> <ul style="list-style-type: none"> <li>&gt; Barrier Free Parking shall be located close to the station building entrance and/or rail/bus platform access. Parking spaces designated for persons with disabilities and accessible passenger pick-up areas that serve GO facilities should be located on the shortest possible circulation route to an accessible entrance (preferably 30m or less).</li> <li>&gt; Parking lots shall have the minimum number of designated Barrier Free Parking spaces for passengers with disabilities</li> </ul>








CI-0106

**TAB 1: GUIDING PRINCIPLES**

Level of Service (LOS)

**STATION BUILDINGS**

[Per Rail Line Stations Level of Service Policy - February 2011]

- ✓ Accessible and easily accessed
- ✓ Located as the central focus of all transit related activity 
- ✓ Well integrated with surrounding community and local transit 
- ✓ Clear linkages displaying modal split 

Key Performance Indicator (KPI) (◆ The station design will include...)	KPI Measure (□Mandatory for next level) Ref. Standards documents for dimensions and details)	Level of Service (LOS)			
		A	B	C	F
Redundant station building access points	Minimum two (2) entrance/exit double doors	□	80% LOS A plus mandatory KPIs	65% LOS A plus mandatory KPIs	40% or less LOS A plus mandatory KPIs
Sight line to drop off area	Clear, unobstructed view from station building waiting area to customer drop off area	◆			
Climate controlled waiting areas	Heating, cooling, and ventilation systems in accordance with OBC	◆			
Energy efficient illumination	Minimum 5 FC (50 LUX) at rail platform access points (i.e. tunnels, pedestrian walkways, etc.)	□			
Convenient fare handling systems	Located at tunnel, bridge, and platform access if <b>Service Counter</b> has:	□			



CI-0107

**TAB 1: GUIDING PRINCIPLES**

System Safety

CI-0107 SYSTEM SAFETY

**OVERVIEW (TBD)**

**SYSTEM SAFETY AND CRIME PREVENTION THROUGH ENVIRONMENTAL DESIGN (CPTED) PRINCIPLES**

Application of Crime Prevention through Environmental Design (CPTED) principles should be used to enhance site security and, where feasible, designers should incorporate the following CPTED principles at a minimum into facility designs:

- > Natural Surveillance
- > Natural Access Control
- > Territorial Reinforcement

Security design guidelines follow these CPTED principles:

- > HUMANIZE station and terminal environments, in order to enhance individuality and autonomy in an otherwise anonymous mass-movement context.
- > MAXIMIZE staff and passenger visibility for passive and active surveillance so as to eliminate isolation;
- > FACILITATE access to communication /monitoring devices.

**SECURITY DESIGN GUIDELINES**

Design Area	Guidelines
Buildings	<ul style="list-style-type: none"> <li>&gt; <b>Stations, terminals, concessions:</b> open plan; maximize windows and sight-lines.</li> <li>&gt; <b>Grade level:</b> maintain and enhance the natural grade level as the human-scale reference level, particularly for future open-air parking garages.</li> <li>&gt; <b>Sight lines:</b> locate <b>service counter</b> at exterior wall(s) and maximize fenestration for sight lines inside and outside. Sight-lines shall be extended by mirrors where necessary (example: tunnel corners).</li> <li>&gt; <b>Service Area:</b> clear tempered glass, <b>with</b> openings <b>and sliding glass panel:</b> electronic voice communication system, recessed cash scoop, staff washroom within;</li> <li>&gt; <b>Public washrooms:</b> to be single-use washrooms, doors visible from station attendant room (multi use washrooms: without doors if possible);</li> <li>&gt; <b>Light:</b> to improve outward vision, luminaires shall not reflect in windows.</li> </ul>



CI-0107

**TAB 1: GUIDING PRINCIPLES**

System Safety

**SECURITY DESIGN GUIDELINES**

Design Area	Guidelines
	<p>Glare from glass shall not obstruct <b>service attendant</b>/passenger vision or visibility at any time.</p>
Vertical Spaces	<ul style="list-style-type: none"> <li>&gt; <b>Stairs and elevators:</b> shall be in close proximity to each other, for acoustical and visual continuity.</li> <li>&gt; <b>Guards and balustrades:</b> shall be glazed where sight lines are required and in order to maximize illumination to lower levels, Photoluminescent strips to be installed above stair guards as required. Refer Tab 4 and Tab 7 for details</li> <li>&gt; <b>Perimeter walls:</b> of stairs and elevator vestibules shall be fully glazed where possible;</li> <li>&gt; <b>Stairwell openings:</b> shall be extended across tunnels where possible, for day-lighting, and to reduce the apparent tunnel lengths; concrete sealed walls to be protected by clear non-sacrificial anti-graffiti coating. Photoluminescent strips to be installed above the nosing and at top, bottom and intermediate landings for entire stair run length. Refer Tab 4 and Tab 7 for details.</li> <li>&gt; <b>Stair centre handrails:</b> shall terminate at landings to permit crossover.</li> </ul>
Tunnels and Overpasses	<ul style="list-style-type: none"> <li>&gt; <b>Open overpasses:</b> shall not have solid guards. Enclosed overpasses and stairs shall have windows/skylights, including at the ends, or shall have mesh type enclosures;</li> <li>&gt; <b>Tunnel corners:</b> shall be 45° angled and internal 90° corners shall have, at a minimum, convex mirror units and concrete sealed walls to be protected by clear non-sacrificial anti-graffiti coating.</li> <li>&gt; <b>Heights of tunnels and overpasses:</b> shall be compatible with CCTV requirements.</li> <li>&gt; <b>Photoluminescent strips</b> to be installed along the entire length of tunnels. Refer Tab 4 and Tab 7 for details</li> </ul>
Shelters	<ul style="list-style-type: none"> <li>&gt; <b>Shelters:</b> shall have clear-glazed walls;</li> <li>&gt; <b>Large shelters:</b> for large shelters, doors shall be at opposite ends (one door at each end) and swing out;</li> <li>&gt; <b>Roofs:</b> shelters shall have translucent roofs and internal and external luminaires that do not reflect/glare in glazed walls. Translucent roofs also borrow illumination from platform light standards and provide sun shade; and</li> <li>&gt; <b>Platform shelters:</b> platform shelters remote from public announcement speakers shall have internal speakers.</li> </ul>
Human Scale	<ul style="list-style-type: none"> <li>&gt; <b>Entrance-waiting areas:</b> shall have indirect illumination as the main source, plus a variety of accent luminaires.</li> <li>&gt; <b>Shelters:</b> shall have illumination.</li> </ul>



<b>CI-0306</b>	<b>TAB 3: BUS INFRASTRUCTURE</b> Bus Terminal Buildings
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**WAITING ROOM**

Room Name	Waiting Room
Location	<ul style="list-style-type: none"> <li>&gt; Terminal waiting rooms are similar to station waiting rooms. However, they shall be larger, to suit ridership. GO Transit will advise the consultant of area requirements. A rule of thumb is to provide one 4-seat bench per bus bay (GO Transit standard interior bench), queuing for 20 at each <b>service counter</b> location, and circulation/waiting space on the basis of 0.7 m<sup>2</sup> for each passenger. GO Transit to advise consultant on passenger capacity in accordance with ridership projections.</li> </ul>
Features	<ul style="list-style-type: none"> <li>&gt; Window walls for sight lines to bus bays: insulating glass in aluminum thermal break frames;</li> <li>&gt; More space for queues in front of <b>service counter</b> than in station buildings. A rule of thumb is to provide double the space at stations. Minimum: 20 passengers; and</li> <li>&gt; The concession space may also need to be larger than at stations (minimum 6 m<sup>2</sup>), requiring also an exterior table/seating area. GO will advise the consultant of concession requirements accordingly.</li> </ul>
Doors	<ul style="list-style-type: none"> <li>&gt; n/a</li> </ul>
Fixtures and Fitments	<ul style="list-style-type: none"> <li>&gt; Minimum 3 lineal metres wall space for GO Information displays;</li> <li>&gt; More pay telephones than in station waiting rooms, as will be advised by GO Transit, to suit ridership. Rule of thumb: one phone per bus bay, minimum four (4) phones;</li> <li>&gt; Window blinds and/or solar film if required, particularly for the concession area;</li> <li>&gt; Concession signs – by Tenant (shall not interfere with Station Attendant sight lines);</li> <li>&gt; GO standard interior benches with armrests;</li> <li>&gt; Waste containers; and Digital clock, etc. (see Station Program).</li> </ul>



CI-0401

**TAB 4: STATION INFRASTRUCTURE**  
Station Buildings

CI-0401 STATION BUILDINGS

**BASIS OF CRITERIA**

The standard Rail Line Station is based on the following functional areas:



**STATION BUILDING**

The Station Building provides **attended** services, waiting area, retail area, washrooms, storage room and accommodation for station systems; refer to Table for Station Typology and associated amenities.



**SERVICE AREA/TVM**

All GO **service** counters and fare vending machines shall be barrier free to the public with clear floor area; heights and adequate manoeuvring space to approach them.

**RAIL PLATFORM**

The Rail Platform includes mini-platform and passenger shelters, including platform maintenance access.



**PLATFORM ACCESS**

Platform Access includes pedestrian tunnel or bridges, at grade crossings, stairs, ramps or elevators. The location of the platform access (tunnels and stairs, parking access and pedestrian routes) and station facilities with respect to the platform length should be considered in relation to other stations on the same corridor in order to distribute activity within the corridor along the full length of the train.



**STATION LAYOUT**

Queuing areas shall be wide enough for people using mobility aids including electric wheelchairs and scooters.

Public telephones, display shelves shall be accessible to and easy to use by patrons with various disabilities, e.g. wheelchair users, persons with low vision or hearing loss. Appropriate lighting shall be installed to ensure that people with vision disabilities may clearly identify colours, patterns and signage.



CI-0401

**TAB 4: STATION INFRASTRUCTURE**  
Station Buildings

Open-concept, accessible routes shall be marked by bright colour or textural changes at floor level, to provide directional cues for people with vision disabilities

There shall be no protruding objects or tripping hazards in accessible routes, and if so, they shall be clearly marked with a bright colour, a cane-detectable floor finish, or a guard.

**EXTERIOR STATION SERVICE AREAS AND PASSENGER SERVICE SYSTEMS**

The Exterior Station Service Areas and Passenger Service Systems include related accommodation, servicing, and infrastructure:

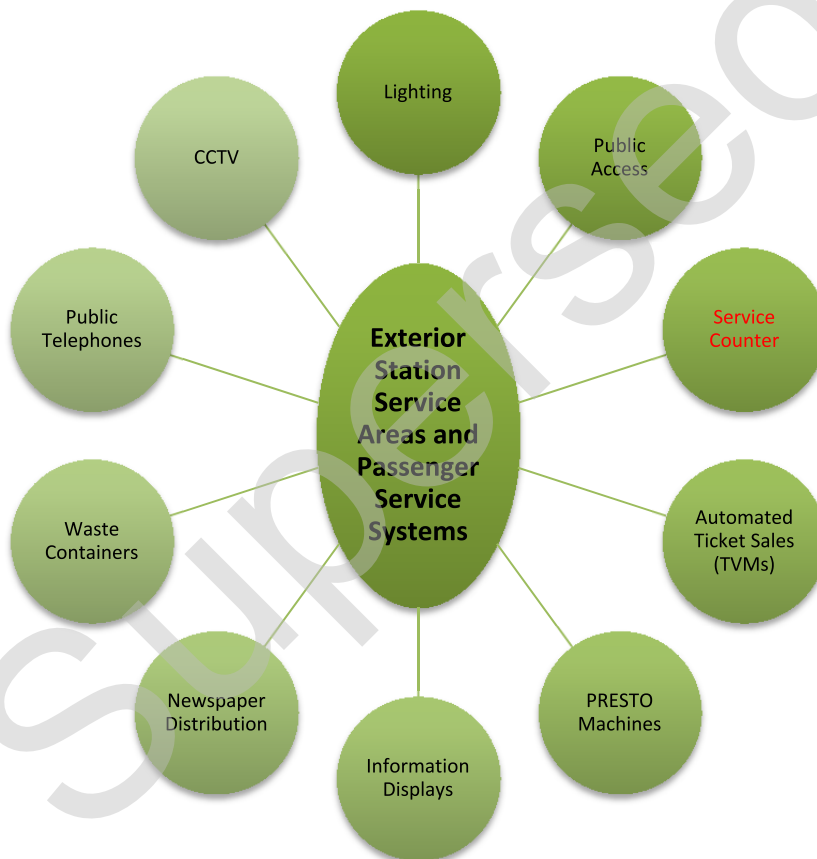


Chart: Exterior Station Service Areas and Passenger Service Systems

**PARKING FACILITIES**

Parking Facilities are located centrally with respect to the station building, taking into account future likely expansion (parking growth, tunnels, etc.).



CI-0401

**TAB 4: STATION INFRASTRUCTURE**  
Station Buildings

**CUSTOMER SERVICES**

Customers approaching the station building area by each of the modes should have convenient access to:

- > Direct access from parking or Kiss n Ride to platform where possible.
- > An information display providing service information at the approach to the station area;
- > **Service Area (Attended, Presto and TVM);**
- > Newspaper boxes and, if appropriate, concessions;
- > Customer amenities including benches, pay phones and waste bins

The arrangement of the station should ensure that all needed facilities are available for customers using the station at times when it is not attended and portions of the station are locked. In addition to automated ticket vending and access to public telephones and information, a shelter should be provided for customers waiting for trains, buses, and rider/taxis as appropriate after staffed hours.

**PLATFORM ACCESS**

The Platform Access Section covers platform access buildings, including Tunnels, Stairs and Stair enclosures, Ramps, Elevators, Bridges and Pedestrian Overpasses, and At Grade Pedestrian Crossings.

The architecture of the Platform Access Buildings can be compatible with the Station Building (principally the roof-forms) or it can be completely diverse, depending on site and municipal requirements (as directed by GO).

Platform Access Buildings shall not visually overpower the Station Building.



CI-0401

**TAB 4: STATION INFRASTRUCTURE**  
Station Buildings

**DESIGN REQUIREMENTS**

The following tables (and/or figures) refer to the detailed room design program for individual rooms in a typical station building:

WAITING AREA	
Room Name	Description
Location	The waiting area shall project beyond the main building, with sight lines along the length of the building and maximized sight lines to the exterior.
Features	<ul style="list-style-type: none"> <li>&gt; Minimum queuing space in front of <b>service</b> counter shall be 5-7 passengers per attendant; queuing space shall be increased based on historical peak station demand information provided by GO staff.</li> <li>&gt; Combined circulation/waiting space shall be provided beyond the queuing space on the basis of 0.7 m<sup>2</sup> for each passenger. Concession space (staffed kiosk or vending alcove);</li> <li>&gt; High ceiling to a maximum of 4 m with daylighting (clerestory bay gable windows, or skylights); peaked or shallow arch ceiling for perimeter illumination (cove lighting);</li> <li>&gt; <b>Service counter</b> complete with purse shelf, with <b>fixed and sliding</b> glazing from the counter top to the bulkhead soffit.</li> <li>&gt; A minimum of 3% of new seating must be accessible with a minimum of one accessible space when constructing a new waiting area or are redeveloping an existing waiting area, where the seating is fixed to the floor.</li> </ul>
Doors	<ul style="list-style-type: none"> <li>&gt; Glazed aluminum frame single door entrances at right angles to the main building, to minimize drafts, protected by the roof overhang, with doors hinging to open against exterior walls.</li> <li>&gt; Two (2) adjacent doors without a post between, with a guard rails. Guardrail to have rubber doughnut bumpers. Power operated doors, where they open into a route of travel, shall have cane-detectable guardrails or other barriers at right angles to the wall containing the door.</li> </ul>





CI-0401

**TAB 4: STATION INFRASTRUCTURE**  
Station Buildings

STAFF WASHROOMS

Room Name	Description
Location	<ul style="list-style-type: none"><li>&gt; Within <b>back of house GO Service Area</b> and Bus Drivers Room.</li></ul>
Doors	<ul style="list-style-type: none"><li>&gt; Where washroom doors have an air transfer grille, dimensions to be determined by the H.V.A.C. Consultant. Single use washroom doors shall be undercut.</li></ul>
Fixtures and Fitments	<ul style="list-style-type: none"><li>&gt; Staff washroom accessories (mirror, recessed stainless steel combined work receptacle and paper towel dispenser with capacity 6L, soap dispenser, coat hook, air freshener and single roll toilet paper dispenser);</li><li>&gt; Staff washroom with a vanity lavatory and floor mounted tank type WC, mirror.</li></ul>
Finishes	<ul style="list-style-type: none"><li>&gt; Floor: Porcelain Tile;</li><li>&gt; Base: Porcelain Tile (coved).</li><li>&gt; Wall: Ceramic Tile (full height).</li><li>&gt; Ceiling: Painted Drywall, painted latex eggshell enamel.</li><li>&gt; Recessed LED lighting with lens or linear LED in ceiling-recessed cove along the plumbing fixture wall for indirect illumination.</li></ul>



CI-0402

**TAB 4: STATION INFRASTRUCTURE**

## Station Sizing

## CI-0402 STATION SIZING

**STATION SIZING**

The following table shows typical space allocations for components of a GO Transit Rail Station building with a two (2) service attendant layout. These spatial allocations are a guide for design and layout of the GO Station Building. The information provided below should be read in conjunction with the functional figure showing spatial relationships. Further analysis is required based on specific site conditions such as ridership projections, arrival modes, interface with other Transit Services, stations designated as “Mobility Hubs”, line station, or terminal station, bus terminal or Lay-By requirements (including drivers facilities), and other station specific requirements.

When more than two **service attendants** are required, provide incremental space allocations subject to GO approval.

ROOM	MIN. SIZE	REMARKS
Waiting Area	40 m <sup>2</sup>	This consists of 20 m <sup>2</sup> of waiting area and 20 m <sup>2</sup> of queuing area* (for two <b>service attendants</b> ).  * 1 m <sup>2</sup> per person queuing
Concession/Retail	16 m <sup>2</sup>	Adjacent to the waiting area and includes 4 m <sup>2</sup> for retail storage.
<b>Service Counter</b>	<b>2.25m x 1.89m</b>	*Space allocation per <b>service counter</b> for each attendant wicket (access and back counter space not included here). Mandatory view to Kiss & Ride. View to platform area where possible.
	<b>20 m<sup>2</sup></b>	Total <b>service counter</b> area for two attendants, including back counter space, wickets, and entry with coat closet.
Station attendants back office	20 m <sup>2</sup>	Attached to the station attendants area includes lockers, kitchenette, safe and counting area hidden from view of the public. ( <b>Station washroom not included in total</b> )



CI-0402

**TAB 4: STATION INFRASTRUCTURE**  
Station Sizing

Staff Washroom	7 m <sup>2</sup>	Staff washroom attached to the station attendants back office.
Multi-Use Public Washroom	16 m <sup>2</sup> each sex	Door-less multi-use male or female accessible washroom having two water closets each. Determination of multi-use washroom design is based on station ridership, bus-meets-train service, and code requirements and subject to direction from GO staff.
Single-Use Public Washroom	5 m <sup>2</sup>	Universal, barrier free washroom.  Determination of single use washroom design is based on station ridership, bus-meets-train service, and code requirements and subject to direction from GO staff.
Maintenance Room	15 m <sup>2</sup>	3.0 m x 5.0 m
Electrical Room	Minimum 17 m of linear wall space for mounted material.	Electrical Room size will be based on the project specific electrical equipment space requirements. Ensure that 25% of extra space is designated for future expansion.
Communications Room		Minimum 3.2 m x 4.8 m  Communications Room size will be based on station type and project specific IT requirements.
Mechanical Room	Approx. 8 m <sup>2</sup>	Mechanical Room size will be based on the project specific mechanical equipment required.
Snowmelting Boiler Room		Boiler Room size based on snowmelt mechanical equipment space requirements. Ensure that 25% of extra space is designated for future expansion.



CI-0701

**TAB 7: TECHNICAL DISCIPLINES**

Architectural

**DESIGN REQUIREMENTS**

Area	Description
Grilles, Covers, etc.,	<ul style="list-style-type: none"> <li>&gt; Cover panels, screens, grilles, etc. and outlet plates shall be flush-mounted using a vandal resistant security system which can be unlocked only by authorized maintenance personnel, or tamper resistant screws shall be used for smaller items.</li> <li>&gt; This applies also to the exterior and the interior, and to signs, light standard or shelter column electrical access covers, hose bibs, soap dispensers, coat hooks, etc.</li> </ul>
Door Hardware	<ul style="list-style-type: none"> <li>&gt; Key items are linear hinges, heavy duty closers, brush sweeps, guardrails with door hold-opens and power assisted door buttons, etc.</li> </ul>
Station Furniture	<ul style="list-style-type: none"> <li>&gt; Most station furniture is supplied by GO Transit and shall be of salt-resistant and durable materials and finishes, and amenable to relocation by staff but secured in place or weighted to resist vandalism.</li> <li>&gt; Furniture items include fare equipment, bicycle racks, salt bins, waste receptacles, information displays, benches, newspaper boxes, recycling bins, and free-standing advertising assemblies.</li> <li>&gt; The consultant shall locate all such items on the interior and around the exterior of station and terminal buildings as part of the general arrangement plan, incorporating them into the architectural/electrical design.</li> </ul>
Foot Grilles	<ul style="list-style-type: none"> <li>&gt; Foot grilles inside public doors shall be recessed flush with the finished floor and the recess. Foot grilles shall be fabric type, closely spaced so as not to trap high heels, and shall have stainless steel or aluminum frames. The pans shall be removable for cleaning;</li> </ul>
Toilet Partitions	<ul style="list-style-type: none"> <li>&gt; Embossed, ceiling hung stainless steel toilet partitions shall be provided at all facilities.</li> </ul>
Millwork	<ul style="list-style-type: none"> <li>&gt; See Station Buildings,– Typical <b>Service</b> Area Layout for general arrangement of millwork;</li> <li>&gt; The key millwork and related features are a solid laminate (solid surfacing polymer) counter top for all items in the station attendant rooms, with an abrasion resistant plastic laminate finish on all cabinets, and a standard plastic laminate cabinet interior finish. All drawers are to be on high quality metal glides. All hinges are to be concealed. All pulls are to be stainless steel (<b>unless otherwise noted</b>). Eases shall be aluminum or stainless steel wall-hung cabinets are to have task-lighting for counters below;</li> <li>&gt; Millwork relates mostly to the <b>back of house service area</b> and the <b>service counter</b> shared with the waiting room.</li> <li>&gt; Millwork is also located in the dispatch room: a window wall built-in counter, with side or back counters and wall-hung cabinets;</li> </ul>



CI-0701

**TAB 7: TECHNICAL DISCIPLINES**  
Architectural

Area	Description
	<ul style="list-style-type: none"><li>&gt; Other millwork comprises the driver room kitchenette counter and cabinets, similar kitchenettes in the Maintenance Facility kitchens, and various office and workstation counters and cabinets;</li><li>&gt; All station building window sills shall be solid laminate sills;</li><li>&gt; For standard laminate colours and finishes, seek GO staff approval.</li><li>&gt; Footrests shall have a non-slip rubber finish;</li><li>&gt; Cash scoop plugs shall be <b>supplied as part of the service counter delivery</b>;</li><li>&gt; Wall cabinets shall have in-fills to ceiling height, to prevent dust collection;</li><li>&gt; A back-splash shall be provided along counter walls, and counters fronting windows with lower window sills;</li><li>&gt; Grommets shall be inserted in counter tops for electrical and communications plugs to go through (diameter to suit; extra-large);</li><li>&gt; Adjustable tilt pull-out keyboard trays required at <b>service area back of house work station</b>;</li><li>&gt; No sharp corners or edges in or near the station attendant knee-spaces;</li><li>&gt; Cabinet doors shall have the same laminate finish on both sides, and on edges. Cabinet and drawer interiors shall be laminate finish;</li><li>&gt; Coat closet to have a removable corrugated rubber raised-edge floor-mat for footwear, to collect dirt and water;</li><li>&gt; The communications cabinet to have concealed touch-latches (push doors to release) and separately keyed lower cabinets for secured hard drive storage;</li><li>&gt; Staff lockers may be prefabricated, pre-finished metal lockers with recesses to house padlocks (staff private padlocks)</li><li>&gt; The CCTV rack recess shall be finished with the same plastic laminate as cabinet fronts;</li><li>&gt; The Communications cabinet top part interior shall be laminate;</li><li>&gt; Pull handles shall be <b>accessible</b> stainless steel contemporary smooth and streamlined design fastened from the inside with tamper-proof screws <b>(unless noted otherwise)</b>;</li><li>&gt; The staff washroom vanity shall have back and side-splashes and the same lower cabinet door pulls as noted above;</li><li>&gt; <b>The fixed glass in the service counter shall be set into a groove in the countertop. All glass edges shall be polished and bull-nosed continuously. If securement of the glass is by clear silicone there shall be no residue on the countertop or into the cash scoops spanned by the glass.</b></li></ul>



CI-0702

**TAB 7: TECHNICAL DISCIPLINES**  
Mechanical

ROOM	° C		NOTES
	WINTER MIN.	SUMMER MAX.	
Workshop	22*	22	Ventilation
Storage	20	22	Ventilation
Station secondary entrances and tunnels	N/A	N/A	Natural Ventilation
Hydro Vaults	N/A	N/A	per Electrical Authority
Shelters	N/A	N/A	Natural Ventilation/Heating

\* Electric heating if required (supplementary) to maintain 18°C winter temperature.

Note 1: High wall, heat pump with hyper heating and low ambient cooling (no night-time set-back).

**STATIONS**

- > Radiant heating should be considered in new Station buildings on a project by project basis.
- > Otherwise, Heating and Air Conditioning of the waiting area and the **service** area shall be achieved by one high efficiency, premium quality furnace c/w outdoor condensing unit.
- > The **service** area will have a VAV box controlled by a thermostat, while the main thermostat should be located in the janitor room and interlocked with the waiting area temperature sensor.
- > Communications room and Electrical room shall have dedicated split Heat Pump A/C unit for each room. Refer to Communications room section for HVAC and ventilation details.
- > Depending on area, washrooms shall be ventilated by Energy Recovery Ventilators or exhaust fans, and shall be heated by radiant heating (if available in the building) or by electric baseboard heating.
- > Refer to Elevators section for Elevator hoistway HVAC.



CI-0702

**TAB 7: TECHNICAL DISCIPLINES**

Mechanical

- > Auto restart after power failure
- > Hot start.

**FANS**

- > In public area and occupied spaces, low noise centrifugal fans shall be used.
- > Public area fan systems shall be provided with suitable attenuating silencers capable of maintaining space noise level no greater than NC40.
- > Airfoil or backward inclined design is preferred. Forward curved wheels may be used for low pressure applications.
- > Variable pitch axial fans should be considered for fan wheel diameters greater than 610mm and where system air volumes vary, due to control characteristics of summer/winter operation.
- > Propeller fans may be used where they serve non-public or unoccupied areas.
- > Additional ventilation with emergency power back-up may be required in large facilities, such as Willowbrook or Steeprock.

**ENERGY RECOVERY**

Energy Recovery Ventilators (ERV) shall be specified for energy conservation in all GO facilities, where practical and cost effective. In station buildings they shall be above the public washrooms or the janitor room, in the attic space, where applicable. Access by ceiling hatch.

**FILTERS**

Filters used in supply air systems shall be 50mm (2") thick throw-away type, with minimum efficiency of 30%.

**HEATERS**

Electric fan forced heaters shall be considered in the waiting area and entrances. Heaters can be wall or ceiling mounted. Heaters should be controlled by wall mounted space sensors. No built-in thermostats should be allowed.

Supplemental electric fan forced heater should be considered in the **service** area.

Electric resistance duct heaters shall have Silicon Control Rectifiers (SCR), minimum airflow switch, and two high-temperature limit sensors.

Gas fired unit heaters and infrared heaters shall be considered in large facilities.



CI-0703

**TAB 7: TECHNICAL DISCIPLINES**

Electrical

**ESSENTIAL LOADS**

The following table shows a list of items that are considered to be essential. The table shows both backup power system conditions (i.e. Generator + UPS OR UPS only) and provides an estimated power draw for each item. The actual power draws shall be considered in the detail design and specification must be verified on a project by project basis.

<b>ESSENTIAL LOADS</b>				
<b>Essential Load</b>	<b>Estimated Power Draw</b>	<b>With Generator</b>		<b>With NO Generator</b>
		<b>Diesel Generator</b>	<b>UPS System</b>	<b>UPS System</b>
	<b>(Watts)</b>			
<i>Life Safety</i>				
Exit signs - buildings, tunnels and similar structures (LED type)	100	x		x + Life Safety
Public Address System	2,000	x	x	x
CCTV System	2,000	x	x	x
Any additional rack in the Comms Room	2,000	x	x	x + Life Safety
GO Transit telephone System	500	x	x	x
Elevator (only one elevator operating at a time)	4,500	x		
Elevator controls	2,000	x		
Alarm Monitoring Systems	400	x	x	x + Life Safety
<i>Lighting</i>				
Tunnels, bridges and stairwell illumination (at least 1 fixture on normal power)	2,000	x		x + Life Safety
Electrical Room Illumination (at least 1 fixture on normal power)	100	x	x	x
Communications Room Illumination (at least 1 fixture on normal power)	100	x	x	x
<b>Service Area</b> Illumination	300	x		x
Waiting Area Illumination - minimal	1,000	x		x + Life Safety
Platform Lighting	9,000	x		





CI-0703

**TAB 7: TECHNICAL DISCIPLINES**

Electrical

**ILLUMINATION LEVELS**

ILLUMINATION LEVELS	
Location	Working Plane Height
Circulation areas both public and non-public including exterior traffic areas.	Floor level
Public seating (waiting) areas	850mm
Workshops	850mm
Vertical illumination (task lighting)	At the task

**Interior Lighting**

Minimum average maintained illumination levels as per IES / CNIB or as directed by GO:

INTERIOR LIGHTING ILLUMINATION LEVELS	
Location	Illumination Level
Waiting Room	20 Fc (200 LUX)
Station Attendant Room	20 Fc (200 LUX)
Service Counter task lighting	40 Fc (400 LUX)
Staff Washroom	20 Fc (200 LUX)
Public Washroom	20 Fc (200 LUX)
Electrical Room	75 Fc (750 LUX)
Communications Room	75 Fc (750 LUX)
Janitorial/Storage Room	20 Fc (200 LUX)
Elevator/Escalator (incl. elevator vestibules)	20 Fc (200 LUX) (Note 1)
Shelter	5 Fc (50 LUX) (Note 2)
BRT Building (Bus Rapid Transit)	15 Fc (150 LUX)
Shop/Workbenches	30 Fc (300 LUX)
Electronic Shop Workbenches (task lights)	As per IES
Garage	30 Fc (300 LUX)
Mechanical Room	20 Fc (200 LUX)
Dispatch Room	15 Fc (150 LUX)
Hallway/Corridor/Tunnel/Stairwell	20 Fc (200 LUX)
Office	As per IES or CIBC
Other	As per IES or as directed by GO or CNIB
<b>Note 1:</b> Elevator Code to govern	



CI-0703

**TAB 7: TECHNICAL DISCIPLINES**

Electrical

- > Bus loop and bus loop shelter lighting to be 100% OFF.
- > Parking lot lighting to be further reduced to 100% OFF.
- > Illuminated facility ID sign to turn OFF.

**EXTERIOR LIGHTING ON/OFF CONTROLS**

The lighting controls shall be designed to provide the following functions:

- > The lighting controller (i.e. timer) shall be programmable controlled, PLC, complete with automatic daylight savings adjustment.
- > Provide a photocell control on all control designs where the default is “dusk to dawn”.
- > Sites that are being rehabilitated should have their lighting controls modified to meet these requirements.

**OVERRIDE SWITCHES**

Station lighting is to be wired into separate zones and each zone shall be controlled independently by one of three master override switches. Switches shall be strategically located at the **service counter**, electrical room and exterior of the station. Override switch will be accessible to GO staff and GO approved contractors/agents.

Zones shall include Station building, surface parking, multi-level parking, bus loop, rail platform, Kiss and Ride and access road at a minimum. An overall master shut off switch is also to be provided. Switches shall be housed in a weather tight, PVC lockable box accessible to GO staff, and GO approved contractors/agents. All switches shall have the ability to control any lighting zone. All switched to be labeled with the zone it is controlling.

Remote parking shall have its own override switches following the same guidelines as above. The locations shall be inside the local power cabinet and outside the cabinet housed in a weather tight, PVC lockable box.

**EXIT LIGHTS**

Exit lights shall be of the fully self-contained and low energy LED type.

**EMERGENCY LIGHTS**

Emergency lighting shall be in accordance with the OBC, the Ontario Electrical Safety Code, and the latest CSA standards.



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## TAB 7: TECHNICAL DISCIPLINES

Electrical

### GLARE

Adjacent properties shall be shielded from glare or light trespass. There shall be no interference with railroad signal or operations systems due to glare.

The discomfort Glare Rating shall have a Visual Comfort Probability (VCP) of 65% or greater for interior lighting.

Station attendants and passengers at **service** counters shall be able to see each other 100% **when the sliding glass panel is in the closed position**. Luminaries in this location shall have parabolic egg crate lenses, with all illumination directed vertically down to the task.

Passengers and station attendants shall be capable of seeing out to the exterior at night. All glass shall be clear and not tinted, for maximum visibility, also of the interior.

Luminaries' placement shall take into account viewing angles and fields of view of close circuit television cameras. Luminaries shall not present a source of glare to surveillance cameras.

### DAYLIGHT

Particular attention shall be directed to parking structure, rail station and bus terminal entrance/exit areas, especially on large projects. Illumination shall provide for a visually comfortable transition from outdoors to facility entry areas during all hours of system operation. Illumination levels will likely have to be graduated during the daylight hours to minimize otherwise abrupt changes from outdoors to indoors, and vice versa. Photoelectric cells for the automatic operation of additional lighting fixtures may be utilized.

### MINIMUM HEIGHT

Light fixtures shall generally be mounted at least 2.44 m above floor level. Exceptions are task lights under cabinets or above counters (including shop maintenance counters). Tunnel-stair fixtures shall be wall recessed below stair handrails, or at tread level.

### SUNDRY

All rail platform poles shall be hinged to avoid flagman services. Hinged poles shall be installed in such a manner to avoid obstructions when lowered. Hinging shall be always parallel to the track.

CCTV camera(s) shall have dedicated split pole(s).

PA speakers can— be installed on existing lighting poles only if they are split.

High-mast lighting poles shall have no objects attached onto (e.g. parking identification, PA speakers, etc) to avoid obstruction of the lowering device.



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**TAB 7: TECHNICAL DISCIPLINES**

Electrical

DESTINATIONS ID		
Service ID "XXXX"	Source ID "YYYY"	Destination ID "DDDD"
	the primary.) or CC - Communications Closet (Typically located in the <b>Service</b> area.)	Communications Closet (Typically located in the <b>Service</b> area.)
"IS" for information signage	"SS" for substation	"SS" for substation
"EVC" for electric Vehicle charging and recovery system	"ES" elect closets / sub elect room	"ES" for elect closets/sub elect rooms
"PARK" for Parking Systems ( car counting)	"HUB" communication hub room	"HUB" for communication hub room
"LFS" for Layover Fuelling Station	"Bell D" for BELL DEMARCATION	
"LCS" for Layover compressor Station	"PX" for patch panel	"PX" for patch panel
"LWS" for Layover Wayside Station	"SEL" sub electrical rooms	"MHC" for Manhole communications
"LPMB" for Preventive Maintenance Bay	"RDC" for Rectifier	"HHC" for Hand well Communication
"LWR" for Wheel Maintenance House	"INV" for Inverter	"MHE" for Manhole Elect Power
"LWL" For Locomotive Wash	"DPLS" for Emergency Distribution for Life Safety	"HHE" for Hand well Elect Power
"BSM" for Boiler Snow Melt	Building Out Building to be determined	"PL" for Pole



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### TAB 7: TECHNICAL DISCIPLINES Communications

#### GENERAL

#### OVERVIEW

Communication design is meant to be a proactive, preventive approach to security through the identification and development of strategies that minimize potential threats and vulnerability to employees and customers, protects company assets from theft, abuse and vandalism and reduces unnecessary damage or waste.

The level of design and installation at each station, facility or wayside layover will depend upon the unique conditions of each site and in accordance with GO Metrolinx corporate policy. Monitoring and recording requirements will be determined by the stakeholders.

This Tab is a guide to the design requirements for Communications of GO Transit fixed facilities in terms of the following subjects:

- > Close Circuit Television (CCTV)
- > Public Address System (PA)
- > Information Technology (IT)
- > Telephone Network
- > Security System
- > Fare Handling Systems
- > **Service Counter** Talk Thru Systems
- > Building Automation Systems
- > Radio



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### TAB 7: TECHNICAL DISCIPLINES

#### Communications

- > Colour Monitors – 24” or 32” display monitor inside station **service area**, 32” or 50” at Transit Safety Dispatch, wall or ceiling mounted each site is dependant on local requirements and conditions. This will include all hardware required for the installation.
- > Outdoor grade platform monitors to assist CSA to ensure doorways are clear of passengers. Typically used on curved platforms with obscured vision and installed on mini-platform on dedicated pole.
- > Cameras – Fixed or Pan/Tilt/Zoom, high sensitivity (0.08fc) and other new technology compatible and approved with the corporate standard system.
- > Camera Housings – weatherproof (outdoor), moisture and dust-proof, maintain the ambient temperature within the housing in the camera operating temperature range of –10°C to +50°C. A sunscreen is fitted to protect the camera from direct sunlight. Indoor housings are either high impact polycarbonate or epoxy coated steel, dust-proof, with top mount assembly, suitable for cameras with fixed focal length.
- > Lenses – Fixed with auto-Iris. Aspherical lenses are used on platforms to suit lighting conditions.
- > CCTV Head End System.

### DESIGN/INSTALLATION CRITERIA

CCTV system implementation is part of the overall facility design. The level of design and installation at each station, facility or wayside layover will depend upon the unique conditions of each site and in accordance with GO corporate needs. Monitoring and recording requirements will be determined by the user groups.



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**TAB 7: TECHNICAL DISCIPLINES**

Communications

STATION OPERATIONS			
Area	Activity	Primary Purpose(s)	Image Quality
		Maintenance.	
<b>Platform Monitors for CSA</b>	<p>Assist CSA to ensure doorways are clear of passengers. Typically used on curved platforms with obscured vision.</p> <p>Camera shall not be used for any recording.</p>	<p>Rail operations, safety.</p> <p>Passenger safety</p>	Detect.
<b>Ticket Vending Machines (TVM)</b>	<p>On lakeshore stations, one camera visible to customers.</p> <p>Identify customers using the TVM machines.</p> <p>New TVM's will have their own cameras.</p> <p>RECORDING (FIXED)</p>	<p>Security, public confidence, deterrence.</p> <p>Investigations</p>	Recognize.
<b>Hold-up</b>	<p>One camera per <b>service attendant</b> to identify the customer currently at the window.</p> <p>RECORDING (FIXED)</p>	<p>Security, public confidence, deterrence.</p> <p>Investigations</p>	Recognize.

**CI-0704****TAB 7: TECHNICAL DISCIPLINES**

Communications

**PUBLIC ADDRESS SYSTEM (PA)****BASIS OF CRITERIA**

Public Address Systems are provided at bus terminals and rail stations for direct communication to passengers. These systems are used by Station Operations and Rail Operations and predominantly include rail and bus platforms, bus loops, passenger waiting areas, tunnels/stairways and shelters. Announcements are made from a wall-mounted touch-tone DTMF paging phone located in the Station **Service** Area. This phone is compatible with the zone selection equipment in the Communication Control enclosure.

**DESIGN REQUIREMENTS****COVERAGE****Local**

A system of speakers divided into zones enable announcements from the **service counter** throughout the station or to specific areas, e.g., tunnels or platforms. Under normal working conditions pages are made using the all call feature to all areas.

**Remote**

Rail Station P.A. Systems can be accessed through a Bell Canada SST Red phone interface to enable announcements to be made by Rail Operations at Union Station. This allows GO Operations personnel to access rail stations P.A. systems to make announcements.

**PAGING**

Paging is presently conducted manually throughout the Rail System P.A. Network. However, both Union Bus and Rail Stations have the capability of automatically making pre-recorded announcements. An IP Ethernet link between these stations also allows access to either system. Replacement or new systems at bus and rail stations will contain provision for connection for any future system-wide IP network.

**REFERENCES**

The design and installation of the P.A. System will comply with the following:

- > GO Transit Station Telecommunications and Electronics Systems Document.
- > Electrical Specifications





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**TAB 7: TECHNICAL DISCIPLINES**  
Communications

**DEFINITIONS**

**Controller**

- > Provides, through a system processor, audio input to the various groups of speakers, referred to as zones. This is accomplished by means of Zone Drivers and Zone Relay Cards. It also interfaces with the Red and Local Paging Phones.

**DTMF**

- > Dual Tone Multi Frequency

**Red Phone**

- > A Bell Canada SST system, serves as an emergency communications network and provides a direct link with the Meridian phones at the stations and terminals. Both Red phones are interfaced with the P.A. system at each facility.

**EXISTING SYSTEMS**

If required by GO Transit to phase out, disconnect and remove an existing system, the Consultant shall specify that the Contractor turn over all removed and unused equipment to GO Transit. The process of phasing in the new system shall not cause any undue disruption to the services of the existing system.

**CODES AND STANDARDS**

The Consultant shall specify that the equipment, materials, installation methods and workmanship shall be equal to or exceed the standards specified by the Canadian Standards Association, Electrical and Electronics Manufacturers Association of Canada, Ontario Electrical Safety Code, OBC, ULC, NFPA, Electrical Safety Authority Bulletins, CSA Standards and all other current applicable codes.

Consultants for specific projects shall define codes as applicable and list them in the contract tender documents.

**SYSTEM REQUIREMENTS**

The P.A. System generally consists of zone-grouped speakers strategically located in or at GO Transit facilities, buildings, tunnels, stairwell entrances, elevator vestibules, rail platforms, Kiss and Ride Areas, and Bus Loops, and a System Controller located in the Communications Room of the facility.

For Station and Terminal Facilities, the System shall accept local inputs from local RED phone and DTMF paging phone in the **Service** Area and a remote input from GO Transit 'RED' phone system (Bell Canada SST System).



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**TAB 7: TECHNICAL DISCIPLINES**

Communications

**EMERGENCY POWER**

P.A. System equipment shall be supplied from the emergency power panel located inside the station communication room.

**PRIORITIZED PAGING**

The P.A. system shall be user configurable to provide prioritized paging announcements when announcements are generated simultaneously from different inputs. Initial configuration shall establish to the following priority level.

Highest Priority	GO Operations 'Red' phone
↕	Local 'Red' phone
Lowest Priority	Other paging telephones including <b>service area</b>

The system shall provide for a separate 600 ohm audio input whose priority access level in the system is also user configurable.

**TIME CLOCK**

The system shall provide for volume adjustment of the P.A. announcements using an internal real time clock. Automatic adjustment of clock changes shall be provided for daylight savings time.

**GENERAL FEATURES**

1. The P.A. system shall interface with a maximum of seven and minimum of four P.A. paging phone inputs and up to three - 600 ohm audio circuits. All three audio inputs shall provide independent audio adjustment of the incoming signal. A common audio adjustment shall also be provided for the P.A. paging phone inputs. Signal levels for the local paging and remote paging shall be separate inputs requiring individual adjustments. The equipment provided shall be capable of adjusting all audio inputs over a range of -30db to +6db.
2. A solid state controller shall provide the switching and signalling required for priority calls, selective zone paging, zone "group" paging, all call, background music mute, paging alert tones and emergency override.
3. On-site user-configurable, prioritized paging access for all audio inputs shall be provided.
4. The P.A. system shall interface with the GO Transit 'RED' phone system to allow both 'RED' phone paging from Union Station and local 'RED' phone paging from the **service counter**. The local 'RED' phone paging facility shall automatically provide **service counter** paging speaker override whenever the local RED phone system is used.



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### TAB 7: TECHNICAL DISCIPLINES Communications

## DESIGN REQUIREMENTS

### LOCATIONS

The STI's Interac equipment and calculator are generally **situated at the station service counter**. STC's Smart card equipment and TVM's may be located either in the station building, platforms and accesses to platforms or in tunnels.

### CONDUITS

Conduits designated for fare handling equipment wiring will be clearly identified and will be installed well clear of power conduits. Conduits will be RSG or EMT depending on the location with a minimum size of 19 mm.

### WIRING

Most fare handling equipment operates with low voltage electrical circuits. Conduits carrying wiring operating at higher voltage must be kept well clear to avoid any possibility of interference. For maximum communications wiring distances see TAB 7. Any of the above machines that are located outside of heated areas such as the station building will necessarily be fitted with anti-condensation heaters. Wiring and circuit protection will be sized to suit the wattage of heater supplied.

### PRESTO OVERVIEW

Presto Fare Handling System is a smartcard-based fare payment system designed to support the use of one common fare card for fare payment on the various participating public transit systems. PRESTO equipment is proprietary, provided and installed by the appropriate supplier, and comprises:

- > SPOS (Station Point of Sale) – **located at the Service Counter**
- > SFTP (Station Fare Transaction Processor)
- > CQD (Card Query Device)
- > HCR (Handheld Card Reader ) and the HCR Cradles – located in Safety Systems Offices
- > WAP (Wireless Access Points) – located at bus facilities
- > CC (Concentrator Complex) – installed in main racks.

See standard diagram number P1 for Presto System Architecture.



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**TAB 7: TECHNICAL DISCIPLINES**  
Communications

- > Multimode fibre patch cords to be c/w LC/LC connectors; cords minimum 1m in length.
- > Four patch cords for each fiber transceiver plus 20% spare to be provided.

**DEVICE (SFTP/CQD) MOUNTING**

SFTPs/CQDs are designed for both stand and wall mounting.

Wall mounted devices do not require any special boxes and will be mounted directly on the wall as shown on standard diagram P10.

Custom made Base Boxes are required to mount SFTP and CQD devices when using 'stand mounting' method. Stainless steel two-piece base box under SFTP and CQD shall be supplied and installed by contractor. Box manufactured by Commex Group Manufacturing Inc. (905-890-0077).

See standard diagrams P6, P7, P8, P9 and P10 for fare device (SFTP and CQD) installation details.

**DEVICE (SFTP/CQD) SIGNAGE**

Standard signage for SFTPs and CQDs shall be provided; refer to Static Signage Catalogue, performance Spec (10400) and Design Requirement Manual (DRM) for design, material and installation details on signage.

**SERVICE COUNTER MODIFICATIONS TO ACCOMMODATE SPOS**

All required modifications shall be performed in wicket's millwork, including adequate ventilation provisions, to accommodate the SPOS equipment.

The SPOS dimensions of the central unit and its peripherals are shown in Table 2:

Components	Physical dimensions (Width x Height x Depth)
Computer	177 x 400 x 530 mm
Touch screen	434 x 430 x 238 mm (Including base)
CID (Card Interface Device)	151 x 37 x 191 mm
Receipt Printer	147 x 148 x 213 mm
UPS	147 x 236 x 419 mm
PID (Process Identifier)	Base: 220 x 41 x 110 mm Display Head: 260 x 70 x 60 mm Overall Height: 291 ~ 426mm



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**TAB 7: TECHNICAL DISCIPLINES**  
Communications**SERVICE COUNTER TALK THRU SYSTEMS****BASIS OF CRITERIA**

The talk-thru system provides instant 2-way voice communication between the public and station attendants through the glass divider at the station **service** counter.

**DESIGN REQUIREMENTS****FUNCTION**

The talk-thru unit provides hands free and effective duplex communication between the station operator and the passengers. The voice switching function is automatically biased in the direction from the passenger to the operator. Noise cancelling and omni-directional microphones will be mounted on the passenger and **service attendant** sides respectively, of the booth glass divider. Two rotary encoded controllers will be provided to adjust the volume of each microphone. The operator's boom microphone will automatically override the passenger microphone when activated. Provision will be made for inter speech pause time.

**COMPONENTS**

- > Microphone Override Pushbutton
- > Power On/Off L.E.D. Switch
- > Noise Cancelling Microphone
- > Seller's Mike-Off Switch

**WIRING**

- > Conduits and 120 volt A/C source power outlets for each voice link assembly.



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#### 3.4 COMMISSIONING AND ACCEPTANCE

All communications systems are required to be commissioned and tested. In addition to the Metrolinx DRM requirements for testing and commissioning the Metrolinx I&IT department must be present for the commissioning of any communications systems. This includes but is not limited to CCTV, Network & Bell Services, PA Systems, Ticket Vending and **Service Counter** systems, Access Control and Security systems, Fuel Management systems and others listed in this document.

#### 3.5 QUALIFICATIONS OF THE QUALIFIED COMMUNICATIONS CABLING INSTALLER (QCCI)

The Consultant shall ensure that the communications cabling installer is experienced in his/her trade. The ideal qualifications of the qualified communications cabling installer (QCCI) could be: a licensed electrician with communications or electronics specialization and/or a licensed electrician with BICSI registration as Installer Level. However, the "licensed electrician" requirement may be waived if the installer demonstrates superior communications and electronics cabling knowledge or other trade specific certifications relating to cable installation. The qualified communications cabling installer is referred to as QCCI throughout this document.

#### 3.6 SITE CLEAN-UP

A full cleaning of the communications room is required prior to systems installations. Upon completion of the cleaning and preparation of systems installations this room must be kept in a clean and tidy fashion. Regular inspection and cleaning is required to protect the equipment during installation. This includes regular vacuuming for dust and debris, maintaining air circulation filtration to ensure dust is not circulated, and general cleanliness of the area including removal of packaging materials, and cable debris.

These spaces are not to be used for tool or other storage during the systems installation nor are these spaces to be used for machining or work other than systems installation. This includes threading pipes, bending conduits, general fitting of any other material.

Final cleaning shall follow Metrolinx Close-Out Specifications as per contract documents. In addition to the standard close-out procedure cleaning, the Consultant shall ensure that the cleaning of the systems equipment, such as CCTV racks, P.A. racks, etc., is carried out by a qualified technician.



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#### IT Telecommunication and Systems Document

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#### 5.1.2 COPPER CABLING REQUIREMENTS

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##### 5.1.2.1 COPPER BACKBONE CABLING

This type of cabling is to be used only for communications structured cabling where more than 4 pairs are required. This is not to be used for runs to the desk or end devices. CAT-5e Telephone Backbone cable is to be used for backbones. A minimum of 25 pairs is required between all telecommunications rooms. In some cases 50 Pair or multiple 25 pair cables will be specified as needed.

Each Telecommunications room is to be connected with a 25 Pair (50 Conductor) CAT-5e Cable. See Cabling Standards for details on termination and cable type.

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##### 5.1.2.2 COPPER HORIZONTAL CABLING REQUIREMENTS

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#### CABLING TO THE DESK / CUBICLE

Each desk requires two CAT-6 data cables. These are to support both voice and data. Some situations require additional network outlets and will be identified during the design phase. All horizontal network / voice cables are to be blue in colour.

---

#### CABLING TO THE SERVICE COUNTER

Each service booth selling position is to have a minimum of eight (8) Category-6 data / voice outlets. These are to be terminated using Category-6 RJ-45 outlets with dust guards or caps. All of these outlets are to be mounted in a patch panel type frame which is mounted below the millwork. These patch panels are to be equivalent to Panduit CWPP12WBL and include the following features:

- Release snap feature on faceplate allows simple front access for termination and accessibility to installed modules
- Accept Modules for UTP, fibre optic, and audio/video, which snap in and out for easy moves, adds, and changes
- Mount directly onto wall
- Modular design for easy cabling revisions
- Have 12 Module Spaces
- Be no more than 9.5" x 2.5" x 1.75" in size.
- Mount directly to wall or millwork surfaces

These are to be located in a convenient location to reach all networked and phone devices within the service position.

All of these cables are to be direct home run cables to the nearest telecommunications room. These are to be terminated on a flat RJ-45 patch panel. (See Patch Panel Specifications for Station Telecommunications Rooms).



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### IT Telecommunication and Systems Document

#### 6 LABELLING STANDARDS

All of Metrolinx Cabling is to be labeled according to the ANSI/TIA/EIA 606A - Administration Standard for Telecommunications Infrastructure.

All cables are to be labeled and recorded as per the 'CLASS III' requirements under the 606A standard.

#### 6.1 TELECOMMUNICATIONS ROOM / RACK NAMING AND SIGNAGE

Each communications room is to be named, and signed as a Telecommunications Room. Each Site is to have one MCR (Main Telecommunications Room) and subsequent rooms being labeled with the following syntax.

<BUILDING>-<FLOOR #><SPACE>-

<RACK> Building Variables:

- ST - Station
- PG - Parking Garage
- PF – Platform
- OB - Outside Building (aka Bunker, Kiosk etc)

Facilities with only one building may omit this field.

Floors:

- B9-B1 - Sub Grade Floors
- 1 - 99 - Above Grade Floors

n.b. Floor identification numbers are to include only the floor number the room is located on, and not the floors it serves.

Spaces:

- MTR - Main Telecommunications Room
- TR - Telecommunications Room (Any other space designated as a communications room which is not the primary.)
- TC - Telecommunications Closet (Typically located in the **Service Counter** area.)

Racks:

Racks at Station Facilities are to be labelled by their use. For example the following rack names are acceptable in station facilities. Should there be multiple cabinets or racks for a single system in the same room – i.e. two CCTV racks, each rack name is to include an index number CCTV1, CCTV2.

- CCTV CCTV Cabinets
- NET Network Cabinets





### APPENDIX A

#### IT Telecommunication and Systems Document

#### 7 SYSTEM DESCRIPTION AND DETAILS

##### 7.1 CCTV

Each head end system shall include, but not be limited to, the following:

- HP Server Console and KVM if required
- HP DL320 Server (Used for Indigo Vision Windows NVR)
- Indigo Vision NVR License Dongle
- Indigo Vision VB 9000 Series Encoder Hardware
- Cisco 2960G Series Switch

In addition to the head end system, monitoring at our Station facility **service counter** is required. Each monitoring system shall include, but not be limited to the following:

- Current model monitoring PC (See attached BOM for details)
- 32" or 24" LCD monitor / panel wall or ceiling mounted depending on local requirements

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##### 7.1.1 EQUIPMENT INSTALLATION

No equipment shall be installed in the CCTV rack unless directly related to CCTV. This equipment will also be installed in the rack in designated rack units, and may not overlap into other rack units.

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##### 7.1.2 RACK CONSOLE

The rack console is to use the 23rd Rack Unit from the base of the rack. The KVM is to be installed in the same RU on the rear of the console. See installation instructions for details on mounting these in the same RU.

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##### 7.1.3 SWITCH GEAR

The Cisco switch shall be configured by the IT Network Engineering team. Two weeks' notice prior to installation is to be given to the Metrolinx IT Network engineering department for configuration of this equipment.

The Cisco switch, if required is to be installed at the uppermost RU of the rack, with the network ports facing the rear of the rack. This is to be installed by the CCTV Installation Vendor. This switch is to be uplinked to the Metrolinx corporate router to the designated port. This is to be done under the supervision (either onsite, or remotely) of a Metrolinx IT Network Engineering specialist.

---

##### 7.1.4 NVR SERVER

Each NVR is to be installed directly above the console, and placed without spacing in between. In cases where multiple NVRs are required, the second NVR will be installed directly above the previous, again with zero spacing between. All manufacturer supplied rails are to be used.



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Resolution	1366 x 768
Brightness (cd/m <sup>2</sup> )	500
Contrast Ratio	4,000:1
Minimum Response Time	8ms
Minimum Viewing Angle	178° Horizontal & Vertical
Display Colours	16.7 Million
Min. Speaker Output	10 Watt Total
Weight Limit	75 Lbs
Physical Maximum External Dimension	810(W) x 515(H) x 120(D) mm

7.1.8 STATION **SERVICE COUNTER** OR OTHER MOUNTED CCTV SCREEN LOCATIONS

Each screen is to be mounted within the **service area** where each **attendant** may see the screen without strain, or discomfort. At the same time the screens are to be kept in a position that does not allow the public to see the contents of the screen. An approved location should be agreed upon at the time of design by Station Operations and Information Technology, Occupational Health & Safety and System Safety

7.1.9 **SERVICE AREA** / MONITORING PC

Each pc must be installed within close proximity of the **service attendants** and the monitor.

Each **service area** / monitoring PC must be connected to the network switch in the telecommunications room and port designated by Metrolinx.

The **service area** PC must be configured with Metrolinx provided user accounts and specifications. This will be provided at the time of installation.

A network outlet and two duplex receptacles are required for the monitoring PC.



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##### 7.1.12 CAMERA CONNECTIVITY AND CONTROL

Each camera connected to the Indigo Vision system must be visible from the corporate network. Working with an IT Representative, each camera will be tested for PTZ control and image quality using the Indigo Vision Client Application

Metrolinx requires two weeks' notice prior to the anticipated completion of the CCTV system to verify and test all camera connectivity and control. Contact the IT Network Engineering department to schedule testing of this system.

##### 7.1.13 REPORTING

Upon completion of the CCTV installation, a complete list in Excel format is to be submitted to the IT Department with the following details for each camera:

- Make
- Model
- Serial Number
- PTZ Protocol Settings
- IP Address
- Description of Location
- Date of Installation (For warranty Purposes)

## 7.2 TELEPHONE NETWORK

### 7.2.1 STATION PHONE

The function of the station telephone is to provide voice communication capability between the station attendant and other Metrolinx staff.

Station telephones are PSTN commercial line telephones located in the **service counter**. These phones are supplied and installed by Metrolinx. Phone Lines will be ordered by Metrolinx IT department. The phone sets must be cabled to the **service counter** cabling jacks. Locations are defined by the **service counter** standard in the DRM.

### 7.2.2 STATION RED-PHONE

The function of the red phone is to provide voice communication capability between the station attendant and the Metrolinx' Rail Operations Control Center GTCC at Union Station as well as to provide connection to the local PA system for emergency announcements. The signalling integration of the Red Phone with the PA system is included in the PA system.



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This telephone set is on a separate 2 wire line connected through a 4 wire circuit to the GTCC. The Red Phone line is ordered by Metrolinx IT. The Red Phone should be cabled to the **service counter** jacks.

#### 7.2.3 PAY PHONES

##### 7.2.3.1 PAY PHONE - STATION

The function of the pay phone-station is to provide telephone service for the use of the passengers.

This telephone is on a regular PSTN circuit and is typically located in a convenient area for passenger access. Usually each station has one internal pay phone and one external pay phone; however, at larger stations the number of pay phones is increased. The telephone is supplied and installed by Bell Canada. The conduit from the telecommunications room to the payphones is to be designed by the Consultant.

At the 25% design stage the Consultant shall request Metrolinx to provide the number and locations of pay phones. Metrolinx will contact Bell Canada to identify the number of pay phones Bell Canada is to provide. Metrolinx Station Operations will select the pay phone locations. The Consultant shall ensure that the appropriate sub-trades provide the telecommunications conduit, pay phone footing and power. The footing template will be provided by Metrolinx. Cable and connections are to be provided by Bell Canada.

##### 7.2.3.2 PAY PHONE - PLATFORM

The function of the pay phone-station is to provide telephone service for the use of the passengers.

These telephones are on regular PSTN circuit and are located near the mini-platform in a well-lit location on each platform. Locations are to be provided by the site specific design Consultant and approved by Metrolinx. The telephone is supplied and installed by Bell Canada. The conduit from the telecommunications room to payphones is to adhere to DRM for communication conduit standards. The footing template will be provided by Metrolinx.

#### 7.2.4 ELEVATOR PHONE & ELEVATOR LOBBY INTERCOM

The function of the elevator phone is to provide voice communication capability for elevator passengers. It is used for elevator emergencies and passenger safety. When activated; emergency calls are placed directly to the Metrolinx' Security Company.

Elevator Phones must meet all of the requirements of the TSSA and other codes and regulations relating to elevator telecommunications.

Elevator Lobby Phones when activated; phones are calls are placed directly to the Metrolinx System Safety Dispatch Office located at the Wolfedale Facility.



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#### 7.2.4.1 NETWORK CONNECTIVITY

All security systems require connectivity from the main alarm panel onto the Metrolinx IP Network. Exact location of this system is to be coordinated through the security system provider. At each main panel location two network outlets are required and are to be cabled back to the nearest telecommunications room network rack. These cables are not to be more than 90m in length.

### 7.3 FARE HANDLING EQUIPMENT

Fare handling equipment refers to POS, TVM, STC and STI equipment and does not include Presto.

#### 7.3.1 POS DEVICES

Each POS or Moneris devices require a network outlet. These devices are to use the outlets provided in the **service counter** cabling. (See “Cabling to the **service counter**”).

#### 7.3.2 TVM EQUIPMENT

##### 7.3.2.1 POWER REQUIREMENTS

The TVM is powered by 120V 60 Hz. The incoming cable has 3 wires of 4 mm<sup>2</sup> (AWG 10) diameter. The main specifications are:

- Hot, Neutral and Ground (Black, White and Green/Yellow),
- Useful length at the pipe outlet = **2000 mm** / 78.7402 inch, Circuit Breaker (out of the machine) 30A bipolar\*.
- Maximum power consumption: 24A with 120V,
- Earth cable will be connected to the TVM cabinet using a bolt and nut, Standard ESA
- Earth resistance: 10 Ohms maximum; test each machine with respect to a reliable reference after wiring.

\*: Bipolar is recommended by PARKEON, but unipolar is accepted in regards to the Canadian electrical network

##### 7.3.2.2 NETWORK CONNECTIVITY

Each TVM requires a network outlet within the TVM. Conduits for power and telecommunications are to be included in the design and construction. Installation of the cabling is to be done prior to the arrival of the TVM, and should be coordinated with the TVM installer. Connectivity of this device is to be done by Metrolinx IT department.



### APPENDIX A

#### IT Telecommunication and Systems Document

#### 7.10 BUILDING UPS TELECOMMUNICATIONS

All Metrolinx UPS systems must be connected to the Metrolinx network infrastructure for future monitoring.

##### 7.10.1 NETWORK CONNECTIVITY

Each of these devices requires a minimum of two network outlets. These network outlets are to be cabled back to the nearest telecommunications room network rack and terminated as per the copper horizontal cabling standard.

#### 7.11 SERVICE COUNTER AREA FAX / PRINTER DEVICES

Each **service counter booth** will have a network printer, fax and copier device. This device shall be located on the electrical drawings along with the location of the below network and power outlets.

##### 7.11.1 MILLWORK REQUIREMENTS

A location for this device must be identified within the **service counter** area. This location is to be determined by Station Operations. The physical dimensions of this unit are (WxDxH): 22 x 762 x 26 in. (558 x 665 x 660 mm) and is to be accommodated within the millwork space. Additional clearance above the unit is necessary for operation of the top tray of the MFP. There shall be no obstructions within 24" or 610mm above this unit.

##### 7.11.2 NETWORK CONNECTIVITY

Each of these devices requires a minimum of two network outlets. These network outlets are to be cabled back to the nearest telecommunications room network rack and terminated as per the copper horizontal cabling standard. These are to be used for both fax and data lines from the telecommunications room.

##### 7.11.3 POWER REQUIREMENTS

Each of these device locations requires a single 20amp duplex receptacle. Emergency / Backup power is required but does not need to be a dedicated circuit.

#### 7.12 STATION ATTENDANT PC

The Station PC is required for each station attendant. The current PC model is an HP DC8200 SFF PC. The PC is intended to provide ATLS Snagit View and PC Whiteboard Services to the station attendant. This computer requires a Keyboard and Mouse as well as a monitor on-top of the station attendant's desk. The purchase and installation of this PC is the responsibility of the Metrolinx I&IT Department.

##### 7.12.1 MILLWORK SIZE REQUIREMENTS



### APPENDIX A

#### IT Telecommunication and Systems Document

The PC's dimensions are as follows: 4.0 x 13.3 x 14.9 in (100 x 338 x 379 mm). This unit is oriented vertically under the **service attendant's** desk. The PC requires a minimum of 200mm at the rear of the machine and a minimum of 80mm in-front to allow for cabling and other devices to be connected front and back. An additional 75mm is required on either side of the unit as well for proper ventilation. This unit requires proper ventilation when placed under the desk. This is not to be installed in any location which does not allow proper air movement.

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#### 7.12.2 POWER REQUIREMENTS

Including Monitor, PC, KVM, and other devices a minimum of two 20a Duplex Receptacles on UPS Power are required. These receptacles may not be ganged into a single box and must allow for a minimum of 100mm between outlets. These outlets must be within close proximity to the PC location within the desk. Refer to DRM **Service Counter** Standards for details.

#### 7.13 FUEL MANAGEMENT SYSTEMS (RAIL)

Fuelling Systems require an isolated facility room for their control and management systems. These are to be isolated from the telecommunications and electrical rooms. Within these rooms adequate space for a half height network and server rack is required. This is to be a floor standing rack with a minimum of 1m clearance on three sides. One side may be placed against the wall.

2 x minimum 53mm conduits are required from this location to the nearest telecommunications room for telecommunications and integration into the GO Transit network infrastructure. See Metrolinx DRM for conduit specifications and requirements.

1 x minimum 27mm conduit is required from this rack to the location of the Fuel Management System Network Switch for network data cables. This is to be coordinated with the Fuel Management System integrators. See Metrolinx DRM for conduit specifications and requirements.

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#### 7.13.1 POWER REQUIREMENTS (IT RACK)

Each rack Location requires 2 x 20amp NEMA L5-20P outlets on The Emergency UPS panel from the telecommunications room. These outlets are to be on separate breakers and follow all electrical standards outlined in the Metrolinx DRM.

One APC – Model AP 7752 is to be installed in the lowest rack unit of the rack. This is provided my Metrolinx IT.

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#### 7.13.2 RACK SPECIFICATIONS AND ELEVATION



CI-0401

**TAB 4: STATION INFRASTRUCTURE**  
Station Buildings

SERVICE AREA

Feature	Description
	<ul style="list-style-type: none"> <li>&gt; Cabinetry will have discreet door hardware or hidden push-latch, typical cabinet width to store extra supplies and specific devices; locked keyed alike. It will house the following equipment:               <ul style="list-style-type: none"> <li><b>Multi-Functional Printer</b></li> <li><b>Courier Box</b> (Outgoing &amp; interoffice mail)</li> <li><b>First Aid Kit</b> (270x400x70mm)</li> <li><b>Intercom AI Phone</b> (mounted in cabinetry)</li> <li><b>Translation Phone</b> (communal storage when not in use, requires power for charge station)</li> <li><b>Flashlights</b> (communal storage for flashlights, requires power for recharging batteries)</li> <li><b>Storage Area for Lost &amp; Found</b></li> <li><b>Shelving and drawers for storage</b></li> </ul> </li> </ul>
<p>General Service Area Requirements</p>	<p><b>Service Area Requirements</b></p> <ul style="list-style-type: none"> <li>&gt; Doors into space requires 'spy hole' for entry into <i>service area</i></li> <li>&gt; Service office access doors to be operable with security wired pin pad</li> <li>&gt; Fire Extinguisher to be installed new Service office access door</li> <li>&gt; Provide a network digital clock within direct sightlines of the Station Attendant either within the GO Service Area or in the adjacent waiting area</li> <li>&gt; One-way glass in any exterior windows to the service office other than the front glazing</li> </ul>





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**TAB 7: TECHNICAL DISCIPLINES**

Electrical

- > Reduction of light pollution of flood lights and wall washers (spill off into surrounding canopies) is to be considered.

Station locations with a high probability of vandalism shall have extra bright illumination, if required and viable in terms of adjacent neighbourhoods.

**Uniformity Ratio**

Maximum to minimum: 4:1 or better

Average to minimum: 3:1 or better.

**Dimmable Illumination**

Photocells, motion and occupancy sensors are to be used within multi-level parking structures, tunnels and pedestrian bridges.

Occupancy sensors are to be placed to allow no blind spots.

Refer to Illumination Levels table on page 478 – 479 TAB 7: ELECTRICAL for minimum lighting levels within multi-level parking structures, tunnels and pedestrian bridges as recommended by IESNA:

The lighting control shall be flexible i.e. programmable controlled per circuit complete with IP addressable and remote access and control.

Methods of reducing energy usage and maintenance shall be considered in design. LED Lighting shall be continuous dimmable (0 to 10 V DC). The design shall consider occupied and a 50 % reduction in light levels when unoccupied. Light harvesting systems shall also be considered.

**LIGHT SOURCES AND CONTROLS**

<b>INTERIOR LIGHTING SOURCES AND CONTROLS</b>		
<b>Location</b>	<b>Light Source</b>	<b>Control and Backup</b>
Waiting	LED down lighting LED sconce lights	Time-of-day controller, 100% station open hours, 10% minimum station closed, 10% on Generator. Day light harvesting were possible.
Station Attendant	LED, continuous task lights over counters with parabolic lenses for glare-free illumination (no visible light source)	Local switches. One fixture UPS + Generator backed-up over service counter, one over cash area and safe, or 10% minimum station closed
Staff Washroom	Mirror task light or surface	Occupancy sensor switch. One



CI-0202

**TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**

Station Sites

**Removable Bollards**

- > Shall consist of: a permanently installed receiver below grade, with a top that is flush with the pavement and a cap to prevent dirt accumulation while the post is removed; a removable post that can be manually lifted out of the receiver to allow access; and an exposed locking mechanism, with a padlock keyed to the station master, to prevent unauthorized removal. Dimensions, covers and colour schemes shall meet Exterior and Interior Bollard's requirements.

**MOTORCYCLE/SCOOTER PARKING**

Motorcycles/scooters are to be provided with a designated parking area at GO Station sites. Motorcycle/scooter parking areas are to be located in parking area spaces that would otherwise not be useable for standard vehicular parking (if available).

The parking area for motorcycles/scooters shall have a concrete base with steel reinforcing (as per soils report recommendation). Each parking space shall be a minimum of 1.5 m wide by 2.5 m long. Individual stalls are not required. Refer to DRM section CI-0202 Station Sites-Figure Scooter/Motorcycle Parking Layout Guidelines for typical corner space and end of parking row configurations.

A designated dismount area is to be provided for safe mounting/dismounting and maneuvering of motorcycles/scooters. Refer to DRM section CI-0204 Pavement and Line Markings- Figure Line Marking – Restricted Area for line painting requirements at the dismount area.



**PASSENGER DROP-OFF & PICK -UP**

GO provides short term parking called Kiss & Ride for passengers being dropped-off and picked-up. The Kiss & Ride area shall be physically separated by 2.5 m raised curbed or landscaped buffer to provide safe and quick drop off/pick up location for passengers.

The passenger pick up and drop off area (Kiss n Ride) or station loading/unloading zone shall provide for barrier free drop off that is:

- > Protected from vehicular traffic with related accessible elements and signage, and
- > Located on the shortest possible accessible route to the station or tunnel entrance.

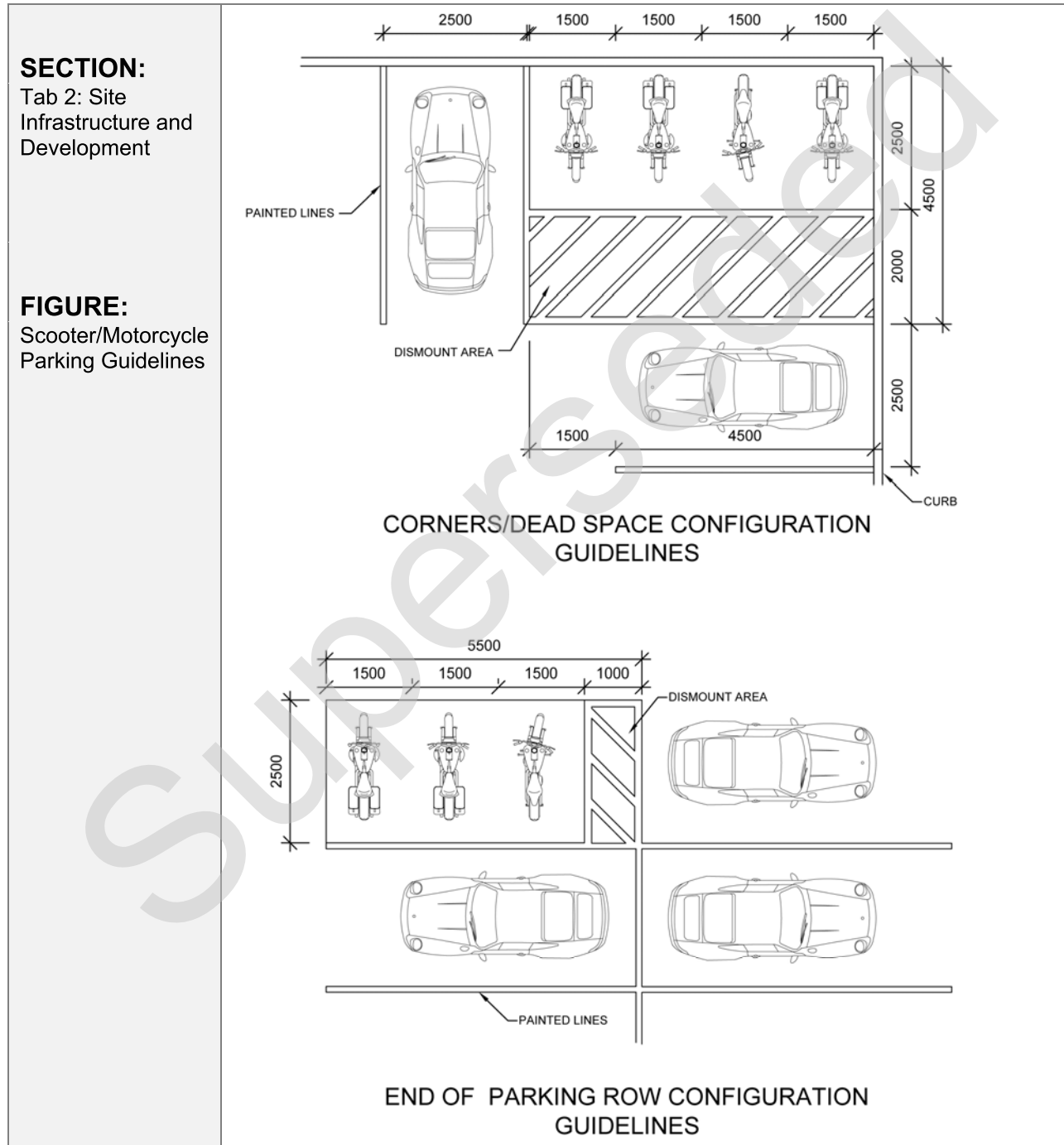
The design should be a lineal, parallel layout, sized on the basis of passenger loading and vehicle projections, allowing a space 3.0 m wide x 6.0 m long for each vehicle. The Kiss & Ride area capacity shall be a minimum 5% of total parking spaces, including multiple lots where Kiss & Ride is not provided.



CI-0202

**TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**  
Station Sites

FIGURE: SCOOTER/MOTORCYCLE PARKING GUIDELINES





CI-0302

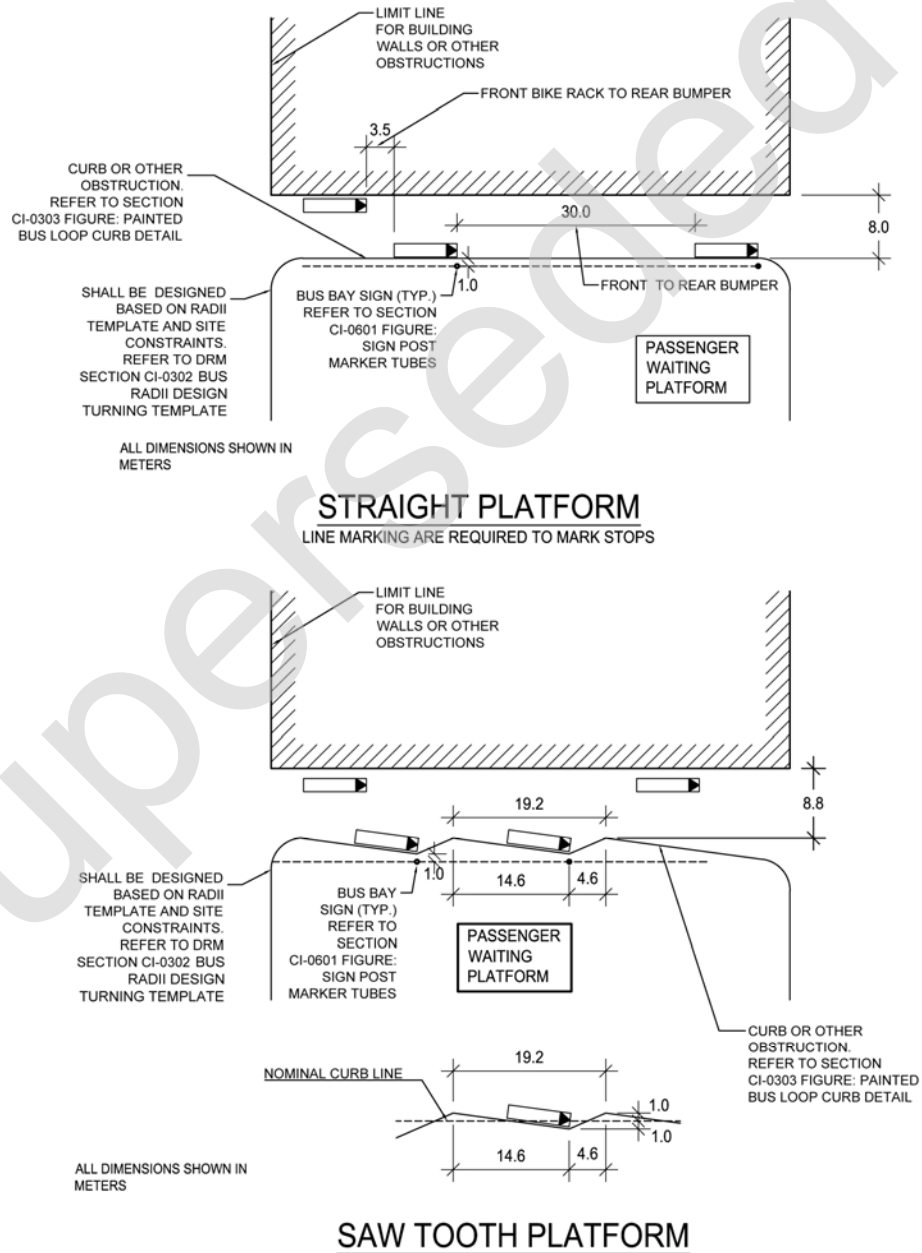
**TAB 3: BUS INFRASTRUCTURE**

Bus Radii Design Guidelines

FIGURE: BUS BAY GUIDELINES FOR D4500 BUS WITH BIKE RACK DEPLOYED.

**SECTION:**  
Tab 3: Bus Infrastructure

**FIGURE:**  
Bus Bay Guidelines for D4500 bus with bike rack deployed.





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**TAB 7: TECHNICAL DISCIPLINES**  
Communications

**FARE HANDLING SYSTEMS**

**BASIS OF CRITERIA**

Fare handling machines are proprietary equipment and will be provided and installed by the appropriate supplier. Consultants shall meet with GO Transit staff to ensure the required facilities needed to operate these machines, e.g., power, are provided.

- > "Interac", etc. (including data polling, Station Control Computer (SCC), Debit and Credit equipment)
- > Smart Card equipment Presto
- > Ticket Vending Machines (TVMs)
- > Network Clock

**CI-0704****TAB 7: TECHNICAL DISCIPLINES**

Communications

**DESIGN REQUIREMENTS****PRESTO OVERVIEW**

Presto Fare Handling System is a smartcard-based fare payment system designed to support the use of one common fare card for fare payment on various participating public transit systems. PRESTO equipment is proprietary, provided and installed by the appropriate supplier, and comprises:

- > SPOS (Station Point of Sale) – located on the Service Counters
- > SFTP (Station Fare Transaction Processor)
- > CQD (Card Query Device)
- > HCR (Handheld Card Reader ) and the HCR Cradles – located in Safety Systems Offices
- > WAP (Wireless Access Points) – located at bus facilities
- > CC (Concentrator Complex) – installed in main racks.

Refer to Standard Drawings PRES-001, Detail 1-Presto System Architecture.

**STATIONS AND BUS TERMINALS****PRINCIPLES OF DEVICE PLACEMENT**

Devices may be located either in the station building, on the platforms, at access points to platforms (tunnels, pedestrian bridges, walkways, stairs, ramps, etc), as directed by Station Services, Field Services and/or Fare Systems.

**General:**

- > Placement of devices and way-finding signage is site specific.
- > Devices shall be placed to avoid work within the Structure Clearance Envelope on/or beside Railway Track (refer to Tab 8 Heavy Rail, Section CI-0807 Structure Interface) to reduce the need for flagging.
- > Bus Terminal locations require CQDs and SPOSs only; all fare collecting equipment is located on the bus.
- > Minimum clearance of 500 mm between two adjacent devices shall be maintained.
- > Devices shall be placed in accessible routes and shall not impede accessible clearances.

**SFTP**

- > Devices shall be placed at all rail platform access points. Devices shall be placed maximum 75 m apart at locations with direct parking lot to rail platform access.



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**TAB 7: TECHNICAL DISCIPLINES**  
Communications

- > Devices shall be placed along passenger natural flow, at clear and visible locations, and shall be readily accessible by Cardholders for fare payment.
- > Remote locations shall be provided with two (2) devices on different circuits, to provide redundancy in case of power failure.

**CQDs**

- > Shall be located outside the passenger flow, near TVM and/or Information Board/Digital Station Information Signs

**Communications Conduits**

Conduits designated for Presto equipment data wiring shall be clearly identified and shall be installed well clear of power conduits. Conduit size shall depend on location with a minimum size of 21 mm. Acceptable conduit type as per Design Requirements Manual Tab 7 Section CI-0703 Electrical.

**ELECTRICAL CONNECTIVITY AND WIRING**

**General**

Wiring and circuit protection will be sized to suit the total wattage on circuit, to address potential voltage drops, and de-rating requirements for multiple circuits run in the same conduit. The following table provides an estimate of the maximum wattage that each device requires. Table 1. shows power requirements for each device.

Device	Watts
SPOS (Station Point of Sale)	200
SFTP (Station Fare Transaction Processor)	35
CQD (Card Query Device)	35
HCR (Handheld Card Reader) Cradles	120

Table 1: Power Requirements

For Electrical wiring specifications, refer to Tab 7 Section CI-0703 Electrical

**Communications Rack**

In the Communications Room, the required receptacles, each fed from dedicated power circuits from a local non UPS (generator backed up if available), shall be provided at each CC Rack.

The types of receptacles required at the different locations are as follows:



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**TAB 7: TECHNICAL DISCIPLINES**

Communications

Main CC Rack – Two (2) dedicated NEMA L5-20R (120V, 20A) mounted on cable tray fed from two (2) 15A breakers on different circuits, providing two (2) extension cords from the two (2) locked receptacles to reach bottom of the CC rack. The two extension cords shall include one (1) L5-20P plug each at top end of cords to plug into the twist lock receptacles and one (1) NEMA 5-20R receptacle each at bottom of cord (which accepts both NEMA 5-15P and NEMA 5-20P for plugging PRESTO UPS which is supplied by PRESTO supplier).

Main CC Rack if Transit Safety is included – In addition to Main CC Rack requirements, One (1) dedicated NEMA L6-20R (208V, 20A) mounted on the cable tray fed from One (1) 20A breaker, providing an extension cord from the locked receptacle to reach bottom of CC rack with one (1) NEMA L6-20P plug at top end to plug into twist lock receptacle and one (1) L6-20R receptacle at bottom of CC Rack (for plugging PRESTO UPS which is supplied by PRESTO supplier).

Secondary CC Rack - Two (2) dedicated NEMA L5-20R (120V, 20A) mounted on cable tray fed from two (2) 15A breakers on different circuits, providing two (2) extension cords from two (2) locked receptacles to reach bottom of the CC rack. The two extension cords shall include one (1) L5-20P plug each at top end of cords to plug into the twist lock receptacles and one (1) NEMA 5-20R receptacle each at bottom of cord (which accepts both NEMA 5-15P and NEMA 5-20P for plugging PRESTO UPS which is supplied by PRESTO supplier).

**PRESTO Devices**

Each **SPOS** (at Service Counter) is locally backed-up by PRESTO UPS (provided by PRESTO equipment supplier) and the PRESTO UPS requires a separate NEMA 5-20R (120V, 20A) receptacle fed from a 15A breaker on a dedicated non UPS power circuit (generator backed up if available). The power outlet shall be located within a maximum 2 m of the service position and labeled with PRESTO.

**SFTP** and **CQD** devices require dedicated power circuits from UPS located in the CC Rack (UPS provided by PRESTO equipment supplier). Power for up to four (4) devices (SFTP and CQD) can be daisy-chain connected to the UPS in the CC Rack. If devices are daisy-chained, they shall be staggered such that devices in close proximity to each other will be fed on separate circuits. Each such circuit shall be protected by a circuit breaker which will also serve as an isolation point near the CC rack (see Standard Drawing PRES-002 Detail 3 for power wiring termination details at CC Rack location).







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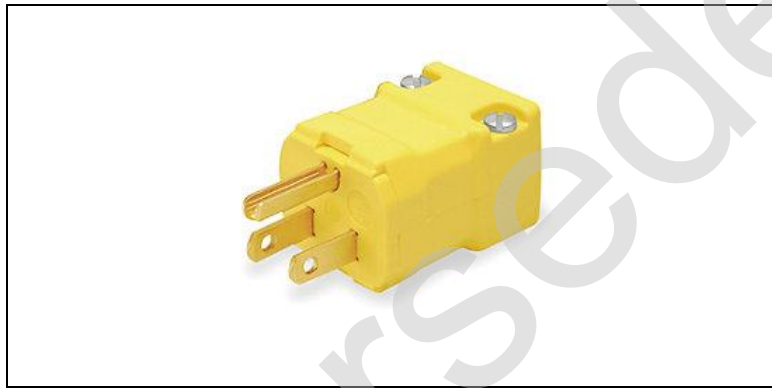
### TAB 7: TECHNICAL DISCIPLINES

#### Communications

An individual ground wire for each SFTP and CQD shall be run and terminated in the copper ground bus at power junction box at CC Rack location.

At the CC rack end the plugs for the SFTP and CQD must be SOW Service Cord complete with Commercial specification grade (straight blade valise type as shown below) plugs to be connected to the PRESTO System UPS in CC Rack.

Example of PRESTO Device plugs (for illustration purposes only):



In order to facilitate operations and maintenance, the power cables that are connected to the PRESTO system UPS must be clearly labeled to indicate which device is connected to each receptacle, following Design Requirements Manual labeling guidelines.

An **HCR** cradle has an input voltage of 120V AC and will require a NEMA 5-20R receptacle in the Transit Safety Office.

#### **DATA CONNECTIVITY AND WIRING**

The main CC Rack shall be placed in the communications room close to the demarcation point.

##### **Demarcation Location**

1 Cat6 (telephone) cable (required for PRESTO out of band modem) shall be terminated in patch panel (and labeled). From the patch panel to be run to the Bell demarcation point terminated with male RJ11 male connector at demarcation end. (Leave 1 meter coiled).

1 Cat6 cable (required for PRESTO router) shall be terminated in patch panel (with label) and run to Bell demarcation point terminated with male RJ 45 male connectors at demarcation end. (Leave 1 meter coiled).

**CI-0704****TAB 7: TECHNICAL DISCIPLINES**

## Communications

**Patch Panel in CC Rack**

These panels are to terminate the cabling coming from the field PRESTO devices and also to terminate the cabling that connects the PRESTO rack switch to the Bell demarcation point.

These patch panels are to be a minimum of 24 port type.

All Cat6 and fiber optic distribution panels will be flat type and supplied and installed by electrical trade. These patch panels are to be installed just below the middle shelf of the GO Network/PRESTO CC rack.

Refer to DRM IT Appendix Section 5.3.1 for patch panel details.

**PRESTO Devices**

Ethernet data cable (Cat6) for **SPOS** shall be terminated into 8P8C (RJ-45) wall jack at device end and 8P8C (RJ-45) female connectors into patch panel at CC Rack (see Standard Drawing PRES-002, Detail 4 for data wiring termination details at CC Rack location).

Where possible, **SFTP** and **CQD** devices will be aggregated such that wired distances do not exceed 90 m (300 ft.) from the CC rack. For distances within 90 m, Ethernet cable (Cat 6) shall be used and terminated with 8P8C (RJ-45) male connectors leaving 1 meter coiled at the device end and RJ45 female end into patch panel (installed by electrical trade) at the CC rack end.

The required amounts of Cat6 RJ45 male ends patch cables to be supplied by electrical trade.

The **HCR** cradles will connect to the Transit Safety CC in the Main Rack using Ethernet Cable (Cat6) for a distance of up to 90m. The cabling shall be terminated into 8P8C (RJ-45) wall jack at the HCR cradle end and 8P8C (RJ-45) female end into the patch panel in main rack. Vendor to provide patch cables.

If the device is more than 90 m from the CC rack, Fiber will be required.

**FIBER**

Fiber optic cable shall be used for distances exceeding 90 m for connection to Fiber Transceiver (installed by PRESTO contractor).

At least 2 fiber strands are required to be pulled for each transceiver, since the fiber media transceiver switch uses 2 strands of fiber.

Fiber optic cable shall be as per DRM IT Appendix, Section 5.2.1.

Fiber optic cable shall be converted into Cat 6 cable through a transceiver (provided by PRESTO equipment supplier) close to device locations at stations. Each transceiver is equipped with 4 - 8 Ethernet outputs to serve 4 - 8 devices. An enclosure to house a fiber transceiver shall be provided by electrical trade (see Standard Drawing PRES-002 Detail 5 for transceiver enclosure detail) at Stations.



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**TAB 7: TECHNICAL DISCIPLINES**

Communications

The power for the Fiber Transceiver shall be run by electrical trade from the Fiber Transceiver NEMA enclosure to the CC rack. Grounding wire shall be connected to the enclosure and door of the enclosure. A power disconnect shall be mounted on the inside of Fiber Transceiver enclosure leaving power cord from disconnect for termination by PRESTO contractor. A din rail is also required. See example below.

Rack to Fiber Transceiver - Multimode fiber that can extend up to 2 km shall be employed and shall be terminated with LC connectors at CC rack patch panel (installed by electrical trade) and terminated with SC connectors into a patch panel (installed by electrical trade) in Fiber Transceiver enclosure (Stations). Required amounts of SC – SC fiber patch cables to be supplied by electrical trade in Fiber Transceiver enclosure and LC-LC fiber patch cables to be supplied by electrical trade in the CC rack.

Rack to Rack – Multimode fiber that can extend up to 2 km shall be employed and shall be terminated with LC connectors at main CC rack patch panel (installed by electrical trade) and terminated with LC connectors in secondary CC rack fiber patch panel (installed by electrical trade). Required amounts of LC – LC fiber patch cables to be supplied by electrical trade in each CC rack.

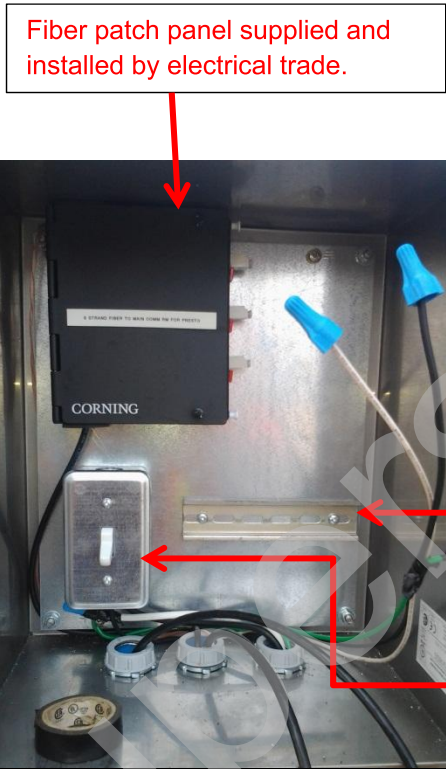


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**TAB 7: TECHNICAL DISCIPLINES**  
Communications

**SECTION:**  
Tab 7:Fare  
Handling  
Systems

**FIGURE:**  
Example of a  
Fiber  
Transceiver  
enclosure  
with  
requirement  
by electrical  
trade.



Fiber patch panel supplied and installed by electrical trade.

Fiber Patch cord to be supplied by electrical trade. (SC – SC connectors not shown in this example).

Din Rail installed by electrical trade (minimum 6 inches long).

Power disconnect installed by electrical trade.

**CI-0704****TAB 7: TECHNICAL DISCIPLINES**

Communications

**CC Rack**

At all new rail stations and bus terminals, PRESTO and Network equipment will share the same rack; (supplied by construction contract); Please see DRM IT Appendix, Section 4.8.3.1 for IT Rack requirements.

All Metrolinx equipment is to be installed above the middle shelf and all PRESTO equipment is to be installed below middle shelf.

If the space is limited at existing facilities, a wall mounted CC Rack may be used and installed. The maximum capacity of the rack and weight shall be stamped on the rack for future information and mounting requirements.

**DEVICE (SFTP/CQD) MOUNTING**

SFTPs/CQDs are designed for both stand and wall mounting.

Wall mounted devices do not require any special boxes and will be mounted directly on the wall as shown on Standard Drawing PRES-003, Detail 2.

Custom made Base Boxes are required to mount SFTP and CQD devices when using 'stand mounting' method. Stainless steel two-piece base box under SFTP and CQD shall be supplied and installed by contractor. Box manufactured by Commex Group Manufacturing Inc. (905-890-0077).

Refer to Drawings PRES-001 for Box Details. Consultant to verify lead time from manufacturer as times may vary with a custom designed box.

See Standard Drawings PRES-002 Detail 6 and 7, PRES-003 Detail 1, 2 and 3 for fare device (SFTP and CQD) installation details.

**DEVICE (SFTP/CQD) SIGNAGE**

Standard signage for SFTPs and CQDs shall be provided; refer to Static Signage Catalogue and Design Requirement Manual (DRM) for design, material and installation details on signage.

**SERVICE COUNTER MODIFICATIONS TO ACCOMDATE SPOS**

All required modifications shall be performed in service counter millwork, including adequate ventilation provisions, to accommodate the SPOS equipment.

The SPOS dimensions of the central unit and its peripherals are shown in Table 2:



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**TAB 7: TECHNICAL DISCIPLINES**  
Communications

<i>Components</i>	<i>Physical dimensions (Width x Height x Depth)</i>
Computer	177 x 400 x 530 mm
Touch screen	434 x 430 x 238 mm (Including base)
CID (Card Interface Device)	151 x 37 x 191 mm
Receipt Printer	147 x 148 x 213 mm
UPS	147 x 236 x 419 mm
PID (Process Identifier)	Base: 220 x 41 x 110 mm Display Head: 260 x 70 x 60 mm Overall Height: 291 ~ 426mm

Table 2: SPOS Required Component Dimensions

A monitor bracket shall be provided and installed by the construction contract at each service position to the right of the desk, one for the SPOS. Bracket shall be provided to suit monitor. Final location of bracket shall be confirmed by Station Services.

**OPERATIONAL SUPPORT FACILITIES**

**ELECTRICAL CONNECTIVITY AND WIRING**

**General**

Wiring and circuit protection will be sized to suit the total wattage on circuit, to address potential voltage drops, and de-rating requirements for multiple circuits run in the same conduit. The following table provides an estimate of the maximum wattage that each device requires. Table 1 shows power requirements for each device.

<b>Device</b>	<b>Watts</b>
SPOS (Station Point of Sale)	200
SFTP (Station Fare Transaction Processor)	35
CQD (Card Query Device)	35
HCR (Handheld Card Reader) Cradles	120

Table 1: Power Requirements

**CI-0704****TAB 7: TECHNICAL DISCIPLINES****Communications**

For Electrical wiring specifications, refer to Tab 7 Section CI-0703 Electrical

**Communications Rack**

In the Communications Room, the required receptacles each fed from dedicated power circuits from a local non UPS (generator backed up if available), shall be provided at each CC Rack.

The types of receptacles required at the different locations are as follows:

Main CC Rack if Station EUT is included – One (1) dedicated NEMA L5-20R (120V, 20A) mounted on cable tray fed from one (1) 15A breaker on different circuits, providing an extension cord from locked receptacle to reach bottom of the CC rack. The extension cord shall include one (1) L5-20P plug at top end of cord to plug into the twist lock receptacle and one (1) NEMA 5-20R receptacle at bottom of cord (which accepts both NEMA 5-15P and NEMA 5-20P for plugging PRESTO UPS supplied by PRESTO supplier).

Main CC Rack if Transit Safety is included - One (1) dedicated NEMA L6-20R (208V, 20A) mounted on the cable tray fed from One (1) 20A breaker, providing an extension cord from the locked receptacle to reach bottom of CC rack with One (1) NEMA L6-20P at top end to plug into twist lock receptacle and One (1) L6-20R at bottom of CC rack (for plugging PRESTO UPS supplied by PRESTO supplier).

Main CC Rack if Station Staging Area is included – Two (2) dedicated NEMA L5-20R (120V, 20A) mounted on cable tray fed from two (2) 15A breakers on different circuits, providing two (2) extension cords from Two (2) locked receptacles to reach bottom of the CC rack. The two extension cords shall include one (1) L5-20P plug each at top end of cords to plug into the twist lock receptacles and one (1) NEMA 5-20R each at bottom of cord (which accepts both NEMA 5-15P and NEMA 5-20P for plugging PRESTO UPS supplied by PRESTO supplier).

**PRESTO Devices**

In EUT (End User Training) environment:

**SFTP** and **CQD** devices in a EUT environment will be equipped with a plug and will require NEMA 5-20R receptacles in the EUT office.

Each **SPOS** (in EUT office) requires a NEMA 5-20R (120V, 20A) receptacle fed from a 15A breaker on a different circuit. The power outlet shall be located within a maximum 2 m of the device.

In Transit Safety office:

An **HCR** cradle has an input voltage of 120V AC and will require a NEMA 5-20R receptacle in the Transit Safety office.

**CI-0704****TAB 7: TECHNICAL DISCIPLINES**

Communications

In IT Staging office:

**SFTP** and **CQD** devices in a Staging environment will be equipped with a plug and will require NEMA 5-20R receptacles in the Staging office.

Each **SPOS** (in Staging office) requires a NEMA 5-20R (120V, 20A) receptacle fed from a 15A breaker on a different circuit. The power outlet shall be located within a maximum 2 m of the device.

**DATA CONNECTIVITY AND WIRING**

The main CC Rack shall be placed in the communications room close to the demarcation point.

**Demarcation Location**

1 Cat6 (telephone) cable (required for PRESTO out of band modem) shall be terminated in patch panel (and labeled). From the patch panel to be run to the bell demarcation point terminated with male RJ11 male connector at demarcation end. (Leave 1 meter coiled)

1 Cat6 cable (required for PRESTO router) shall be terminated in patch panel (with label) and run to bell demarcation point terminated with male RJ 45 male connectors at demarcation end. (Leave 1 meter coiled)

**Patch Panel in CC Rack**

These panels are to terminate the cabling coming from the field PRESTO devices and also to terminate the cabling that connects the PRESTO rack switch to the Bell demarcation point.

These patch panels are to be a minimum of 24 port type.

All Cat6 and fiber optic distribution panels will be flat type and supplied and installed by electrical trade. These patch panels are to be installed just below the middle shelf of the GO Network/PRESTO CC rack or at top of Bus Facility PRESTO CC rack.

Refer to DRM IT Appendix Section 5.3.1 for patch panel details.

**PRESTO Devices**

In Station EUT (End User Training) environment:

**SFTP** and **CQD** devices will be aggregated such that wired distances do not exceed 90 m (300 ft) from the CC rack. For distances within 90 m, Ethernet cable (Cat 6) shall be used and terminated into 8P8C (RJ-45) wall jack at the device end and 8P8C (RJ-45) female end into patch panel (installed by electrical trade) at the CC rack end.





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### TAB 7: TECHNICAL DISCIPLINES

#### Communications

Ethernet data cable (Cat6) for **SPOS** shall be terminated into 8P8C (RJ-45) wall jack at device end and 8P8C (RJ-45) female connectors into patch panel at CC Rack (see Standard Drawing PRES-002 Detail 4) for data wiring termination details at CC Rack location).

#### In Transit Safety office:

The **HCR** cradles will connect to the Transit Safety CC in the Main Rack using Ethernet Cable (Cat6) for a distance of up to 90m. The cabling shall be terminated into 8P8C (RJ-45) wall jack at the HCR cradle end and 8P8C (RJ-45) female end into the patch panel in main rack. Vendor to provide patch cables.

#### In IT Staging office:

**SFTP** and **CQD** devices will be aggregated such that wired distances do not exceed 90 m (300 ft) from the CC rack. For distances within 90 m, Ethernet cable (Cat 6) shall be used and terminated into 8P8C (RJ-45) wall jack at the device end and 8P8C (RJ-45) female end into patch panel (installed by electrical trade) at the CC rack end.

Ethernet data cable (Cat6) for **SPOS** shall be terminated into 8P8C (RJ-45) wall jack at device end and 8P8C (RJ-45) female connectors into patch panel at CC Rack (see Standard Drawing PRES-002 Detail 4) for data wiring termination details at CC Rack location).

In the Bus IT staging environment the BFTP come attached to a plywood board (Supplied by PRESTO). Each BFTP has an input voltage of 120V AC and will each require a NEMA 5-20R receptacle in the IT staging office.

#### FIBER

Fiber optic cable shall be used for distances exceeding 90 m for connection to Fiber Transceiver (installed by PRESTO contractor). At least 2 fiber strands are required to be pulled for each transceiver, since the fiber media transceiver switch uses 2 strands of fiber.

Fiber optic cable shall be as per DRM IT Appendix, Section 5.2.1.2

Fiber optic cable shall be converted into Cat 6 cable through a transceiver (provided by PRESTO equipment supplier) close to device locations. Each transceiver is equipped with 4 - 8 Ethernet outputs to serve 4 - 8 devices.

An enclosure to house a fiber transceiver shall be provided by electrical trade (see Standard Drawing PRES-002 Detail 5 for transceiver enclosure detail).

The power for the Fiber Transceiver shall be run by electrical trade from the Fiber Transceiver NEMA enclosure to the CC rack. Grounding wire shall be connected to the enclosure and door of the enclosure. A power disconnect shall be mounted on the inside of Fiber Transceiver enclosure leaving power cord from disconnect for termination by PRESTO contractor. A din rail is also required.

**CI-0704****TAB 7: TECHNICAL DISCIPLINES**

Communications

Rack to Fiber Transceiver - Multimode fiber that can extend up to 2 km shall be employed and shall be terminated with LC connectors at CC rack patch panel (installed by electrical trade) and terminated with SC connectors into a patch panel (installed by electrical trade) in Fiber Transceiver enclosure (Stations). Required amounts of SC – SC fiber patch cables to be supplied by electrical trade in Fiber Transceiver enclosure and LC-LC fiber patch cables to be supplied by electrical trade in the CC rack.

Rack to Rack – Multimode fiber that can extend up to 2 km shall be employed and shall be terminated with LC connectors at main CC rack patch panel (installed by electrical trade) and terminated with LC connectors in secondary CC rack fiber patch panel (installed by electrical trade). Required amounts of LC – LC fiber patch cables to be supplied by electrical trade in each cc rack.

**CC Rack**

At all new operational support facilities, PRESTO and Network equipment will share the same rack; (supplied by construction contract); Please refer to DRM IT Appendix, Section 4.8.3.1 for IT Rack requirements.

All Metrolinx equipment is to be installed above the middle shelf and all PRESTO equipment is to be installed below middle shelf.

If the space is limited at existing facilities, a wall mounted CC Rack may be used and installed. The maximum capacity of the rack and weight shall be stamped on the rack for future information and mounting requirements

**DEVICE (SFTP/CQD) MOUNTING**

SFTPs/CQDs are designed for a stand mounting.

Custom made Base Boxes are required to mount SFTP and CQD devices when using 'stand mounting' method. Station Ops West will have these cement bases made for the EUT and staging SFTPs and CQDs to mount to.



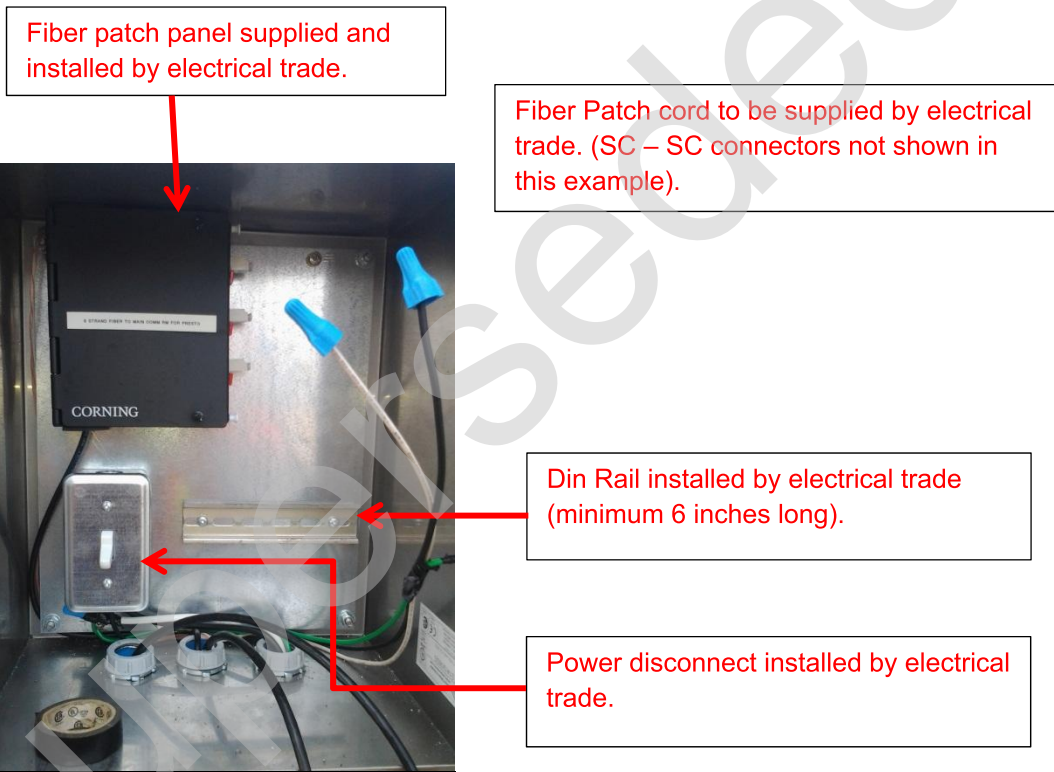
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**TAB 7: TECHNICAL DISCIPLINES**  
Communications

**SECTION:**

Tab 7: Fare Handling Systems

**FIGURE:**  
Example of a Fiber Transceiver enclosure with requirement by electrical trade.





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**TAB 7: TECHNICAL DISCIPLINES**  
Communications

**BUS MAINTENANCE FACILITIES**

**ELECTRICAL CONNECTIVITY AND WIRING**

**General**

Wiring and circuit protection will be sized to suit the total wattage on circuit, to address potential voltage drops, and de-rating requirements for multiple circuits run in the same conduit. The following table provides an estimate of the maximum wattage that each device requires.

Table 1 shows power requirements for each device.

Device	Watts
SPOS (Station Point of Sale)	200
SFTP (Station Fare Transaction Processor)	35
CQD (Card Query Device)	35
HCR (Handheld Card Reader) Cradles	120

Table 1: Power Requirements

**Communications Room**

In the Communications Room, the required receptacles each fed from dedicated power circuits from a local non UPS (generator backed up if available), shall be provided at each CC Rack.

The types of receptacles required at the different locations are as follows:

Main CC rack for Bus WLAN Solution – One (1) dedicated NEMA L6-20R (208, 20A) mounted on cable tray fed from One (1) 20 A breaker, providing an extension cord from locked receptacle to reach bottom of CC rack. The extension cord shall include one (1) NEMA L6-20P at top end to plug into twist lock receptacle and one (1) L6-20R at bottom of CC rack (for plugging PRESTO UPS supplied by PRESTO supplier) and One (1) dedicated NEMA L5-30R (120, 30A) mounted on cable tray fed from one (1) 30A breaker, providing an extension cord from locked receptacle to reach bottom of CC rack. The extension cord shall include one (1) NEMA L5-30P at top end to plug into twist lock receptacle and one (1) L5-30R at bottom of CC rack (for plugging PRESTO UPS supplied by PRESTO supplier).

Main CC rack when Transit Safety is included – In addition to Bus WLAN solution above, One (1) dedicated NEMA L6-20R (208V, 20A) mounted on cable tray fed from One (1) 20A breaker on different circuit, providing an extension cord from the locked receptacle to reach bottom of CC Rack. The extension cord shall include one (1) NEMA L6-20P at top end of cord to plug into twist lock receptacle and an L6-20R at bottom of CC rack for plugging PRESTO UPS supplied by PRESTO supplier).



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### TAB 7: TECHNICAL DISCIPLINES

#### Communications

Main CC rack when Bus EUT is included - In addition to Bus WLAN solution above, One (1) dedicated NEMA L5-20R (120V, 20A) mounted on cable tray fed from One (1) 15A breaker on different circuit, providing an extension cord from the locked receptacle to reach bottom of CC Rack. The extension cord shall include one (1) NEMA L5-20P at top end of cord to plug into twist lock receptacle and an L5-20R at bottom of CC rack (which accepts both NEMA 5-15P and NEMA 5-20P for plugging PRESTO UPS supplied by PRESTO supplier).

Main CC Rack if Station Staging Area is included – Two (2) dedicated NEMA L5-20R (120V, 20A) mounted on cable tray fed from two (2) 15A breakers on different circuits, providing two (2) extension cords from two (2) locked receptacles to reach bottom of the CC rack. The two extension cords shall include one (1) L5-20P each at top end of cords to plug into the twist lock receptacles and one (1) NEMA 5-20R each at bottom of cord (which accepts both NEMA 5-15P and NEMA 5-20P for plugging PRESTO UPS supplied by PRESTO supplier).

Secondary CC rack for Bus WLAN Solution – One (1) dedicated NEMA L5-30R (120V, 30A) installed beside rack for each secondary rack (secondary rack locations determined during RF Survey completed by PRESTO equipment supplier).

#### **PRESTO Devices**

In Bus EUT (End User Training) environment:

In the Bus EUT environment the BFTP come on a cart. Each BFTP has an input voltage of 120V AC and will require a NEMA 5-20R receptacle in the EUT office.

In Transit Safety office:

An HCR cradle has an input voltage of 120V AC and will require a NEMA 5-20R receptacle in the Transit Safety office.

In IT Staging office:

SFTP and CQD devices in a Staging environment will be equipped with a plug and will require NEMA 5-20R receptacles in the Staging office.

Each SPOS (in Staging office) requires a NEMA 5-20R (120V, 20A) receptacle fed from a 15A breaker on a different circuit. The power outlet shall be located within a maximum 2 m of the device.

In the Bus IT staging environment the BFTP come attached to a plywood board (Supplied by PRESTO). Each BFTP has an input voltage of 120V AC and will each require a NEMA 5-20R receptacle in the IT staging office.

#### **DATA CONNECTIVITY AND WIRING**

The main CC Rack shall be placed in the communications room close to the demarcation point.



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**TAB 7: TECHNICAL DISCIPLINES**

Communications

**Demarcation Location**

1 Cat6 (telephone) cable (required for PRESTO out of band modem) shall be terminated in patch panel (and labeled). From the patch panel to be run to the bell demarcation point terminated with male RJ11 male connector at demarcation end. (Leave 1 meter coiled)

1 Cat6 cable (required for PRESTO router) shall be terminated in patch panel (with label) and run to bell demarcation point terminated with male RJ 45 male connectors at demarcation end. (Leave 1 meter coiled)

**Patch Panel in CC Rack**

These panels are to terminate the cabling coming from the field PRESTO devices and also to terminate the cabling that connects the PRESTO rack switch to the Bell demarcation point.

These patch panels are to be a minimum of 24 port type.

All Cat6 and fiber optic distribution panels will be flat type and supplied and installed by electrical trade. These patch panels are to be installed just below the middle shelf of the GO Network/PRESTO CC rack or at top of Bus Facility PRESTO CC rack.

Refer to DRM IT Appendix Section 5.3.1 for patch panel details.

**PRESTO Devices**

In Transit Safety Office:

The **HCR** cradles will connect to the Transit Safety CC in the Main Rack using Ethernet Cable (Cat6) for a distance of up to 90m. The cabling shall be terminated into 8P8C (RJ-45) wall jack at the HCR cradle end and 8P8C (RJ-45) female end into the patch panel in main rack. Vendor to provide patch cables.

In IT Staging office:

**SFTP** and **CQD** devices will be aggregated such that wired distances do not exceed 90 m (300 ft) from the CC rack. For distances within 90 m, Ethernet cable (Cat 6) shall be used and terminated into 8P8C (RJ-45) wall jack at the device end and 8P8C (RJ-45) female end into patch panel (installed by electrical trade) at the CC rack end.

Ethernet data cable (Cat6) for **SPOS** shall be terminated into 8P8C (RJ-45) wall jack at device end and 8P8C (RJ-45) female connectors into patch panel at CC Rack (see Standard Drawing PRES-002, Detail 4 for data wiring termination details at CC Rack location).

**BFTP** are wireless and may require an WAP to be installed. See AP section below.

**CI-0704****TAB 7: TECHNICAL DISCIPLINES**  
Communications**DEVICE (SFTP/CQD) MOUNTING**

SFTPs/CQDs are designed for a stand mounting.

Custom made Base Boxes are required to mount SFTP and CQD devices when using 'stand mounting' method. Station Ops West will have these cement bases made for the EUT and IT staging SFTPs and CQDs to mount to.

The **AP** (Access Points) for the WLAN solution at Bus Facilities shall be connected to the BUS CC rack in the main rack or secondary rack using Ethernet cable (Cat6) for distances of up to 90m. The cabling shall be terminated with 8P8C (RJ-45) male connectors leaving 10 meter coiled at the AP end and 8P8C (RJ-45) female ends into patch panel in rack.

**FIBER**

Fiber optic cable shall be used for distances exceeding 90 m for connection to Fiber Transceiver (installed by PRESTO). At least 2 fiber strands are required to be pulled for each transceiver, since the fiber media transceiver switch uses 2 strands of fiber.

Fiber optic cable shall be as per DRM IT Appendix, Section 5.2.1.2

Rack to Rack – Multimode fiber that can extend up to 2 km shall be employed and shall be terminated with LC connectors at main CC rack patch panel (installed by electrical trade) and terminated with LC connectors in secondary CC rack patch panel (installed by electrical trade)

At Bus Facilities, secondary racks shall be provided by PRESTO equipment providers to house the network switch with fiber for the APs. Cat 6 cables shall be run from the secondary CC rack to the AP terminated with 8P8C (RJ-45) male ends in the rack patch panel.

**BUS MAINTENANCE FACILITY TYPES AND CC RACKS**

At bus maintenance and storage facilities, the PRESTO equipment shall be in a separate CC Rack from GO Network rack. These CC racks will be supplied by the PRESTO equipment providers but shall be installed by the electrical trade.

Type A facilities - The rack is installed in the main communications room and is typically an HP Rack 10636 G2 36U or equivalent with the following dimensions: H x D x W: 68.6 x 39.691 x 24 in (173.5 x 101.5 x 59.7 cm) Any secondary racks will be installed in the Garage area and is typically an APC NetShelter WX 13U w/vented frond door or equivalent with the following dimensions: HxDxW: 26 x 24.5 x 23 in (654 x 622 x 584 mm)

Type B facilities - In the main communications room and are typically an HP Rack 10636 G2 36U or equivalent with the following dimensions:

HxDxW: 68.6 x 39.691 x 24 in (173.5 x 101.5 x 59.7 cm)





CI-0704

### TAB 7: TECHNICAL DISCIPLINES

#### Communications

Any secondary racks required will be installed in the Garage area and is typically an APC NetShelter WX 13U w/vented front door or equivalent with the following dimensions:

HxDxW: 26 x 24.5 x 23 in (654 x 622 x 584 mm)

Type C facilities – In the main communications room and is typically an HP Rack 10636 G2 22U or equivalent with the following dimensions:

HxDxW: 43 x 39.37 x 24 in (1092 x 1000 x 600 mm)

Expansion of PRESTO system at facilities that are live, may require upgrading the existing CC Rack to a larger size or addition of a new rack.

Refer to DRM IT Appendix, Section 5.3.1 for patch panel details.

#### **HVAC**

The operating temperature range for the Concentrator Complex is 0°C - 40°C.

#### **TESTING**

Upon completion of the installation, the Contractor shall perform complete copper and fiber optic cable certification tests, according to all manufacturer's requirements for warranty and all testing including, but not limited to:

- > Copper Data Cable
- > Continuity checks on each cable, checking for opens and shorts.
- > Cable length (Channel and Permanent Link).
- > Correct pair polarity.
- > Correct cable labeling at both ends.
- > Tests shall be performed with connectors installed.

#### **FIBER OPTIC CABLE**

All cable testing shall be conducted by an experienced technician using a Microtest Simplifiber meter or equivalent tester. Test all fiber (100%) using a power meter in both directions and provide following in the report:

- > Fiber cable number
- > Fiber length.
- > Attenuation (loss in dB).
- > Test date
- > Tester make and model no.
- > Tester calibration date.



**CI-0704****TAB 7: TECHNICAL DISCIPLINES**

Communications

**INSTALLATION COMPLETION**

Installation and Testing of PRESTO system infrastructure (conduit, wiring, bases, etc) as described in this document and shown on standard drawings shall be completed at least six(6) to eight(8) weeks prior to new area/device/station opening to allow for device installation and testing by supplier. These design requirements shall be also read in conjunction with the PRESTO installations guidelines provided by Metrolinx Fare Systems department.

**SERVICE COUNTER TALK THRU SYSTEMS****BASIS OF CRITERIA**

The talk-thru system provides instant 2-way voice communication between the public and station attendants through the glass divider at the station service counter.

**DESIGN REQUIREMENTS****FUNCTION**

The talk-thru unit provides hands free and effective duplex communication between the station operator and the passengers. The voice switching function is automatically biased in the direction from the passenger to the operator. Noise cancelling and omni-directional microphones will be mounted on the passenger and service attendant sides respectively, of the booth glass divider. Two rotary encoded controllers will be provided to adjust the volume of each microphone. The operator's boom microphone will automatically override the passenger microphone when activated. Provision will be made for inter speech pause time.

**COMPONENTS**

- > Microphone Override Pushbutton
- > Power On/Off L.E.D. Switch
- > Noise Cancelling Microphone
- > Seller's Mike-Off Switch

**WIRING**

- > Conduits and 120 volt A/C source power outlets for each voice link assembly.



CI-0202

### TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT Station Sites



#### **PEDESTRIAN AND BICYCLE PATHS**

- > Provide dedicated and continuous routes for pedestrians throughout the station and connections to surrounding areas.
- > Pedestrians should not be required to cross the parking lot in order to access the station building.
- > Ensure pedestrian pathways are separated from vehicular traffic whenever possible.
- > Walkways shall be minimum 1.5 m wide.
- > When an entrance is provided from a recreational trail, a clear opening between 850 mm to 1000 mm is required, whether the entrance includes a gate, bollard, or other barrier.
- > The exterior path must meet the following requirements:
  - It must have a 1:2 bevel at changes in level between 6 mm and 13 mm.
  - It must have a maximum running slope of 1:8, or be designed as a ramp, at changes in level greater than 13 mm and less than 75 mm.
  - It must have a maximum running slope of 1:10, or be designed as a ramp, at changes in level greater than 75 mm or less than 200 mm.
  - It must be designed as a ramp, meeting all requirements and codes pertaining to ramps at changes in level greater than 200 mm.
- > Sidewalk and walkways shall be raised and constructed of hard and sustainable level materials that are slip resistant. They shall be smooth with few joint connections (similar to standard sidewalk pads and asphalt).
- > Provide curb cuts at all crossings to enable access for people using mobility devices.
- > Provide dedicated or shared bicycle lanes along primary vehicular roads leading to and from the station. Depending on the station configuration, it may be preferable to introduce a separate bicycle entrance. The width of a dedicated bike lane shall be no less than 1.5 m.
- > The bike route shall be distinguished with specially coloured paving, line painting, or graphic.
- > Ensure bicycle access routes are free of obstacles such as curbs and signs. Provisions for bicycle ramps and gutters shall be considered where barriers are unavoidable.



CI-0202

**TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**  
Station Sites

**SHARED PEDESTRIAN/CYCLISTS PATH**

Design Use:

- > Shared pedestrian/cyclists paths are to be used, on a site by site case, where it is determined to promote a safe and visible alternate mode of transportation at stations.
- > Shared paths should provide connectivity from the main municipal access points, surrounding neighbourhoods and to existing recreational paths, where applicable.
- > Shared paths are to be implemented in conjunction with and leading to bicycle shelters and racks.

Design Intent:

- > A “shared path” is considered to be a single lane of travel, delineated for pedestrians and a single lane of travel delineated for cyclists.
- > Newly constructed shared-use paths should be built to provide access for people with disabilities and provide sufficient width to accommodate the potential condition of two wheelchairs having to pass, side by side.
- > The shared path should have a centreline pavement marking, to reduce the cyclists’ perception of freedom to manoeuvre between lanes.
- > Key features to be considered include trail access points, grade, cross-slope, street crossings, curb ramp design, railings, and signage.

Design Requirements:

- > The shared path width should be minimum 3 m wide.
- > Surfaces must be constructed of hard and sustainable level materials that are firm, stable, and slip-resistant. They shall be smooth with few joint connections (similar to standard sidewalk pads and asphalt).
- > Grades should generally be less than 5 percent. Level landings or rest areas should be provided at appropriate intervals on grades steeper than five percent.
- > Cross-slopes for drainage or super elevated curves should be no greater than two percent.
- > The shared path should have a 100 mm solid, standard yellow, painted centreline pavement marking.
- > See Figure – Typical Cross Section for Shared Pedestrian/Cyclist Path



CI-0203

**TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**

Parking Infrastructure

- > The use of concrete, masonry, galvanized steel, stainless steel, anodized aluminium and other low maintenance materials is preferred. The mixing of different materials, including fastening systems, shall be avoided. One material shall be used for any given application and the fastening system shall be the same material.
- > Refer to the GO Signage and Branding Guidelines for detailed guidelines on exterior signage and branding elements.

**EXTERIOR PAVEMENT & WALKWAYS**

- > Walkways shall be constructed of hard and sustainable materials that are slip resistant and capable of clearing during winter months and shall include cantilevered canopies as directed by GO. They shall be smooth with few joint connections (similar to standard sidewalk pads and asphalt).
- > Pavement patterns are to follow and assist in defining entrances, ramps, stairs, and pedestrian paths.
- > Exterior pavement and walkways should be suitable for wheelchair and mobility device usage, physical delineation of walkways is preferred.

**STRUCTURAL DESIGN**

- > The parking structure must be designed to withstand the loading to which is it subjected in the completed state as well as when it is partially complete during construction, and also during maintenance.
- > The design shall be based on the most cost effective structural system when considered in the context of both the capital cost of construction and the projected life-cycle cost of the parking garage with a design service life in accordance with the latest CSA standards.
- > Ideal structural bays that allow for maximum number of parking spaces and flow of automobiles dependent upon site and structure should be designed.
- > The ground level parking slab shall be concrete slab on grade. The designer will consider the geotechnical information in the selection and design of the foundation system and structure type and consideration and recommendations will also be required for any special conditions that may exist at the site, such as slopes or adjacent land features.
- > Various miscellaneous features of the parking structure must be included in the structural design. Each feature must be designed to accommodate the proper functioning and maintenance of the item in question, including installation and removal as appropriate.



CI-0401

**TAB 4: STATION INFRASTRUCTURE**  
Station Buildings

**CUSTOMER SERVICES**

Customers approaching the station building area by each of the modes should have convenient access to:

- > Direct access from parking or Kiss n Ride to platform where possible.
- > An information display providing service information at the approach to the station area;
- > Service Area (Attended, Presto and TVM);
- > Newspaper boxes and, if appropriate, concessions;
- > Customer amenities including benches, pay phones and waste bins

The arrangement of the station should ensure that all needed facilities are available for customers using the station at times when it is not attended and portions of the station are locked. In addition to automated ticket vending and access to public telephones and information, a shelter should be provided for customers waiting for trains, buses, and rider/taxis as appropriate after staffed hours.

**PLATFORM ACCESS**

The Platform Access Section covers platform access buildings, including Tunnels, Stairs and Stair enclosures, Ramps, Elevators, Bridges and Pedestrian Overpasses, and At Grade Pedestrian Crossings.

The architecture of the Platform Access Buildings can be compatible with the Station Building (principally the roof-forms) or it can be completely diverse, depending on site and municipal requirements (as directed by GO).

Platform Access Buildings shall not visually overpower the Station Building.

**S4 DIGITAL SIGN PLACEMENT PHILOSOPHY (RAIL LINE STATIONS)**

**MONITOR SIZE**

- > 47' or 55" (Use current IT standard)

**MOUNTING HEIGHT**

- > 2.134 m (7'-0") minimum clearance to u/s of monitor.
- > 2.438 m (8'-0") minimum clearance to u/s of monitor where maintenance and snow clearing equipment is used.



CI-0401

**TAB 4: STATION INFRASTRUCTURE**  
Station Buildings

**LOCATION CRITERIA**

- > 1 monitor inside station buildings adjacent to ticket sales area.
- > 1 monitor outside of station building near main entrance.
- > 1 monitor at each tunnel access point.
- > 1 monitor at each Pedestrian Bridge access point
- > 1 monitor to service the bus loop area.
- > 1 monitor for remote parking lot locations (at GO discretion).
- > 1 monitor mounted at barrier free height as per OBC and AODA regulations. Monitor to be placed along accessible route to platform.
- > If no station building is provided, 1 monitor will be placed at main entrance to platform (as per site conditions)
- > Where possible recess eye-level signage into walls to prevent potential injuries.
- > Monitor placement should avoid disruption of pedestrian traffic flow.
- > Location of S4 Digital Sign to be coordinated with location of Ticket Vending Machines (TVM) where possible.

**S4 DIGITAL SIGN MOUNTING BRACKET REQUIREMENTS**

- > Monitor mounting bracket to be stainless steel weldment system and stainless steel hardware.
- > Bracket to be vandal proof, corrosion resistant and exterior grade with a minimum safe loading capacity of 500kg.
- > Tilt capability (20 degrees)
- > Provision of an optional prefabricated sunshade.
- > Required bracket mounting configurations:
  - o Ceiling mounted
  - o Wall mounted
  - o Pole mounted
  - o Back to back, side to side and double back to back mounting options required.
- > Ability to support attachment of NEMA enclosure.

Refer to TAB 7: Technical Disciplines (CI-0704 Communications) for data and power connection.



CI-0401

**TAB 4: STATION INFRASTRUCTURE**  
Station Buildings

WAITING AREA

Room Name	Description
Fixtures and Fittings	<ul style="list-style-type: none"> <li>&gt; Digital clock;</li> <li>&gt; Ceiling down-draft fan(s).</li> <li>&gt; Fare equipment;</li> <li>&gt; Bench seating;</li> <li>&gt; Pay telephone(s);</li> <li>&gt; Food/beverage vending machine(s), if required;</li> <li>&gt; GO information display; S4 Digital Signs, Static Information Signs and decals (including GO logos on end gable clerestory glass if required);</li> <li>&gt; Waste receptacle(s);</li> <li>&gt; Motion detectors;</li> <li>&gt; CCTV cameras;</li> <li>&gt; P/A speakers;</li> <li>&gt; Fire extinguisher; and</li> <li>&gt; Recessed floor mats at all entrance doors.</li> </ul>
Finishes	<ul style="list-style-type: none"> <li>&gt; Floor: Porcelain Tile; Base: Porcelain Tile (coved); Wall: Porcelain Tile</li> <li>&gt; Waiting room curved ceiling: Drywall, painted, curved to maximize indirect lighting from above the perimeter bulkhead, subject to acoustical repercussions.</li> <li>&gt; Bulkhead soffit: Drywall painted off-white. Drywall joints and corners: J-mould, typical. Consideration should be given to 13 mm radius corner moulds (interior and exterior corners) for drywall bulkheads and skylight apertures.</li> <li>&gt; Waiting room flat ceiling: Perforated off-white or silver satin metal faced acoustical tile, 600 mm x 600 mm recessed module, on suspended T-</li> </ul>



CI-0403

**TAB 4: STATION INFRASTRUCTURE**  
Tunnels

FEATURE	DESCRIPTION
	or in front of service doors or elevator doors.
Photoluminescent Strips	<ul style="list-style-type: none"><li>&gt; Tunnel walls (both sides) shall have surface mounted photoluminescent strips at 0.3m above finished tunnel floor. Strips to be installed continuously along entire length of tunnel transitioning in a continuous manner to all stairwells. Refer Tab 4 CI-0404 Stairs and Stairwells for detail information and figures on stair/tunnel interface of photoluminescent strips.</li></ul>
S4 Digital Signs	<ul style="list-style-type: none"><li>&gt; These dynamic digital display signs provide the Station Service Status System (S4) to continuously update information to customers at GO Rail Stations, strategically located inside station buildings, at tunnel entrances and platform entrances and providing an enhanced level of customer information.</li><li>&gt; Refer to section CI-0401 S4 Digital Sign Placement Philosophy (Rail Line Stations) for design guidelines.</li><li>&gt; Refer to section CI-0704 Communications-S4 Digital Signs for IT and power details.</li></ul>





CI-0408

**TAB 4: STATION INFRASTRUCTURE**  
Pedestrian Bridges and Overpasses

Feature	Description
Cut and Cover Structures	<ul style="list-style-type: none"><li>&gt; The construction of cut and cover structures such as pedestrian tunnels on the railway operating Right-of-Way is restricted to short durations, therefore design shall be such as to enable expedient construction</li></ul>
S4 Digital Signs	<ul style="list-style-type: none"><li>&gt; These dynamic digital display signs provide the Station Service Status System (S4) to continuously update information to customers at GO Rail Stations, strategically located inside station buildings, at tunnel entrances and platform entrances and providing an enhanced level of customer information.</li><li>&gt; Refer to section CI-0401 S4 Digital Sign Placement Philosophy (Rail Line Stations) for design guidelines.</li><li>&gt; Refer to section CI-0704 Communications- S4 Digital Signs for IT and power details.</li></ul>



CI-0704

### TAB 7: TECHNICAL DISCIPLINES

Communications

## S4 DIGITAL SIGNS

### DESIGN REQUIREMENTS

- > Each S4 Digital Sign location must be shown on the electrical drawings and must include data and electrical outlet locations as well as any enclosures or other infrastructure associated with these signs.
- > Monitors: (Use current IT standard):
- > Digital Media Player (DMP):(Use current IT standard)

### CONNECTIVITY

- > Each of these devices requires a minimum of one network outlet. These network outlets are to be cabled back to the nearest telecommunications room network rack and terminated as per the copper horizontal cabling standard.
- > CAT6 for devices placed within 90m from the Communications (Hub) Room
- > Multimode 6 strand fiber for installation beyond the 90m mark
- > Transceivers: GE D7100 Series IFS 10/100 Mbps or approved equal

### NEMA ENCLOSURE

- > NEMA/EEMAC Type 4X IP-65 with solid door capable to accept box lock requested by IT Field Services, and physically separated into two compartments to isolate power from communications devices.
- > BEL R SS Series EEMAC/NEMA 4-4x-12 / IP-65 or Hoffman CONCEPT™ Type 4x or any other box meeting NEMA Type 4X IP-65, physical separation capabilities and box lock requirements.
- > The enclosure size selection shall be based on the electrical and electronic equipment to be housed inside the box.

### CONDUIT

- > One conduit for power and separate conduit for data 2" from the electrical room or communications (hub) room all the way to the last pull point before the device 1" from the last pull point to the device
- > Follow DRM in terms of conduit selection (PVC for buried conduit, epoxy coated for rust prone locations such as tunnels, etc) 2" liquidtight conduits from the NEMA enclosure to the monitor mounting bracket. Provided with drip loops and easy release on the NEMA enclosure side.

### POWER

- > Dedicated single 20amp duplex receptacle for indoor locations.
- > Outdoor locations require sizing based on external enclosure and screen power draws. All outdoor outlets must be GFI Type receptacle which may be reset at the NEMA enclosure. This is to be coordinated at time of design and must adhere to DRM for outdoor outlets.



CI-0704

**TAB 7: TECHNICAL DISCIPLINES**

Communications

- > UPS backed-up. If the existing UPS does not provide enough capacity or if there is no UPS whatsoever, provide a Surge Protection Device in the local panel where the monitor and DMP is fed from. This device shall be appropriate for the specific panel at each location.

Superseded



CI-0202

**TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**  
Station Sites

cuts should be provided from the accessible parking spaces and accessible drop-off and pick-up location to the station building, and continue throughout the station facility.

- > Station egress should be designed to mitigate the peak volumes of vehicles leaving the site after arrival of a busy train; multiple egress points should be provided where feasible, and intersection design should reflect the high peak volumes.
- > Provisions shall be made for access by emergency vehicles. Designated fire access routes shall meet OBC and local fire department requirements.



**ACCESSIBLE ROUTE**

The accessible route is defined as a continuous unobstructed external and internal path connecting all accessible elements and spaces to enable personal barrier free mobility. At GO facilities, the accessible route is identified as the travel path to/from/between the barrier free parking or drop off area, to the rail mini platform / bus platform. Features on the accessible route are to meet the conditions listed above and be accompanied with appropriate signage. Exterior accessible routes elements include parking access aisles, curb ramps, crosswalks at vehicular ways, walks and ramps at a minimum. Interior accessible routes elements include corridors, floors, ramps, elevators and clear floor space at fixtures.



**SITE ENTRANCE**

An accessible pedestrian route(s), path(s) and sidewalks wide enough to accommodate wheelchairs, scooters, or other mobility devices and be connected with accessible municipal sidewalks, signals, crossings, etc.

- > The accessible routes shall not be obstructed by poles, plants, bicycle racks, etc.
- > At least one primary pedestrian entrance to GO Facilities shall be accessible with a no-step entrance and be connected to or integrated with an accessible interior route.
- > If a pedestrian entrance from an enclosed parking garage to the building is provided, at least one entrance from the enclosed parking garage to the building shall be accessible.

**MONUMENT GROUND SIGN AND BLADE SIGN LOCATION AND PLACEMENT CRITERIA**

- > Monument Ground signs and Blade signs should be located perpendicular, not parallel, to the visitor's line of sight and movement.
- > Monument ground signs are required at the principal entrance for Maintenance and Storage facilities



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### TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT Station Sites

- > Blade signs are required at auxiliary entrances to the main lot or entrances to secondary lots applicable to the following GO Facilities; Rail Stations, Bus Stations and Park and Ride facilities.
- > The signs are not to be obstructed by site or landscape features;
- > Location of the sign is not to interfere with daylight triangles and sightlines for vehicular traffic. Grade at sign location to be taken into account when locating signs. Sizes and location of daylight triangles to be verified on a site by site basis.
- > When an orientation perpendicular to the direction of traffic is not possible, alternate orientations are permitted with approval from GO Transit.
- > Refer to GO Static signage catalogue for blade sign artwork.
- > Refer to GO Standard Drawings for blade sign details.



#### **SITE ACCESS PRIORITIES AND VEHICULAR CIRCULATION**

A basic objective of GO is the integration of rail, bus and other modes of transportation. In order to achieve this objective, sites should be designed to promote convenient and efficient transfer of users and passengers between various modes of transportation by prioritizing:

- > Pedestrians and cyclists;
- > Public Transit;
- > Passenger Drop-off and Pick-up Area; and
- > Private vehicles.

Multiple access points shall be implemented where feasible to facilitate access and egress, in particular pedestrian/cyclist only entry ways to connect from adjacent communities or trails.

#### **BASIS OF CRITERIA**



A typical GO Rail Station Site comprises the following key components:

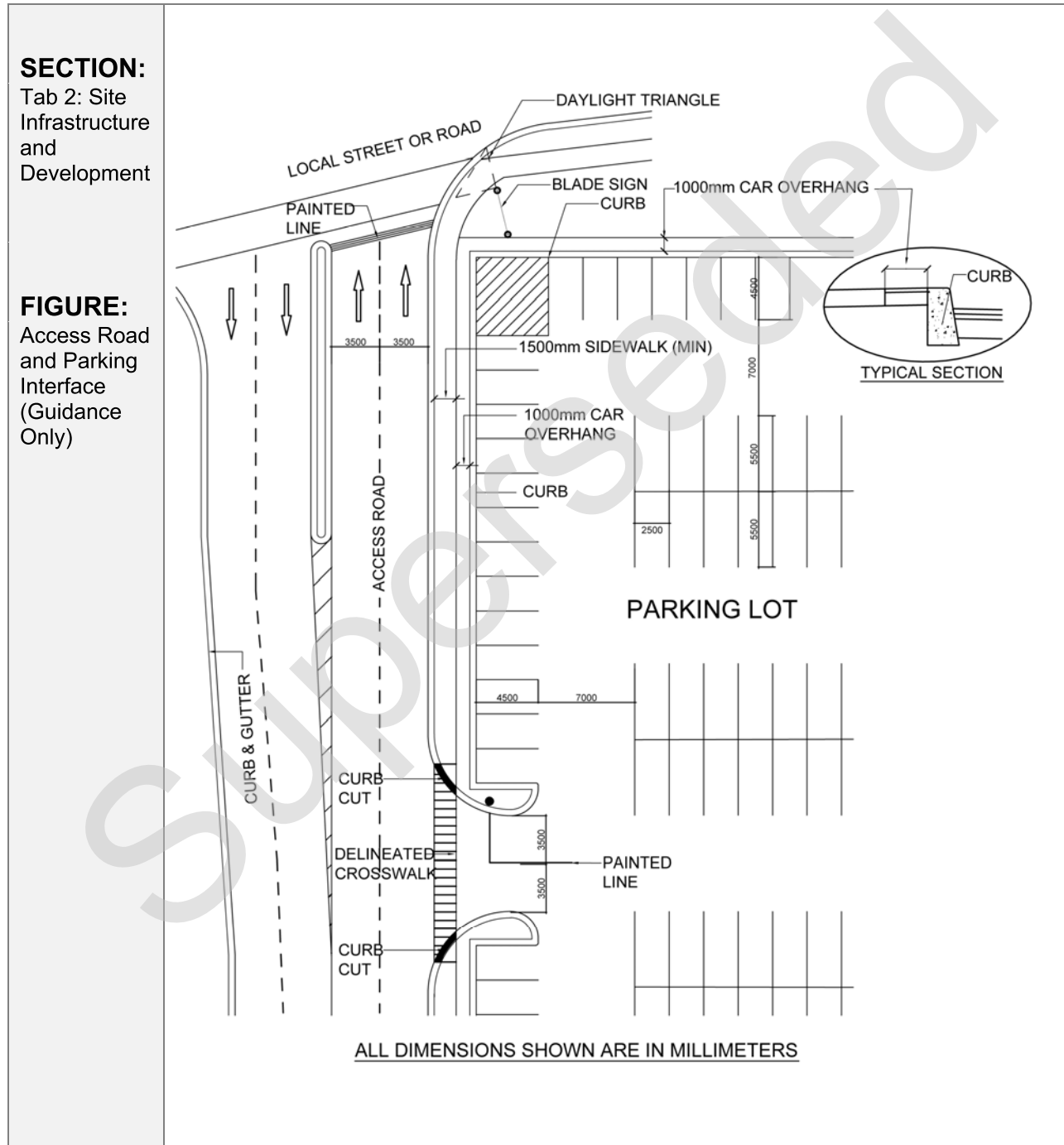
- > Site access;



CI-0202

**TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**  
Station Sites

FIGURE: ACCESS ROAD AND PARKING INTERFACE (GUIDANCE ONLY)





CI-0404

**TAB 4: STATION & TERMINAL BUILDING INFRASTRUCTURE**  
Stairs & Stair Enclosures

STAIR ENCLOSURE

*(ALL STAIR ENCLOSURE WINDOW WALLS SHALL COMPLY WITH THESE REQUIREMENTS)*



FEATURE	DESCRIPTION
Structure	<ul style="list-style-type: none"> <li>&gt; Frameless with silicone butt-joint glazing, with top and bottom stainless steel glazing channels.</li> <li>&gt; Structural steel framing shall not be exposed to the salt-corrosive atmosphere of the rail platform and must be contained within the building envelope. Fully glazed enclosures with stainless steel framing system. All exposed structural steel framing, including all anchors and fasteners, shall be non-corrosive. Ensure all exposed members are resistant to severe weather conditions and elements, including de-icing chemicals and salts. Provide appropriate protective coatings or cover plates as required.</li> </ul>
Glazing	<ul style="list-style-type: none"> <li>&gt; Glazing shall be clear, fully-tempered, designed for local wind loads and high speed train turbulence (including door glazing).</li> <li>&gt; Glass in doors and sidelights that could be mistaken for doors shall have horizontal framing or a distraction pattern applied to the glass surface as per Tab 7, Section 0701 Architectural-Design Requirements, Exterior:Windows.</li> </ul>
Cladding	<ul style="list-style-type: none"> <li>&gt; Designed to minimum 1.0 kPa Reference Wind Pressure, with appropriate gust factor and wind pressure coefficients applied to the RWP.</li> <li>&gt; Cladding material, especially for canopies, soffits and fascias must be designed for wind turbulence generated by high-speed trains.</li> <li>&gt; Roofing shall also resist train turbulence.</li> <li>&gt; Shingled roofs shall not be used on platform buildings (unless rigid material).</li> </ul>
Guardrails	<ul style="list-style-type: none"> <li>&gt; Guardrails shall be provided behind the window walls of stair and elevator wells, for safety in the event of glass breakage.</li> <li>&gt; Guardrails that come in contact with passengers, both interior and</li> </ul>



CI-0701

**TAB 7: TECHNICAL DISCIPLINES**

Architectural

Area	Description
 Door Guards	<p>glass replacement in case of breakage.</p> <ul style="list-style-type: none"> <li>&gt; Power-assisted doors where they open into a barrier free route of travel shall be provided with cane-detectable guardrails or other barriers at right angles to the wall containing the door.</li> <li>&gt; Location and size of controls for power assisted doors along the route of travel shall: be clearly visible before reaching the door with clear floor area and placement of the buttons to open the power assisted doors should be such that the passenger can continuously flow on their journey</li> </ul>
 Windows	<ul style="list-style-type: none"> <li>&gt; Window frames shall be thermal break anodized aluminum, medium bronze finish, or to suit;</li> <li>&gt; All glazing shall be clear fully tempered insulating glass;</li> <li>&gt; Glazing thickness shall suit windloads: minimum 6 mm thickness for buildings, 10 mm thickness for standard shelter fully tempered single glazing, platform access building shall be fully tempered single glazing, thickness shall be engineered to suit air pressure changes generated by high speed trains and vibration, as noted previously;</li> <li>&gt; Where frosted film or solar film is required on glass, it shall be installed on the interior surface;</li> <li>&gt; Distraction Pattern is required on any glazing that extends to the ground and there is no 600mm curb or object, such as a railing, behind.</li> <li>&gt; Provide Multicolour dots on glass for safety centered on adjacent guard (where applicable) otherwise at 1350mm o/c. above finished floor as per CNIB guidelines. Refer to drawing S1.1 in the GO Static Signage Catalogue for details.</li> <li>&gt; For glazing on Public facing buildings where a Distraction Pattern is required, the designer may develop a contextual, fritted pattern meeting AODA requirements and obtain GO Transit approval.</li> <li>&gt; Opening sash frames shall be anodized to match fixed glass frames; and</li> <li>&gt; To minimize salt damage to aluminum frame, window sashes shall be 600 mm minimum above grade for all elevator and stair enclosures.</li> </ul>

**INTERIORS**

Interior materials include those that form part of the interior surface of:

- > Floors;





CI-0203

### TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT

#### Parking Infrastructure

- > All electrical components, panels, ducts are to be mounted on standoffs. No direct connections to the wall or ceilings are permitted.
- > Lightning protection and surge suppression systems shall be part of the design.
- > Provide Fire Alarm and Security Systems as applicable.
- > Provide cathodic protection on underground metal piping.
- > Provide heat tracing on all water pipes and down spouts.
- > Power and communication lines should be provided to accommodate future payment equipment at point of entry and exit, as well as for dynamic and/or illuminated signage.

#### **ILLUMINATION OF THE STRUCTURE**

- > LED lighting to be used in all areas except service rooms. For more details on LED requirements refer to TAB 7: CI-0703 Electrical LED Lighting Minimum requirements.

#### **PROVISION FOR INFRASTRUCTURE FOR FUTURE EV CHARGING STATIONS**

- > When planning/building a new or rehab parking area, consider the following five factors to determine whether to provision for future Electric Vehicle (EV) charging stations (should GO Transit's current pilot become a standard):
  - Electric Vehicle demand (MTO current EV ownership and projections data, surrounding amenities, proximity to regional roads and highways).
  - Profile of GO Rail Station/Mobility Hub (visibility of service)
  - Location of the space (Covered/Uncovered)
  - Cost of providing empty conduit (vs. trenching and patching later)
  - Feedback from the pilot (once available)
- > The order of priority for the location of EV Charging Station spaces is as follows:
  - I. Barrier Free,
  - II. Carpool to GO,
  - III. EV Charging Stations Spaces
- > EV charging stations should be placed indoors if a parking structure exists.



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**TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**  
Parking Infrastructure

- > EV Charging Station Electrical details as per Tab 7 CI-0703 Electrical.

**MECHANICAL SERVICES AND DESIGN CRITERIA**

- > Mechanical systems to be designed without confined spaces
- > The Electrical and Communications rooms shall be heated and air conditioned by a split heat pump A/C unit with R410A refrigerant, variable compressor speed, refer to the DRM for ambient cooling range tables. Also, provide in these two rooms low and high temperature alarms. Refer DRM for HVAC requirements within these service rooms.
- > If drainage from level 1 cannot be connected to the proposed building sanitary sewer by gravity, provision shall be made for a sanitary sump pit including:
  - Duplex sump pump system, pumps shall be epoxy coated with two totally independent seal assemblies;
  - Guide bars; Four float level control system; Lifting equipment including lifting davit, chain hoist, lifting device, chain hook; Gas tight access frame and self-opening cover complete with piston kit and safety grid cover shall be traffic bearing where needed and completely assembled stainless steel control panel shall be provided
  - There shall be no need for personnel to enter the wet well to service the pumps.
- > Complete storm and sanitary systems shall be provided as part of the parking structure design.
- > Utility water meter to municipal standards shall be provided with 3 valve by-pass arrangement.
- > Water service on every level including the roof should be accommodated for.
- > Provide exterior non-freeze water hydrants evenly spaced along the perimeter.
- > Incorporate heat tracing where needed to prevent freezing.
- > All pipes and mechanical fixtures shall be designed to be corrosion free.
- > No Copper type M is permitted.
- > Provide heavy duty parking area drains complete with heavy duty grate and sediment buckets.

**CI-0703****TAB 7: TECHNICAL DISCIPLINES**

Electrical

Each motor starter shall have stop and start button and/or hand/off/auto switch with indicator lights. A local heavy-duty unfused isolating disconnect shall be provided within sight of the motor to safely disconnect equipment for servicing.

The power for the control circuit shall be from the downstream of the breaker supplying power for the motor.

**WAYSIDE POWER**

Wayside power requirements for trains and buses (bus layover bays). Refer GO STANDARD DRAWINGS.

**PROGRAMMABLE LOGIC CONTROLLER – RELAY PANEL (TBD)****MONITORING AND CONTROLS (TBD)****POWER FACTOR CORRECTOR (TBD)****SELECTION OF BREAKERS (TBD)****PANEL REQUIREMENTS (TBD)****TRANSFORMERS (TBD)****PROVISION FOR INFRASTRUCTURE FOR FUTURE EV CHARGING STATIONS**

- > If provisioning for future Electric Vehicle Charging Stations, provide empty conduit, complete with #12 AWG green insulated grounding conductor RWU90 for easy tracing terminated in a handwell, sized as per OESC (Ontario Electrical Safety Code) but, not smaller than 2" (50mm) for future use. Impact on existing power services and building infrastructure shall be investigated by the designer.
- > When considering the provision of Electric Vehicle Charging Station infrastructure, ensure the physical space required for an EV Charging Station panel is reserved in the Electrical Room for its future installation
- > EV Charging Station Design details as per Tab 2 CI-0203 Parking Infrastructure.

**CI-0702****TAB 7: TECHNICAL DISCIPLINES**

Mechanical

In all shelters where electrical capacity allows, install CSA approved electric infrared radiant heaters complete with factory installed protective safety guard, anodized aluminum reflector and built-in adjustable directional system components on a dedicated circuit, independent of all other electrical circuits in the shelter. The heating element shall be tubular quartz with tungsten coil and shall be glare reducing. Unit shall be installed at a minimum height of 2440mm (8') from the underside of the heater to finished floor and controlled by a push button and timer.

Refer to GO Transit Performance Specifications for Prefabricated Bus/Rail Shelters for description.

**DIFFUSERS**

Diffusers shall be aluminum. For perforated metal ceilings; diffusers to be perforated type to match the ceiling profile and colour. For high-traffic door locations, or where drafts are a problem with station attendants, linear diffuser air-curtains shall be provided at the doors.

**DUCTS**

Air ducts shall be galvanized sheet metal conforming to ASHRAE, SMACNA Duct Construction Standards, and NFPA 90A. Diffuser branch-ducts and air terminal ducts may be circular metal flex-ducts where concealed. Exposed ducts in public areas shall be aluminium spiral ducts. Hangers and fasteners should also be protected from the detergents and moisture or be fabricated of materials that are not subject to corrosion.

**FIRE DAMPERS**

Fire dampers shall be fusible link type conforming to ULC-S505. An access door shall be installed for inspection and resetting.

**CONNECTORS**

Flexible connectors shall be provided between vibrating equipment and connecting ducts.

**INSULATION**

Acoustical and thermal duct insulation shall be in accordance with the O.B.C. and ASHRAE 90.1. Acoustical insulation shall be provided to maintain a maximum room sound rating of 40dBA. Piping insulation shall be in accordance with ASHRAE 90.1, with PVC jackets.

**SYSTEM CONTROL**

HVAC systems shall be controlled using programmable thermostats to achieve night setbacks. Interlocks for fire protection to be as per OBC and NFPA. If a room has 2 HVAC systems, both systems shall be controlled by a single programmable automatic heating/cooling changeover controller.



CI-0407

**TAB 4: STATION INFRASTRUCTURE**  
Rail Platforms and Corridors

**Platform Design Criteria**

These criteria are based on CN Rail data, applicable also to CP Rail, for preliminary design. Detail design shall be reviewed by the appropriate railway authority and GO Transit, at which time some dimensions may be defined more precisely.

CRITERIA	SPECIFICATIONS
Track centres, centre line to centre line, new station facilities only	4.27 m
Centre line of track to edge of platform	1.632 m
Width of island platform	7.4 m
Width of side platform	3.6 m-4.9 m
Length of platform	315 m
Centre line to centre line of tracks serving island platform	(35 feet even) 10.668 m
Maximum height of platform A.T.R.	0.127 m
Exclusive GO Transit tracks, maximum height of platform A.T.R.	0.25 m
Passenger circulation zone, edge of platform to platform structures (shelters/stair enclosures, etc.)	2.44 m
Lateral clearance to major and elevated platform structures, centre line of track to canopies, roof overhangs, etc.	3.35 m
Lateral clearance from centre line of track to mini-platforms	1.98 m
Maximum height of mini-platform A.T.R.	0.559 m
Yellow Detectable Tile at Platform Edge	0.61 m
Tunnel (pedestrian underpass) clearance, top of tunnel roof membrane overlay to underside of rail, minimum approximately. (This is based on 300 mm sub-ballast, 300 mm ballast to bottom of ties and 178 mm ties).	0.8 m



CI-0407

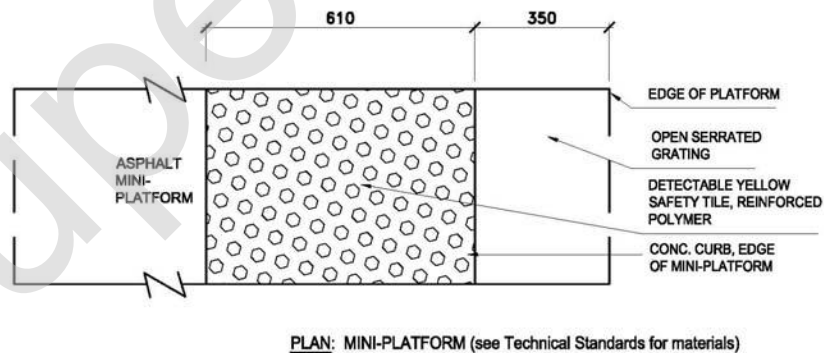
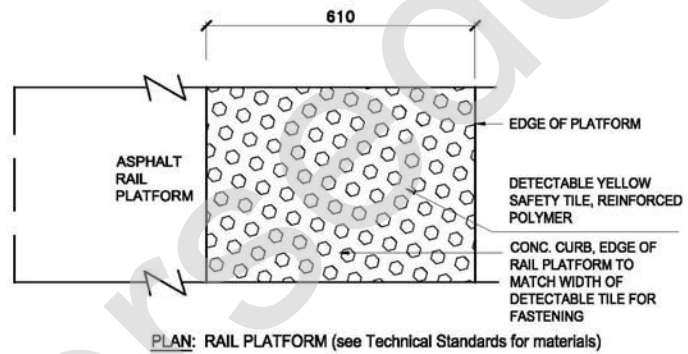
**TAB 4: STATION INFRASTRUCTURE**  
Rail Platforms and Corridors

FIGURE: RAIL AND MINI PLATFORM EDGE DETAILED VIEW

**SECTION:**

Tab 4:  
Station  
Infrastructur  
e

**FIGURE:**  
Rail and Mini  
Platform  
Edge  
Detailed  
View



THE YELLOW DETECTABLE TILES SHALL CONSIST OF A SURFACE OF TRUNCATED DOMES OF REINFORCED POLYMER COMPOSITE. THE SURFACE OF AN EPOXY POLYMER COMPOSITION WITH ULTRA-VIOLET RESISTANCE. THE TRUNCATED DOMES SHALL MEET AODA AND OBC STANDARDS.



CI-0407

**TAB 4: STATION INFRASTRUCTURE**  
Rail Platforms and Corridors

**DESIGN REQUIREMENTS**

Feature	Description
Platform Edge	<ul style="list-style-type: none"> <li>&gt; Platform shall have 610mm detectable domed tile along the full length of the rail platform and lined up with the platform edge.</li> <li>&gt; Detectable tile shall be bright yellow, composed of a truncated dome design that meets AODA and OBC requirements.</li> </ul>
Rail Platform Curbs	<ul style="list-style-type: none"> <li>&gt; Rail platform curbs at track-side, including mini-platform curbs shall be sealed pre-cast concrete, or sealed cast-in-place concrete and able to accommodate detectable domed tile and snow melt capabilities on a single substrate.</li> </ul>

**MINIMUM PLATFORM WIDTHS**

<b>DESIGN REQUIREMENTS</b>		
Conditions	Minimum Acceptable Dimension	Criteria
All new rail platform construction.	<b>2.4m (8'-0")</b> (inclusive of the 0.61m distance from the platform detectable tile to the edge of the rail platform curb)	<b>Preferred clearance width</b> for passenger circulation, waiting and maintenance equipment zone from edge of platform to platform structures
Where <b>2.4m (8'-0")</b> clearance is not achievable due to site constraints and existing conditions.	<b>2.1m (6'-10 ¾")</b> (inclusive of the 0.61m distance from the platform detectable tile to the edge of the rail platform curb)	<b>Minimum allowable clearance width</b> for passenger circulation, waiting and maintenance equipment zone from edge of platform to platform structures
Permitted for passenger circulation only areas where <b>2.1m (6'-10 ¾")</b> is not achievable due	<b>1.7m (5'-7")</b> (inclusive of the 0.61m distance from the platform detectable tile to the edge of the rail platform	<b>Minimum passenger circulation zone</b> , edge of platform to platform



CI-0407

**TAB 4: STATION INFRASTRUCTURE**  
Rail Platforms and Corridors

<p>to site constraints.</p>	<p>curb)</p> <p>Note:</p> <p>The 1.7m (5'-7") minimum passenger circulation zone from edge of platform to platform structures was determined by OBC requirements for minimum unobstructed width for the passage of wheelchairs by the following calculation:</p> <p>Minimum unobstructed width for the passage of wheelchairs as prescribed in the OBC + distance from the platform safety line to the edge of the rail platform curb = 1.1m +0.6m = 1.7m to the edge of the rail platform curb.</p>	<p>structures clearance</p>
<p>When the minimum passenger circulation zone, edge of platform to platform structures clearance of <b>1.7m (5'-7")</b> cannot be met due to existing site conditions including tapered platforms..</p> <p>Augment with yellow painted hatch markings on the platform (see attached sketch) augmented by warning signage indicate the reduced clearance. <b>(See related signage and figure below)</b></p> <p>Location and orientation of signage as per site conditions. Final layout and specifications to be approved by GO Transit Signage Services and GO Transit Design Standards.</p>	<p><b>&lt; than 1.7m (5'-7")</b> (inclusive of the 0.61m distance from the platform detectable tile to the edge of the rail platform curb)</p>	<p><b>Reduced clearance width</b> for passenger circulation and maintenance equipment zone from edge of platform to platform structures</p>





CI-0107

**TAB 1: GUIDING PRINCIPLES**

System Safety

**SECURITY DESIGN GUIDELINES**

Design Area	Guidelines
Vertical Spaces	<p>Glare from glass shall not obstruct service attendant/passenger vision or visibility at any time.</p> <ul style="list-style-type: none"> <li>&gt; <b>Stairs and elevators:</b> shall be in close proximity to each other, for acoustical and visual continuity.</li> <li>&gt; <b>Guards and balustrades:</b> shall be glazed where sight lines are required and in order to maximize illumination to lower levels, Photoluminescent strips to be installed above stair guards as required. Refer Tab 4 and Tab 7 for details</li> <li>&gt; <b>Perimeter walls:</b> of stairs and elevator vestibules shall be fully glazed where possible;</li> <li>&gt; <b>Stairwell openings:</b> shall be extended across tunnels where possible, for day-lighting, and to reduce the apparent tunnel lengths; concrete sealed walls to have a smooth architectural finish. Should graffiti appear and cannot be cleaned, finish to be re-applied to the entire area (no patchwork). Photoluminescent strips to be installed above the nosing and at top, bottom and intermediate landings for entire stair run length. Refer Tab 4 and Tab 7 for details.</li> <li>&gt; <b>Stair centre handrails:</b> shall terminate at landings to permit crossover.</li> </ul>
Tunnels and Overpasses	<ul style="list-style-type: none"> <li>&gt; <b>Open overpasses:</b> shall not have solid guards. Enclosed overpasses and stairs shall have windows/skylights, including at the ends, or shall have mesh type enclosures;</li> <li>&gt; <b>Tunnel corners:</b> shall be 45° angled and internal 90° corners shall have, at a minimum, convex mirror units and concrete walls to have a smooth architectural finish. Should graffiti appear and cannot be cleaned, finish to be re-applied to the entire area (no patchwork).</li> <li>&gt; <b>Heights of tunnels and overpasses:</b> shall be compatible with CCTV requirements.</li> <li>&gt; <b>Photoluminescent strips</b> to be installed along the entire length of tunnels. Refer Tab 4 and Tab 7 for details</li> </ul>
Shelters	<ul style="list-style-type: none"> <li>&gt; <b>Shelters:</b> shall have clear-glazed walls;</li> <li>&gt; <b>Large shelters:</b> for large shelters, doors shall be at opposite ends (one door at each end) and swing out;</li> <li>&gt; <b>Roofs:</b> shelters shall have translucent roofs and internal and external luminaires that do not reflect/glare in glazed walls. Translucent roofs also borrow illumination from platform light standards and provide sun shade; and</li> <li>&gt; <b>Platform shelters:</b> platform shelters remote from public announcement speakers shall have internal speakers.</li> </ul>



CI-0203

### TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT Parking Infrastructure

- > Stair handrails and guardrails and associated fastening system shall all be stainless steel where provided and walls shall have a smooth architectural finish. Should graffiti appear and cannot be cleaned, finish to be re-applied to the entire area (no patchwork).
- > Exterior stairwell walls should be provided with glazing for natural light and security, with consideration of limiting distance issues.
- > Eliminate potential hiding places under open stairs by suitable design options.
- > Stairwell doors are to have exit devices, proper latching and smoke seals.
- > There shall be no ceiling mounted luminaries over stairwells due to maintenance access problems with stair step lighting recessed in the concrete walls below the handrails.
- > Lighting at the top of the stairs shall be easily accessed from a flat surface by a 2m ladder. These lights may be ceiling mounted.
- > Stairwells shall be natural ventilated with louvers complete with fly screens, in door transoms.
- > Provide water supply and hose bibs at each level inside the stairwell and a 120V convenience outlet at each level outside the stairwell as a minimum.

#### **EXTERIOR ELEVATION**

- > Where parking structures and pedestrian areas adjoin, the exterior edge of the parking structure should exhibit a high level of architecture detail such as decorative screens, overhead canopies over pedestrian walkways that establish a comfortable and well-proportioned human scale.
- > The exterior design of a structure should minimize its visual identity as parking by disrupting the monotony of its underlying structure system through wall mass and window opening and through variations in color, material, and/or texture and a combination of solid and transparent areas.
- > Exterior lighting should always be aimed away from adjacent buildings with shades, shields, and optics and residential areas to avoid light pollution.
- > Architectural elements such as spandrel or enclosure panels should minimize snow drifting and wind. They should be tall enough to satisfy building code requirements of fall arrest and to ensure that the overall building envelope meets the open air requirements.
- > Maintenance, bird control and lighting should be considered in the exterior finishes and configuration.



CI-0203

### TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT Parking Infrastructure

- > These features may include but are not limited to: Pole lighting supports, equipment bases sleeved penetrations, permanent interior partitions, miscellaneous metals, stairs and handrails, curtain wall and cladding systems, doors and frames, ceiling support requirements and the like, elevator support requirements, mechanical and electrical support requirements; fall arrest system; decorative metal screens; signage; and window washing system.
- > Window washing systems and Fall Protection systems shall be designed in accordance with the Occupational Health & Safety Act and regulations, as a minimum requirement, and should consider incorporating reasonably optimal and practical safety measures beyond these requirements.
- > The window washing system shall ensure building surfaces and finishes will not be marred or otherwise damaged during normal operation of equipment.

#### WALLS

- > All interior and exterior walls materials selected shall depend on location and site specific elevational constraints.
- > Interior walls are to have a smooth finish to limit potential abrasion and allow easy maintenance.
- > All areas exposed to high traffic public use should be left bare. Should graffiti appear and cannot be cleaned, paint the entire area (no patchwork) with a white, 100% acrylic latex paint as per industry standard.
- > Consideration should be given to the use of colour on walls, doors and in key locations for coding or location identification. See GO Signage Manual for detailed requirements.

#### ROOF

- > The design of the parking garage shall accommodate a maintenance free roof.
- > Sustainable roof construction options could be proposed such as white reflective roof; roof systems with PV roof applications with related inverter room provision in the structure as directed by GO.
- > Peripheral roof protection shall be provided by parapets as mandated by industry standards and code requirements.
- > Extend Stairwell to mitigate fall arrest and provided better serviceability to the roof. Roof access door to be locked with keyed access. Key set to be keyed to rail line master and slave system



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**TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**

Civil Works

Slope Protection:

- > All unpaved slopes shall be stabilized with appropriate hydro-seeding to avoid erosion. The preferred slope is 3:1 maximum 2:1.

Retaining Walls:

- > The Consultant shall select the optimum permanent retaining method (wood shall not be used for retaining walls). Where concrete retaining walls are in proximity to the public, they shall be sandblasted and left bare. Should graffiti appear and cannot be cleaned, paint the entire area (no patchwork) with 100% acrylic latex paint as per industry standard. Low retaining walls shall be precast concrete units. Gabion walls may be used in non-public areas.
- > Where retaining walls are adjacent to buildings, the material shall be compatible with the architecture.

**UTILITIES**

**Easements**

The Consultant shall identify and show utility easements on the site plan, where applicable, in accordance with GO's survey plan(s).

As-built drawings shall be provided at completion of work, accurately showing the location of all utilities.

**Existing or New Utilities**

The Consultant shall be responsible for field locates of all existing utilities, confirmed with the Utility owner or authority. All existing utilities must be shown on the Contract Drawings.

Where existing utilities are disrupted, they shall be replaced with new or modified construction to the approval of the utility and GO Transit.

Where utility work is done by others prior to new construction, it is to be shown on the Contract Drawings as "existing" for reference.

**Hydro Overhead Power Lines**

High voltage overhead clearance constraints pertaining to any buildings or structures shall be identified and co-ordinated.

**Coordination**



CI-0403

**TAB 4: STATION INFRASTRUCTURE**  
Tunnels

**BASIS OF CRITERIA**

Platform access tunnels can be linked to the station building, connected to the station building or remotely located, as determined by site layout.

Design of Tunnels shall meet railway standards and the standards of other authorities having jurisdiction.

Advertising signs may be in tunnels but not in stairwells, and shall not interfere with exit signs or GO Transit signs.

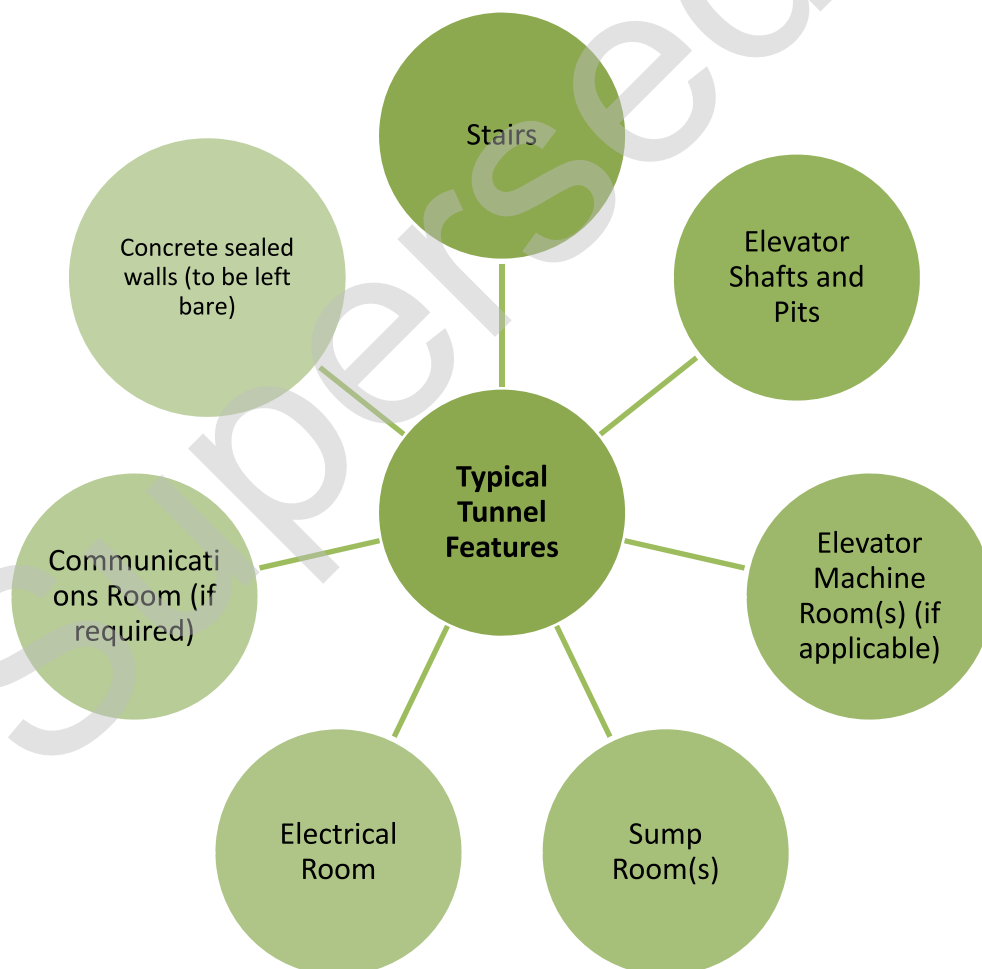


Chart1: Typical Tunnel Features



CI-0403

**TAB 4: STATION INFRASTRUCTURE**  
Tunnels

**DESIGN REQUIREMENTS**

FEATURE	DESCRIPTION
Height	<ul style="list-style-type: none"><li>&gt; Heights of tunnels shall be compatible with CCTV requirements.</li><li>&gt; The minimum tunnel height shall be 2.7 m inclusive of concrete floor topping.</li></ul>
Width	<ul style="list-style-type: none"><li>&gt; Tunnel width under the tracks to be 3.66 m, or as directed by GO to suit pedestrian traffic flow characteristics.</li></ul>
Slope	<ul style="list-style-type: none"><li>&gt; Tunnels shall have a minimum slope of 0.30% for drainage.</li></ul>
Corners	<ul style="list-style-type: none"><li>&gt; Tunnel corners shall be 45° angled and internal 90° corners shall have, at a minimum:<ul style="list-style-type: none"><li>• Convex mirror units, and</li><li>• Concrete sealed walls to have a smooth architectural finish. Should graffiti appear and cannot be cleaned, finish to be re-applied to the entire area (no patchwork).</li></ul></li><li>&gt; Angled wall corners at directional changes (300 mm x 300 mm minimum corner cuts at 45 degrees) shall be provided for sight lines to reduce probability of passenger collisions.</li></ul>
Pedestrian Tunnels	<ul style="list-style-type: none"><li>&gt; Pedestrian tunnels shall be cast-in-place concrete.</li><li>&gt; The portion of tunnels under railway tracks to be pre-cast concrete units.</li></ul>
Conduits	<ul style="list-style-type: none"><li>&gt; Exposed conduits between luminaires to be painted gray to match concrete.</li></ul>



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**TAB 4: STATION & TERMINAL BUILDING INFRASTRUCTURE**  
Stairs & Stair Enclosures

INTERIOR AND EXTERIOR STAIRS

(ALL INTERIOR AND EXTERIOR STAIRS SHALL COMPLY WITH THESE REQUIREMENTS)

FEATURE	DESCRIPTION
Perimeter Walls of Stairs and Elevator Vestibules	<ul style="list-style-type: none"> <li>&gt; Perimeter walls of stairs and elevator vestibules shall be fully glazed where possible.</li> <li>&gt; Stairwell walls shall have surface mounted photoluminescent strips at 0.3m above stair nosing's and landings. Strips to be installed continuously along entire length of stairwell wall transitioning in a continuous manner at tunnel level. Refer Tab 4 CI-0403 Tunnels for detailed information on stair/tunnel interface of photoluminescent strips.</li> <li>&gt; Photoluminescent strips are NOT required above stair nosings at locations within the stairwell that are directly adjacent to open glazing areas with natural light.</li> </ul>
Stairwell Openings	<ul style="list-style-type: none"> <li>&gt; Stairwell openings shall be extended across tunnels where possible for day-lighting and to reduce the apparent tunnel lengths.</li> <li>&gt; Concrete sealed walls to have a smooth architectural finish. Should graffiti appear and cannot be cleaned, finish to be re-applied to the entire area (no patchwork).</li> </ul>
Handrails	<ul style="list-style-type: none"> <li>&gt; Stair centre handrails shall terminate at landings to permit crossover.</li> <li>&gt; Stairwell walls (both sides) shall have surface mounted photoluminescent strips at 0.1m above top of handrail. Strips to be installed continuously along entire length of wall above the handrail terminating at the end of the handrail extension.</li> <li>&gt; Photoluminescent strips are NOT required above the handrail at locations in within the stairwell that are directly adjacent to open glazing areas with natural light.</li> <li>&gt; Exterior stair and ramp handrails shall commonly be Stainless Steel. All anchorage and fittings shall also be stainless steel or to match materiality of handrail. Mixing of materials is not recommended.Exterior stair and ramp handrails shall be smooth galvanized or stainless steel where continuity of handrail from interior to exterior is direct (to be determined</li> </ul>



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**TAB 7: TECHNICAL DISCIPLINES**

Architectural

Area	Description
	<ul style="list-style-type: none"> <li>&gt; Electrical boxes and other wall-mounted equipment shall not project into this base; and</li> <li>&gt; The bases of floor anchored equipment shall be continuous, matching adjacent wall base details.</li> <li>&gt; Where possible, thresholds shall be flush with the finished floor. Thresholds higher than 10 mm from the finished floor shall be bevelled to a 30° angle;</li> <li>&gt; Where enclosed, stairs shall be cast-in place concrete sealed, steel trowelled broom finish with contrasting cast in safety nosing inserts on an extruded aluminum or carborundum base with epoxy or abrasive filler. Minimum strength of concrete shall be 35 MPa with non chloride admixture for waterproofing. Refer to B651-M90 and CNIB for contrasting factor. A detectable ribbed tile shall indicate whether approaching grade changes are ramp or stairs, with ridges placed perpendicular to the direction of travel.</li> </ul>
Walls	<ul style="list-style-type: none"> <li>&gt; See preceding criteria concerning High and Low Contact Zones. All high contact zones in station and terminal buildings shall have walls finished with ceramic tiles:</li> <li>&gt; Waiting rooms or other high resistance material;</li> <li>&gt; Public washrooms;</li> <li>&gt; Staff washrooms (dado height); and</li> <li>&gt; Concession areas that are part of waiting rooms and where a tenant lease has not been executed in advance of design and construction or where such space may become a vending machine area.</li> <li>&gt; Ceramic tile finishes, full height or dado height, shall also be provided for staff washrooms in maintenance buildings (full height in shower rooms);</li> <li>&gt; Tunnel walls, though high contact zones, shall NOT be finished with ceramic tiles. Objective: monitoring of hair-line cracks and leaks, and facilitation of repairs. They shall be concrete, sealed and left bare. Should graffiti appear and cannot be cleaned, paint the entire area (no patchwork) with a white, 100% acrylic latex paint as per industry standard.</li> <li>&gt; Walls in platform access buildings (stairwells, elevator shafts, etc.) shall have concrete walls with a smooth architectural finish. Should graffiti appear and cannot be cleaned, surface to be sandblasted and finish to be re-applied to the entire area (no patchwork). Access walls may require ceramic tile finishes (see CNE GO Station) if requested by GO Transit;</li> <li>&gt; The colour for all utility, storage and shop rooms shall be a manufacturer's standard lightest off-white;</li> <li>&gt; Communication room walls: painted drywall over suitable framing system for brick veneer vernacular stations, or painted concrete block where cavity walls are constructed;</li> </ul>





<b>CI-0701</b>	<b>TAB 7: TECHNICAL DISCIPLINES</b> Architectural
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Area	Description
	<p>closet doors similar, unless they are access hatch doors: then they are to be stainless steel, textured No. 4 finish or equal.</p> <p>Non-Public Area Doors:</p> <ul style="list-style-type: none"> <li>&gt; Where washroom doors have an air transfer grille, dimensions to be determined by the H.V.A.C. Consultant. Single use washroom doors shall be undercut.</li> <li>&gt; Provide thermally broken frames and doors for exterior use in heated buildings.</li> </ul> <p>Wood Doors:</p> <ul style="list-style-type: none"> <li>&gt; Wood doors are generally not permitted in GO Transit buildings, however, should a need arise for their use, the Consultant shall obtain GO Transit's approval.</li> </ul>
Windows	<ul style="list-style-type: none"> <li>&gt; Windows shall have solid laminate (solid surfacing polymer) interior sills, sloped away from windows.</li> </ul>
Ceilings	<ul style="list-style-type: none"> <li>&gt; Dispatcher Room: As station attendant room including parabolic eggcrate luminaire lenses, but ceiling height minimum may be 2.13 m.</li> <li>&gt; Driver Room: As station attendant room, but luminaires shall be office type recessed LED fixtures (task lighting underside kitchenette wall cabinets).</li> <li>&gt; Platform Access Buildings :Ceilings shall be the underside of the architectural roof. Luminaires in stairwell shall be easily accessible for lights suspended from ceiling or walls, step lights shall be wall recessed below handrail access as noted previously. The undersides of roofs shall have a factory finish integral to the materials and be light in colour for reflectivity without glare.</li> <li>&gt; Roof fasteners shall be concealed with plastic covers coloured to match underside of roof. Standard shelter roof tinted thermoclear translucent and barrel vaulted roofs are recommended. Objective: continuity of forms and space for surface mounted CCTV cameras and PA speakers.</li> <li>&gt; Standard Platform Shelters Medium bronze tinted thermoclearlexan, barrel vaulted, translucent, as noted above.</li> <li>&gt; Tunnels Concrete, sealed walls, to be left bare. Should graffiti appear and cannot be cleaned, paint entire area (no patchwork) with a white, 100% acrylic latex paint as per industry standard. Raceways to be painted accent colour. Exposed conduits between luminaires to be painted gray to match concrete.</li> <li>&gt; Exposed pipes in tunnels are to be insulated against condensation. Any pipe runs exposed in tunnels shall be integrated with the structure by recessing if possible, or be surface mounted with a heavy gauge protective metal cover running the length of the exposed run. Provide an appropriate finish to the metal cover to match surrounding context. Ensure cover can be easily demounted for servicing of pipes.</li> </ul>
Skylights	<ul style="list-style-type: none"> <li>&gt; Frames shall be anodized aluminum thermal-break frames with condensation gutters, finish dark bronze or in a colour to suit the ceiling finish;</li> </ul>



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**TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**  
Parking Infrastructure

- > Stalls abutting curbs shall be 4.5 m long with a 1.0 m allowance for vehicle overhang.
- > Parallel parking stalls shall be 3 m wide x 7 m long.
- > Material for 1 m overhang shall be determined by implementing progressive, sustainable and environmentally friendly design practices and solutions.
- > Refer to Line Marking Section to see appropriate Figures.



**Barrier Free Parking**

- > +
- > The following two types of parking spaces shall be provided for the use of persons with disabilities:
  - Type A, a wider parking space which has a **width of 3.4 m by a depth of 5.5 m** and signage that identifies the space as “van accessible”. In addition a 1.5 m wide barrier free access aisle is required adjacent to the parking space. This can be shared with another parking space.
  - Type B, a standard parking space which has a **width of 2.6 m by a depth of 5.5 m** In addition, a 1.5 m wide barrier free access aisle is required adjacent to the parking space. This can be shared with another parking space.
- > If the total number of accessible spaces is an even number, the types required are divided equally. If the total number of accessible spaces is an odd number, the one remaining ‘odd-numbered’ space may be a Type B.
- > Parking lots shall have the minimum number of designated Barrier Free Parking spaces for passengers with disabilities in accordance with the DRM standard outlines in the table below.

(Note: GO transit has issued a memo to the AODA agency in response to the increase in the number of accessible spaces required in the AODA regulation. The number of accessible parking spaces will meet the DRM standard currently in place, or whatever the ridership demands are at a specific location, which may amount to more than the DRM standard and AODA regulation)



## LEED and what it means to GO

At Metrolinx, Sustainability is a core part of our business. LEED (Leadership in Energy and Environmental Design) NC 2009 is a green building rating system by which major rehab and new construction projects can achieve points towards Certified, Silver, Gold or Platinum certification.

All GO Station and Maintenance Facilities are to achieve LEED NC 2009 Gold certification. In addition, mandatory credits have been established for each building type to ensure that credits that are important to GO Transit's goals of energy efficiency and reduced operating and maintenance costs are targeted, integrated into the design early and achieved.

Designers are to incorporate LEED Gold and the GO Transit Mandatory credits into each project's scope of work.

## Guidance on How To Use the GO LEED Mandatory Credit Checklist

LEED has five key areas under which credits are obtained. These are:

- Sustainable Sites;
- Water Efficiency;
- Energy & Atmosphere;
- Materials & Resources and
- Indoor Environmental Quality.

Each area has Prerequisites that the project must achieve in order to consider going for LEED certification, these are non-negotiable. There is also an Innovation & Design section where innovative systems not accounted for elsewhere, exemplary performance and operational procedures can be considered for a credit. Each credit is worth anywhere from one to nineteen points, the number of points obtained determines the LEED rating achieved.

In order to achieve LEED Gold certification, anywhere between sixty (60) and seventy nine (79) points must be granted by the Canadian Green Building Council (CaGBC). It is recommended that sixty five points are targeted on each project pursuing Gold certification since the CaGBC is the final arbiter on which points are granted, so some points may be lost.

The GO LEED credit checklist that follow indicate the Prerequisites and GO Transit Mandatory credits which must be targeted and achieved. There are additional columns indicating optional points for consideration from which the shortfall can be made, credits that are not to be pursued are also identified in the checklist.



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**TAB 1: GUIDING PRINCIPLES**  
Sustainability

**LEED Mandatory Credits for Station Buildings**

Mandatory	Optional	Not to be Pursued	Available Points	Project Totals (pre-certification estimates)			110
47	57	8	110	<b>Points</b>			
				Certified 40-49 points	Silver 50-59 points	Gold 60-79 points	Platinum 80 points and above
7	17	2	26	<b>SS</b>	<b>SUSTAINABLE SITES</b>		
<b>M</b>	<b>O</b>	<b>N</b>	<b>A</b>	<b>Credit No.</b>	<b>Credit Name</b>	<b>Comments</b>	
PREREQUISITE				SSp1	Construction Activity Pollution Prevention		
	1		1	SSc1	Site Selection		
	5		5	SSc2	Development Density & Community Connectivity		
	1		1	SSc3	Brownfield Redevelopment		
6			6	SSc4.1	Alternative Transportation, Public Transportation Access		
		1	1	SSc4.2	Alternative Transportation, Bicycle Storage & Changing Rooms		
	3		3	SSc4.3	Alternative Transportation, Low-Emitting & Fuel Efficient Vehicles		
	2		2	SSc4.4	Alternative Transportation Parking Capacity		
	1		1	SSc5.1	Site Development, Protect or Restore Habitat		
		1	1	SSc5.2	Site Development, Maximize Open Space		
	1		1	SSc6.1	Stormwater Design, Quantity Control		
	1		1	SSc6.2	Stormwater Design, Quality Control		
	1		1	SSc7.1	Heat Island Effect, Non-Roof		
1			1	SSc7.2	Heat Island Effect, Roof		
	1		1	SSc8	Light Pollution Reduction		
7	3	0	10	<b>WE</b>	<b>WATER EFFICIENCY</b>		
<b>M</b>	<b>O</b>	<b>N</b>	<b>A</b>	<b>Credit No.</b>	<b>Credit Name</b>	<b>Comments</b>	
PREREQUISITE				WEp1	Water Use Reduction		
4			4	WEc1	Water Efficient Landscaping		
	2		2	WEc2	Innovative Wastewater Technologies		
3	1		4	WEc3	Water Use Reduction		



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**TAB 1: GUIDING PRINCIPLES**  
Sustainability

14	17	4	35	EA	ENERGY & ATMOSPHERE	
M	O	N	A	Credit No.	Credit Name	Comments
PREREQUISITE				EAp1	Fundamental Commissioning of Building Energy Systems	
PREREQUISITE				EAp2	Minimum Energy Performance	
PREREQUISITE				EAp3	Fundamental Refrigerant Management	
7	12		19	EAc1	Optimized Energy Performance	
	3	4	7	EAc2	On-Site Renewable Energy	
2			2	EAc3	Enhanced Commissioning	
2			2	EAc4	Enhanced Refrigerant Management	
3			3	EAc5	Measurement & Verification	
	2		2	EAc6	Green Power	
7	6	1	14	MR	MATERIALS & RESOURCES	
M	O	N	A	Credit No.	Credit Name	Comments
PREREQUISITE				MRp1	Storage & Collection of Recyclables	
	3		3	MRC1.1	Building Reuse: Maintain Existing Walls, Floors, Roof	
	1		1	MRC1.2	Building Reuse: Maintain Interior Non-Structural Elements	
2			2	MRC2	Construction Waste Management	
	2		2	MRC3	Materials Reuse	
2			2	MRC4	Recycled Content	
2			2	MRC5	Regional Materials	
		1	1	MRC6	Rapidly Renewable Materials	
1			1	MRC7	Certified Wood	
8	6	1	15	EQ	INDOOR ENVIRONMENTAL QUALITY	
M	O	N	A	Credit No.	Credit Name	Comments
PREREQUISITE				EQp1	Minimum Indoor Air Quality Performance	
PREREQUISITE				EQp2	Environmental Tobacco Smoke Control	
	1		1	EQc1	Outdoor Air Delivery Monitoring	
		1	1	EQc2	Increased Ventilation	
1			1	EQc3.1	Construction IAQ Management Plan, During Construction	
	1		1	EQc3.2	Construction IAQ Management Plan, Before Occupancy	
1			1	EQc4.1	Low Emitting Materials, Adhesives & Sealants	
1			1	EQc4.2	Low Emitting Materials, Paints and Coatings	
1			1	EQc4.3	Low Emitting Materials, Flooring Systems	



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**TAB 1: GUIDING PRINCIPLES**  
Sustainability

1			1	EQc4.4	Low Emitting Materials, Composite Wood & Laminate Adhesives	
	1		1	EQc5	Indoor Chemical & Pollutant Source Control	
1			1	EQc6.1	Controllability of System: Lighting	
	1		1	EQc6.2	Controllability of System: Thermal Comfort	
1			1	EQc7.1	Thermal Comfort, Design	
	1		1	EQc7.2	Thermal Comfort, Verification	
1			1	EQc8.1	Daylight & Views, Daylight	
	1		1	EQc8.2	Daylight & Views, Views	

4	4	0	6	ID	INNOVATION & DESIGN PROCESS	
<b>M</b>	<b>O</b>	<b>N</b>	<b>A</b>	<b>Credit No.</b>	<b>Credit Name</b>	<b>Comments</b>
1			1	IDc1.1	Innovation in Design: Green Housekeeping	
1			1	IDc1.2	Innovation in Design: Solid Waste Management Policy	
1			1	IDc1.3	Innovation in Design: Green Education	
	1		1	IDc1.4	Innovation in Design: Low Mercury Lamps	
	1		1	IDc1.5	Innovation in Design: Exemplary Performance SSc4.1 or other	
	1				Innovation in Design: Process Water Reuse, vehicle wash (if applicable)	
	1				Innovation in Design: TBD	
1			1	IDc2	LEED AP	

0	4	0	4	RP	REGIONAL PRIORITY	
<b>M</b>	<b>O</b>	<b>N</b>	<b>A</b>	<b>Credit No.</b>	<b>Credit Name</b>	<b>Comments</b>
	1		1	RP1	Durable Building	
	1		1	RP2.1	Regional Priority Credit 1	
	1		1	RP2.2	Regional Priority Credit 2	
	1		1	RP2.3	Regional Priority Credit 3	



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**TAB 1: GUIDING PRINCIPLES**  
Sustainability

**LEED Mandatory Credits for Maintenance Facilities**

Mandatory	Optional	Not to be Pursued	Available Points	Project Totals (pre-certification estimates)			110
47	56	8	110	Points			
				Certified 40-49 points	Silver 50-59 points	Gold 60-79 points	Platinum 80 points and above
8	17	1	26	SS	SUSTAINABLE SITES		
M	O	N	A	Credit No.	Credit Name	Comments	
PREREQUISITE				SSp1	Construction Activity Pollution Prevention		
	1		1	SSc1	Site Selection		
	5		5	SSc2	Development Density & Community Connectivity		
	1		1	SSc3	Brownfield Redevelopment		
3	3		6	SSc4.1	Alternative Transportation, Public Transportation Access		
1			1	SSc4.2	Alternative Transportation, Bicycle Storage & Changing Rooms		
3			3	SSc4.3	Alternative Transportation, Low-Emitting & Fuel Efficient Vehicles		
	2		2	SSc4.4	Alternative Transportation Parking Capacity		
	1		1	SSc5.1	Site Development, Protect or Restore Habitat		
		1	1	SSc5.2	Site Development, Maximize Open Space		
	1		1	SSc6.1	Stormwater Design, Quantity Control		
	1		1	SSc6.2	Stormwater Design, Quality Control		
	1		1	SSc7.1	Heat Island Effect, Non-Roof		
1			1	SSc7.2	Heat Island Effect, Roof		
	1		1	SSc8	Light Pollution Reduction		
7	3	0	10	WE	WATER EFFICIENCY		
M	O	N	A	Credit No.	Credit Name	Comments	
PREREQUISITE				WEp1	Water Use Reduction		
4			4	WEc1	Water Efficient Landscaping		
	2		2	WEc2	Innovative Wastewater Technologies		
3	1		4	WEc3	Water Use Reduction		



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**TAB 1: GUIDING PRINCIPLES**  
Sustainability

14	17	4	35	EA	ENERGY & ATMOSPHERE	
M	O	N	A	Credit No.	Credit Name	Comments
PREREQUISITE				EAp1	Fundamental Commissioning of Building Energy Systems	
PREREQUISITE				EAp2	Minimum Energy Performance	
PREREQUISITE				EAp3	Fundamental Refrigerant Management	
7	12		19	EAc1	Optimized Energy Performance	
	3	4	7	EAc2	On-Site Renewable Energy	
2			2	EAc3	Enhanced Commissioning	
2			2	EAc4	Enhanced Refrigerant Management	
3			3	EAc5	Measurement & Verification	
	2		2	EAc6	Green Power	

7	6	1	14	MR	MATERIALS & RESOURCES	
M	O	N	A	Credit No.	Credit Name	Comments
PREREQUISITE				MRp1	Storage & Collection of Recyclables	
	3		3	MRC1.1	Building Reuse: Maintain Existing Walls, Floors, Roof	
	1		1	MRC1.2	Building Reuse: Maintain Interior Non-Structural Elements	
2			2	MRC2	Construction Waste Management	
	2		2	MRC3	Materials Reuse	
2			2	MRC4	Recycled Content	
2			2	MRC5	Regional Materials	
		1	1	MRC6	Rapidly Renewable Materials	
1			1	MRC7	Certified Wood	

7	6	2	15	EQ	INDOOR ENVIRONMENTAL QUALITY	
M	O	N	A	Credit No.	Credit Name	Comments
PREREQUISITE				EQp1	Minimum Indoor Air Quality Performance	
PREREQUISITE				EQp2	Environmental Tobacco Smoke Control	
		1	1	EQc1	Outdoor Air Delivery Monitoring	
		1	1	EQc2	Increased Ventilation	
1			1	EQc3.1	Construction IAQ Management Plan, During Construction	
	1		1	EQc3.2	Construction IAQ Management Plan, Before Occupancy	
1			1	EQc4.1	Low Emitting Materials, Adhesives & Sealants	
1			1	EQc4.2	Low Emitting Materials, Paints and Coatings	
1			1	EQc4.3	Low Emitting Materials, Flooring Systems	





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**TAB 1: GUIDING PRINCIPLES**  
Sustainability

1			1	EQc4.4	Low Emitting Materials, Composite Wood & Laminate Adhesives	
	1		1	EQc5	Indoor Chemical & Pollutant Source Control	
1			1	EQc6.1	Controllability of System: Lighting	
	1		1	EQc6.2	Controllability of System: Thermal Comfort	
	1		1	EQc7.1	Thermal Comfort, Design	
	1		1	EQc7.2	Thermal Comfort, Verification	
1			1	EQc8.1	Daylight & Views, Daylight	
	1		1	EQc8.2	Daylight & Views, Views	

4	3	0	6	<b>ID</b>	<b>INNOVATION &amp; DESIGN PROCESS</b>	
<b>M</b>	<b>O</b>	<b>N</b>	<b>A</b>	<b>Credit No.</b>	<b>Credit Name</b>	<b>Comments</b>
1			1	IDc1.1	Innovation in Design: Green Housekeeping	
1			1	IDc1.2	Innovation in Design: Solid Waste Management Policy	
1			1	IDc1.3	Innovation in Design: Green Education	
	1		1	IDc1.4	Innovation in Design: Low Mercury Lamps	
	1		1	IDc1.5	Innovation in Design: Exemplary Performance SSc4.1 or other	
	1				Innovation in Design: Process Water Reuse, vehicle wash (if applicable)	
	1				Innovation in Design: TBD	
1			1	IDc2	LEED AP	

0	4	0	4	<b>RP</b>	<b>REGIONAL PRIORITY</b>	
<b>M</b>	<b>O</b>	<b>N</b>	<b>A</b>	<b>Credit No.</b>	<b>Credit Name</b>	<b>Comments</b>
	1		1	RP1	Durable Building	
	1		1	RP2.1	Regional Priority Credit 1	
	1		1	RP2.2	Regional Priority Credit 2	
	1		1	RP2.3	Regional Priority Credit 3	



CI-0501

**TAB 5: RAIL AND BUS OPERATIONAL FACILITIES**  
Bus Operational Facilities

**BUS OPERATIONAL FACILITIES**

**BASIS OF CRITERIA**

GO owns a number of Bus Operational Facilities for the purpose of storage, repair, maintenance, cleaning, and fuelling, with ancillary administrative offices. Bus Operational Facilities are classified as Type A, B, or C based on land sizing, parking, facilities provided and fleet requirements. Refer to the **Table for Bus Operational Facility Typology** and associated amenities.

Consultants are required to incorporate LEED building rating system strategies, features, and technologies for the design of these facilities to achieve minimum LEED “Gold” certification. The building must be designed and built in accordance with all applicable legislations, as a minimum requirement.

The optimum design solution shall demonstrate the architectural integration of all building elements, including structural, mechanical, electrical, communications, life safety, security systems, easier access, and accessible route(s).

Detailed design criteria will be provided by GO at the commencement of new projects. This Section is not intended to be a specification; the intent is to ensure uniformity in the Bus Operational Facility designs. Any variance from these guidelines will require written approval from GO.

The standard Bus Operational Facility program is based on the following:

- > Maintenance Facility
- > Storage Facility
- > Office Facilities.



CI-0701

### TAB 7: TECHNICAL DISCIPLINES

Architectural

#### **SAFETY**

- > Materials shall be selected so as to reduce the risk of hazard to patrons and maintenance staff and shall have the following safety considerations:
- > Fire resistance of facilities shall be maximized, and smoke generation hazard from fire shall be reduced, by using finish materials with minimum burning rate, smoke generation, and toxicity characteristics consistent with Code requirements.
- > Proper fasteners and adequate bond strength shall be used to minimize hazards from dislodgment due to temperature change, vibration, wind, seismic forces, aging, or other causes, such as vandalism.
- > Floor materials with non-slip qualities shall be utilized to increase pedestrian safety and accommodate the needs of individuals with disabilities.
- > Stairways, walkways, platform edge strips, and areas around equipment shall have high-friction, non-slip properties. All specified floor materials shall be resistant to damage from common de-icers.

#### **SUSTAINABLE DEVELOPMENT**

- > Material selection, where possible, should reflect green initiatives of sustainable development and meet the LEED mandatory requirements.

#### **DURABILITY AND PERFORMANCE**

Following are standards and guidelines for selecting materials for durability and adaptability:

- > Materials with excellent wear, strength, and weathering qualities shall be used, and shall be generally durable and hard-wearing with due regard to both initial replacement costs and required maintenance.
- > Materials shall maintain their good appearance throughout their useful life and shall have a minimum twenty-five (25) year performance capability.
- > For ceiling and canopy finishes/systems and their application, materials shall allow for commissioning, adjustment, and future retrofitting of subsystems such as CCTV and public address systems.

Materials should also be:

- > Easily maintainable and repairable.
- > Of high quality and installed at high levels of workmanship.



CI-0203

**TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**  
Parking Infrastructure -

**CARPOOL TO GO PARKING GUIDELINES**

- > 1% of total parking spaces per station site to be dedicated as Carpool to GO. Final breakdown to be provided by GO Transit Operations Central.
- > Carpool to GO Parking shall be located in proximity to barrier free parking spaces at GO Rail stations. Carpool to GO parking spots may be located on surface lot.
- > Provide Carpool to GO Signage: Carpool to GO Introduction and Information Billboard sign, Banner signs, parking stall marker signs (Refer to Figure: Carpool to GO Sign Details).:
  - Signage billboard to be located adjacent to parking spaces. Billboard to be post or fence mounted. (Refer to Figure: Carpool to GO Installation Details).
  - Signage banner to be located adjacent to parking spaces. Banner to be mounted on light standard near Carpool to GO parking area. (Refer to Figure: Carpool to GO Installation Details).
  - Signage shall be provided at each carpool parking space location (Refer to Figure Carpool to GO Installation Details).
- > Refer to Parking section CI-0203 for Parking space design criteria.
- > Refer to Section CI-0204 Pavement and Line Markings for parking space line markings.



CI-0203

TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT  
Parking Infrastructure -

Figure: Surface Parking-Carpool to GO Sign Details

SECTION:  
Tab 2:  
Parking

FIGURE:  
Carpool to  
GO Sign  
Details





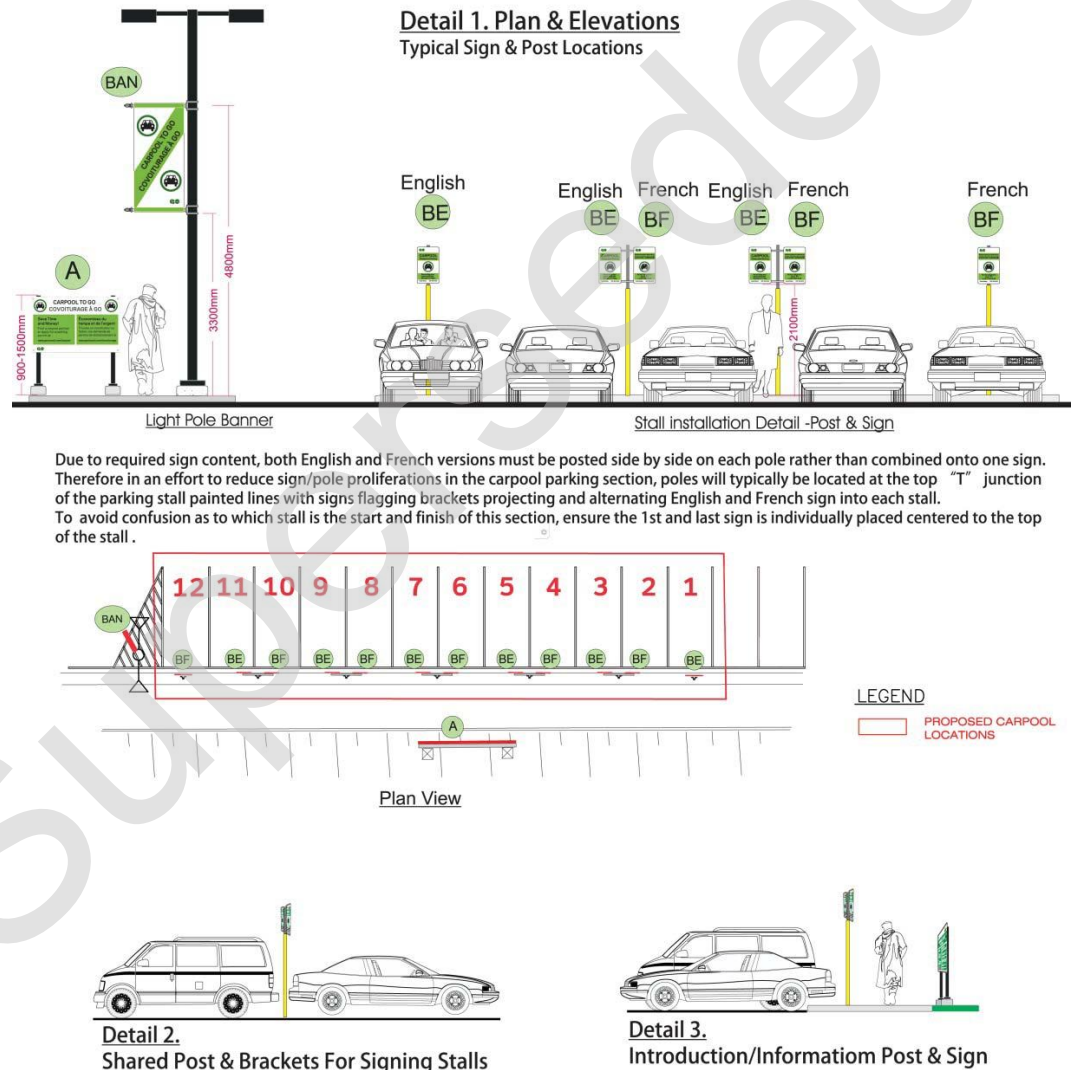
CI-0203

**TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**  
Parking Infrastructure -

Figure: Surface Parking-Carpool to GO Sign Details

**SECTION**  
Tab 2:  
Parking

**FIGURE:**  
Carpool to GO  
Installation  
Details





CI-0107

**TAB 1: GUIDING PRINCIPLES**

System Safety

**SECURITY DESIGN GUIDELINES**

Design Area	Guidelines
Vertical Spaces	<p>Glare from glass shall not obstruct service attendant/passenger vision or visibility at any time.</p> <ul style="list-style-type: none"> <li>&gt; <b>Stairs and elevators:</b> shall be in close proximity to each other, for acoustical and visual continuity.</li> <li>&gt; <b>Guards and balustrades:</b> shall be glazed where sight lines are required and in order to maximize illumination to lower levels, Photoluminescent strips to be installed above stair guards as required. Refer Tab 4 and Tab 7 for details</li> <li>&gt; <b>Perimeter walls:</b> of stairs and elevator vestibules shall be fully glazed where possible;</li> <li>&gt; <b>Stairwell openings:</b> shall be extended across tunnels where possible, for day-lighting, and to reduce the apparent tunnel lengths; concrete sealed walls to have a smooth architectural finish. Should graffiti appear and cannot be cleaned, finish to be re-applied to the entire area (no patchwork). Photoluminescent strips to be installed above the nosing and at top, bottom and intermediate landings for entire stair run length. Refer Tab 4 and Tab 7 for details.</li> <li>&gt; <b>Stair centre handrails:</b> shall terminate at landings to permit crossover.</li> </ul>
Tunnels and Overpasses	<ul style="list-style-type: none"> <li>&gt; <b>Open overpasses:</b> shall not have solid guards. Enclosed overpasses and stairs shall have windows/skylights, including at the ends, or shall have mesh type enclosures;</li> <li>&gt; <b>Tunnel corners:</b> shall be 45° angled and internal 90° corners shall have, at a minimum, convex mirror units and concrete walls to have a smooth architectural finish. Should graffiti appear and cannot be cleaned, finish to be re-applied to the entire area (no patchwork).</li> <li>&gt; <b>Heights of tunnels and overpasses:</b> shall be compatible with CCTV requirements.</li> <li>&gt; <b>Photoluminescent strips</b> to be installed along the entire length of tunnels. Refer Tab 4 and Tab 7 for details</li> </ul>
Shelters	<ul style="list-style-type: none"> <li>&gt; <b>Shelters:</b> shall have clear-glazed walls;</li> <li>&gt; <b>Large shelters:</b> for large shelters, doors shall be at opposite ends (one door at each end) and swing out;</li> <li>&gt; <b>Roofs:</b> shelters shall have translucent roofs and internal and external luminaires that do not reflect/glare in glazed walls. Translucent roofs also borrow illumination from platform light standards and provide sun shade; and</li> <li>&gt; <b>Platform shelters:</b> platform shelters remote from public announcement speakers shall have internal speakers.</li> </ul>





CI-0203

### TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT

#### Parking Infrastructure -

- > Stair handrails and guardrails and associated fastening system shall all be stainless steel where provided and walls shall have a smooth architectural finish. Should graffiti appear and cannot be cleaned, finish to be re-applied to the entire area (no patchwork).
- > Exterior stairwell walls should be provided with glazing for natural light and security, with consideration of limiting distance issues.
- > Eliminate potential hiding places under open stairs by suitable design options.
- > Stairwell doors are to have exit devices, proper latching and smoke seals.
- > There shall be no ceiling mounted luminaries over stairwells due to maintenance access problems with stair step lighting recessed in the concrete walls below the handrails.
- > Lighting at the top of the stairs shall be easily accessed from a flat surface by a 2m ladder. These lights may be ceiling mounted.
- > Stairwells shall be natural ventilated with louvers complete with fly screens, in door transoms.
- > Provide water supply and hose bibs at each level inside the stairwell and a 120V convenience outlet at each level outside the stairwell as a minimum.

#### **EXTERIOR ELEVATION**

- > Where parking structures and pedestrian areas adjoin, the exterior edge of the parking structure should exhibit a high level of architecture detail such as decorative screens, overhead canopies over pedestrian walkways that establish a comfortable and well-proportioned human scale.
- > The exterior design of a structure should minimize its visual identity as parking by disrupting the monotony of its underlying structure system through wall mass and window opening and through variations in color, material, and/or texture and a combination of solid and transparent areas.
- > Exterior lighting should always be aimed away from adjacent buildings with shades, shields, and optics and residential areas to avoid light pollution.
- > Architectural elements such as spandrel or enclosure panels should minimize snow drifting and wind. They should be tall enough to satisfy building code requirements of fall arrest and to ensure that the overall building envelope meets the open air requirements.
- > Maintenance, bird control and lighting should be considered in the exterior finishes and configuration.





CI-0203

### TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT

#### Parking Infrastructure -

- > These features may include but are not limited to: Pole lighting supports, equipment bases sleeved penetrations, permanent interior partitions, miscellaneous metals, stairs and handrails, curtain wall and cladding systems, doors and frames, ceiling support requirements and the like, elevator support requirements, mechanical and electrical support requirements; fall arrest system; decorative metal screens; signage; and window washing system.
- > Window washing systems and Fall Protection systems shall be designed in accordance with the Occupational Health & Safety Act and regulations, as a minimum requirement, and should consider incorporating reasonably optimal and practical safety measures beyond these requirements.
- > The window washing system shall ensure building surfaces and finishes will not be marred or otherwise damaged during normal operation of equipment.

#### WALLS

- > All interior and exterior walls materials selected shall depend on location and site specific elevational constraints.
- > Interior walls are to have a smooth finish to limit potential abrasion and allow easy maintenance.
- > All areas exposed to high traffic public use should be left bare. Should graffiti appear and cannot be cleaned, paint the entire area (no patchwork) with a white, 100% acrylic latex paint as per industry standard.
- > Consideration should be given to the use of colour on walls, doors and in key locations for coding or location identification. See GO Signage Manual for detailed requirements.

#### ROOF

- > The design of the parking garage shall accommodate a maintenance free roof.
- > Sustainable roof construction options could be proposed such as white reflective roof; roof systems with PV roof applications with related inverter room provision in the structure as directed by GO.
- > Peripheral roof protection shall be provided by parapets as mandated by industry standards and code requirements.
- > Extend Stairwell to mitigate fall arrest and provided better serviceability to the roof. Roof access door to be locked with keyed access. Key set to be keyed to rail line master and slave system



CI-0205

### TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT

#### Civil Works

##### Slope Protection:

- > All unpaved slopes shall be stabilized with appropriate hydro-seeding to avoid erosion. The preferred slope is 3:1 maximum 2:1.

##### Retaining Walls:

- > The Consultant shall select the optimum permanent retaining method (wood shall not be used for retaining walls). Where concrete retaining walls are in proximity to the public, they shall be sandblasted and left bare. Should graffiti appear and cannot be cleaned, paint the entire area (no patchwork) with 100% acrylic latex paint as per industry standard. Low retaining walls shall be precast concrete units. Gabion walls may be used in non-public areas.
- > Where retaining walls are adjacent to buildings, the material shall be compatible with the architecture.

## UTILITIES

### Easements

The Consultant shall identify and show utility easements on the site plan, where applicable, in accordance with GO's survey plan(s).

As-built drawings shall be provided at completion of work, accurately showing the location of all utilities.

### Existing or New Utilities

The Consultant shall be responsible for field locates of all existing utilities, confirmed with the Utility owner or authority. All existing utilities must be shown on the Contract Drawings.

Where existing utilities are disrupted, they shall be replaced with new or modified construction to the approval of the utility and GO Transit.

Where utility work is done by others prior to new construction, it is to be shown on the Contract Drawings as "existing" for reference.

### Hydro Overhead Power Lines

High voltage overhead clearance constraints pertaining to any buildings or structures shall be identified and co-ordinated.

### Coordination



CI-0403

**TAB 4: STATION INFRASTRUCTURE**  
Tunnels

**BASIS OF CRITERIA**

Platform access tunnels can be linked to the station building, connected to the station building or remotely located, as determined by site layout.

Design of Tunnels shall meet railway standards and the standards of other authorities having jurisdiction.

Advertising signs may be in tunnels but not in stairwells, and shall not interfere with exit signs or GO Transit signs.

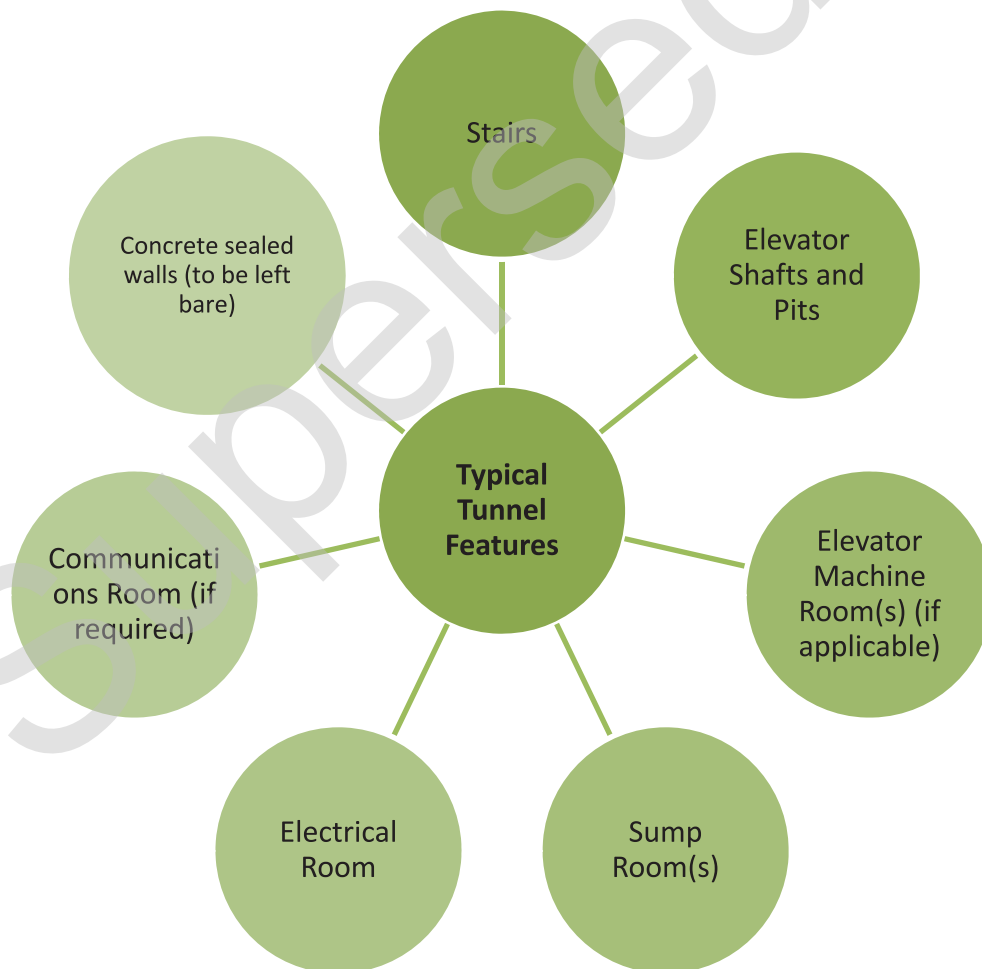


Chart1: Typical Tunnel Features



CI-0403

**TAB 4: STATION INFRASTRUCTURE**  
Tunnels

**DESIGN REQUIREMENTS**

FEATURE	DESCRIPTION
Height	<ul style="list-style-type: none"><li>&gt; Heights of tunnels shall be compatible with CCTV requirements.</li><li>&gt; The minimum tunnel height shall be 2.7 m inclusive of concrete floor topping.</li></ul>
Width	<ul style="list-style-type: none"><li>&gt; Tunnel width under the tracks to be 3.66 m, or as directed by GO to suit pedestrian traffic flow characteristics.</li></ul>
Slope	<ul style="list-style-type: none"><li>&gt; Tunnels shall have a minimum slope of 0.30% for drainage.</li></ul>
Corners	<ul style="list-style-type: none"><li>&gt; Tunnel corners shall be 45° angled and internal 90° corners shall have, at a minimum:<ul style="list-style-type: none"><li>• Convex mirror units, and</li><li>• Concrete sealed walls to have a smooth architectural finish. Should graffiti appear and cannot be cleaned, finish to be re-applied to the entire area (no patchwork).</li></ul></li><li>&gt; Angled wall corners at directional changes (300 mm x 300 mm minimum corner cuts at 45 degrees) shall be provided for sight lines to reduce probability of passenger collisions.</li></ul>
Pedestrian Tunnels	<ul style="list-style-type: none"><li>&gt; Pedestrian tunnels shall be cast-in-place concrete.</li><li>&gt; The portion of tunnels under railway tracks to be pre-cast concrete units.</li></ul>
Conduits	<ul style="list-style-type: none"><li>&gt; Exposed conduits between luminaires to be painted gray to match concrete.</li></ul>



CI-0404

**TAB 4: STATION & TERMINAL BUILDING INFRASTRUCTURE**  
Stairs & Stair Enclosures

INTERIOR AND EXTERIOR STAIRS

(ALL INTERIOR AND EXTERIOR STAIRS SHALL COMPLY WITH THESE REQUIREMENTS)

FEATURE	DESCRIPTION
Perimeter Walls of Stairs and Elevator Vestibules	<ul style="list-style-type: none"> <li>&gt; Perimeter walls of stairs and elevator vestibules shall be fully glazed where possible.</li> <li>&gt; Stairwell walls shall have surface mounted photoluminescent strips at 0.3m above stair nosing's and landings. Strips to be installed continuously along entire length of stairwell wall transitioning in a continuous manner at tunnel level. Refer Tab 4 CI-0403 Tunnels for detailed information on stair/tunnel interface of photoluminescent strips.</li> <li>&gt; Photoluminescent strips are NOT required above stair nosings at locations within the stairwell that are directly adjacent to open glazing areas with natural light.</li> </ul>
Stairwell Openings	<ul style="list-style-type: none"> <li>&gt; Stairwell openings shall be extended across tunnels where possible for day-lighting and to reduce the apparent tunnel lengths.</li> <li>&gt; Concrete sealed walls to have a smooth architectural finish. Should graffiti appear and cannot be cleaned, finish to be re-applied to the entire area (no patchwork).</li> </ul>
Handrails	<ul style="list-style-type: none"> <li>&gt; Stair centre handrails shall terminate at landings to permit crossover.</li> <li>&gt; Stairwell walls (both sides) shall have surface mounted photoluminescent strips at 0.1m above top of handrail. Strips to be installed continuously along entire length of wall above the handrail terminating at the end of the handrail extension.</li> <li>&gt; Photoluminescent strips are NOT required above the handrail at locations in within the stairwell that are directly adjacent to open glazing areas with natural light.</li> <li>&gt; Exterior stair and ramp handrails shall commonly be Stainless Steel. All anchorage and fittings shall also be stainless steel or to match materiality of handrail. Mixing of materials is not recommended. Exterior stair and ramp handrails shall be smooth galvanized or stainless steel where continuity of handrail from interior to exterior is direct (to be determined</li> </ul>



CI-0701

**TAB 7: TECHNICAL DISCIPLINES**  
Architectural

Area	Description
	<ul style="list-style-type: none"> <li>&gt; Electrical boxes and other wall-mounted equipment shall not project into this base; and</li> <li>&gt; The bases of floor anchored equipment shall be continuous, matching adjacent wall base details.</li> <li>&gt; Where possible, thresholds shall be flush with the finished floor. Thresholds higher than 10 mm from the finished floor shall be bevelled to a 30° angle;</li> <li>&gt; Where enclosed, stairs shall be cast-in place concrete sealed, steel trowelled broom finish with contrasting cast in safety nosing inserts on an extruded aluminum or carborundum base with epoxy or abrasive filler. Minimum strength of concrete shall be 35 MPa with non chloride admixture for waterproofing. Refer to B651-M90 and CNIB for contrasting factor. A detectable ribbed tile shall indicate whether approaching grade changes are ramp or stairs, with ridges placed perpendicular to the direction of travel.</li> </ul>
Walls	<ul style="list-style-type: none"> <li>&gt; See preceding criteria concerning High and Low Contact Zones. All high contact zones in station and terminal buildings shall have walls finished with ceramic tiles:</li> <li>&gt; Waiting rooms or other high resistance material;</li> <li>&gt; Public washrooms;</li> <li>&gt; Staff washrooms (dado height); and</li> <li>&gt; Concession areas that are part of waiting rooms and where a tenant lease has not been executed in advance of design and construction or where such space may become a vending machine area.</li> <li>&gt; Ceramic tile finishes, full height or dado height, shall also be provided for staff washrooms in maintenance buildings (full height in shower rooms);</li> <li>&gt; Tunnel walls, though high contact zones, shall NOT be finished with ceramic tiles. Objective: monitoring of hair-line cracks and leaks, and facilitation of repairs. They shall be concrete, sealed and left bare. Should graffiti appear and cannot be cleaned, paint the entire area (no patchwork) with a white, 100% acrylic latex paint as per industry standard.</li> <li>&gt; Walls in platform access buildings (stairwells, elevator shafts, etc.) shall have concrete walls with a smooth architectural finish. Should graffiti appear and cannot be cleaned, surface to be sandblasted and finish to be re-applied to the entire area (no patchwork). Access walls may require ceramic tile finishes (see CNE GO Station) if requested by GO Transit;</li> <li>&gt; The colour for all utility, storage and shop rooms shall be a manufacturer's standard lightest off-white;</li> <li>&gt; Communication room walls: painted drywall over suitable framing system for brick veneer vernacular stations, or painted concrete block where cavity walls are constructed;</li> </ul>



CI-0701

**TAB 7: TECHNICAL DISCIPLINES**

Architectural

Area	Description
	<p>closet doors similar, unless they are access hatch doors: then they are to be stainless steel, textured No. 4 finish or equal.</p> <p>Non-Public Area Doors:</p> <ul style="list-style-type: none"> <li>&gt; Where washroom doors have an air transfer grille, dimensions to be determined by the H.V.A.C. Consultant. Single use washroom doors shall be undercut.</li> <li>&gt; Provide thermally broken frames and doors for exterior use in heated buildings.</li> </ul> <p>Wood Doors:</p> <ul style="list-style-type: none"> <li>&gt; Wood doors are generally not permitted in GO Transit buildings, however, should a need arise for their use, the Consultant shall obtain GO Transit's approval.</li> </ul>
Windows	<ul style="list-style-type: none"> <li>&gt; Windows shall have solid laminate (solid surfacing polymer) interior sills, sloped away from windows.</li> </ul>
Ceilings	<ul style="list-style-type: none"> <li>&gt; Dispatcher Room: As station attendant room including parabolic eggcrate luminaire lenses, but ceiling height minimum may be 2.13 m.</li> <li>&gt; Driver Room: As station attendant room, but luminaires shall be office type recessed LED fixtures (task lighting underside kitchenette wall cabinets).</li> <li>&gt; Platform Access Buildings :Ceilings shall be the underside of the architectural roof. Luminaires in stairwell shall be easily accessible for lights suspended from ceiling or walls, step lights shall be wall recessed below handrail access as noted previously. The undersides of roofs shall have a factory finish integral to the materials and be light in colour for reflectivity without glare.</li> <li>&gt; Roof fasteners shall be concealed with plastic covers coloured to match underside of roof. Standard shelter roof tinted thermoclear translucent and barrel vaulted roofs are recommended. Objective: continuity of forms and space for surface mounted CCTV cameras and PA speakers.</li> <li>&gt; Standard Platform Shelters Medium bronze tinted thermoclearlexan, barrel vaulted, translucent, as noted above.</li> <li>&gt; Tunnels Concrete, sealed walls, to be left bare. Should graffiti appear and cannot be cleaned, paint entire area (no patchwork) with a white, 100% acrylic latex paint as per industry standard. Raceways to be painted accent colour. Exposed conduits between luminaires to be painted gray to match concrete.</li> <li>&gt; Exposed pipes in tunnels are to be insulated against condensation. Any pipe runs exposed in tunnels shall be integrated with the structure by recessing if possible, or be surface mounted with a heavy gauge protective metal cover running the length of the exposed run. Provide an appropriate finish to the metal cover to match surrounding context. Ensure cover can be easily demounted for servicing of pipes.</li> </ul>
Skylights	<ul style="list-style-type: none"> <li>&gt; Frames shall be anodized aluminum thermal-break frames with condensation gutters, finish dark bronze or in a colour to suit the ceiling finish;</li> </ul>





CI-0203

### TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT

#### Parking Infrastructure -

- > The use of concrete, masonry, galvanized steel, stainless steel, anodized aluminium and other low maintenance materials is preferred. The mixing of different materials, including fastening systems, shall be avoided. One material shall be used for any given application and the fastening system shall be the same material.
- > Refer to Section CI-0601 for application of GO Logo and Station name guidelines, GO Signage and GO Branding Guidelines for further details.

#### **EXTERIOR PAVEMENT & WALKWAYS**

- > Walkways shall be constructed of hard and sustainable materials that are slip resistant and capable of clearing during winter months and shall include cantilevered canopies as directed by GO. They shall be smooth with few joint connections (similar to standard sidewalk pads and asphalt).
- > Pavement patterns are to follow and assist in defining entrances, ramps, stairs, and pedestrian paths.
- > Exterior pavement and walkways should be suitable for wheelchair and mobility device usage, physical delineation of walkways is preferred.

#### **STRUCTURAL DESIGN**

- > The parking structure must be designed to withstand the loading to which is it subjected in the completed state as well as when it is partially complete during construction, and also during maintenance.
- > The design shall be based on the most cost effective structural system when considered in the context of both the capital cost of construction and the projected life-cycle cost of the parking garage with a design service life in accordance with the latest CSA standards.
- > Ideal structural bays that allow for maximum number of parking spaces and flow of automobiles dependent upon site and structure should be designed.
- > The ground level parking slab shall be concrete slab on grade. The designer will consider the geotechnical information in the selection and design of the foundation system and structure type and consideration and recommendations will also be required for any special conditions that may exist at the site, such as slopes or adjacent land features.
- > Various miscellaneous features of the parking structure must be included in the structural design. Each feature must be designed to accommodate the proper functioning and maintenance of the item in question, including installation and removal as appropriate.





CI-0401

### TAB 4: STATION INFRASTRUCTURE Station Buildings

#### **CUSTOMER SERVICES**

Customers approaching the station building area by each of the modes should have convenient access to:

- > Direct access from parking or Kiss n Ride to platform where possible.
- > An information display providing service information at the approach to the station area;
- > Service Area (Attended, Presto and TVM);
- > Newspaper boxes and, if appropriate, concessions;
- > Customer amenities including benches, pay phones and waste bins

The arrangement of the station should ensure that all needed facilities are available for customers using the station at times when it is not attended and portions of the station are locked. In addition to automated ticket vending and access to public telephones and information, a shelter should be provided for customers waiting for trains, buses, and rider/taxis as appropriate after staffed hours.

#### **PLATFORM ACCESS**

The Platform Access Section covers platform access buildings, including Tunnels, Stairs and Stair enclosures, Ramps, Elevators, Bridges and Pedestrian Overpasses, and At Grade Pedestrian Crossings.

The architecture of the Platform Access Buildings can be compatible with the Station Building (principally the roof-forms) or it can be completely diverse, depending on site and municipal requirements (as directed by GO).

Platform Access Buildings shall not visually overpower the Station Building.

#### **STATION BUILDING LOGO AND STATION NAME**

- > Refer to Section CI-0601 for GO Logo and Station name design guidelines.

#### **S4 DIGITAL SIGN PLACEMENT PHILOSOPHY (RAIL LINE STATIONS)**

##### **MONITOR SIZE**

- > 47' or 55" (Use current IT standard)



CI-0408

**TAB 4: STATION INFRASTRUCTURE**  
Pedestrian Bridges and Overpasses

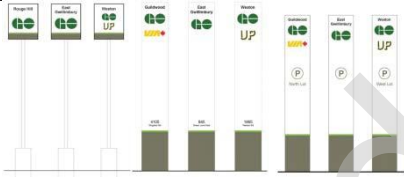


Feature	Description
Cut and Cover Structures	<ul style="list-style-type: none"><li>&gt; The construction of cut and cover structures such as pedestrian tunnels on the railway operating Right-of-Way is restricted to short durations, therefore design shall be such as to enable expedient construction</li></ul>
S4 Digital Signs	<ul style="list-style-type: none"><li>&gt; These dynamic digital display signs provide the Station Service Status System (S4) to continuously update information to customers at GO Rail Stations, strategically located inside station buildings, at tunnel entrances and platform entrances and providing an enhanced level of customer information.</li><li>&gt; Refer to section CI-0401 S4 Digital Sign Placement Philosophy (Rail Line Stations) for design guidelines.</li><li>&gt; Refer to section CI-0704 Communications- S4 Digital Signs for IT and power details.</li></ul>
Exterior GO Logo	<ul style="list-style-type: none"><li>&gt; Refer to Section CI-0601 for GO Logo design guidelines.</li></ul>



CI-0601

**TAB 6: WAYFINDING AND SIGNAGE**  
Static Signage

**GO LOGO AND STATIONS NAME GUIDELINES (STRUCTURES)**

Location	Application	Purpose	Image	Placement Criteria
<b>At Entrances (i.e. pylon/totem)</b>	<b>Station name</b> (illuminated) + GO logo (illuminated)	<i>beacon to station and confirmation of arrival</i>		UNDER DEVELOPMENT
<b>On Station Building Façade</b>	<b>Station name + GO logo</b>  (illumination of both station name and logo made on case by case basis)	<ul style="list-style-type: none"> <li>•identity</li> <li>•sense of respect,</li> <li>•differentiate from surrounding buildings</li> </ul>		<ul style="list-style-type: none"> <li>○ Title case for letters: Capital first letter, lower case on balance for each word.</li> <li>○ Keep GO logo and name positioned together, with Station name first. Station name is 2/3 height of GO Logo.</li> <li>○ Align station name and logo at bottom</li> <li>○ Vertical placement on the building facade is contextual to the roof line and architecture</li> <li>○ Flat plane applications preferable (no substantial curved surfaces)</li> <li>○ Text should be +/-15% overall façade height (guideline only). Size can vary to suit site context with GO approval.</li> <li>○ Logos and Letters permitted to be integrated into the building veneer or</li> </ul> <p>Materials and methods used in surface mounted applications to prohibit vandalism.</p>
<b>On Parking Structures</b>	<b>GO logo only</b>  (illumination of the logo made on case by case basis)	<i>Station name only in cases where there is no other beacon/identifier. In this case, both station name and logo likely to be illuminated.</i>		<ul style="list-style-type: none"> <li>○ Provide a clear space area around the GO Logo as per section 2.2.3 of the Static Signage Catalogue.</li> <li>○ Vertical placement on the building facade is contextual to the roof line and architecture</li> <li>○ Flat plane applications preferable (no substantial curved surfaces)</li> <li>○ Text should be +/-15% overall façade height (guideline online). Size can vary to suit site context with GO approval.</li> </ul>



CI-0601

**TAB 6: WAYFINDING AND SIGNAGE**

Static Signage

<p><b>On Other Structures</b> (i.e. utility buildings)</p>	<p><b>GO logo only</b> (non-illuminated)</p>	<p><i>GO logo only in cases where there is no other beacon/identifier</i></p>	<p>No image available</p>	<ul style="list-style-type: none"> <li>○ Provide a clear space area around the GO Logo as per section 2.2.3 of the Static Signage Catalogue.</li> <li>○ Vertical placement on the building facade is contextual to the roof line and architecture</li> <li>○ Flat plane applications preferable (no substantial curved surfaces)</li> <li>○ Text should be +/-15% overall façade height (guideline online). Size can vary to suit site context with GO approval.</li> </ul>
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**Additional guidelines for GO Logo and Station Name application:**

- > The GO Logo should be five individual elements with a negative space. The negative space should be open, showing the background material making the “T”. Two shapes for the GO logo are not permitted.
- > The GO Logo should be used sparingly, and not applied to every façade of a building. Location and frequency of signs to be considered in the overall context of the site. Initial proposal to be provided by Consultant, however, final application (location and size) to be reviewed and approved by GO Signage staff.
- > The GO Logo and/or Station Name are typically not to be placed on bridges (pedestrian, rail, vehicular, etc.) or on elevator overrun shafts.
- > Proportions, dimensions, and location of the GO Logo must be meticulously analyzed and determined early in the design of a structure.
- > GO Logo and Station Name should ideally be mounted on a solid background. This is to ensure a clear visible distinction and colour contrast of the sign elements with the background.
- > Mounting of signs over glazed/open areas on the façade is not recommended. If mounting over glazing is unavoidable, then a solid background to go behind the GO Logo should be included in the design of the structure.
- > For GO Logo/font sizing and corporate colours, refer to the Static Signage Catalogue.
- > Kerning for Station Name lettering to be directed by GO signage staff on a case by case basis.
- > Sign face materials vary to suit site conditions for ease of access and to limit vandalism. Recommended materials as follows:
  - UV stabilized Polycarbonate for easily accessed signs and locations prone to vandalism.
  - Flex face for larger, high mounted items (mounted at least 3m above grade).
- > Illuminated sign components (ballast, transformers etc) to be remotely and easily accessible for repair/maintenance purposes.



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**TAB 6: WAYFINDING AND SIGNAGE**

Static Signage

- > Backlit signs to be illuminated with LED targeting white 6500 to 7,000K colour temperature while ensuring an evenly distributed lighting across the surface of the material.
- > Illuminated sign may not be placed on a building or structure facing rail traffic that could be mistaken for rail signals as directed by GO Rail Operations.

Superseded



CI-0305

### TAB 3: BUS INFRASTRUCTURE

Park and Ride and Car Pool Lots

- > Pay phone  
Fare Equipment - if required
- > Public art – if required
- > Bear proof waste containers required in rural locations

#### BASIS OF CRITERIA

Various Park & Ride may have to accommodate local transit or other carriers, which may have their own specific design requirements.

The bus access and bus loop shall be designed to meet movement and turning radius performance requirements and ensure safe and smooth vehicle movements with minimal restrictions.

#### DESIGN REQUIREMENTS

##### BUS LOOP

The factors affecting the layout of areas for bus loops are the “turning space” and

“Turning radius”. Park-and-ride lots are intermodal transfer facilities and these factors are of prime importance to operating efficiency and safety.

Where the buses turn and stop the pavement shall be concrete with final texturing meeting OPSS 350 recommendations to achieve desired skid resistant surface.

Bus driving roads and lanes should be heavy asphalt as a minimum as per Tab 3 of this manual. Concrete may be considered for bus driving roads and lanes, the pavement design should be based on geotechnical information.

##### VEHICLE PARKING LOT

For parking lot design guidelines and criteria including kiss and ride (if applicable) refer to Parking Infrastructure, Tab 2 of this manual.

##### PASSENGER PLATFORM

Passenger platform shall be located and designed to minimize passenger path of travel and ideally to avoid passengers crossing any vehicular roads or bus loop. Platform configuration shall be dictated by the number of bus bays.

Platform design to meet the requirements of Tab 3 of this manual.

Ticket vending equipment to be located as per section CI-0401 Station Infrastructure-Ticket Vending



CI-0305

**TAB 3: BUS INFRASTRUCTURE**

Park and Ride and Car Pool Lots

Machine Placement Guidelines.

Passenger safety shall be given consideration when locating the passenger platform to minimize danger from overhead ice accumulation which may occur on hydro cables and support structures.

Grading shall be flat and allow space for bus barrier free lift deployment. Platform shall be hard, level material that is resistant to slipping and capable of clearing during the winter months by motorized equipment.

**HEATED PASSENGER SHELTER**

The passenger shelter shall be one of the GO typical heated shelters. The size of the shelter is determined by usage (number of customers).

Shelter rain water leaders shall discharge into subgrade where available to avoid slippery conditions on platforms.

**SITE SERVICES**

Electrical and communications service shall be brought into separately locked compartments of a power / communications cabinet.

Payphone shall be an accessible unit with illuminated telephone directory and illuminated signage (phone symbol minimum), located in proximity to the bus stop/shelter.

**ILLUMINATION**

Refer to Design Requirements Manual – Tab 7 – Electrical.

**COMMUNICATIONS**

A telephone pedestal shall be provided by the shelter.

If requested by GO, provision shall be made for CCTV, PA systems, TVM, electronic signage and related infrastructure including ducting and handholes where applicable.

Communications equipment shall be housed in the communications compartment.

Each compartment separately locked.

Combination cabinets are to be considered, containing electrical and communication equipment but physical separation is required.

**LANDSCAPING**



CI-0306

**TAB 3: BUS INFRASTRUCTURE**

Bus Terminal Buildings

- > Ticket vending equipment to be located as per section CI-0401 Station Infrastructure-Ticket Vending Machine Placement Guidelines.
- > Increased display areas and signage to address needs of terminal passengers.

**DESIGN REQUIREMENTS**

For mechanical, electrical, communications, washrooms, janitor, and storage rooms, the architectural program is basically the same as for station buildings, except washrooms are typically multi-use with stainless steel toilet partitions.

The program for additional terminal-specific components and rooms is as follows:

**ROOF CANOPY / PLATFORM**

(the following minimum clearances shall be provided for roofs and canopies)

Room Name	Description
Features	<ul style="list-style-type: none"> <li>&gt; Passenger platform canopy height above the platform: 3.35 m (11'-0") minimum;</li> <li>&gt; Platform curb to canopy edge: 0.5 m (20") (this applies also to sawtooth platforms at the narrowest point); and</li> <li>&gt; Height of a passenger platform canopy within 0.5 m (20") of the platform curb, extending also partly over a bus, or a roof over a bus driveway: 4.775 m (15'-8") minimum above the bus driveway. GO Transit may also require additional clearances for bus tow-trucks, particularly on ramps.</li> <li>&gt; A radio antenna above the roof;</li> <li>&gt; Any roof-mounted HVAC equipment to be fully screened;</li> <li>&gt; Where a canopy or a roof may trap diesel fumes, the consultant shall design natural ventilation features;</li> <li>&gt; Where mechanical ventilation must be provided, the consultant shall design acoustical features to ensure that passengers may hear P/A announcements and converse on the platform;</li> <li>&gt; Exposed structural members shall be HSS steel and shall have fittings to prevent bird-nesting;</li> </ul>





CI-0401

**TAB 4: STATION INFRASTRUCTURE**  
Station Buildings

**TICKET VENDING MACHINE (TVM) PLACEMENT GUIDELINES**

**TVM PLACEMENT PHILOSOPHY**

- > Each Rail Line Station and GO Bus Terminal should provide, when possible a minimum of 2 Ticket Vending Machines (TVM) at the following mandatory locations:
  - 1 TVM located within the vicinity of the station building. If no station building is provided, 1 TVM will be placed at main entrance to platform (as per site conditions) along the Barrier free path of travel in such a way that the path remains barrier free.
  - 1 TVM to be located at an additional platform access point.
- > Additional TVM's locations to be considered at the following pedestrian access points for the following areas within Rail Line and Bus Station sites:
  - Main Bus Loop/Platform;
  - Parking Structure;
  - Pedestrian bridge, mid span, as site conditions allow;
  - Satellite surface parking lot.
  - Any additional areas as determined by GO Design Standards staff.
- > Park and Ride Facilities may be provided 1 TVM located on passenger platform adjacent to the shelter where power and communication infrastructure is available.

**TVM CONFIGURATION CRITERIA**

- > When site configuration allows, it is encouraged to locate TVM's that satisfy both mandatory and preferred locations. The intention is to maximize TVM accessibility and convenience to customers with the use of a single TVM. The TVM must be visible from main entrance and located where there is a high volume of passengers. Ensure that placement does not block major egress locations
- > Location of TVM to be coordinated with the location of CDQ tower, S4 Digital Information Sign and the SFTP tower where possible. When a cluster of all 4 devices is possible, the TVM and CQD should be placed adjacent to each other. A minimum 500 mm horizontal clearance is required between the CQD and the TVM.
- > TVM to be weather sheltered where possible. Preference is for a shelter over the TVM. TVM's are to utilize sunshade top (both large and smaller sized sunshades) as site conditions warrant where a full shelter is not possible (Refer to Section CI-0401 Figure: Ticket Vending Machine- Detailed Graphic Layout-With Sunshade).
- > A minimum queuing space in front of TVM shall be 3 customers. Queuing space shall be increased based on historical peak station demand information provided by GO staff. Placement and orientation of TVM's and queuing areas should not adversely impact the main flow of customers
- > TVM concrete base installation details as per GO Standard Drawings TVM-001, TVM-002 and TVM-003.
- > TVM Electrical and Communication details as per Tab 7 CI-0703 Electrical and CI-0704 Communications.



CI-0401

**TAB 4: STATION INFRASTRUCTURE**  
Station Buildings

FIGURE: TVM DETAILED GRAPHIC LAYOUT-WITH SUNSHADE

**SECTION:**  
Tab 4-Station  
Infrastructure

**FIGURE:**  
Ticket  
Vending  
Machine-  
Detailed  
Graphic  
Layout-With  
Sunshade





CI-0704

**TAB 7: TECHNICAL DISCIPLINES**  
Communications

<b>STATION OPERATIONS</b>			
<b>Area</b>	<b>Activity</b>	<b>Primary Purpose(s)</b>	<b>Image Quality</b>
	LIVE MONITORING	Investigations. Maintenance.	
<b>Platforms</b>	PTZ at either end to monitor trains and deter trespassing.  View maximum length of platform achievable.  LIVE MONITORING (PTZ)	Rail operations.  Security, public confidence, deterrence.  Maintenance.	Detect
<b>Union Station Platforms</b>	100% coverage and PTZ at either end to monitor trains and deter trespassing.  View maximum length of platform achievable.  LIVE MONITORING (PTZ)	Rail operations.  Security, public confidence, deterrence.  Maintenance.	Detect
<b>Designated Waiting Area (Platforms)</b>	Full view of entire accessible platform.  LIVE MONITORING (PTZ)	Rail operations.  Security, public confidence, deterrence.  Maintenance.	Recognize
<b>Platform Monitors for CSA</b>	Assist CSA to ensure doorways are clear of passengers. Typically used on curved platforms with obscured vision.  Camera shall not be used for any recording.	Rail operations, safety.  Passenger safety	Detect.
<b>Ticket Vending Machines (TVM)</b>	At all rail stations, one camera visible to customers. Pin pad not visible by camera.  Identify customers using the	Security, public confidence, deterrence.  Investigations	Recognize .



CI-0704

**TAB 7: TECHNICAL DISCIPLINES**  
Communications

<b>STATION OPERATIONS</b>			
<b>Area</b>	<b>Activity</b>	<b>Primary Purpose(s)</b>	<b>Image Quality</b>
	TVM machines.  RECORDING (FIXED)	Conduct Control  Registering Evidence  Operational requirements	
<b>Hold-up</b>	One camera per service attendant to identify the customer currently at the window.  RECORDING (FIXED)	Security, public confidence, deterrence.  Investigations	Recognize .
<b>PARKING LOTS</b>			
<b>Area</b>	<b>Activity</b>	<b>Primary Purpose(s)</b>	<b>Image Quality</b>
<b>Vehicle entrances/exits</b>	Parking lots with a capacity greater than 1,000 cars and/or higher crime rates.  Identify vehicle license plates, facial recognition of drivers entering <u>or</u> exiting the parking lot, not both. (Preference given to entering.)  RECORDING (FIXED)	Security, public confidence, deterrence.  Claims management.  Investigations.  Maintenance.	Recognize .
<b>Parking Area</b>  Parking lots with a capacity greater than 1,000 cars and/or higher crime rates.	One PTZ camera visible from any location within the lot.  Max 10% blind spots.  Record vehicle movements.	Security, public confidence, deterrence.  Claims management.  Investigations.	Monitor

**CI-0704****TAB 7: TECHNICAL DISCIPLINES**  
Communications**STATIONS AND BUS TERMINALS****PRINCIPLES OF DEVICE PLACEMENT**

Devices may be located either in the station building, on the platforms, at access points to platforms (tunnels, pedestrian bridges, walkways, stairs, ramps, etc), as per Tab 4 CI-0401 Station Infrastructure Ticket Vending Machine (TVM) placement guidelines.

**General:**

- > Placement of devices and way-finding signage is site specific.
- > Devices shall be placed to avoid work within the Structure Clearance Envelope on/or beside Railway Track (refer to Tab 8 Heavy Rail, Section CI-0807 Structure Interface) to reduce the need for flagging.
- > Bus Terminal locations require CQDs and SPOs and TVM's; all fare collecting equipment is located on the bus. For TVM placement, refer to Tab 4 CI-0401 Station Infrastructure Ticket Vending Machine (TVM) placement guidelines.
- > Minimum clearance of 500 mm between two adjacent devices shall be maintained.
- > Devices shall be placed in accessible routes and shall not impede accessible clearances.

**SFTP**

- > Devices shall be placed at all rail platform access points. Devices shall be placed maximum 75 m apart at locations with direct parking lot to rail platform access.
- > Devices shall be placed along passenger natural flow, at clear and visible locations, and shall be readily accessible by Cardholders for fare payment.
- > Remote locations shall be provided with two (2) devices on different circuits, to provide redundancy in case of power failure.

**CQDs**

- > Shall be located outside the passenger flow, near TVM and/or Information Board/Digital Station Information Signs. Refer to Tab 4 CI-0401 Station Infrastructure Ticket Vending Machine (TVM) placement guidelines.

**Communications Conduits**

Conduits designated for Presto equipment data wiring shall be clearly identified and shall be installed well clear of power conduits. Conduit size shall depend on location with a minimum size of 21 mm. Acceptable conduit type as per Design Requirements Manual Tab 7 Section CI-0703 Electrical.

**ELECTRICAL CONNECTIVITY AND WIRING****General**

Wiring and circuit protection will be sized to suit the total wattage on circuit, to address potential voltage drops, and de-rating requirements for multiple circuits run in the same conduit. The following table



CI-0203

### TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT Parking Infrastructure -

#### ELECTRICAL SERVICES AND DESIGN CRITERIA

- > Investigate impact of parking structure on the existing electrical service because the existing service may not accommodate the additional load. Refer to the DRM for detailed requirements.
- > Energy Management System/ Smart Panels should provide the most flexible control system available: multi-level lighting, occupancy lighting changes, light harvesting, programmable circuit control, IP addressable for future remote control, open architecture backnet/modbus compliant accessible through Microsoft windows software.
- > Emergency Backup Power Systems shall include, but not be limited, to the following:
  - Communications equipment, safety and security equipment shall be supported by a conditioned backup power source like a UPS.
  - Egress Lighting shall be on the UPS or use of battery powered light packs if a generator power source is not available.
  - For elevators , power back up requirements see essential load table in electrical section.
  - Generators shall be sized to meet the current load of the parking structure and nearby station's emergency load and 50% growth.
  - The generators should be sufficiently sized to permit lighting and dynamic signage to continue to operate (both in the parking garage and throughout the Station facility).
  - The generator should be located and positioned to minimize public exposure to noise, vibration, exhaust and Arc Flash (if hazard level is greater than 0).
  - All backup power systems shall have monitoring and alarms local and remote capability, and ability to connect by modem or internet. The ability to monitor and change set point remotely.
  - Appropriately sized fuel storage tank for the size and height of the parking garage shall be provided and shall have a minimum of 24hr support or generator.
- > The Generator and fuel tank are to be TSSA certified and a fuelling number provided.
- > Convenient 20 amp 5-20R duplex GFI receptacles shall be located at each stairway and elevator area, on each level, around equipment on roofs, in service and storage rooms, near entrances and exits and at convenient locations on each parking level.



CI-0401

**TAB 4: STATION INFRASTRUCTURE**  
Station Buildings

ELECTRICAL ROOM	
Room Name	Description
Location	<ul style="list-style-type: none"><li>&gt; Behind station attendant room, exterior access.</li></ul>
Features, Fixtures and Fitments	<ul style="list-style-type: none"><li>&gt; Rectangular room, centrally located access hatch complete with pull down ladder; room sized per Electrical Design requirements.</li><li>&gt; If the station has a tunnel, elevator, etc., additional space shall be provided as required.</li><li>&gt; Spare wall space shall be allocated for future equipment.</li><li>&gt; Generators shall be on a raised base enclosed with a decorative fence with one access gate. This space shall be shared with a condenser unit.</li><li>&gt; Refer to the Electrical Section in the DRM (for detailed requirements).</li></ul>
Doors	<ul style="list-style-type: none"><li>&gt; Exterior in-swinging door.</li></ul>
Finishes	<ul style="list-style-type: none"><li>&gt; Floor: Epoxy on concrete;</li><li>&gt; Base: Vinyl;</li><li>&gt; Wall: Paint.</li><li>&gt; Ceiling: Drywall Painted.</li></ul>



CI-0702

**TAB 7: TECHNICAL DISCIPLINES**

Mechanical

- > Relevant TSSA requirements
- > Relevant ASME codes and standards

**DESIGN REQUIREMENTS**

**ENERGY SOURCE**

Heating, Ventilation and Air-Conditioning shall be by means of the most cost-effective energy source available at the site. Temperatures (Daytime: with Night-time set-backs) Daytime design temperatures for rooms shall be as tabulated below.

ROOM	° C		NOTES
	WINTER MIN.	SUMMER MAX.	
Passenger Waiting (including vending/concessions)	18	25	HVAC
Station Attendant	22	22	HVAC
Staff Room	22	22	HVAC
Dispatcher	22	22	HVAC
Office	22	22	HVAC
Communications	15	22	HVAC (Note 1)
Electronics Workshop	22	22	HVAC
Washrooms	*	*	Ventilation & Heating
Janitor	*	*	Ventilation & Heating
Battery	*	*	Ventilation & Gas Monitoring
Electrical	15	25	HVAC (Note 1)
Mechanical Equipment	*	*	Ventilation
Elevator Mechanical (Passenger)	5*	25	HVAC or exhaust fan





CI-0702

**TAB 7: TECHNICAL DISCIPLINES**  
Mechanical

ROOM	° C WINTER MIN.	° C SUMMER MAX.	NOTES
and Equipment)			
Workshop	22*	22	Ventilation
Storage	20	22	Ventilation
Station secondary entrances and tunnels	N/A	N/A	Natural Ventilation
Hydro Vaults	N/A	N/A	per Electrical Authority
Shelters	N/A	N/A	Natural Ventilation/Heating

\* Electric heating if required (supplementary) to maintain 18°C winter temperature.

Note 1: High wall, heat pump with hyper heating and low ambient cooling (no night-time set-back).

**STATIONS**

- > Radiant heating should be considered in new Station buildings on a project by project basis.
- > Otherwise, Heating and Air Conditioning of the waiting area and the service area shall be achieved by one high efficiency, premium quality furnace c/w outdoor condensing unit.
- > The service area will have a VAV box controlled by a thermostat, while the main thermostat should be located in the janitor room and interlocked with the waiting area temperature sensor.
- > Communications room and Electrical room shall have dedicated split Heat Pump A/C unit for each room. Refer to Communications room section for HVAC and ventilation details.
- > Depending on area, washrooms shall be ventilated by Energy Recovery Ventilators or exhaust fans, and shall be heated by radiant heating (if available in the building) or by electric baseboard heating.



CI-0703

**TAB 7: TECHNICAL DISCIPLINES**

Electrical

**BACKUP EMERGENCY POWER SYSTEM**

**SCOPE**

This subject describes the functional requirements for Metrolinx facilities backup power system. The power generated by the backup system shall be either true sinusoidal 60 Hz or DC, depending on the requirements.

The intent is to ensure the continuing operation of essential equipment and services, and to effectively move passengers from station buildings and train platforms to outside parking areas in the event of a sustained power failure.

The final design of the backup power system must include an as-built schematic drawing of the system distribution. It should also include a checklist for commissioning, operation and maintenance, respectively.

Back-up power generators are a mandatory requirement, for providing the majority of our operational elements/systems for 8 hours system operational duration (and additional 16 hours of testing capacity), in the event of a power failure at the following GO facilities:

- GO Rail Line Stations (including Parking Structures)
- GO Bus Terminals (facilities with a station building only)
- GO Rail Layover Facilities
- GO Operational Support Facilities (i.e. Wofldale, GTCC, Middlefield)
- GO Bus Maintenance Facilities
- GO Rail Maintenance Facilities.

**GENERAL DESCRIPTION**

Backup Power System's design can include components such as: Generator, UPS, Inverter, Rectifier, etc. As a minimum, the backup Power System shall include:

- > Diesel or natural gas generator complete with UPS systems having a minimum of 30 minute duration,

OR

- > UPS systems with 90 minute minimum duration if there is no diesel/natural gas generator set.

In each case, the UPS shall be double conversion continuous duty type to provide the electronic communications systems with clean sine wave power. The UPS shall be rated for life safety applications



CI-0703

**TAB 7: TECHNICAL DISCIPLINES**

Electrical

and shall be provided with signals for indication of UPS general alarms and with dial-in remote monitoring control, plus a remote alarm to the station alarm system.

Diesel is the preferred fuel for back-up generators. Where site and operational conditions do not allow for the use of diesel fuel, natural gas fuel powered generators are acceptable with GO approval.

Rectifiers shall be used for backup DC power in maintenance and layover facilities where required.

**ESSENTIAL LOADS**

The following table shows a list of items that are considered to be essential. The table shows both backup power system conditions (i.e. Generator + UPS OR UPS only) and provides an estimated power draw for each item. The actual power draws shall be considered in the detail design and specification must be verified on a project by project basis.

<b>ESSENTIAL LOADS</b>				
<b>Essential Load</b>	<b>Estimated Power Draw</b>	<b>With Generator</b>		<b>With NO Generator</b>
		<b>Diesel Generator</b>	<b>UPS System</b>	<b>UPS System</b>
	<b>(Watts)</b>			
<i>Life Safety</i>				
Exit signs - buildings, tunnels and similar structures (LED type)	100	x		x + Life Safety
Public Address System	2,000	x	x	x
CCTV System	2,000	x	x	x
Any additional rack in the Comms Room	2,000 ea.	x	x	x + Life Safety
GO Transit telephone System	500	x	x	x
All Passenger Elevators and shafts	4,500 ea.	x		
Elevator controls	2,000	x		
Alarm Monitoring Systems	400	x	x	x + Life Safety
<i>Lighting</i>				



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**TAB 7: TECHNICAL DISCIPLINES**

Electrical

<b>ESSENTIAL LOADS</b>				
<b>Essential Load</b>	<b>Estimated Power Draw</b>	<b>With Generator</b>		<b>With NO Generator</b>
		<b>Diesel Generator</b>	<b>UPS System</b>	<b>UPS System</b>
	<b>(Watts)</b>			
Tunnels, bridges and stairwell illumination (at least 1 fixture on normal power)	2,000	x		x + Life Safety
Electrical Room Illumination (at least 1 fixture on normal power)	100	x	x	x
Communications Room Illumination (at least 1 fixture on normal power)	100	x	x	x
Service Area Illumination	300	x		x
Waiting Area Illumination - minimal	1,000	x		x + Life Safety
Platform Lighting (Train and Bus)	9,000	x		
Main Parking Lots (Surface Parking)	Project Specific	x		
Parking Structures	Project Specific	x		
PPUDO (Passenger Pick up and Drop off)	Project Specific	x		
Bus Loop Lighting	Project Specific	x		
<b>Systems</b>				
Ticket Sales Equipment	3,000	x	x	x
Communications Equipment (white board, Pins etc...)				
Presto	4,500	x		
Door Operators (Building, vestibules, Shelters)	Project Specific	x		
<b>Mechanical</b>				



CI-0703

**TAB 7: TECHNICAL DISCIPLINES**

Electrical

**ESSENTIAL LOADS**

Essential Load	Estimated Power Draw	With Generator		With NO Generator
		Diesel Generator	UPS System	UPS System
	(Watts)			
Sump/Sanitary Pump	3,000	x		
HVAC for electrical & communication room	7,500	x		
HVAC for Service Counter and Waiting Area	Project Specific	x		
Water Heater Equipment	Project Specific	x		
HVAC and Exhaust of Elevator Shafts	Project Specific	x		
<b>Estimated Total Power Draw in Watts</b>		<b>280,000</b>		
		<b>(Varies with site conditions)</b>	<b>15,000</b>	<b>15,000</b>

\* Public washrooms shall have their own dedicated plug-in emergency light fixture x

\*\* CHUBB security to be considered if automatic locking system is implemented

\*\*\* Tunnels, Bridges and stairwell assumed to be single tunnel and stair structure at both ends; separate conduit for emergency lighting

\*\*\*\* Satellite lots not to be included in emergency lighting

\*\*\*\*\* Presto system is backed up by its own UPS systems ( 20 and 30 amp receptacles.)

**CI-0703****TAB 7: TECHNICAL DISCIPLINES**

Electrical

**DIESEL GENERATOR REQUIREMENTS**

The generator shall be provided as a factory tested single unit and rated kW, 120/208 or 347/600 Volts, 3 phase, 4 wire, 60Hz, 1800 rpm. The generator shall be certified to CSA C22.2 No. 100, EEMAC MG1-22.40, and NEMA MG1, and shall meet the requirements of Ontario Electrical Safety Code, ESA, EPA, MOE, TSSA, along with all applicable local codes and regulations.

The generator shall be self ventilated and shall be a single bearing type direct coupled to the engine. Under short circuit conditions, the generator shall be capable of delivering sufficient current to enable protective breakers to trip.

Ambient working temperature: -35°C to 40°C

Acceptable noise level: maximum 65 dB(A) at 7.0 m

**1. Diesel Engine**

- The engine shall be EPA compliant (tier 2 engine), with maximum nox plus hc of 3.87g/kw-hr.
- ULC/CSA labelled double wall construction sub-base mounted steel fuel tank with an enough storage capacity to run the generator set at full load for 24 hours without refuelling. The tanks and fuelling system has to be accepted by TSSA and equipped with fuel paddling system.

**2. Alternator**

- The alternator (generator) shall be 120/208 or 347/600 Volt, 3 phase, 4 wire, 60 Hz AC, drip proof, rotating field type with an integral exciter of the brushless or static type and a static voltage regulator utilizing silicon rectifiers on solid-state amplifiers.
- Voltage regulation shall be within plus or minus 2% of rated voltage for all loads from no load to full load. Output voltage shall be manually adjustable over a range of plus or minus 5% of rated voltage.
- Rotors shall be salient pole type with amortisseur windings. The generator shall include for 300% short circuit capability for 10 seconds.

**3. Engine-generator mounting**

- The engine and generator shall be aligned and mounted on a common fabricated steel base of sufficient rigidity to maintain adequate alignment. Approved adjustable steel spring vibration isolators shall be supplied with such set by the set manufacturer.

**4. Control panel**

- Environmentally sealed, solid state, microprocessor-based module for engine control, monitoring, protection and metering.
- The controller shall meet the CSA (Z462). The controller shall be listed under ULC and UL-508. Set-mounted controller capable of facing right, left, or rear shall be vibration isolated on the generator enclosure. Remote-mounted controller shall also be supplied.

**CI-0703****TAB 7: TECHNICAL DISCIPLINES**

Electrical

There should be a load bank for testing available on site rather than bringing a load bank onto site and connecting and disconnecting it. This load bank shall be able to be added in steps for testing up to 110 of the generators capacity. The controller shall have provisions for disconnecting a load bank (during exercise) if there is a loss of normal power by an Electrical and Mechanical interlock through ATS.

**NATURAL GAS GENERATOR REQUIREMENTS**

-Details TBD

**UNINTERRUPTIBLE POWER SUPPLY (UPS) REQUIREMENTS**

Uninterruptible Power Supplies (UPS) are used to support Life Safety systems and protects computers and other sensitive electronic loads from power outages and other power anomalies. This Section includes 3 phase  $\geq 3$  kVA and Single phase  $< 3$  kVA, on-line, static-type, UPS system, comprising the following:

- Complete rectifier/charger-battery-inverter system with automatic static switch and maintenance bypass circuit;
- Central Monitoring System for all UPS units, along with proper interfacing with METROLINX software, IT communication and station operations shall be provided in order to display and control all required parameters. All intercommunication shall be through the Mod bus, BAC Net, etc.;
- Input isolation transformer for UPS units, where technically required; and
- Connection of normal AC power from assigned terminals/switch/circuit breaker.

The UPS shall be of commercial type and shall comply with relevant IEC, EIA, NEMA, NFPA 70, IEEE, ISO 9001, ISO 14001, UL-1778, CSA, FCC Class A and Life Safety certified standards. Radio frequency interference (RFI) suppression shall be in accordance with CISPR and IEC 50091-2 recommendations. UPS should be certified for use to support Life Safety Systems.

UPS assembly shall include a mimic diagram with digital and LED displays, indicating instruments and control devices, in true relative positions.

**1. General requirements**

To meet the existing codes, a separation of equipment backup power and life safety devices must be achieved by a life safety approved UPS system. The UPS shall be interposed between normal AC power supply and critical load, to secure a minimum period of continuity of no-break battery back-up in case of failure of normal AC supply and maintain output voltage, frequency and phase deviation



CI-0703

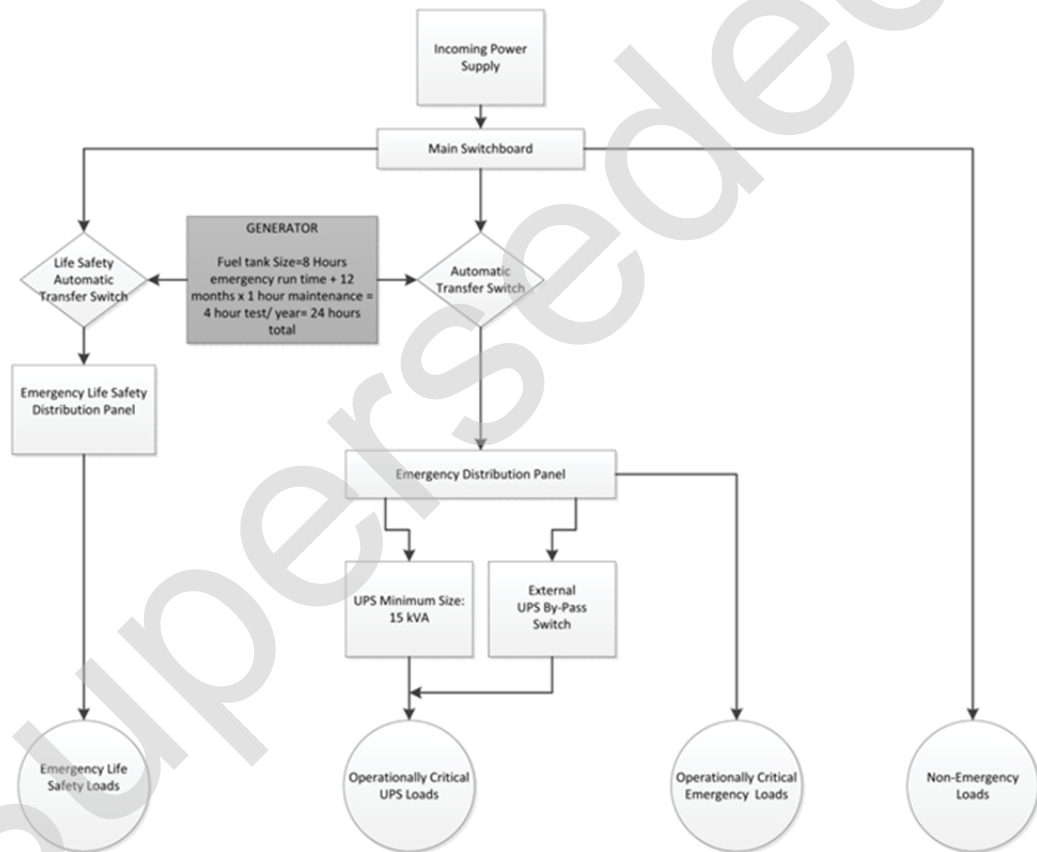
TAB 7: TECHNICAL DISCIPLINES

Electrical

FIGURE: EMERGENCY POWER DISTRIBUTION WITH GENERATOR

**SECTION:**  
Emergency Power Distribution with Generator

**FIGURE:**







CI-0703

**TAB 7: TECHNICAL DISCIPLINES**

Electrical

**INTERIOR LIGHTING SOURCES AND CONTROLS**

Location	Light Source	Control and Backup
	mounted LED vandal resistant lenses	luminary on UPS + Generator
Public Washroom	LED, vandal resistant luminaries or valance or cove lights for large facilities	On/Off switch with occupancy sensor, one fixture on UPS + Generator
Electrical, Comms., Mechanical, Janitor, and Storage Rooms.	Linear LED 1219 mm long or surface mounted luminaries vandal resistant	On/Off switch with occupancy sensor, 50% on UPS + Generator in Mechanical, Electrical and Comms. Rooms only
Shop	Linear LED 2438 mm long, suspended. Task lights over equipment and workbenches to suit functions	Local switching or to suit particular application, 10% on UPS + Generator
Garage Maintenance Shop	LED for shops. LED Task lights where required	Panel or central switching to suit particular application. 10% on UPS + Generator or to Code requirements
Dispatch	LED, and supplementary illumination for maintenance with task lights to suit	Local switches, dimmers, 10% on UPS + Generator.
Office	Per IES	10% on UPS + Generator

**EXTERIOR LIGHTING SOURCES AND CONTROLS**

Location	Light Source	Control and Backup
Parking Lot, Passenger Drop-off and Pick-up Areas, and Bus Loop Areas including Bus Platforms.	LED area lights or down lights on 6 or 12 m high galvanized steel poles or 30m high masts (use of LED on 30m high masts approved by GO Transit on a case by case basis). See Notes below.	Circuited and dimmed for 30% in operation during station closed hours (photo-control only) and to have manual override of the photo control and time-clock (the manual override shall not be digital) on generator.
Access Roads	LED area lights or down lights on 6 or 12 m high galvanized steel poles or 30m high masts (use of LED on 30m high masts approved by GO Transit on a case by case basis). See Notes below.	Circuited for 30% in operation during station closed hours (photo-control only) and to have manual override of the photo control and time-clock (the manual override shall not be digital)
Parking Structure	LED	Day light harvesting and occupancy sensor control of two light levels and timer on



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**TAB 7: TECHNICAL DISCIPLINES**

Electrical

**EXTERIOR LIGHTING SOURCES AND CONTROLS**

Location	Light Source	Control and Backup
Rail Platform	LED on 6 m hinged poles on 300 mm high concrete bases or in canopy.	generator Both timer and photo cell controlled, on Generator. During station closed hours 100% off. Override switch (snow removal use): 100% on
Mini-Platform	Same as Rail Platform	Controlled as part of Rail Platform
Tunnel, enclosed bridges and canopies	LED , 1219 mm long, c/w vandal resistant lenses, lights should be dimmable, when space not occupied. Allow for at least 2 circuits, alternate circuits every other pole	Breaker control, 50% on UPS + Generator
Internal Stairwell (tunnel, parking structure)	LED luminaries, semi-recessed in walls, below handrails	Breaker control, 30% on UPS + Generator
Exterior Stair and Walkway	Same as parking lot, Pole location to suit	Same as parking lot



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**TAB 7: TECHNICAL DISCIPLINES**  
Communications

**TELEPHONE NETWORK**

**DESIGN REQUIREMENTS**

- > The main telephone switch shall consist of trunk lines supplied as either individual or T1 circuits to allow for local and/or long distance calling. The network is to be capable of interfacing with 4-digit dialling as well as integrating with the voice mail system.
- > Telephone switches at remote sites such as Middlefield or Wolfedale shall be linked to the main switch at Head Office to permit 4-digit dialling between all sites.
- > All systems are to be provided with backup power supplies from Uninterruptible Power Sources at each location and by generator power.
- > The network shall be capable of permitting paging to be performed through the local telephone system at all stations.
- > Provision shall be made for local caller I.D., call hold, call waiting, transfer and conferencing.
- > Individual telephones shall be speaker type, capable of accepting multiple lines and speed dialling.

**WIRING**

- > Conduits and power for the telephone network shall be provided at each trunk switch location.



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**TAB 7: TECHNICAL DISCIPLINES**  
Communications

provides an estimate of the maximum wattage that each device requires. Table 1. shows power requirements for each device.

Device	Watts
SPOS (Station Point of Sale)	200
SFTP (Station Fare Transaction Processor)	35
CQD (Card Query Device)	35
HCR (Handheld Card Reader) Cradles	120

Table 1: Power Requirements

For Electrical wiring specifications, refer to Tab 7 Section CI-0703 Electrical

**Communications Rack**

In the Communications Room, the required receptacles, each fed from dedicated power circuits from a local non UPS (generator backed up), shall be provided at each CC Rack.

The types of receptacles required at the different locations are as follows:

Main CC Rack – Two (2) dedicated NEMA L5-20R (120V, 20A) mounted on cable tray fed from two (2) 15A breakers on different circuits, providing two (2) extension cords from the two (2) locked receptacles to reach bottom of the CC rack. The two extension cords shall include one (1) L5-20P plug each at top end of cords to plug into the twist lock receptacles and one (1) NEMA 5-20R receptacle each at bottom of cord (which accepts both NEMA 5-15P and NEMA 5-20P for plugging PRESTO UPS which is supplied by PRESTO supplier).

Main CC Rack if Transit Safety is included – In addition to Main CC Rack requirements, One (1) dedicated NEMA L6-20R (208V, 20A) mounted on the cable tray fed from One (1) 20A breaker, providing an extension cord from the locked receptacle to reach bottom of CC rack with one (1) NEMA L6-20P plug at top end to plug into twist lock receptacle and one (1) L6-20R receptacle at bottom of CC Rack (for plugging PRESTO UPS which is supplied by PRESTO supplier).

Secondary CC Rack - Two (2) dedicated NEMA L5-20R (120V, 20A) mounted on cable tray fed from two (2) 15A breakers on different circuits, providing two (2) extension cords from two (2) locked receptacles to reach bottom of the CC rack. The two extension cords shall include one (1) L5-20P plug each at top end of cords to plug into the twist lock receptacles and one (1) NEMA 5-20R receptacle each at bottom of cord (which accepts both NEMA 5-15P and NEMA 5-20P for plugging PRESTO UPS which is supplied by PRESTO supplier).

**PRESTO Devices**



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**TAB 7: TECHNICAL DISCIPLINES**  
Communications

Each **SPOS** (at Service Counter) is locally backed-up by PRESTO UPS (provided by PRESTO equipment supplier) and the PRESTO UPS requires a separate NEMA 5-20R (120V, 20A) receptacle fed from a 15A breaker on a dedicated non UPS power circuit (generator backed up). The power outlet shall be located within a maximum 2 m of the service position and labeled with PRESTO.

**SFTP** and **CQD** devices require dedicated power circuits from UPS located in the CC Rack (UPS provided by PRESTO equipment supplier). Power for up to four (4) devices (SFTP and CQD) can be daisy-chain connected to the UPS in the CC Rack. If devices are daisy-chained, they shall be staggered such that devices in close proximity to each other will be fed on separate circuits. Each such circuit shall be protected by a circuit breaker which will also serve as an isolation point near the CC rack (see Standard Drawing PRES-002 Detail 3 for power wiring termination details at CC Rack location).



An individual ground wire for each SFTP and CQD shall be run and terminated in the copper ground bus at power junction box at CC Rack location.

At the CC rack end the plugs for the SFTP and CQD must be SOW Service Cord complete with Commercial specification grade (straight blade valise type as shown below) plugs to be connected to the PRESTO System UPS in CC Rack.

Example of PRESTO Device plugs (for illustration purposes only):





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**TAB 7: TECHNICAL DISCIPLINES**  
Communications

For Electrical wiring specifications, refer to Tab 7 Section CI-0703 Electrical

**Communications Rack**

In the Communications Room, the required receptacles each fed from dedicated power circuits from a local non UPS (generator backed up), shall be provided at each CC Rack.

The types of receptacles required at the different locations are as follows:

Main CC Rack if Station EUT is included – One (1) dedicated NEMA L5-20R (120V, 20A) mounted on cable tray fed from one (1) 15A breaker on different circuits, providing an extension cord from locked receptacle to reach bottom of the CC rack. The extension cord shall include one (1) L5-20P plug at top end of cord to plug into the twist lock receptacle and one (1) NEMA 5-20R receptacle at bottom of cord (which accepts both NEMA 5-15P and NEMA 5-20P for plugging PRESTO UPS supplied by PRESTO supplier).

Main CC Rack if Transit Safety is included - One (1) dedicated NEMA L6-20R (208V, 20A) mounted on the cable tray fed from One (1) 20A breaker, providing an extension cord from the locked receptacle to reach bottom of CC rack with One (1) NEMA L6-20P at top end to plug into twist lock receptacle and One (1) L6-20R at bottom of CC rack (for plugging PRESTO UPS supplied by PRESTO supplier).

Main CC Rack if Station Staging Area is included – Two (2) dedicated NEMA L5-20R (120V, 20A) mounted on cable tray fed from two (2) 15A breakers on different circuits, providing two (2) extension cords from Two (2) locked receptacles to reach bottom of the CC rack. The two extension cords shall include one (1) L5-20P plug each at top end of cords to plug into the twist lock receptacles and one (1) NEMA 5-20R each at bottom of cord (which accepts both NEMA 5-15P and NEMA 5-20P for plugging PRESTO UPS supplied by PRESTO supplier).

**PRESTO Devices**

In EUT (End User Training) environment:

**SFTP** and **CQD** devices in a EUT environment will be equipped with a plug and will require NEMA 5-20R receptacles in the EUT office.

Each **SPOS** (in EUT office) requires a NEMA 5-20R (120V, 20A) receptacle fed from a 15A breaker on a different circuit. The power outlet shall be located within a maximum 2 m of the device.

In Transit Safety office:

An **HCR** cradle has an input voltage of 120V AC and will require a NEMA 5-20R receptacle in the Transit Safety office.



CI-0704

**TAB 7: TECHNICAL DISCIPLINES**  
Communications

**BUS MAINTENANCE FACILITIES**

**ELECTRICAL CONNECTIVITY AND WIRING**

**General**

Wiring and circuit protection will be sized to suit the total wattage on circuit, to address potential voltage drops, and de-rating requirements for multiple circuits run in the same conduit. The following table provides an estimate of the maximum wattage that each device requires.

Table 1 shows power requirements for each device.

Device	Watts
SPOS (Station Point of Sale)	200
SFTP (Station Fare Transaction Processor)	35
CQD (Card Query Device)	35
HCR (Handheld Card Reader) Cradles	120

Table 1: Power Requirements

**Communications Room**

In the Communications Room, the required receptacles each fed from dedicated power circuits from a local non UPS (generator backed up), shall be provided at each CC Rack.

The types of receptacles required at the different locations are as follows:

Main CC rack for Bus WLAN Solution – One (1) dedicated NEMA L6-20R (208, 20A) mounted on cable tray fed from One (1) 20 A breaker, providing an extension cord from locked receptacle to reach bottom of CC rack. The extension cord shall include one (1) NEMA L6-20P at top end to plug into twist lock receptacle and one (1) L6-20R at bottom of CC rack (for plugging PRESTO UPS supplied by PRESTO supplier) and One (1) dedicated NEMA L5-30R (120, 30A) mounted on cable tray fed from one (1) 30A breaker, providing an extension cord from locked receptacle to reach bottom of CC rack. The extension cord shall include one (1) NEMA L5-30P at top end to plug into twist lock receptacle and one (1) L5-30R at bottom of CC rack (for plugging PRESTO UPS supplied by PRESTO supplier).

Main CC rack when Transit Safety is included – In addition to Bus WLAN solution above, One (1) dedicated NEMA L6-20R (208V, 20A) mounted on cable tray fed from One (1) 20A breaker on different circuit, providing an extension cord from the locked receptacle to reach bottom of CC Rack. The extension cord shall include one (1) NEMA L6-20P at top end of cord to plug into twist lock receptacle and an L6-20R at bottom of CC rack for plugging PRESTO UPS supplied by PRESTO supplier).





CI-0204

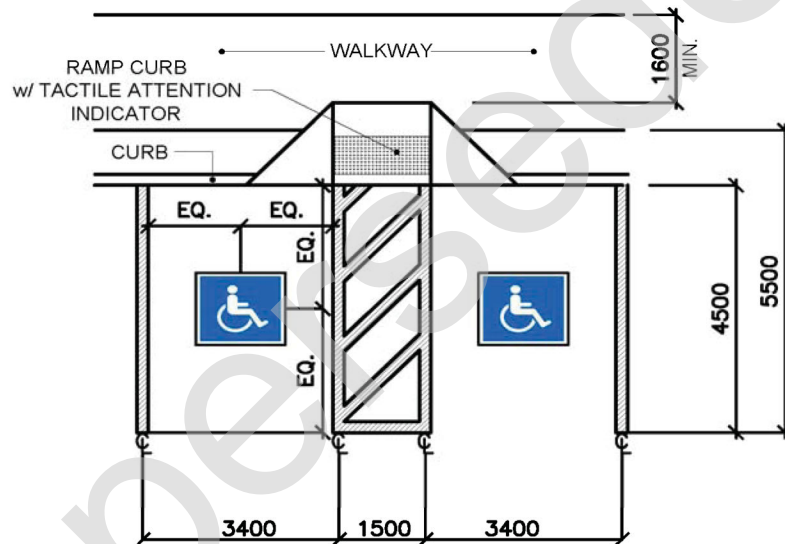
**TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**  
Pavement and Line Markings

FIGURE: DESIGNATED PARKING - CONFIGURATION FOR TWO OR LESS PARKING SPOTS

**SECTION:**  
Tab 2: Site Infrastructure and Development

**FIGURE:**  
Designated Parking – Configuration for Two or Less Parking Spots

**DESIGNATED PARKING CONFIGURATION FOR TWO OR LESS PARKING SPOTS**



**NOTES:**

- RECOMMENDED UNOBSTRUCTED ACCESSIBLE ROUTE SHALL BE MINIMUM 1600 mm WIDE
- SEE ALSO LINE MARKING FOR CROSSWALKS

**COLOR :** LINE MARKING : REFER TO TAB 2: SECTION C1-0204 LINE MARKINGS CHART .  
WHEELCHAIR SYMBOL: REFER TAB 2, SECTION C1-0203 BARRIER FREE PARKING STALLS FOR COLOUR SCHEME

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS



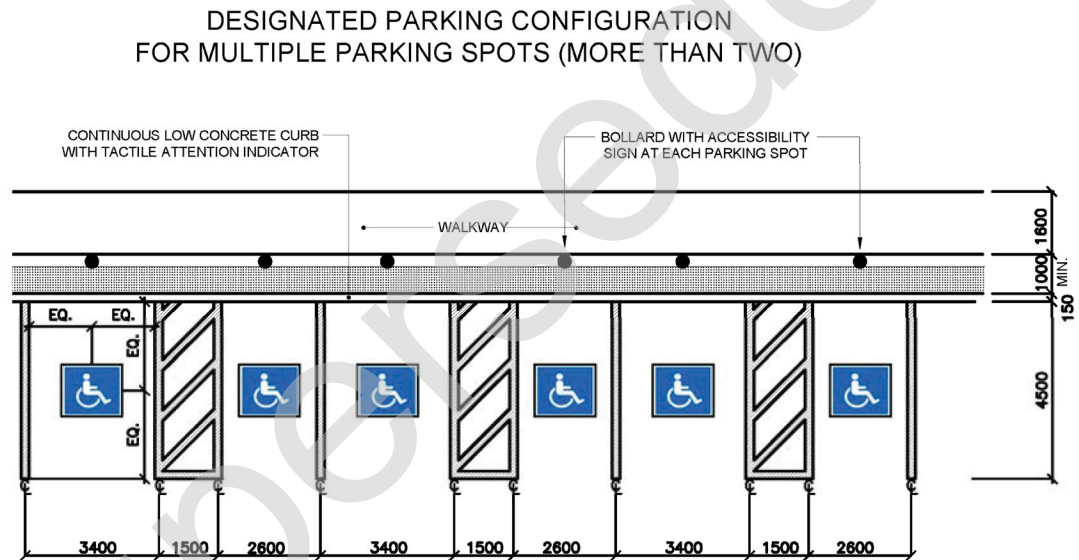
CI-0204

**TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**  
Pavement and Line Markings

FIGURE: DESIGNATED PARKING - CONFIGURATION OF MULTIPLE PARKING SPOTS (MORE THAN TWO)

**SECTION:**  
Tab 2: Site Infrastructure and Development

**FIGURE:**  
Designated parking – Configuration of Multiple Parking Spots (More than Two)



**NOTE:**

THE RECOMMENDED MAXIMUM PATH OF TRAVEL SHALL NOT EXCEED 30 m, FROM LAST ACCESSIBLE PARKING SPOT TO THE NEAREST ENTRANCE.

THE MAXIMUM NUMBER OF BARRIER FREE PARKING SPOTS IN ONE ROW SHALL NOT EXCEED 8 SPACES INCLUDING 4 HATCHED UNLOADING AREA.

**COLOR :** LINE MARKING : REFER TO TAB 2: SECTION C1-0204 LINE MARKINGS CHART .  
WHEELCHAIR SYMBOL: REFER TAB 2, SECTION C1-0203 BARRIER FREE PARKING STALLS FOR COLOUR SCHEME



CI-0401

**TAB 4: STATION INFRASTRUCTURE**  
Station Buildings

**DESIGN REQUIREMENTS**

The following tables (and/or figures) refer to the detailed room design program for individual rooms in a typical station building:

WAITING AREA	
Room Name	Description
Location	The waiting area shall project beyond the main building, with sight lines along the length of the building and maximized sight lines to the exterior.
Features	<ul style="list-style-type: none"> <li>&gt; Minimum queuing space in front of service counter shall be 5-7 passengers per attendant; queuing space shall be increased based on historical peak station demand information provided by GO staff.</li> <li>&gt; Combined circulation/waiting space shall be provided beyond the queuing space on the basis of 0.7 m<sup>2</sup> for each passenger. Concession space (staffed kiosk or vending alcove);</li> <li>&gt; High ceiling to a maximum of 4 m with daylighting (clerestory bay gable windows, or skylights); peaked or shallow arch ceiling for perimeter illumination (cove lighting);</li> <li>&gt; Service counter complete with purse shelf, with fixed and sliding glazing from the counter top to the bulkhead soffit.</li> <li>&gt; Seating shall be provided along a barrier-free path of travel and provide adjacent clear space designated for Wheeled Mobility Aids (WMAs).</li> <li>&gt; Non-fixed seating should be designed with intermediate armrests and without end armrests to accommodate a side transfer from an assistive mobility device.</li> </ul>
Doors	<ul style="list-style-type: none"> <li>&gt; Glazed aluminum frame single door entrances at right angles to the main building, to minimize drafts, protected by the roof overhang, with doors hinging to open against exterior walls.</li> <li>&gt; Two (2) adjacent doors without a post between, with a guard rails. Guardrail to have rubber doughnut bumpers. Power operated doors, where they open into a route of travel, shall have cane-detectable guardrails or other barriers at right angles to the wall containing the door.</li> </ul>



CI-0401

**TAB 4: STATION INFRASTRUCTURE**

Station Buildings

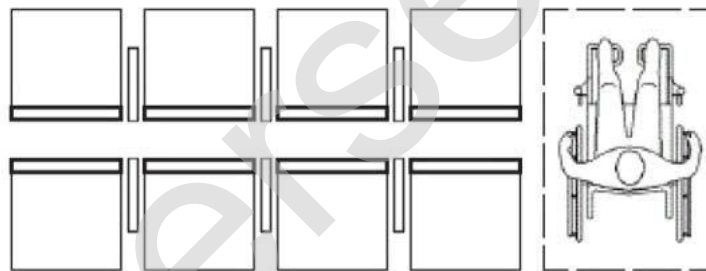
**FIGURE: BARRIER FREE DESIGNATED WAITING AREA WITH FIXED SEATING DESIGN REQUIREMENTS**

**SECTION:**

Tab 4 Station Buildings

**FIGURE:**

Barrier Free Designated Waiting Area with fixed seating Design requirements



**NOTES:**

- THERE SHALL BE NO ARMRESTS ON ENDS OF SEATING UNITS TO ALLOW FOR A SIDE TRANSFER FROM AN ASSISTIVE MOBILITY DEVICE.
- SEATING UNITS SHALL BE ARRANGED SO THAT THERE IS ADJACENT CLEAR SPACE AVAILABLE TO ACCOMMODATE A WHEELED MOBILITY AID (WMA).



CI-0401

**TAB 4: STATION INFRASTRUCTURE**  
Station Buildings



**PUBLIC WASHROOMS**

Room Name	Description
Location	<ul style="list-style-type: none"> <li>&gt; In station attendant line of sight.</li> </ul>
Features	<ul style="list-style-type: none"> <li>&gt; Public Washrooms shall be determined as universal or multi-use in addition to universal washrooms based on patronage and size of the station building.</li> <li>&gt; A minimum of one universal washroom shall be provided.</li> <li>&gt; Universal washrooms shall be provided with provisions for the future installation of an adult change table. An emergency two-way call system shall be provided in universal washrooms and shall follow the same call flow as the two-way intercoms as outside elevators (ie. to Station Attendant first, then Transit Safety, etc.)</li> <li>&gt; A minimum of one barrier-free water closet stall shall be provided in a multi-use washroom.</li> <li>&gt; In universal washrooms, door swing and/or screens shall at least partially obstruct the line of vision to water closets and urinals.</li> <li>&gt; Signage shall be provided that advises patrons to lock the door behind them for privacy.</li> <li>&gt; All plumbing fixtures to be located on interior walls.</li> </ul>
Doors	<ul style="list-style-type: none"> <li>&gt; Entrance to multi use washrooms shall be door less.</li> <li>&gt; In multi-use washrooms, doors shall have closers, and be undercut for exhaust make-up air (doors shall not have louvers).</li> <li>&gt; Single use Door hardware to be a lever handle passage set, and a latch, operable from the interior, to display “vacant” or “occupied”.</li> <li>&gt; Barrier-free power door operators shall be provided for universal washrooms.</li> </ul>



CI-0702

### TAB 7: TECHNICAL DISCIPLINES

Mechanical

#### **CUSTODIAN SINKS**

Janitor sinks to be terrazzo, floor mounted.

#### **WASHBASINS**

- > Multi use public washrooms to have individual semi-countertop basins with one barrier free basin. Faucets to be two-handle centreset type for the barrier free basin.
- > Universal washrooms to have a barrier free semi-countertop mounted basin with a two-handle centreset faucet.
- > Staff washroom basin to be countertop type with a two handle centreset faucet. There shall be a storage cabinet below.
- > Shop or maintenance facility washrooms to have a trough-type multi-station sink or circular wash basin. Faucets can have foot control, infrared control, or push button control.

#### **WATER CLOSETS**

- > Water closets in public washrooms shall be wall hung, with carrier elongated siphon jet flush action bowl, top spud for exposed manual flush valve with non-hold open feature. Seats shall be white, elongated, heavy duty, solid material, open front without cover.
- > Water closets in staff washrooms shall be floor mounted tank type. Seat shall be white, heavy duty, open front, solid material, oval, with cover.
- > Barrier-free (accessible) water closets shall have covers (lids) as back-rests, to code requirements.

#### **URINALS**

Urinals shall be wall hung with carrier, top spud for exposed manual flush valve with non-hold open feature and vacuum breaker, siphon jet flush action, integral flush spreader.

#### **EYE WASH FOUNTAINS**

In rail and bus maintenance facilities, eye wash fountains shall be wall recessed, stainless steel, located per Code outside battery rooms, or other areas with hazardous products. Typically found in plant facilities.

#### **SPECIAL REQUIREMENTS**

- > Septic systems and/or holding tanks for rural facilities.



CI-0402

**TAB 4: STATION INFRASTRUCTURE**

Station Sizing

		Determination of multi-use washroom design is based on station ridership, bus-meets-train service, and code requirements and subject to direction from GO staff.
Universal Washroom	5 m <sup>2</sup> with 1700mm clear turning radius and clear space for future provision of an adult change table.	<p>Universal, barrier free washroom.</p> <p>Determination of single use washroom design is based on station ridership, bus-meets-train service, and code requirements and subject to direction from GO staff.</p>
Maintenance Room	15 m <sup>2</sup>	3.0 m x 5.0 m
Electrical Room	Minimum 17 m of linear wall space for mounted material.	Electrical Room size will be based on the project specific electrical equipment space requirements. Ensure that 25% of extra space is designated for future expansion.
Communications Room		<p>Minimum 3.2 m x 4.8 m</p> <p>Communications Room size will be based on station type and project specific IT requirements.</p>
Mechanical Room	Approx. 8 m <sup>2</sup>	Mechanical Room size will be based on the project specific mechanical equipment required.
Snowmelting Boiler Room		Boiler Room size based on snowmelt mechanical equipment space requirements. Ensure that 25% of extra space is designated for future expansion.



CI-0404

**TAB 4: STATION & TERMINAL BUILDING INFRASTRUCTURE**  
Stairs & Stair Enclosures

**DESIGN REQUIREMENTS**

The following requirements pertain to tunnel and exterior stairs, including stairs remote from buildings):

FEATURE	DESCRIPTION
Risers & Treads	<ul style="list-style-type: none"><li>&gt; Risers: 150 mm preferred.</li><li>&gt; Treads: 305 mm preferred.</li><li>&gt; The design shall not incorporate open risers; be slip resistant; have uniform treads and risers in any one flight and shall not alter significantly in run and rise in successive flights in any stair system.</li></ul>
Nosing's	<ul style="list-style-type: none"><li>&gt; Stair nosing's shall project not more than 38 mm and have no abrupt undersides.</li><li>&gt; Where projecting, be sloped to the riser at an angle greater than 60° to the horizontal; and the radius of curvature at the leading edge of the tread not more than 13 mm.</li><li>&gt; Nosing's shall have a cast-in safety insert on an extruded aluminum or carborundum base with epoxy or abrasive filler that is minimum 40 mm +/- 10 mm deep and which:<ul style="list-style-type: none"><li>• Is located at the leading edge of the tread;</li><li>• Is tonal contrasted with the tread and riser; and</li><li>• Extends the full width of the tread.</li></ul></li></ul>
Tactile Attention Indicators	<ul style="list-style-type: none"><li>&gt; Tactile Attention Indicators at the top of stairs shall be provided:<ul style="list-style-type: none"><li>• At each landing incorporating an entrance into a stair system;</li><li>• Where the regular pattern of a stairway is broken; and</li><li>• Where the run of a landing not having a continuous handrail is greater than 2100 mm.</li></ul></li><li>&gt; The tactile attention indicators shall:</li></ul>



CI-0404

**TAB 4: STATION & TERMINAL BUILDING INFRASTRUCTURE**  
Stairs & Stair Enclosures

FEATURE	DESCRIPTION
	<ul style="list-style-type: none"> <li>• Extend the full width of the stair;</li> <li>• Have a depth of 610 mm (24 in) commencing one tread depth from the edge of the stair; and</li> <li>• The cane-detectable warnings on this surface shall be colour and texture contrasted with the adjacent surfaces.</li> </ul>
Edge Drain	<ul style="list-style-type: none"> <li>&gt; Tunnel stairs shall have concrete drainage side-gutters 40 mm deep by 80 mm wide, continuous with the tunnel floor gutters.</li> <li>&gt; Gutter drains shall not be located at the bottom of tunnel stairs or in front of service doors or elevator doors.</li> </ul>
Handrails	<ul style="list-style-type: none"> <li>&gt; Handrails shall be provided on both sides of all stairs.</li> <li>&gt; Exterior stair and ramp handrails shall be smooth galvanized steel pipe, minimum 30 mm, and maximum 43 mm diameter, 915 mm above nosing's or ramps.</li> <li>&gt; All anchorage and fittings shall also be galvanized.</li> <li>&gt; Tunnel stair or bridge stair handrails to be stainless steel 38 mm diameter, be mounted not less than 865 mm and not more than 965 mm high, measured vertically from a line drawn through the outside edges of the stair nosing's.</li> <li>&gt; All anchorage and fittings shall also be stainless steel. Handrail ends shall extend in accordance with the OBC and the OBC Illustrated Guide, also for exterior stairs.</li> <li>&gt; Handrails shall be continuous around landings less than 2100 mm in length and placed on the inside edge of stairs; and               <ul style="list-style-type: none"> <li>• Have the rail extension return to the post, floor or wall;</li> <li>• At the top of stairs, extend at least 300 mm (12 in) parallel to the floor surface;</li> <li>• At the bottom of the stairs, continue to slope for a distance equal to the depth of one tread and then extend at least 300</li> </ul> </li> </ul>



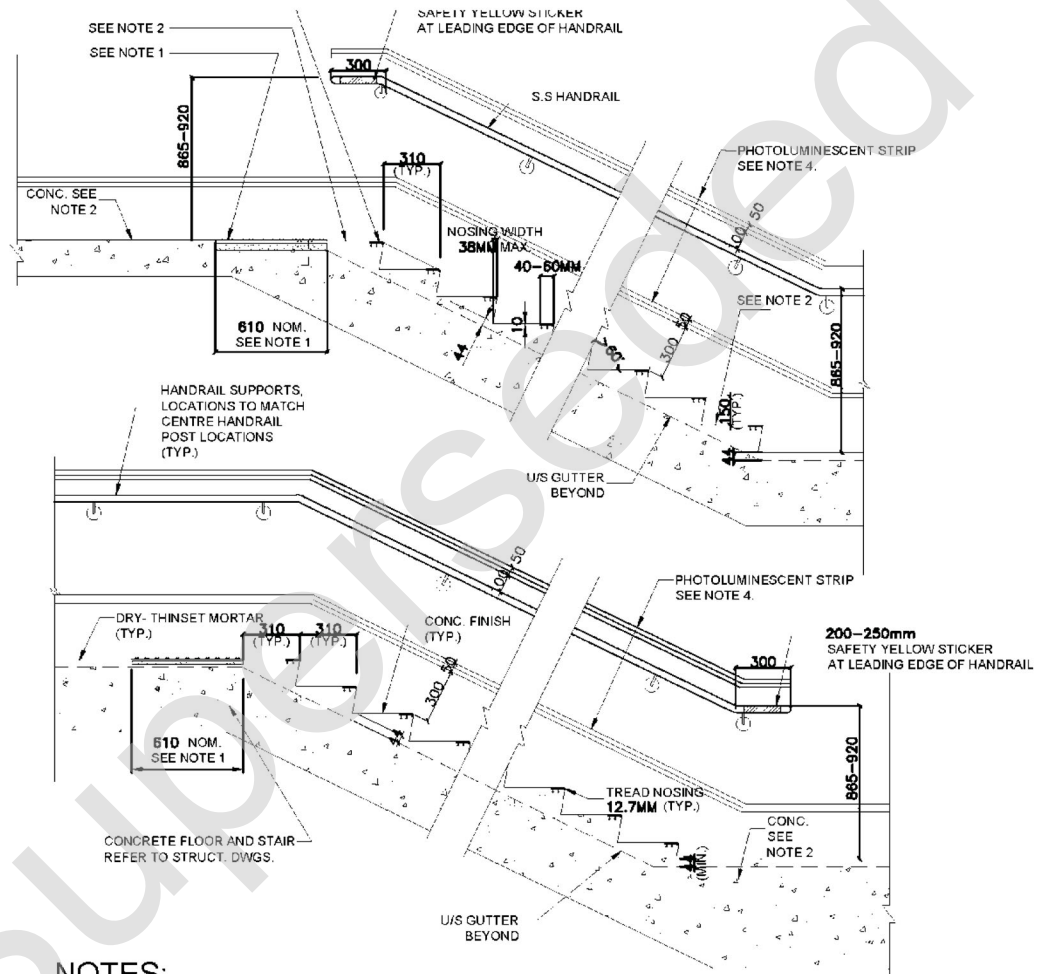
CI-0404

**TAB 4: STATION & TERMINAL BUILDING INFRASTRUCTURE**  
Stairs & Stair Enclosures

FIGURE: TILES AT RAMP / STAIR APPROACH (SECTIONS)

**SECTION:**  
Tab 4:  
Station  
Infrastructure

**FIGURE:**  
Tiles at Ramp  
/ Stair  
Approach  
(Sections)



**NOTES:**

1. TACTILE ATTENTION INDICATORS IN COMPLIANCE WITH OBC.
2. CONCRETE - STEEL TROWEL WITH BRUSH FINISH
3. CAST IN SAFETY NOSING (50mm+/-10mm) ON AN EXTRUDED ALUMINUM CARBORUNDUM BASE W/ EPOXY OR ABRASIVE FILLER/GRIT; EXTENDING THE FULL WIDTH OF THE TREAD REFER CSA B651-04 & CNIB STANDARDS FOR SLIP RESISTANCE & COLOUR CONTRAST REQUIREMENTS
4. WALL MOUNTED PHOTOLUMINESCENT STRIP C/W ALUM.FRAME MADE OF CORROSION RESISTANT MATERIAL (ALUMINUM OR STAINLESS STEEL) IS TO BE SUPPLIED AND INSTALLED TO SUPPORT THE PHOTOLUMINESCENT STRIPS ALONG THE ENTIRE LENGTH (FOR BOTH STAIR AND HANDRAIL CONDITIONS). FASTENERS TO BE CORROSION RESISTANT (STAINLESS STEEL OR ALUMINUM) AND NOT VISIBLE. END CAPS TO BE VANDAL PROOF. (TYP. BOTH SIDES OF THE STAIR AND ABOVE THE HANDRAIL) . ALIGN HANDRAIL PORTION TO LEADING EDGE OF HANDRAIL EXTENSION.REFER TO TAB 7 OF THE DRM FOR DETAILS.



## BASIS OF CRITERIA

Where site conditions permit, side platforms should be designed as pedestrian ramps as required in a barrier-free path of travel as an accessible means of egress onto site grade level. Ramps may be used by wheeled mobility devices, strollers, trolleys, or pedestrians to overcome level changes. Vehicular ramps with excessive slopes may be designed with snow melting system. Typical ramp installations shall provide access from grade to side platforms. Ramp installation may also be considered at locations where installation of an accessible passenger elevator is not possible due to island platform width restrictions.

Adverse weather can cause slippery conditions on exterior ramps; based on the infrastructure availability at the location, the ramp surface may be heated or the ramp may be covered.

## DESIGN REQUIREMENTS

Ramps shall have a 200 mm painted line marking indicator at the start and finish of a ramp slope. Design requirements include ramp elements such as:

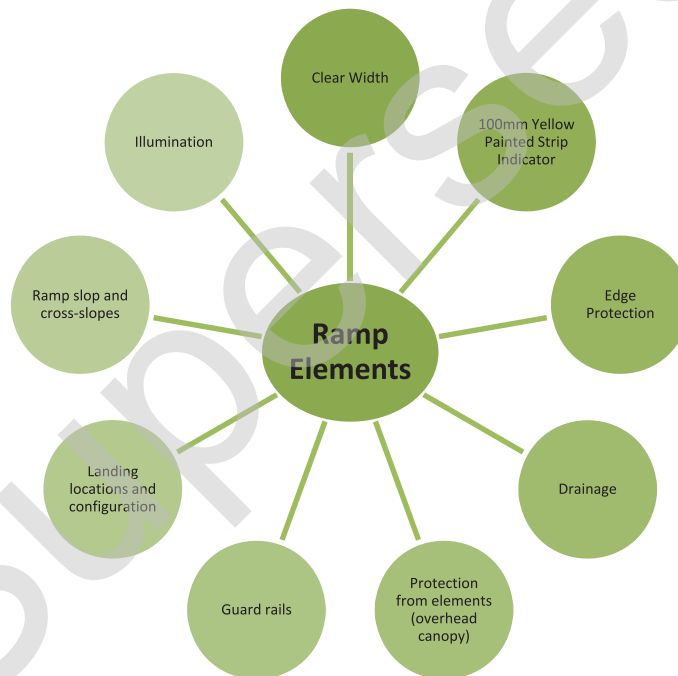


Chart: Ramp Elements

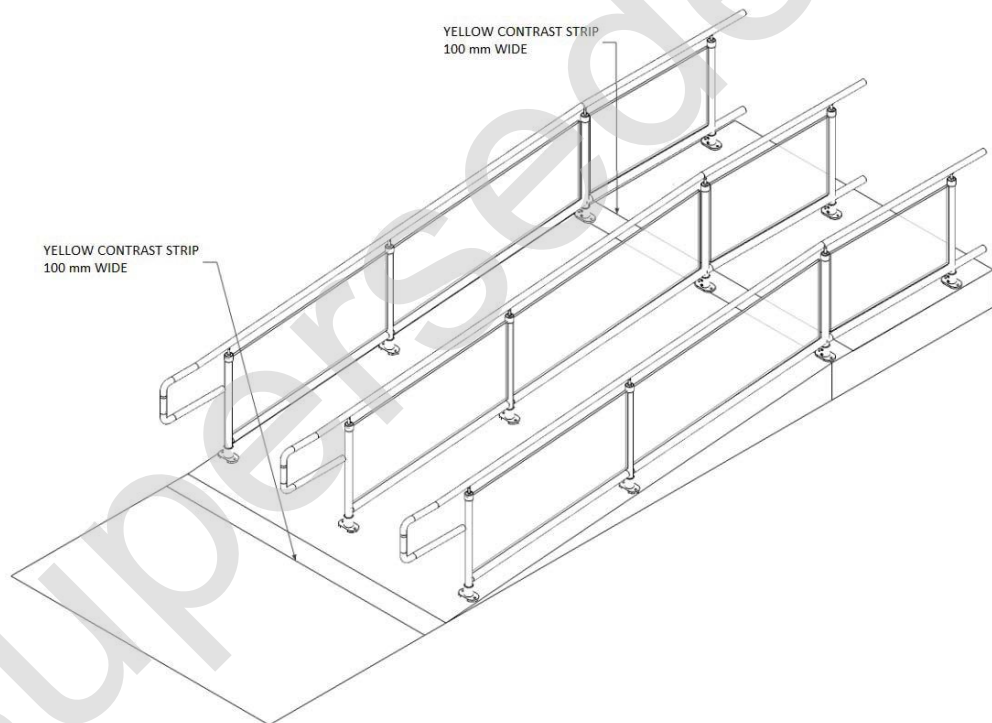


**CI-0406**

**TAB 4: STATION INFRASTRUCTURE**  
**Ramps**

**SECTION:**  
**Tab 4: Station**  
**Infrastructure**

**FIGURE:**  
**Yellow Painted**  
**Strip**  
**Indicators at**  
**Ramp**



Notes: A 100mm wide yellow painted strip indicator to be placed at the top and bottom of a ramp slope.



CI-0202

**TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**  
Station Sites

**BASIS OF CRITERIA**



A typical GO Rail Station Site comprises the following key components:

- > Site access;
- > Rail platform(s) including mini-platform(s);
- > Platform maintenance access;
- > Platform access including at-grade rail crossings, pedestrian tunnels or bridges and associated stairs, ramps, elevators and service rooms;
- > Bus loops and platforms where applicable;
- > Station building(s);
- > Platform shelters or integrated shelters;
- > Passenger Drop-off and Pick-up area;
- > Parking facilities;
- > Landscaped components (berms, swales, retaining walls, planter beds, trees, lawns, rockeries, etc.);
- > Fences; and
- > Signage.

**DESIGN REQUIREMENTS**



**UNOBSTRUCTED PATHWAYS/SIDEWALKS, WALKWAYS**

**Every accessible exterior and interior route:** shall have unobstructed minimum widths and where adjacent to a vehicular route be provided with a physical separation.

The minimum width of a pedestrian walkway shall be 1.6 m wide.

**The Principal Entrance to GO facilities:** shall be mobility accessible and shall be located on a level that would provide access to elevators and or ramps.



CI-0202

**TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**

Station Sites

They shall be accessible to people using wheelchairs or scooters. The following features shall form part of an accessible entrance:

- > Power assisted door operators, with guards;
  - Power door operators when mounted onto a wall surface shall be 150 mm in diameter at all door entrances.
  - Power door operators when mounted on shelter guardrails shall be 50 mm in width and 100 mm in height.
- > Accessible entrances shall be clearly marked with the International Symbol of Accessibility;
- > Can be easily opened with one hand;
- > Canopies or other sheltering devices where present, shall have adequate headroom; and
- > Mats shall be level with the floor and door thresholds are bevelled so they do not create a tripping hazard.



**ACCESSIBLE CURBS**

- > Accessible curbs (curb cuts) shall be provided where pedestrian paths intersect with vehicular roads, at barrier-free parking spaces, and wherever there is change in level along a barrier-free path of travel.
- > Where an accessible curb is provided, the surface shall have tactile indicators on its surface that meet the following requirements:
  - have raised tactile profiles
  - have a high tonal contrast with the adjacent surface
  - are set back between 150 mm and 200 mm from the curb edge
  - extend the full width of the curb
  - have a minimum of 610 mm in depth
  - have a maximum running slope of 1:15



CI-0202

### TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT Station Sites



#### PEDESTRIAN AND BICYCLE PATHS

- > Provide dedicated and continuous and direct routes for pedestrians throughout the station and connections to surrounding areas.
- > Pedestrians should not be required to cross the parking lot in order to access the station building.
- > Ensure pedestrian pathways are separated from vehicular traffic whenever possible.
- > Walkways shall be minimum 1.6 m wide.
- > When an entrance is provided from a recreational trail, a clear opening between 850 mm to 1000 mm is required, whether the entrance includes a gate, bollard, or other barrier.
- > The exterior path must meet the following requirements:
  - It must have a 1:2 bevel at changes in level between 6 mm and 13 mm.
  - It must have a maximum running slope of 1:8, or be designed as a ramp, at changes in level greater than 13 mm and less than 75 mm.
  - It must have a maximum running slope of 1:10, or be designed as a ramp, at changes in level greater than 75 mm or less than 200 mm.
  - It must be designed as a ramp, meeting all requirements and codes pertaining to ramps at changes in level greater than 200 mm.
- > Sidewalk and walkways shall be raised and constructed of hard and sustainable level materials that are slip resistant. They shall be smooth with few joint connections (similar to standard sidewalk pads and asphalt) and visually distinct from surrounding areas.
- > Provide curb cuts at all crossings to enable access for people using mobility devices.
- > Provide dedicated or shared bicycle lanes along primary vehicular roads leading to and from the station. Depending on the station configuration, it may be preferable to introduce a separate bicycle entrance. The width of a dedicated bike lane shall be no less than 1.5 m.
- > The bike route shall be distinguished with specially coloured paving, line painting, or graphic.
- > Ensure bicycle access routes are free of obstacles such as curbs and signs. Provisions for bicycle ramps and gutters shall be considered where barriers are unavoidable.



CI-0202

**TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**

Station Sites

shall be a minimum 5% of total parking spaces, including multiple lots where Kiss & Ride is not provided.

Where possible, provide more lanes of shorter length to allow for easier vehicle access and exit. Orient vehicle circulation in a counter-clockwise direction to eliminate vehicle cross over. The Kiss & Ride should be oriented so that waiting users and passengers face the front of cars, not the sides.

Drop-off and pick-up area should also accommodate the physical requirements of passengers with disabilities. Passenger Kiss & Ride design shall include a 3000 mm x 7400 mm wide hatched area for lift equipped vehicles with a minimum vertical clearance of 3600 mm.

**TAXI FACILITIES**

Taxi facilities/lanes shall be part of the passenger Kiss & Ride area.



CI-0203

**TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**  
Parking Infrastructure -

Total Number of Parking Spaces	Number of Designated Spaces*		
	Percentage Formula	Minimum Number of Spaces (Type A)	Minimum Number of Spaces (Type b)
1 – 100	4%	1	1
101 – 200	3%	2	2
201 – 500	2%	3	3
501 – 1,000	1.5%	4	4
1,001 – more	1%	5	5

The accessible route shall not be located where it would require people to pass behind vehicles that may be backing out. Colour-contrasted bollards or curbs should be used to prevent parked vehicles from protruding into the accessible circulation route.

Each Barrier Free Parking space shall be clearly marked with a sign bearing the International Symbol of Accessibility. Where the location of designated accessible parking spaces is not obvious, directional signage incorporating the International Symbol of Access shall be placed along the route leading to the designated parking spaces.

If there are more than three (3) designated spaces adjacent to each other, there shall be continuous low curb with a tactile attention indicator along the entire length of multiple designated spaces (no curb ramp for each unloading area).

For additional guidelines regarding accessibility and Figures refer to Accessibility section, TAB 1 of this manual. For signage refer to Signage Section, TAB 6 of this manual.





CI-0601

**TAB 6: WAYFINDING AND SIGNAGE**  
Static Signage

**GO LOGO AND STATIONS NAME GUIDELINES (STRUCTURES)**

Location	Application	Purpose	Image	Placement Criteria
<b>At Entrances (i.e. pylon/totem)</b>	<b>Station name</b> (illuminated) + GO logo (illuminated)	<i>beacon to station and confirmation of arrival</i>		UNDER DEVELOPMENT
<b>On Station Building Façade</b>	<b>Station name + GO logo</b>  (illumination of both station name and logo made on case by case basis)	<ul style="list-style-type: none"> <li>•identity</li> <li>•sense of respect,</li> <li>•differentiate from surrounding buildings</li> </ul>		<ul style="list-style-type: none"> <li>○ Title case for letters: Capital first letter, lower case on balance for each word.</li> <li>○ Keep GO logo and name positioned together, with Station name first. Station name is 2/3 height of GO Logo.</li> <li>○ Align station name and logo at bottom</li> <li>○ Vertical placement on the building facade is contextual to the roof line and architecture</li> <li>○ Flat plane applications preferable (no substantial curved surfaces)</li> <li>○ Text should be +/-15% overall façade height (guideline only). Size can vary to suit site context with GO approval.</li> <li>○ Logos and Letters permitted to be integrated into the building veneer or</li> </ul> <p>Materials and methods used in surface mounted applications to prohibit vandalism.</p>
<b>On Parking Structures</b>	<b>GO logo only</b>  (illumination of the logo made on case by case basis)	<i>Station name only in cases where there is no other beacon/identifier. In this case, both station name and logo likely to be illuminated.</i>		<ul style="list-style-type: none"> <li>○ Provide a clear space area around the GO Logo as per section 2.2.3 of the Static Signage Catalogue.</li> <li>○ Vertical placement on the building facade is contextual to the roof line and architecture</li> <li>○ Flat plane applications preferable (no substantial curved surfaces)</li> <li>○ Logo should be +/-10% overall façade height (guideline online). Size can vary to suit site context with GO approval.</li> </ul>



CI-0601

**TAB 6: WAYFINDING AND SIGNAGE**

Static Signage

<p><b>On Other Structures</b> (i.e. utility buildings)</p>	<p><b>GO logo only</b> (non-illuminated)</p>	<p><i>GO logo only in cases where there is no other beacon/identifier</i></p>	<p>No image available</p>	<ul style="list-style-type: none"> <li>○ Provide a clear space area around the GO Logo as per section 2.2.3 of the Static Signage Catalogue.</li> <li>○ Vertical placement on the building facade is contextual to the roof line and architecture</li> <li>○ Flat plane applications preferable (no substantial curved surfaces)</li> <li>○ Logo should be +/-10% overall façade height (guideline online). Size can vary to suit site context with GO approval.</li> </ul>
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**Additional guidelines for GO Logo and Station Name application:**

- > The GO Logo should be five individual elements with a negative space. The negative space should be open, showing the background material making the “T”. Two shapes for the GO logo are not permitted.
- > The GO Logo should be used sparingly, and not applied to every façade of a building. Location and frequency of signs to be considered in the overall context of the site. Initial proposal to be provided by Consultant, however, final application (location and size) to be reviewed and approved by GO Signage staff.
- > The GO Logo and/or Station Name are typically not to be placed on bridges (pedestrian, rail, vehicular, etc.) or on elevator overrun shafts.
- > Proportions, dimensions, and location of the GO Logo must be meticulously analyzed and determined early in the design of a structure.
- > GO Logo and Station Name should ideally be mounted on a solid background. This is to ensure a clear visible distinction and colour contrast of the sign elements with the background.
- > Mounting of signs over glazed/open areas on the façade is not recommended. If mounting over glazing is unavoidable, then a solid background to go behind the GO Logo should be included in the design of the structure.
- > For GO Logo/font sizing and corporate colours, refer to the Static Signage Catalogue.
- > Kerning for Station Name lettering to be directed by GO signage staff on a case by case basis.
- > Sign face materials vary to suit site conditions for ease of access and to limit vandalism. Recommended materials as follows:
  - UV stabilized Polycarbonate for easily accessed signs and locations prone to vandalism.
  - Flex face for larger, high mounted items (mounted at least 3m above grade).
- > Illuminated sign components (ballast, transformers etc) to be remotely and easily accessible for repair/maintenance purposes.



CI-0203

### TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT Parking Infrastructure -

#### ELECTRICAL SERVICES AND DESIGN CRITERIA

- > Investigate impact of parking structure on the existing electrical service because the existing service may not accommodate the additional load. Refer to the DRM for detailed requirements.
- > Energy Management System/ Smart Panels should provide the most flexible control system available: multi-level lighting, occupancy lighting changes, light harvesting, programmable circuit control, IP addressable for future remote control, open architecture backnet/modbus compliant accessible through Microsoft windows software.
- > Emergency Backup Power Systems shall include, but not be limited, to the following:
  - Communications equipment, safety and security equipment shall be supported by a conditioned backup power source like a UPS.
  - Egress Lighting shall be on the UPS or use of battery powered light packs if a generator power source is not available.
  - For elevators , power back up requirements see essential load table in electrical section.
  - Generators shall be sized to meet the current load of the parking structure and nearby station's emergency load and 50% growth.
  - The generators should be sufficiently sized to permit lighting and dynamic signage to continue to operate (both in the parking garage and throughout the Station facility).
  - The generator should be located and positioned to minimize public exposure to noise, vibration, exhaust and Arc Flash (if hazard level is greater than 0).
  - All backup power systems shall have monitoring and alarms local and remote capability, and ability to connect by modem or internet. The ability to monitor and change set point remotely.
  - Appropriately sized fuel storage tank for the size and height of the parking garage shall be provided and shall have a minimum of 24hr support or generator.
- > The Generator and fuel tank are to be TSSA certified and a fuelling number provided.
- > Convenient 20 amp 5-20R duplex GFI receptacles shall be located at each stairway and elevator area, on each level, around equipment on roofs, in service and storage rooms, near entrances and exits and at convenient locations on each parking level.



CI-0702

**TAB 7: TECHNICAL DISCIPLINES**  
Mechanical

ROOM	° C		NOTES
	WINTER MIN.	SUMMER MAX.	
Elevator Mechanical (Passenger and Equipment)	5*	25	HVAC or exhaust fan
Workshop	22*	22	Ventilation
Storage	20	22	Ventilation
Station secondary entrances and tunnels	N/A	N/A	Natural Ventilation
Hydro Vaults	N/A	N/A	per Electrical Authority
Shelters	N/A	N/A	Natural Ventilation/Heating

\* Electric heating if required (supplementary) to maintain 18°C winter temperature.

Note 1: High wall, heat pump with hyper heating and low ambient cooling (no night-time set-back).

**STATIONS**

- > Radiant heating should be considered in new Station buildings on a project by project basis.
- > Otherwise, Heating and Air Conditioning of the waiting area and the service area shall be achieved by one high efficiency, premium quality furnace c/w outdoor condensing unit.
- > The service area will have a VAV box controlled by a thermostat, while the main thermostat should be located in the janitor room and interlocked with the waiting area temperature sensor.
- > Communications room and Electrical room shall have dedicated split Heat Pump A/C unit for each room. Refer to Communications room section for HVAC and ventilation details.



CI-0703

**TAB 7: TECHNICAL DISCIPLINES**

Electrical

and shall be provided with signals for indication of UPS general alarms and with dial-in remote monitoring control, plus a remote alarm to the station alarm system.

Diesel is the preferred fuel for back-up generators. Where site and operational conditions do not allow for the use of diesel fuel, natural gas fuel powered generators are acceptable with GO approval.

**Natural Gas**

Natural Gas option is acceptable with approval from Metrolinx. The emergency fuel supply must meet the operation requirements written above, from the fuel supplier. The Design must include the hazardous fuel designations and appropriated steps taken with regard to fitting and equipment to make the area safe.

Rectifiers shall be used for backup DC power in maintenance and layover facilities where required.

**ESSENTIAL LOADS**

The following table shows a list of items that are considered to be essential. The table shows both backup power system conditions (i.e. Generator + UPS OR UPS only) and provides an estimated power draw for each item. The actual power draws shall be considered in the detail design and specification must be verified on a project by project basis.

<b>ESSENTIAL LOADS</b>				
<b>Essential Load</b>	<b>Estimated Power Draw</b>	<b>With Generator</b>		<b>With NO Generator</b>
		<b>Diesel Generator</b>	<b>UPS System</b>	<b>UPS System</b>
	<b>(Watts)</b>			
<i>Life Safety</i>				
Exit signs - buildings, tunnels and similar structures (LED type)	100	x		x + Life Safety
Public Address System	2,000	x	x	x
CCTV System	2,000	x	x	x
Any additional rack in the Comms Room	2,000 ea.	x	x	x + Life Safety
GO Transit telephone System	500	x	x	x
All Passenger Elevators and shafts	4,500 ea.	x		
Elevator controls	2,000	x		
Alarm Monitoring Systems	400	x	x	x + Life Safety
<i>Lighting</i>				



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**TAB 7: TECHNICAL DISCIPLINES**

Electrical

<b>ESSENTIAL LOADS</b>				
<b>Essential Load</b>	<b>Estimated Power Draw</b>	<b>With Generator</b>		<b>With NO Generator</b>
		<b>(Watts)</b>	<b>Diesel Generator</b>	<b>UPS System</b>
Tunnels, bridges and stairwell illumination (at least 1 fixture on normal power)	2,000	x		x + Life Safety
Electrical Room Illumination (at least 1 fixture on normal power)	100	x	x	x
Communications Room Illumination (at least 1 fixture on normal power)	100	x	x	x
Service Area Illumination	300	x		x
Waiting Area Illumination - minimal	1,000	x		x + Life Safety
Platform Lighting (Train and Bus)	9,000	x		
Main Parking Lots (Surface Parking)	Project Specific	x		
Parking Structures	Project Specific	x		
PPUDO (Passenger Pick up and Drop off)	Project Specific	x		
Bus Loop Lighting	Project Specific	x		
<i>Systems</i>				
Ticket Sales Equipment	3,000	x	x	x
Communications Equipment (white board, Pins etc...)				
Presto	4,500	x		
Door Operators (Building, vestibules, Shelters)	Project Specific	x		
<i>Mechanical</i>				



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**TAB 7: TECHNICAL DISCIPLINES**

Electrical

**ESSENTIAL LOADS**

Essential Load	Estimated Power Draw (Watts)	With Generator		With NO Generator
		Diesel Generator	UPS System	UPS System
Sump/Sanitary Pump	3,000	x		
HVAC for electrical & communication room	7,500	x		
HVAC for Service Counter and Waiting Area	Project Specific	x		
Water Heater Equipment	Project Specific	x		
HVAC and Exhaust of Elevator Shafts	Project Specific	x		
<b>Estimated Total Power Draw in Watts</b>		<b>280,000</b> (Varies with site conditions)	<b>15,000</b>	<b>15,000</b>

\* Public washrooms shall have their own dedicated plug-in emergency light fixture x

\*\* CHUBB security to be considered if automatic locking system is implemented

\*\*\* Tunnels, Bridges and stairwell assumed to be single tunnel and stair structure at both ends; separate conduit for emergency lighting

\*\*\*\* Satellite lots not to be included in emergency lighting

\*\*\*\*\* Presto system is backed up by its own UPS systems ( 20 and 30 amp receptacles.)



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TAB 7: TECHNICAL DISCIPLINES

Electrical

GENERATOR REQUIREMENTS

The generator shall be provided as a factory tested single unit and rated kW, 120/208 or 347/600 Volts, 3 phase, 4 wire, 60Hz, 1800 rpm. The generator shall be certified to CSA C22.2 No. 100, EEMAC MG1-22.40, and NEMA MG1, and shall meet the requirements of Ontario Electrical Safety Code, ESA, EPA, MOE, TSSA, along with all applicable local codes and regulations.

The generator shall be self ventilated and shall be a single bearing type direct coupled to the engine. Under short circuit conditions, the generator shall be capable of delivering sufficient current to enable protective breakers to trip.

Ambient working temperature: -35°C to 40°C

Acceptable noise level: MOE standards or as per table below at 7 °C or whichever is the most stringent.

1. Noise Matrix Table

Generators noise levels:

kW	dB(A)	meters
≤ 150	65	7.0
175 to 500	75	7.0
600 to 1200	80	7.0

A. Diesel Engine

1. The engine shall be EPA compliant with maximum nox plus hc of 3.87g/kw-hr.
2. ULC/CSA labelled double wall construction sub-base mounted steel fuel tank with an enough storage capacity to run the generator set at full load for 24 hours without refuelling. The tanks and fuelling system has to be accepted by TSSA and equipped with fuel paddling system.

B. Natural or propane Gas Engine

1. Include liquid cooled, spark ignition engine.
2. Furnish engine and cooling system capable of driving generator at specified load for minimum of 120 minutes, taking into account fuel type and altitude duration and at maximum ambient temperature of 122 deg F (50 deg C).
3. Isochronous Governor: Speed regulation plus or minus 0.25 cycle from no load to full load with two second recovery to steady state.
4. Integral 10-amp system battery charging system, unit mounted to maintain emergency system batteries at required charge levels.
  - a. Flexible engine connection fuel line.
  - b. Electric fuel solenoid valve.
  - c. Fuel line strainer.



**CI-0703****TAB 7: TECHNICAL DISCIPLINES**

Electrical

5. Dual Fuel Systems: Include the following:
  - a. cUL Listed Natural gas regulator for 7-14" water column gas pressure entering complete with the following cUL Listed installation accessories:
    - i. Flexible engine connection fuel line.
    - ii. Electric fuel solenoid valve.
    - iii. Fuel line strainer.
  - b. cUL Listed LP vapour regulator complete with the following cUL Listed installation accessories:
    - i. Flexible engine connection fuel line.
    - ii. Electric fuel solenoid valve.
    - iii. Fuel line strainer.
6. Accessories: Include replaceable type oil filters, dry type air cleaners, automatic choke, lubricating oils, greases, and coolant.

**2. Alternator**

- The alternator (generator) shall be 120/208 or 347/600 Volt, 3 phase, 4 wire, 60 Hz AC, drip proof, rotating field type with an integral exciter of the brushless or static type and a static voltage regulator utilizing silicon rectifiers on solid-state amplifiers.
- Voltage regulation shall be within plus or minus 2% of rated voltage for all loads from no load to full load. Output voltage shall be manually adjustable over a range of plus or minus 5% of rated voltage.
- Rotors shall be salient pole type with amortisseur windings. The generator shall include for 300% short circuit capability for 10 seconds.

**3. Engine-generator mounting**

- The engine and generator shall be aligned and mounted on a common fabricated steel base of sufficient rigidity to maintain adequate alignment. Approved adjustable steel spring vibration isolators shall be supplied with such set by the set manufacturer.

**4. Control panel**

- Environmentally sealed, solid state, microprocessor-based module for engine control, monitoring, protection and metering.
- The controller shall meet the CSA (Z462). The controller shall be listed under ULC and UL-508. Set-mounted controller capable of facing right, left, or rear shall be vibration isolated on the generator enclosure. Remote-mounted controller shall also be supplied.
- The microprocessor control board shall be moisture proof and capable of operation from -40°C to 85°C. Relays will only be acceptable in high-current circuits.
- Staging the load:  
When sizing a generator, stage the loads in the following order: Life safety equipment, Critical Loads and essential loads, and Elevators, Heaters, etc.
- The unit must be able to interface easily to provide remote monitoring and control capabilities over the METROLINX Windows based Network. Monitoring shall include, but not be limited to, the following:
  - a. Dual range voltmeter +/- 2% accuracy



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**TAB 7: TECHNICAL DISCIPLINES**

Electrical

- b. Maximum demand ammeter +/- 2% accuracy
- c. Voltmeter-ammeter 3 phase selector switch
- d. Battery charging voltmeter and AMP
- e. Coolant temperature reading
- f. Oil pressure reading
- g. Running time
- h. Direct reading frequency meter 0.5% accuracy on 45 to 65 Hz

**5. System protection**

- Circuitry to shut down the engine when signal for high coolant temperature, low coolant level, low oil pressure, or over speed is received. Circuitry shall be of plug-in design for quick replacement. Controller shall be equipped to accept a plug-in device capable of allowing maintenance personnel to test controller performance without operating the engine. The controller shall include:
  - a. Indicating Lights to signal:
  - b. Standard (Not-in-Auto (flashing red))
  - c. Equipment (Over crank (Red))
  - d. UPS + Generator Stop (Red)
  - e. High Engine Temperature (Red)
  - f. Over speed (Red)
  - g. Low Oil Pressure (Red)
  - h. Air Damper (Red)
  - i. Battery Charger Malfunction (Red)
  - j. Low Battery Voltage (Red)
  - k. Low Fuel (Red)
  - l. Auxiliary Pre-alarm (Yellow)
  - m. Auxiliary Fault (Red)
  - n. System Ready (Green)
  - o. Optional (Prealarm High Engine Temp. (Yellow))
  - p. Anticipatory (Prealarm Low Oil Pressure (Yellow))
  - q. Group (Low Coolant Temp. (Red))
  - r. Push to test button for indicating lights
  - s. Alarm horn with silencer switch per CSA (Z462).

**Note:** Terminals shall be provided for each signal in above, plus additional terminals for common fault and common pre-alarm

**6. Minimum required accessories**

- Line circuit breakers
- Dedicated load bank of 100% capacity for each generator (On Site)

There should be a load bank for testing available on site rather than bringing a load bank onto site and connecting and disconnecting it. This load bank shall be able to be added in steps for testing up to 110 of the generators capacity. The controller shall have provisions for disconnecting a load bank (during exercise) if there is a loss of normal power by an Electrical and Mechanical interlock through ATS.



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## TAB 7: TECHNICAL DISCIPLINES

Electrical

## 7. Exterior enclosure

**A. Exterior weatherproof enclosure:**

- a. Common keyed padlockable doors.
- b. Compliant with CSA Standard.
- c. Sound Attenuated.
- d. Capable of withstanding 150mph sustained winds.
- e. Designed to resist rainfall angles of up to 45 degrees without interior flooding.
- f. Enclosure to be rodent and serpent proof.

**B. Construction:**

- a. Aluminum panel construction.
- b. Power baked paint.

**C. Roof:**

- a. One piece pitched roof designed to prevent water accumulation.

**D. Exhaust System:**

- a. Internally mounted muffler and sound insulating Panels.
- b. Catalytic Converter: Include catalytic converter when defined by local codes.

**E. Doors:**

- a. Door Hardware:
  - i. Corrosion resistant, zinc plated or stainless steel.
  - ii. Hardware locks to be keyed the same.
- b. Door drip caps designed to keep moisture accumulation off the top of doors.
- c. Doors hinged to allow 180 degree opening.

**F. Sound Attenuation:**

- a. Generator to be sound attenuated.
- b. Average dB level, measured at 7 meters from generator center, at full load, not to exceed 73 db.

**G. Block Heater:**

- a. 1500 watt.

**H. Space Heater:** Include inside enclosure, thermostatically controlled to maintain 10 deg C, except when engine is running, in accord with CSA C282, 208v.

**I. Motorized Louvers:** Include on air intake to meet CSA C282, level 2 sound attenuated.

**J. Emergency Lighting:** Include inside enclosure, 50 lumens, DC battery powered, two hour operation, in accord with CSA C282.

**K. Engine Fluid Containment Pan:** Sized to 110 percent of available fluid in accord with CSA C282.



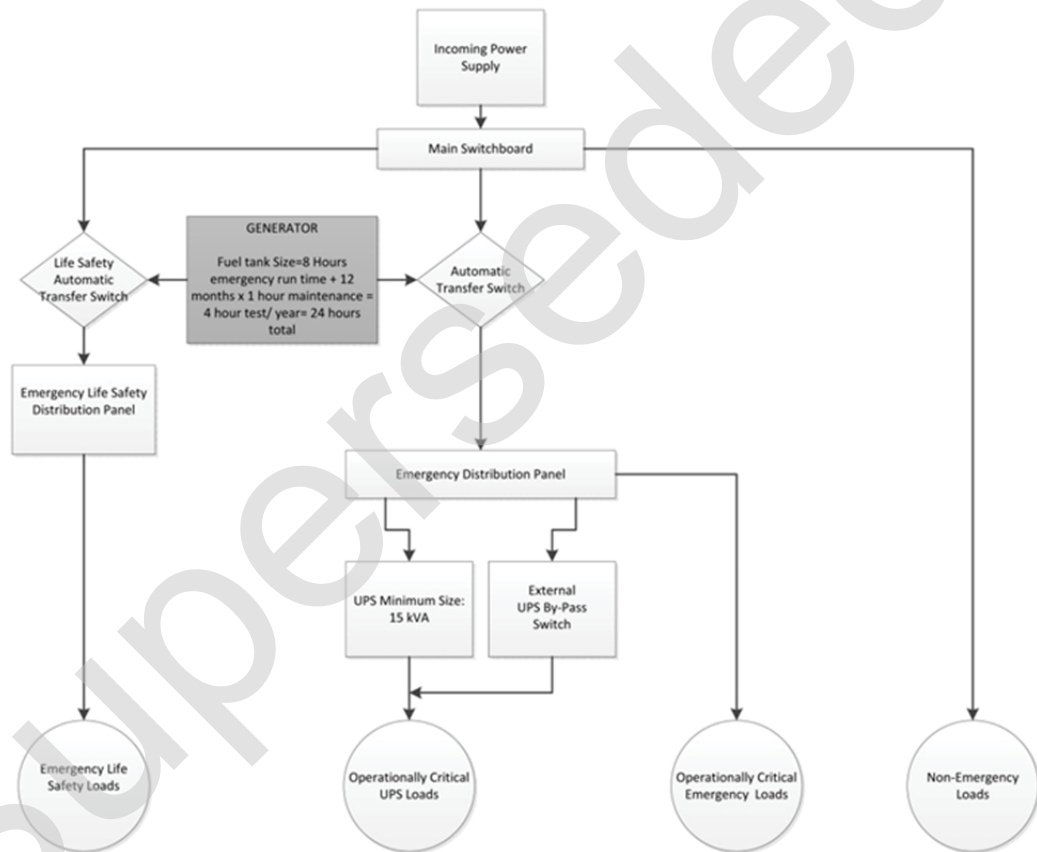
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**TAB 7: TECHNICAL DISCIPLINES**  
Electrical

FIGURE: EMERGENCY POWER DISTRIBUTION WITH GENERATOR

**SECTION:**  
Tab 7:  
Technical  
Disciplines

**FIGURE:**  
Emergency  
Power  
Distribution  
with  
Generator





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**TAB 7: TECHNICAL DISCIPLINES**

Electrical

**INTERIOR LIGHTING SOURCES AND CONTROLS**

Location	Light Source	Control and Backup
	mounted LED vandal resistant lenses	luminary on UPS + Generator
Public Washroom	LED, vandal resistant luminaries or valance or cove lights for large facilities	On/Off switch with occupancy sensor, one fixture on UPS + Generator
Electrical, Comms., Mechanical, Janitor, and Storage Rooms.	Linear LED 1219 mm long or surface mounted luminaries vandal resistant	On/Off switch with occupancy sensor, 50% on UPS + Generator in Mechanical, Electrical and Comms. Rooms only
Shop	Linear LED 2438 mm long, suspended. Task lights over equipment and workbenches to suit functions	Local switching or to suit particular application, 10% on UPS + Generator
Garage Maintenance Shop	LED for shops. LED Task lights where required	Panel or central switching to suit particular application. 10% on UPS + Generator or to Code requirements
Dispatch	LED, and supplementary illumination for maintenance with task lights to suit	Local switches, dimmers, 10% on UPS + Generator.
Office	Per IES	10% on UPS + Generator

**EXTERIOR LIGHTING SOURCES AND CONTROLS**

Location	Light Source	Control and Backup
Parking Lot, Passenger Drop-off and Pick-up Areas, and Bus Loop Areas including Bus Platforms.	LED area lights or down lights on 6 or 12 m high galvanized steel poles or 30m high masts (use of LED on 30m high masts approved by GO Transit on a case by case basis). See Notes below.	Circuited and dimmed for 30% in operation during station closed hours (photo-control only) and to have manual override of the photo control and time-clock (the manual override shall not be digital) on generator.
Access Roads	LED area lights or down lights on 6 or 12 m high galvanized steel poles or 30m high masts (use of LED on 30m high masts approved by GO Transit on a case by case basis). See Notes below.	Circuited for 30% in operation during station closed hours (photo-control only) and to have manual override of the photo control and time-clock (the manual override shall not be digital)
Parking Structure	LED	Day light harvesting and occupancy sensor control of two light levels and timer on generator



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**TAB 7: TECHNICAL DISCIPLINES**

Electrical

**EXTERIOR LIGHTING SOURCES AND CONTROLS**

<b>Location</b>	<b>Light Source</b>	<b>Control and Backup</b>
Rail Platform	LED on 6 m hinged poles on 300 mm high concrete bases or in canopy.	Both timer and photo cell controlled, on Generator. During station closed hours 100% off. Override switch (snow removal use): 100% on
Mini-Platform	Same as Rail Platform	Controlled as part of Rail Platform
Tunnel, enclosed bridges and canopies	LED , 1219 mm long, c/w vandal resistant lenses, lights should be dimmable, when space not occupied. Allow for at least 2 circuits, alternate circuits every other pole	Breaker control, 50% on UPS + Generator
Internal Stairwell (tunnel, parking structure)	LED luminaries, semi-recessed in walls, below handrails	Breaker control, 30% on UPS + Generator
Exterior Stair and Walkway	Same as parking lot, Pole location to suit	Same as parking lot



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**TAB 7: TECHNICAL DISCIPLINES**  
Communications

**TELEPHONE NETWORK**

**DESIGN REQUIREMENTS**

- > The main telephone switch shall consist of trunk lines supplied as either individual or T1 circuits to allow for local and/or long distance calling. The network is to be capable of interfacing with 4-digit dialling as well as integrating with the voice mail system.
- > Telephone switches at remote sites such as Middlefield or Wolfedale shall be linked to the main switch at Head Office to permit 4-digit dialling between all sites.
- > All systems are to be provided with backup power supplies from Uninterruptible Power Sources at each location and by generator power.
- > The network shall be capable of permitting paging to be performed through the local telephone system at all stations.
- > Provision shall be made for local caller I.D., call hold, call waiting, transfer and conferencing.
- > Individual telephones shall be speaker type, capable of accepting multiple lines and speed dialling.

**WIRING**

- > Conduits and power for the telephone network shall be provided at each trunk switch location.

**SECURITY SYSTEMS**

**BASIS OF CRITERIA**

Security at GO Transit Rail and Bus Stations is managed by integrated access control and alarm systems. These systems are supplied and installed, as well as monitored by Chubb Security Systems on a 24-hour basis.

**CODES AND STANDARDS**

The equipment, materials, installation methods and workmanship will be equal to or exceed the standards specified by the Canadian Standards Association, Electrical and Electronics Manufacturers Association of Canada, Ontario Electrical Safety Code, OBC, ULC, NFPA and all other current applicable codes.

**DESIGN REQUIREMENTS**





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**TAB 7: TECHNICAL DISCIPLINES**  
Communications

provides an estimate of the maximum wattage that each device requires. Table 1. shows power requirements for each device.

Device	Watts
SPOS (Station Point of Sale)	200
SFTP (Station Fare Transaction Processor)	35
CQD (Card Query Device)	35
HCR (Handheld Card Reader) Cradles	120

Table 1: Power Requirements

For Electrical wiring specifications, refer to Tab 7 Section CI-0703 Electrical

**Communications Rack**

In the Communications Room, the required receptacles, each fed from dedicated power circuits from a local non UPS (generator backed up), shall be provided at each CC Rack.

The types of receptacles required at the different locations are as follows:

Main CC Rack – Two (2) dedicated NEMA L5-20R (120V, 20A) mounted on cable tray fed from two (2) 15A breakers on different circuits, providing two (2) extension cords from the two (2) locked receptacles to reach bottom of the CC rack. The two extension cords shall include one (1) L5-20P plug each at top end of cords to plug into the twist lock receptacles and one (1) NEMA 5-20R receptacle each at bottom of cord (which accepts both NEMA 5-15P and NEMA 5-20P for plugging PRESTO UPS which is supplied by PRESTO supplier).

Main CC Rack if Transit Safety is included – In addition to Main CC Rack requirements, One (1) dedicated NEMA L6-20R (208V, 20A) mounted on the cable tray fed from One (1) 20A breaker, providing an extension cord from the locked receptacle to reach bottom of CC rack with one (1) NEMA L6-20P plug at top end to plug into twist lock receptacle and one (1) L6-20R receptacle at bottom of CC Rack (for plugging PRESTO UPS which is supplied by PRESTO supplier).

Secondary CC Rack - Two (2) dedicated NEMA L5-20R (120V, 20A) mounted on cable tray fed from two (2) 15A breakers on different circuits, providing two (2) extension cords from two (2) locked receptacles to reach bottom of the CC rack. The two extension cords shall include one (1) L5-20P plug each at top end of cords to plug into the twist lock receptacles and one (1) NEMA 5-20R receptacle each at bottom of cord (which accepts both NEMA 5-15P and NEMA 5-20P for plugging PRESTO UPS which is supplied by PRESTO supplier).

**PRESTO Devices**





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**TAB 7: TECHNICAL DISCIPLINES**

Communications

Each **SPOS** (at Service Counter) is locally backed-up by PRESTO UPS (provided by PRESTO equipment supplier) and the PRESTO UPS requires a separate NEMA 5-20R (120V, 20A) receptacle fed from a 15A breaker on a dedicated non UPS power circuit (generator backed up). The power outlet shall be located within a maximum 2 m of the service position and labeled with PRESTO.

**SFTP** and **CQD** devices require dedicated power circuits from UPS located in the CC Rack (UPS provided by PRESTO equipment supplier). Power for up to four (4) devices (SFTP and CQD) can be daisy-chain connected to the UPS in the CC Rack. If devices are daisy-chained, they shall be staggered such that devices in close proximity to each other will be fed on separate circuits. Each such circuit shall be protected by a circuit breaker which will also serve as an isolation point near the CC rack (see Standard Drawing PRES-002 Detail 3 for power wiring termination details at CC Rack location).



An individual ground wire for each SFTP and CQD shall be run and terminated in the copper ground bus at power junction box at CC Rack location.

At the CC rack end the plugs for the SFTP and CQD must be SOW Service Cord complete with Commercial specification grade (straight blade valise type as shown below) plugs to be connected to the PRESTO System UPS in CC Rack.

Example of PRESTO Device plugs (for illustration purposes only):



**CI-0704****TAB 7: TECHNICAL DISCIPLINES****Communications**

For Electrical wiring specifications, refer to Tab 7 Section CI-0703 Electrical

**Communications Rack**

In the Communications Room, the required receptacles each fed from dedicated power circuits from a local non UPS (generator backed up), shall be provided at each CC Rack.

The types of receptacles required at the different locations are as follows:

Main CC Rack if Station EUT is included – One (1) dedicated NEMA L5-20R (120V, 20A) mounted on cable tray fed from one (1) 15A breaker on different circuits, providing an extension cord from locked receptacle to reach bottom of the CC rack. The extension cord shall include one (1) L5-20P plug at top end of cord to plug into the twist lock receptacle and one (1) NEMA 5-20R receptacle at bottom of cord (which accepts both NEMA 5-15P and NEMA 5-20P for plugging PRESTO UPS supplied by PRESTO supplier).

Main CC Rack if Transit Safety is included - One (1) dedicated NEMA L6-20R (208V, 20A) mounted on the cable tray fed from One (1) 20A breaker, providing an extension cord from the locked receptacle to reach bottom of CC rack with One (1) NEMA L6-20P at top end to plug into twist lock receptacle and One (1) L6-20R at bottom of CC rack (for plugging PRESTO UPS supplied by PRESTO supplier).

Main CC Rack if Station Staging Area is included – Two (2) dedicated NEMA L5-20R (120V, 20A) mounted on cable tray fed from two (2) 15A breakers on different circuits, providing two (2) extension cords from Two (2) locked receptacles to reach bottom of the CC rack. The two extension cords shall include one (1) L5-20P plug each at top end of cords to plug into the twist lock receptacles and one (1) NEMA 5-20R each at bottom of cord (which accepts both NEMA 5-15P and NEMA 5-20P for plugging PRESTO UPS supplied by PRESTO supplier).

**PRESTO Devices**

In EUT (End User Training) environment:

**SFTP** and **CQD** devices in a EUT environment will be equipped with a plug and will require NEMA 5-20R receptacles in the EUT office.

Each **SPOS** (in EUT office) requires a NEMA 5-20R (120V, 20A) receptacle fed from a 15A breaker on a different circuit. The power outlet shall be located within a maximum 2 m of the device.

In Transit Safety office:

An **HCR** cradle has an input voltage of 120V AC and will require a NEMA 5-20R receptacle in the Transit Safety office.



CI-0704

**TAB 7: TECHNICAL DISCIPLINES**  
Communications

**BUS MAINTENANCE FACILITIES**

**ELECTRICAL CONNECTIVITY AND WIRING**

**General**

Wiring and circuit protection will be sized to suit the total wattage on circuit, to address potential voltage drops, and de-rating requirements for multiple circuits run in the same conduit. The following table provides an estimate of the maximum wattage that each device requires.

Table 1 shows power requirements for each device.

Device	Watts
SPOS (Station Point of Sale)	200
SFTP (Station Fare Transaction Processor)	35
CQD (Card Query Device)	35
HCR (Handheld Card Reader) Cradles	120

Table 1: Power Requirements

**Communications Room**

In the Communications Room, the required receptacles each fed from dedicated power circuits from a local non UPS (generator backed up), shall be provided at each CC Rack.

The types of receptacles required at the different locations are as follows:

Main CC rack for Bus WLAN Solution – One (1) dedicated NEMA L6-20R (208, 20A) mounted on cable tray fed from One (1) 20 A breaker, providing an extension cord from locked receptacle to reach bottom of CC rack. The extension cord shall include one (1) NEMA L6-20P at top end to plug into twist lock receptacle and one (1) L6-20R at bottom of CC rack (for plugging PRESTO UPS supplied by PRESTO supplier) and One (1) dedicated NEMA L5-30R (120, 30A) mounted on cable tray fed from one (1) 30A breaker, providing an extension cord from locked receptacle to reach bottom of CC rack. The extension cord shall include one (1) NEMA L5-30P at top end to plug into twist lock receptacle and one (1) L5-30R at bottom of CC rack (for plugging PRESTO UPS supplied by PRESTO supplier).

Main CC rack when Transit Safety is included – In addition to Bus WLAN solution above, One (1) dedicated NEMA L6-20R (208V, 20A) mounted on cable tray fed from One (1) 20A breaker on different circuit, providing an extension cord from the locked receptacle to reach bottom of CC Rack. The extension cord shall include one (1) NEMA L6-20P at top end of cord to plug into twist lock receptacle and an L6-20R at bottom of CC rack for plugging PRESTO UPS supplied by PRESTO supplier).



CI-0203

### TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT Parking Infrastructure -

#### ELECTRICAL SERVICES AND DESIGN CRITERIA

- > Investigate impact of parking structure on the existing electrical service because the existing service may not accommodate the additional load. Refer to the DRM for detailed requirements.
- > A Building Automation System should provide the most flexible control system available, Refer to C1-0702 Mechanical and to the Building Automation Systems performance specification for additional information. Multi-level lighting, occupancy lighting changes, light harvesting, programmable circuit control, IP addressable for future remote control, open architecture backnet/modbus compliant accessible through Microsoft windows software.
- > Emergency Backup Power Systems shall include, but not be limited, to the following:
  - Communications equipment, safety and security equipment shall be supported by a conditioned backup power source like a UPS.
  - Egress Lighting shall be on the UPS or use of battery powered light packs if a generator power source is not available.
  - For elevators , power back up requirements see essential load table in electrical section.
  - Generators shall be sized to meet the current load of the parking structure and nearby station's emergency load and 50% growth.
  - The generators should be sufficiently sized to permit lighting and dynamic signage to continue to operate (both in the parking garage and throughout the Station facility).
  - The generator should be located and positioned to minimize public exposure to noise, vibration, exhaust and Arc Flash (if hazard level is greater than 0).
  - All backup power systems shall have monitoring and alarms local and remote capability, and ability to connect by modem or internet. The ability to monitor and change set point remotely.
  - Appropriately sized fuel storage tank for the size and height of the parking garage shall be provided and shall have a minimum of 24hr support or generator.
- > The Generator and fuel tank are to be TSSA certified and a fuelling number provided.
- > Convenient 20 amp 5-20R duplex GFI receptacles shall be located at each stairway and elevator area, on each level, around equipment on roofs, in service and storage rooms, near entrances and exits and at convenient locations on each parking level.



CI-0501

**TAB 5: RAIL AND BUS OPERATIONAL FACILITIES**  
Bus Operational Facilities

**COMMUNICATIONS**

Feature	Design Requirements
	<ul style="list-style-type: none"><li>&gt; Security system</li><li>&gt; Building Automation System (BAS). Refer to Building Automation Systems performance specification for details.</li><li>&gt; Tank and Fuel Card Lock System</li><li>&gt; CCTV system</li><li>&gt; Signal lights</li></ul>

**MECHANICAL**

Feature	Design Requirements
Guidelines	<ul style="list-style-type: none"><li>&gt; Guidelines for the design, specification and installation of mechanical equipment are to be used in conjunction with GO's Design Requirements Manual.</li><li>&gt; The Consultant shall ensure that all applicable codes and standards are included in the construction documents.</li><li>&gt; Fire suppression systems should be provided in all applicable areas.</li><li>&gt; Domestic hot water will be supplied by natural-gas fire instantaneous hot water heaters.</li><li>&gt; Floor drains should be used in the office and general area and trench drains or precast concrete catch basins and degrease bays are to be provided in repair garages, bus bays and storage areas.</li><li>&gt; Control Flow of roof drainage with heat tracing shall be provided.</li><li>&gt; Stand pipe system for type "A" facilities shall be provided.</li></ul>



CI-0702

**TAB 7: TECHNICAL DISCIPLINES**

Mechanical

Acoustical and thermal duct insulation shall be in accordance with the O.B.C. and ASHRAE 90.1. Acoustical insulation shall be provided to maintain a maximum room sound rating of 40dBA. Piping insulation shall be in accordance with ASHRAE 90.1, with PVC jackets.

**SYSTEM CONTROL**

HVAC systems shall be controlled using programmable thermostats to achieve night setbacks. Interlocks for fire protection to be as per OBC and NFPA. If a room has 2 HVAC systems, both systems shall be controlled by a single programmable automatic heating/cooling changeover controller.

**BUILDING AUTOMATION SYSTEM (BAS)**

All facilities, stations and terminal buildings shall have a central computer-based, Building Automation System installed that will control and / or monitor the following building systems at a minimum:

<u>Mechanical</u>	<u>Electrical</u>	<u>Communications</u>
All ventilation and exhaust systems,	Power Systems,	Telecommunications Systems (excluding CCTV),
Fire Alarm Systems,	Lighting Systems,	PA and Intercom Systems,
All HVAC units and associated systems,	Programmable Logic Controller (PLC),	Security and Access Management Systems.
Air compressors, Chillers and Chilled Water,	Shelter Heater System,	
Vehicular and Pedestrian Gates and Doors,	Panel Loads per circuit,	
Gas, Hydro and Water,	SCADA Remote Monitoring,	
Sump pumps and Pits,	Car Counting System,	
Gas Detection Systems, Interlock with Detection System,	All third party (retail, users): power,	
Well water systems, if installed,	Environmental readings,	
Elevator Alarms,	Radio Systems (power consumption),	
Compressed air dryers,	Monitoring of signalling system capability,	
	Light conditions harvesting from perimeter sensors and	



CI-0703

**TAB 7: TECHNICAL DISCIPLINES**

Electrical

- > Local Hydro inspection procedures and approval requirements.

**POWER SUPPLY**

**INCOMING UTILITY SERVICES**

Utility services to a site or building will be supplied by the local Supply Authority (PUC). Services to an electrical room or kiosk shall be underground.

**SERVICE REQUIREMENTS**

- > Line Stations: 120/208 volt service or 347/600 volt; 400 amp min.
- > Maintenance, Repair, Shop and Garage facilities and facilities with elevators: 347/600 volt service.
- > Remote facilities: 120/208 volt service.
- > Incoming services, utility metering, dedicated GO Transit metering complete with remote monitoring, disconnected switches, distribution breakers shall be in one switchboard/distribution panel.
- > Where GO Transit has tenants, check meters shall be required. One for each tenant.
- > Service size shall be based on the application of conservative engineering design principles consistent with cost effective provisions for future station/terminal or other facility expansion.
- > Temporary facilities shall have overhead service.

Disconnect switches shall come equipped with visual means to ensure power disconnection (LED indicator or viewing window.) Utilization Voltages

Utilization voltages shall be as follows:

<b>UTILIZATION VOLTAGES</b>		
<b>System</b>	<b>Utilization</b>	<b>Voltage</b>
Lighting	LED	347V or 120 V 1 phase interior, 347 V or 120 V 1 phase for all





CI-0703

**TAB 7: TECHNICAL DISCIPLINES**  
Electrical

**UTILIZATION VOLTAGES**

System	Utilization	Voltage
Video Transmission		120V 1 phase + emergency power
Digital Clock System (network)		120V 1 phase + emergency power
Signage and Display System		120V 1 phase + emergency power
Wayside Power System:		600V 3 phase
Building Automation System		120V 1 phase + emergency power
Computers		120V 1 phase + emergency power
Fuel Management Systems		120/208V, or 600/347V 3 phase + emergency power
Sand Distribution Systems		120/208V, or 600/347V 3 phase + emergency power
Electric Vehicle Charging Systems		120V/208 1 phase
Car counting Systems		120V1 phase + emergency power



**CI-0703****TAB 7: TECHNICAL DISCIPLINES**

Electrical

Manholes and handholes shall be located remotely from doors and main road and pedestrian traffic areas.

No splices are permitted below grade.

Underground conduits entering Mechanical, Electrical and Communications Rooms from the exterior shall be sloped to ensure positive drainage away from room.

Underground raceways entering any Mechanical, Electrical or Communications Room shall be interrupted by a drained manhole or handhole within 3 m of the room.

The minimum opening in the top of the handhole shall be no smaller than 460 mm.

The lip of the handhole and manholes shall be identified as to the type of service within by means of grooves cut into the collar of the handhole or manhole. These markings are on the collar shall be 2 grooves; 3mm deep for communications in the direction of conduit in and out and 1 groove; 3mm deep in the direction of conduit in and out for electrical.

All electrical or communications handholes placed in the path of vehicular traffic or snow removal equipment shall be OPSD-2112.040 with OPSD-401.030 covers. If OPSD-2112.02 handholes are used, the covers shall be reinforced.

**RELAY PROTECTION AND METERING**

Relays shall have RS485 communication port and connectivity to monitoring system using Modbus RTU protocol as a minimum.

Communication ports of relays and meters on the bus shall be daisy chained from breaker cell to breaker cell and connected to a separate terminal block for connection to a SCADA system.

Phase overcurrent and ground fault devices shall be coordinated such that ground faults, short circuits or overloads will trip only the immediate upstream protective device from the point where the fault or overload occurs.

The Preliminary Arc Flash hazard study analysis shall be submitted along with the design drawings prior to the co-ordination study. The preliminary arc flash study shall be used to modify the design in order to minimize the hazard. The study shall also be used for the floor boundary marking. The Preliminary Short Circuit, Load flow and Co-ordination study analysis shall be submitted with design. The final studies shall be provided after purchasing of equipment.

Dedicated incoming digital metering, besides Hydro metering, and sub-metering, shall be provided, and shall measure true RMS current, voltage and display, minimum 3 years history capabilities. Units to be measured: per phase Volts, Amps, also kW, KVA KVAR, Pf, Hz, kW demand and peak.



CI-0702

**TAB 7: TECHNICAL DISCIPLINES**

Mechanical

Drainage interceptors,  Generator and Emergency Power Systems (loss of power, monitoring of damper status, batteries status and alarms),  All third party (retail, users): water, gas,  Well Water Systems,  Compressed Air Dryers,  Drainage Interceptors,  Layover Systems (Sand, Fuel, Air, Track Load).	by-pass detection,	
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Provide sub-metering for panels and sub-panels with remote communication capability from IT Central Gathering Centre.

The system should be able to store data for a minimum of three (3) years.

The local BAS shall be able to communicate and send information to an IT Central Gathering Centre.

The location of the BAS control panel and location of the outlets is to be included on the electrical drawings.

Refer to the Building Automation Systems performance specification for additional information.



CI-0501

**TAB 5: RAIL AND BUS OPERATIONAL FACILITIES**  
Bus Operational Facilities

**MECHANICAL**

Feature	Design Requirements
	<ul style="list-style-type: none"><li>&gt; Use CSA approved plumbing fixtures in all washrooms, showers, lunchrooms and kitchenettes and wherever else applicable.</li><li>&gt; Provide gravity drainage systems wherever possible.</li><li>&gt; Comply with code requirements for indoor air quality.</li><li>&gt; Ensure proper maintenance of repair garages, inspection pits, service lanes and storage garages.</li><li>&gt; High level ducted exhaust shall be provided.</li><li>&gt; Unit heaters or radiant heating system shall be provided at every external door location.</li><li>&gt; Central hot water generating and distribution system shall be provided.</li><li>&gt; Bus engine exhaust and bus auxiliary heater exhaust system, battery charging areas, lube room and hazardous materials storage, shall be provided.</li><li>&gt; Insulate ductwork and piping shall be provided as specified.</li><li>&gt; Piping materials which are compatible with environmental conditions shall be used.</li><li>&gt; Valves, thermometers, pressure gauges shall be installed as detailed.</li><li>&gt; Complete building automation system shall be provided. Refer to Building Automation Systems performance specification for details.</li><li>&gt; Where applicable, provide fuel storage and dispensing system which shall be designed and certified by a licensed engineer.</li><li>&gt; Provide gas fired, heated, multi-station pressure washer systems.</li><li>&gt; Provide vehicle wash systems as specified by GO standards.</li></ul>



CI-0703

### TAB 7: TECHNICAL DISCIPLINES

Electrical

- > Receptacles shall also be provided for tenants and vending machines as required; and
- > Communications room - minimum of 4 receptacles with 2 on emergency power.

## SWITCH GEAR, SWITCHBOARDS AND PANEL BOARDS

### GENERAL (TBD)

### SWITCHBOARDS

All components of the completed assembly shall be CSA approved and bear a CSA label.

Dimensional coordination: Verify that dimensions for switchboard do not exceed space provided.

#### Construction and Ratings:

Factory assembled, dead front, metal enclosed and self-supporting switchboard. Complete with line and load side terminations. Bus material to be copper, silver plated. Bus Bracing minimum 65 kA RMS.

Enclosure: CSA Type 2, Indoor use equipped with arc flash reduction protection. Control compartments to be installed on front of the board away from buses.

Future Provisions: Fully equipped spaces for future devices with bussing and bus connections suitably braced for short circuit currents. Allow for 25% spare breakers on new installations.

#### Monitoring and Metering:

Provide dedicated digital monitoring meters system and sub-meters c/w remote communication capability and capable of storing data for minimum 3 years.

#### Service Entrance Circuit Breakers:

Provide Sensor and trip plug, solid state trip circuit breakers, 100% continuous duty rating, factory mounted.

#### Trip Unit Functions:

Adjustable:

- long time ampere rating;
- long time delay;
- short time pick up;
- short time delay;
- Instantaneous pick up.

**CI-0703****TAB 7: TECHNICAL DISCIPLINES**

Electrical

Ground fault protectors as per OESC requirements.

If ground fault is required on main breakers provide ground fault protections for downstream breakers as well.

**PANELBOARDS**

Shall be flush or surface mounted as required, complete with hinged locking door and flush catch, and finished with corrosion-resistant primer, equipment gray. Surface mounted panelboards shall be installed on unistrut galvanized steel framing channels with 75mm clear between back of panelboard and wall. Where practical, panelboards shall be grouped in proximity.

Panelboard shall be copper bus type, with full capacity solid neutral design and sequence style bussing, composed of an assembly of bolt-in-place moulded case circuit breakers with thermal and magnetic trip and trip-free position separate from either the "ON" or "OFF" positions. Multi-pole circuit breakers shall have common simultaneous trip.

Overcurrent devices feeding emergency equipment shall be located only in electrical equipment rooms, and fitted with breaker locking devices.

Provide 30% spare breakers in panel; Allow for 30% spare Amp capacity and spaces in each panel.

Panel boards shall be provided with type-written directories indicating loads controlled by each circuit installed in metal framed clear acetate cover, affixed to the inside cover of the panel board.

Provide panels that will allow the monitoring and control of each circuit. The CT/PT, transducers, relaying, to be able to send information by means of a network connection and address system to both a local and remote communication to power monitoring system.

For retrofit panels, provide relays, CT's and PT's in a relay control panel as close as possible to the power meter monitoring system which is connected to the local and remote communication to power monitoring system.

Provide dedicated relay panel, smart panels, powerlink panels, multi circuit monitoring panel or equivalent, for circuit control, energy saving and monitoring capability. Requirements to be established on site by site basis together with Metrolinx.

**SWITCHGEAR**

All components at the completed assembly shall be CSA approved and bear a CSA label.

Dimensional Coordination: Verify that dimensions of switchgear do not exceed spaces provided.

Construction and Ratings

**CI-0703****TAB 7: TECHNICAL DISCIPLINES**

Electrical

Use arc-resistant, metal-clad switchgear, free standing, dead-front steel structure. Vendor shall provide details describing that arc-resistant testing of equipment.

The switch gear assembly shall be suitable for bolting each cell to steel rails embedded in concrete floor of a substation building.

Sheet steel barriers shall be provided between the vertical units and between the control compartments and the power compartments.

The switchgear shall be suitable for the future additions of units at each end.

A copper ground buss shall be installed for the entire length of switchgear, affording connection to all units and equipped with solderless #2/0-4/0 cable connectors at each end. Bus material to be copper, silver plated.

For outdoor units provide waterproof and tamper proof equipment.

Space heaters 240 volts, operated at 120 volts.

Meters, indicating lights, protective relays shall be mounted on the front of the switchgear panels and arranged in an approved, logical, symmetrical manner. Meters and readout devices shall be mounted at eye level (approx. 5'-6" A.F.F.).

Digital Metering and Relaying: Provide dedicated power monitoring meters system and sub-meters c/w remote communication capability and capable of storing data for minimum 3 years.

**POWER CIRCUIT BREAKERS**

The power circuit breakers shall be 3 pole, single throw, vacuum break, draw-out type, 5 cycle operation, with self-aligning primary and secondary disconnecting devices.

the breakers shall be 100% continuous duty, 5 cycle operation maximum. Each breaker shall be equipped with "stored energy operation" type, anti-pump operating mechanism. It shall be possible to open and close all breakers manually. Remote operation of each breaker from a remote control panel. OPEN and CLOSED complete with visual verification (indicating light). breakers to have capability of lock out, tag out, locked in open position.

The draw out mechanism shall hold breaker rigidly in the fully connected, and full test/disconnect position, with the door closed. Breaker shall be capable of being locked in the test/disconnect position. Breaker cell door handle shall be capable of being locked in the door closed position.

Interlocks shall be provided that will prevent disconnecting the breaker from the bus stabs or inserting the breaker into the bus stabs unless the breaker is in the tripped (open) position. Interlocks shall be provided to only allow installation of the properly rated breakers in the appropriate rated cells.

**CI-0703****TAB 7: TECHNICAL DISCIPLINES**

Electrical

Voltage surge, lightning, phase overcurrent and ground fault protection shall be provided as required.

For load protection other than motors use moulded case circuit breakers with thermal-magnetic trip technology wherever possible. Limit the use of electronic trip technology to situations where flexibility and coordination in circuit protection is necessary.

Only bolt-on circuit breakers may be used in panel boards.

**MOTOR CONTROL / MOTOR CONTROL CENTRES**

In general, circuit breaker type combination starters in Motor Control Centres shall be used for 600 volt motors. However, individually mounted circuit breaker type combination starters may be used where practicable. All starters shall be magnetic, full voltage start, single speed, non-reversing type (except when the driven equipment characteristics or power company limitations require other types), and shall be equipped with an additional one open and one normally closed contact for possible remote status indication at the Motor Control Centre. Each starter shall be equipped with 120 volt transformer and three thermal overload relays. To be able to be monitored, solid state overload relays to be equipped with controller capable of remote communication.

Each motor starter shall have stop and start button and/or hand/off/auto switch with indicator lights. A local heavy-duty unfused isolating disconnect shall be provided within sight of the motor to safely disconnect equipment for servicing.

The power for the control circuit shall be from the downstream of the breaker supplying power for the motor.

The MCC shall be built-up of vertical sections of the manufacturer's standard dimensions joined together to form a rigid free-standing, dead front structure. There shall be provision for future extension at both ends of each MCC and extension openings shall be covered with removable steel cover plates. Back to back MCC's sharing common horizontal and vertical bus shall not be allowed.

The rear of each vertical single sided power section shall have a bolted steel cover plate. All components shall be accessible from the front. The overall height of the MCC shall be approximately 2286 mm (90 inches), exclusive of the channel base and lifting angles.

Each MCC shall be provided with a steel channel base extending along the front and back of the MCC, complete with bolt holes for the purpose of bolting the motor control centre to the floor.

Horizontal control wiring trough shall be provided at the top and bottom of each section such that when sections are fastened together, they shall form continuous wireway that extend the full length of the control centre. Each vertical section shall be provided with an individual full-height wiring trough, which shall connect to the horizontal troughs at the top and at the bottom. Access to this trough shall be through a hinged door having captive type fastening. These wireways shall, when in service, provide complete isolation from all 600V bus and terminations and shall provide sufficient space to easily accommodate all power and/or control cables related to that section.



**CI-0703****TAB 7: TECHNICAL DISCIPLINES**

Electrical

Dead front bus barriers are required. The vertical bus shall have automatic shutters that isolate the bus from accidental contact when starters/wrappers are withdrawn. Blank sections, or future spaces, shall have similar barriers complete with removable covers for the bus stab openings. Each phase of the vertical bus shall be isolated and insulated from each other and form the front and rear compartments.

Where specified, "back to back" construction will consist of two standard single front access units mounted back to back with a double steel wall between the front and back unit. The front and back units shall have two separate buses and be provided with a bus interconnection link so that either side of the unit may be disconnected from the incoming cables.

The total Motor Control Centre assembly shall have a current fault rating according to short circuit calculation, unless specified otherwise on the MCC specification. In addition, all main and vertical buses shall be braced to withstand stresses developed by fault currents of minimum 42,000 amperes RMS symmetrical, verify with short circuit calculation.

For layover sites use 1200A rated MCC.

Provide MCC with arc flash reduction protection complete with pressure relief system, arc containment door latches, insulated power bus plates at the ends of each MCC line-up.

The incoming power supply cables shall enter either at the top or the bottom, as shown on the consultant drawings.

Provide top hat or bottom entry cabinet for service feeds.

Sufficient space shall be provided in the incoming section for the supporting and the termination of these incoming power cables.

Suitable compression type terminal lugs (YA hylug or equivalent) shall be provided. Lugs shall be long barrel, minimum two hole NEMA compression type for copper conductors. All connectors shall be provided. Each 3 phase connection shall be supplied with a reusable form fitting indoor insulating boot, suitable for voltage level application.

Digital Metering devices shall be housed in a separate compartment having no exposure to the 600 Volt bus or terminations. Metering compartments shall be installed such the metering unit is viewable at approx. 5' –6".

Metering shall be as specified on specification sheet. In addition, each MCC shall have an incoming Power Measurement meter. The meter shall be complete with Modbus RTU communications module, and 2 PT's and 3 CT's. Provide fuse blocks for PT's and shorting blocks for CT's.

Only dead front fuse holders shall be utilized in metering circuits.





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**TAB 7: TECHNICAL DISCIPLINES**

Electrical

**WAYSIDE POWER**

Wayside power requirements for trains and buses (bus layover bays). Refer GO STANDARD DRAWINGS.

**PROGRAMMABLE LOGIC CONTROLLER – RELAY PANEL (TBD)**

**POWER FACTOR CORRECTOR (TBD)**

**SELECTION OF BREAKERS (TBD)**

**PANEL REQUIREMENTS (TBD)**

**TRANSFORMERS (TBD)**

**MONITORING AND CONTROLS**

Installation of supervision monitoring and control systems at selected locations, will monitor status of equipment, power quality and demand, control and will provide capacity for automated reporting.

Metrolinx Main Computer Centre will monitor the selected sites via the Metrolinx Network.

Meter additions are considered in designated locations.

One (1) or a maximum of two (2) Internet Static (IP) addresses 10Mb will be required per selected Central Office. For each new installation, inform Metrolinx IT representative that a new IP address is required.

The Main Meter/Controller is set up with **BACnet network Card**.

Communication is established through Metrolinx Corporate Network utilizing TCP/IP.

Sub Meters are connected to the Main Meter/Controller through a local RS-485 communication bus.

The main meter/controller should ideally be placed in the control compartment of the main switchboard. If space is confined an auxiliary wall mounted box should be installed.

The cabling will be routed directly to the main meter/controller and the physical connection shall be isolated within the control compartment or the auxiliary Panel where the meter resides.

The compartment or the auxiliary Panel should be located in electrical room.



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### TAB 7: TECHNICAL DISCIPLINES

Electrical

Design and Installation should be done in AutoCAD. Send Cad design to Metrolinx Representative to confirm acceptance and allows comments.

#### Power Measurement Controller

At selected offices and sites install Power Measurement Controller, providing per-phase power monitoring, analysis and control capabilities, at each low voltage incoming main distribution point.

The following option shall be included depending on the applications:

Limit the required Digital Inputs and the Return Input in consideration of:

- 1) Connection with other Counters such as Gas Meter, Water Meter, etc. Counters taking in consideration that they can use the same return Input;
- 2) Synchronization with Hydro Meter.

#### Monitor Controller for MCC

At each motor control centre in selected central offices install a Power Measurement providing per-phase power monitoring and analysis.

#### Monitor Breaker Controller

At each supervised breaker in selected Central Offices, install Power Measurement meter providing per-phase power monitoring.

For local supervised breaker in remote Offices, install a breaker controller Power Measurement meter providing per-phase power monitoring.

#### Monitors for load sharing

When load sharing is required, install Power measurement meter providing per-phase power monitoring.

#### Monitor Panels or equivalent

Special monitoring panels are to be manufactured by an external supplier to house power meters.

The meters to be mounted at the factory into a metal box that needs to be attached on the wall as close as possible to the panel to monitor. The panels to include all the accessories to allow proper functioning of the unit (even the current transformers). All the current transformers not included in the power monitoring panels are split-core in order to allow installation without having to disconnect the power cables. A wide variety of monitoring panels are available depending on:

- a) The model on power meter model



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### TAB 7: TECHNICAL DISCIPLINES

Electrical

b) Amperage capacity

Panels to be available for the following Power Measurement meters:

- a) Main Power measurement controller,
- b) Monitor Controller for MCC,
- c) Monitor Controller for Breaker,
- d) Monitor Controller for load sharing.

Panels are available in different ampere capacities to accommodate the most common sizes of panels.

#### Electric Power Monitors – Installation

Coordination with Metrolinx Technical Support Representative:

The installation of power monitoring units in a Metrolinx Main Computer Centre office (number and models of units to install, location of units,) must be coordinated with a representative of the Metrolinx Technical Support group.

Install three (3) Current Transformers (CT's) even if a two (2) CT's arrangement is feasible, to ensure proper collection of the parameters and the waveform. Always provide CT's Shorting Device. When existing CT's are reused validate, their ratio in comparison with the load.

Even if not required by the manufacturer, install two (2) Potential Transformers (PT's) where there are no neutral conductors. Otherwise install three (3) PT's to prevent injuries and isolate the Meter from 600 V or 208 V Source. Ensure that primary and secondary PT's are protected with fuses (IC of 100 kA minimum). When existing PT's are reused validate, their accuracy (better than 1%) and their protection.

Connect all meter power supply from a UPS or inverter circuit.

Request commissioning by the manufacturer's representative for proper configuration.

Install the power meters in compartments of the switchboards, Power metering arrangement will vary among locations. The Metrolinx IT Representative will review each installation approach.

#### Physical location

Communication (i.e. BACnet network):

- > Supply a 6"x6" box on a wall as close as possible from the Main Power Measurement Controller master unit in electrical room.
- > Supply a 19mm conduit and a communication cable.



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### TAB 7: TECHNICAL DISCIPLINES

Electrical

- > Between the 6"x6" box and the Main Power Measurement Controller master unit, install a 19mm conduit and cable inside. The length of the cable must be 25' at the maximum.

#### RS-485:

- > Starting from the Main Power Measurement Controller master unit, install a 19mm conduit between all powers monitoring unit in order to create a daisy chain. The sequence used to link all those units has no importance.
- > Use #12AWG, 2 conductors cable with metal shield, type FT-4 to link all the power monitoring units.
- > The metal shield in the daisy chain sequence must be continuous.
- > When connecting the cable to the RS-485 port, the shield of the incoming cable must be linked to the shield of the outgoing cable.
- > The metal shield in the daisy chain sequence must be connected to the terminal of only one (1) power monitoring unit. This is to avoid a ground loop.

#### 120V power feed:

- > The 120V power feed of the power monitoring devices must continuous, i.e. come from a UPS or an inverter.
- > Install a 19mm conduit between the UPS or inverter and the Main Power Measurement Controller master unit.
- > Starting from the Main Power Measurement Controller master unit, install a 19mm conduit between all powers monitoring unit in order to create a daisy chain. The sequence used to link all those units has no importance.
- > Connect the 120V power feed of all power monitoring units to one UPS or inverter circuit of 15A.
- > Use a #12AWG cable, type multi-strand, for the 120V power feed.

#### Current Transformers (CT's):

Follow CT polarity at the time of installation. The dot must be towards the source (not towards the load).

- > Special case: when replacing an old analog meter by a new unit from Power Measurement, if the re-usage of existing CT's is needed, do not assume that the polarity of the existing CT's is correct. Functioning of an analog meter is not affected by the incorrect polarity of one or more CT but the functioning of Power Measurement is affected.



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**TAB 7: TECHNICAL DISCIPLINES**

Electrical

- > In the case of the Breaker controller and Power Measurement controller master units, the CT's must be installed at the output of the breaker (load side).
- > In the case of the Load sharing and MCC controller, if there is not enough space inside the Panel cabinet to install the CT's, install in the nearest structure located before the panel (example: pull-box, output of the transformer feeding the panel,...).
- > Use a #12AWG cable, type multi-strand; to link the CT's to the power monitoring unit. If the distance exceeds 25', use a #10AWG cable.
- > Cover the two connectors of each CT with black tape, 2000V.
- > CT's transformer will be split core type with a maximum of 3% of tolerance drift and ratio to five (5).
- > CT's transformer will be provided by contractor.

Voltage measurement points:

- > In the case of Breaker controller and Power Measurement controller master unit, the voltage measurement points must be installed at the input of the breaker (feeder side).
- > Use a #12AWG cable, type multi-strand, to link the voltage measurement points to the power monitoring unit. If the distance exceeds 25', use a #10AWG cable.
- > Special case: when the use of an external power measurement panel is not possible and the power monitoring unit must be installed directly on the front of an existing panel, the CSA specifications require is such a situation that we use Power Transformers (PT's) if the voltage of the point to monitor is more than 250V.

Status of breakers or/and automatic transfer switch:

- > When monitoring the status of breakers (or/and the automatic transfer switch), install a 19mm conduit between each breaker and the Power Measurement controller master unit.
- > The relay on the breaker (or the automatic transfer switch) must be Normally Open, form-A or form-C, dry type relay.
- > Connect the Main breaker or transfer switch relay contact on input I/O of Power Measurement controller master unit meter
- > Connect the Diesel Generator breaker relay where applicable
- > Use a #12AWG cable multi-strand, to link each breaker to the Power Measurement controller master unit.



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### TAB 7: TECHNICAL DISCIPLINES

Electrical

#### 20mA output signal:

When the 4-20mA output signals generated by the Controller for Breakers unit must be used, install a 19mm conduit between Controller for Breakers unit and the Energy Management System of the site.

Use a #12AWG, 2 conductors cable with metal shield, type FT-4 to link the Controller for Breakers unit to the Energy Management System of the site.

#### Commissioning:

When the installation activity performed by the electrician is done and that all monitoring units are functional, commissioning of these units must be performed.

An agreement with GO/ Metrolinx has to be signed for commissioning activities.

Commissioning agent to be present on site and verify the quality of installation, program and calibrate the monitoring units, verify the communication between the units and also between the Power Measurement controller master unit and the server.

#### Power Monitors – Monitoring Program

Install Monitoring Program to locally monitor all Power Meters at selected sites.

### PROVISION FOR INFRASTRUCTURE FOR FUTURE EV CHARGING STATIONS

- > If provisioning for future Electric Vehicle Charging Stations, provide empty conduit, complete with #12 AWG green insulated grounding conductor RWU90 for easy tracing terminated in a handwell, sized as per OESC (Ontario Electrical Safety Code) but, not smaller than 2" (50mm) for future use. Impact on existing power services and building infrastructure shall be investigated by the designer.
- > When considering the provision of Electric Vehicle Charging Station infrastructure, ensure the physical space required for an EV Charging Station panel is reserved in the Electrical Room for its future installation
- > EV Charging Station Design details as per Tab 2 CI-0203 Parking Infrastructure.

## SERVICE ROOMS

### GENERAL REQUIREMENTS



CI-0703

**TAB 7: TECHNICAL DISCIPLINES**

Electrical

- (iv) "DDDD - NN..."is one of following sources.
- (v) Outlet Assembly: YYYY- NN - nnn where:
  - A. "NN" is the source alpha-numeric identifier panel or rack, etc.;
  - B. "nnn" is a digit address .i.e. circuit number, etc.

<b>DESTINATIONS ID</b>		
<b>Service ID "XXXX"</b>	<b>Source ID "YYYY"</b>	<b>Destination ID " DDDD"</b>
"T" for telephone outlet.	"EU" for electrical utility supply	"EU" for electrical utility supply
"C" for data (copper) outlet.	"EG" for Emergency standby generator	"EG" for Emergency standby generator
"FO" for data (fiber) outlet.	"UPS" for Uninterruptible Power Supply or inverter	"UPS" for Uninterruptible Power Supply or inverter
"D" for data building automation system.	"COG" for cogeneration Power	"COG" for cogeneration Power
"FA" for fire alarms equipment.	"PV" for Photovoltaic power source	"PV" for Photovoltaic power source
"PA" for PA & intercom systems.	"DP" for distribution panel	"DP" for distribution panel
"FARE" for Presto Rack	"DPE" Emergency Distribution Panel	"DPE" for Emergency distribution panel
"RF" for radio system.	"DPU" for UPS distribution panel	"PP" for Power Distribution Panel
"S" for security systems.	"PP" for Power Distribution Panel	"PPE" for Emergency Power Distribution Panel
"TV" for CCTV and TV systems.	"PPU" for UPS Power Distribution Panel	"PPUn" for UPS Power Distribution Panel
"EL" for ELECTRICAL POWER.	"LP" for Lighting panel	"LP" for Lighting panel
"RK" for rack	"MCC" for motor control centre	"MCC" for motor control centre
"ST" for Station	"PDB" for Punch down block	"PDB" for Punch down block
"PG" for Parking Garage	"NS" for network server	"NS" for network server
"PF" for Platform	"RT" for router, multiplexer etc	"RT" for router, multiplexer etc.
"OB" for Outside Building (Bunker, Kiosk etc)	"RK" for rack	"RK" for rack
"CCTV" for CCTV Cabinets	"FL" for floor followed by B9-B1 - Sub Grade Floors or 1 - 99 - Above Grade Floors	"FL" for floor followed by B9-B1 - Sub Grade Floors or 1 - 99 - Above Grade Floors
"NET" for Network Cabinets	7. "RM" for room followed by : MC - Main Telecommunications Room or CR - communications Room	8. "RM" for room followed by : MC - Main Telecommunications Room or CR - communications Room (Any other space designated as a communications room which is not



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### 7.7.1 NETWORK CONNECTIVITY

Each of these devices requires a minimum of one network outlet. These network outlets are to be cabled back to the nearest telecommunications room network rack and terminated as per the copper horizontal cabling standard.

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### 7.7.2 POWER REQUIREMENTS

Each of these device locations requires a single 20amp duplex receptacle. These do not need to be connected to UPS / Emergency power and do not require a dedicated outlet. See Metrolinx DRM for electrical outlet specifications.

## 7.8 DIGITAL SIGNAGE

Each digital signage location shown on the electrical drawings must include data and electrical outlet locations as well as any enclosures or other infrastructure associated with these signs.

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### 7.8.1 NETWORK CONNECTIVITY

Each of these devices requires a minimum of one network outlet. These network outlets are to be cabled back to the nearest telecommunications room network rack and terminated as per the copper horizontal cabling standard.

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### 7.8.2 POWER REQUIREMENTS

Each of these device locations requires a dedicated single 20amp duplex receptacle for indoor locations. Outdoor locations require sizing based on external enclosure and screen power draws. All outdoor outlets must be GFI Type receptacle which may be reset at the NEMA enclosure. This is to be coordinated at time of design and must adhere to Metrolinx DRM for outdoor outlets.

## 7.9 BUILDING AUTOMATION SYSTEMS

Refer to CI-0702 Mechanical and to the Building Automation Systems performance specification.

## 7.10 BUILDING UPS TELECOMMUNICATIONS

All Metrolinx UPS systems must be connected to the Metrolinx network infrastructure for future monitoring.

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### 7.10.1 NETWORK CONNECTIVITY

Each of these devices requires a minimum of two network outlets. These network outlets are to be cabled back to the nearest telecommunications room network rack and terminated as per the copper horizontal cabling standard.

## 7.11 SERVICE COUNTER AREA FAX / PRINTER DEVICES

Each service counter booth will have a network printer, fax and copier device. This device shall be located on the electrical drawings along with the location of the below network and power outlets.



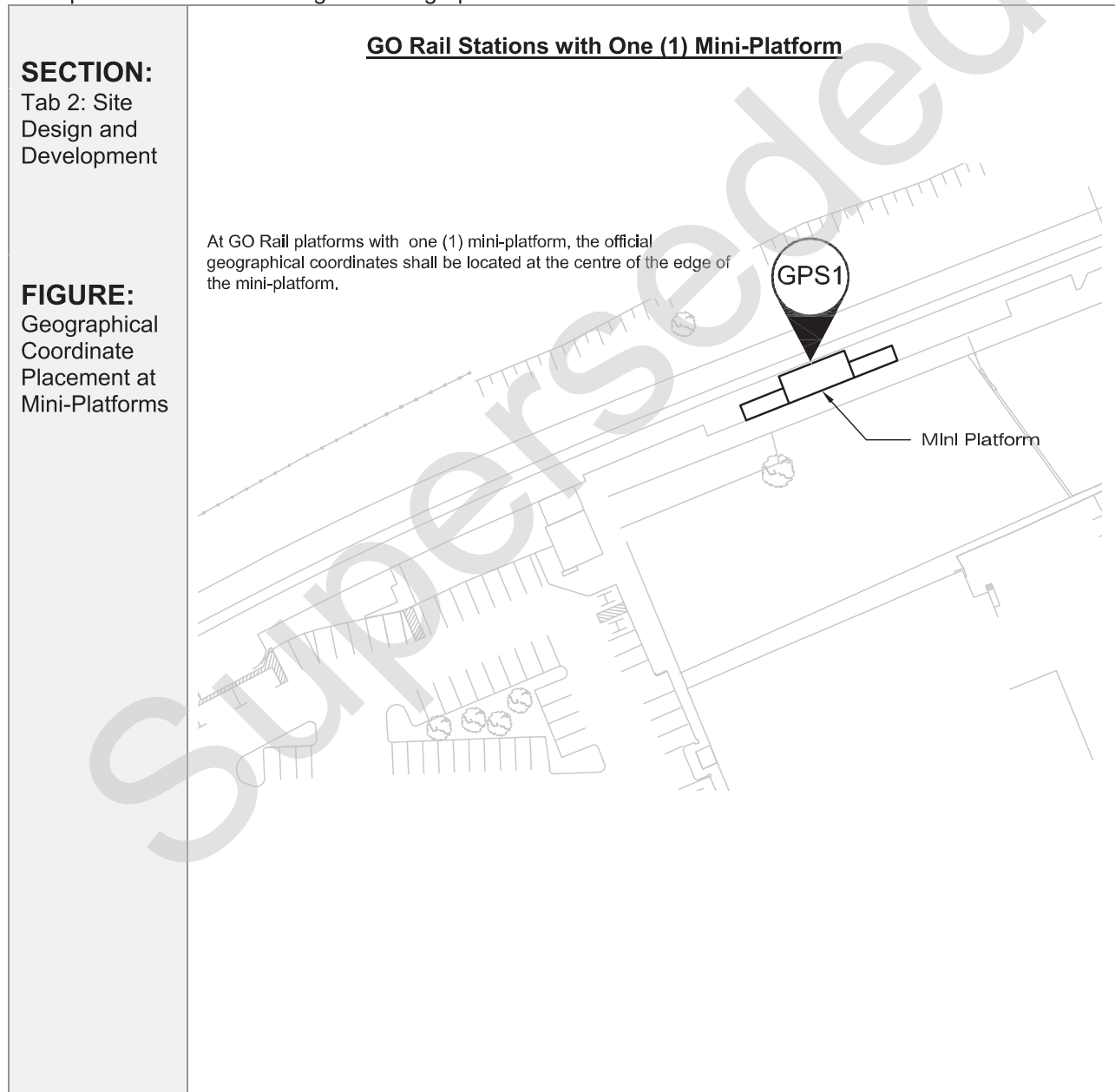


CI-0201

**TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**  
Station Sites

**STATION GEOGRAPHICAL COORDINATES**

For GO Stations, the official geographical coordinates are to be located at the centre of the edge of the mini platform as outlined in figure - Geographical Coordinate Placement at Mini-Platforms:





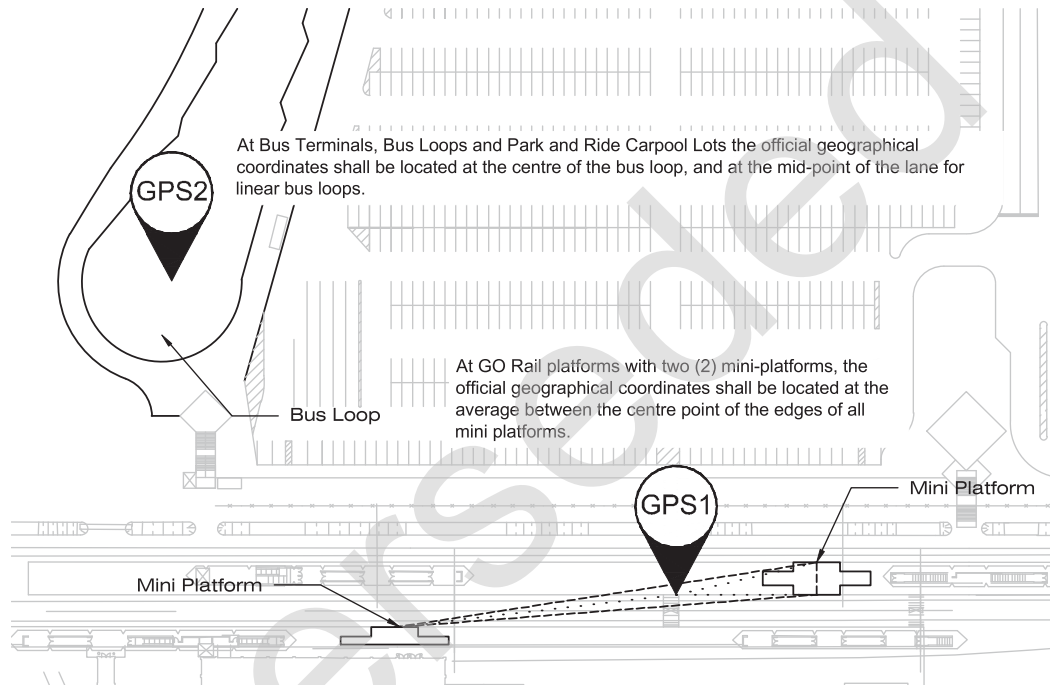
CI-0201

**TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**  
Station Sites

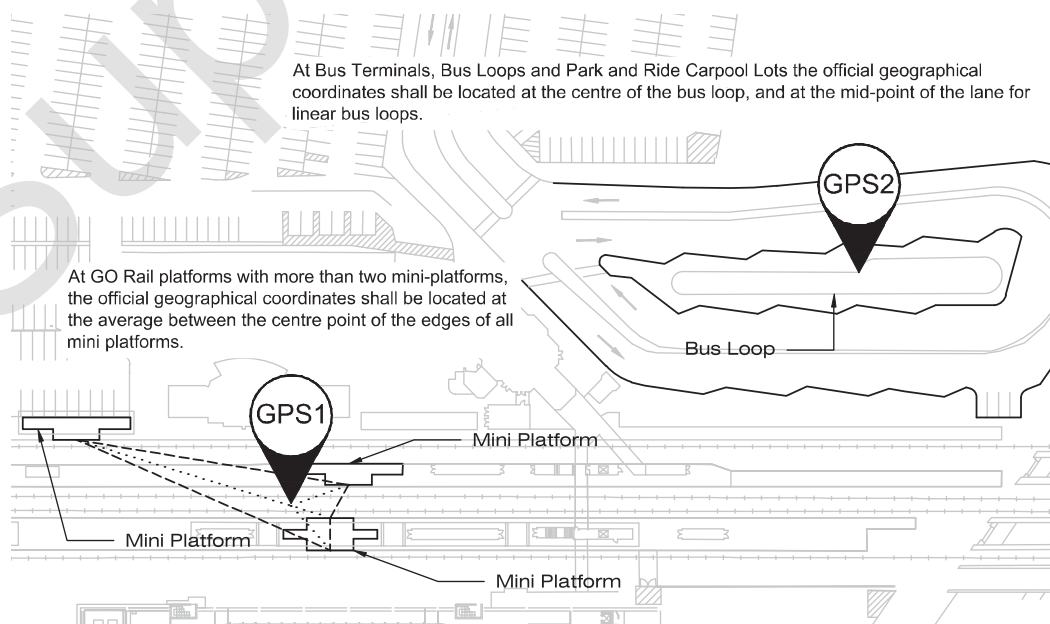
**SECTION:**  
Tab 2: Site Design and Development

**FIGURE:**  
Geographical Coordinate Placement at Mini-Platforms

**GO Rail Stations with Two (2) Mini-Platforms and a Bus Loop**



**GO Rail Stations with More than Two (2) Mini-Platforms and a Bus Loop**





CI-0201

### TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT Station Sites

#### **PROJECTION SYSTEM**

The following Reference Datums and Grid System shall be used, in accordance with: the MTO's Engineering Survey Manual dated October 2006:

- > **Map Projection:** 3-degree Modified Transverse Mercator (MTM).
  - o MTM Zone 10
- > **Horizontal Reference Datum:** North American Datum (NAD) 1983, using the NAD83 Canadian Spatial Reference System (CSRS) adjustment.
  - o Horizontal Datum / Ellipsoid: NAD83 CSRS v.6 (epoch 2010.0) / GRS80
- > **Vertical Reference Datum:** Canadian Geodetic Vertical Datum (CGVD) 1928.
  - o Orthometric Elevation: CGVD1928:78 Adjustment

#### **THREE-DIMENSIONAL GEODETIC CONTROL POINTS**

- > All GO Stations, Bus Terminals and Park and Ride Carpool Lots shall have three-dimensional geodetic control points installed with both Vertical and Horizontal known measurements.
- > Along the rail corridors, three-dimensional geodetic control points shall be installed and the monuments placed on fixed and stable structures including: bridges, abutments, retaining walls and grade separations.
- > Control points shall be placed on a fixed and stable structure, including, station buildings, parking structures, tunnels, bridges or abutments.
- > The horizontal coordinates may be derived by suitable technologies including RTK GPS, Photogrammetry or Total Station surveys.
- > At locations with existing geodetic control points, benchmarks shall be removed and replaced during construction.
- > For new construction or expansion, geo-reference plans need to be created or updated.
- > Accuracy:
  - o Horizontal Control Points:
    - Network Accuracy of 4 cm (95% Confidence Interval) for Northing, Easting and Ellipsoid Elevation relative to the Active Control Stations.



CI-0201

**TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**

Station Sites

- Local Accuracy of 2 cm (95% Confidence Interval) for Northing, Easting, Ellipsoid Elevation relative to the adjoining station baselines at each location.
- Vertical Control Points:
  - Elevation values of all installed monuments to be established by precise leveling. Methodology, equipment and procedures shall comply with “Vertical Control Survey Specifications”, MTO, May 2011. Vertical accuracy shall be 1st Order.
  - Level loops to begin and end on an existing 1st Order vertical benchmark. For each existing benchmark used, a stability check shall be done prior to commencement of leveling. All existing 1st Order geodetic benchmarks adjacent to a GO station must be measured.
  - In cases where stable 1st Order benchmarks do not exist in areas adjacent to a GO station, other benchmarks may be used subject to authorization and instructions from the GO lead surveyor



CI-0601

### TAB 6: WAYFINDING AND SIGNAGE

Static Signage

## DESIGN REQUIREMENTS

### INTRODUCTION

Static Signage design requirements have been developed based on criteria and rules related to conveying messages through the use of universally recognized pictograms; development of standard font, sizes, and colours, contrast, reducing overall sign text, and compliance with corporate branding.

These requirements have been compiled in the Static Signage Catalogue (Appendix).

This Catalogue is to be used as a guide in developing the static signage component of the way finding program at GO rail line stations (excluding Union Station) and facilities.

It includes a detailed listing of:

- > The product family;
- > Electronic drawing files; and
- > Methodology for design and implementation.

The Static Signage Catalogue does not include electronic signage.

### TYPEFACE

GO Polaris has been approved as the signage typeface of choice, for usage throughout the GO system (excluding Union Station), as outlined in catalogue.

### COLOUR

Consistent colours and information layouts should be applied to all stations so that users can familiarize themselves with the design and can more easily recognize the signs as belonging to the same transit system during their travels.

### ATTAINMENT OF MAXIMUM LEGIBILITY

Factors which affect legibility are: typeface, type size, contrast between text and background, sign location, and illumination and/or finish glare, as well as a number of words and symbols along with travel speeds.

If any of these elements are not properly addressed, the overall effectiveness of the sign system may be reduced.

Many of these elements are identified in the signage catalogue and above-reference standards; others include:



CI-0205

**TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**  
Civil Works

**STATION GEOGRAPHICAL COORDINATES**

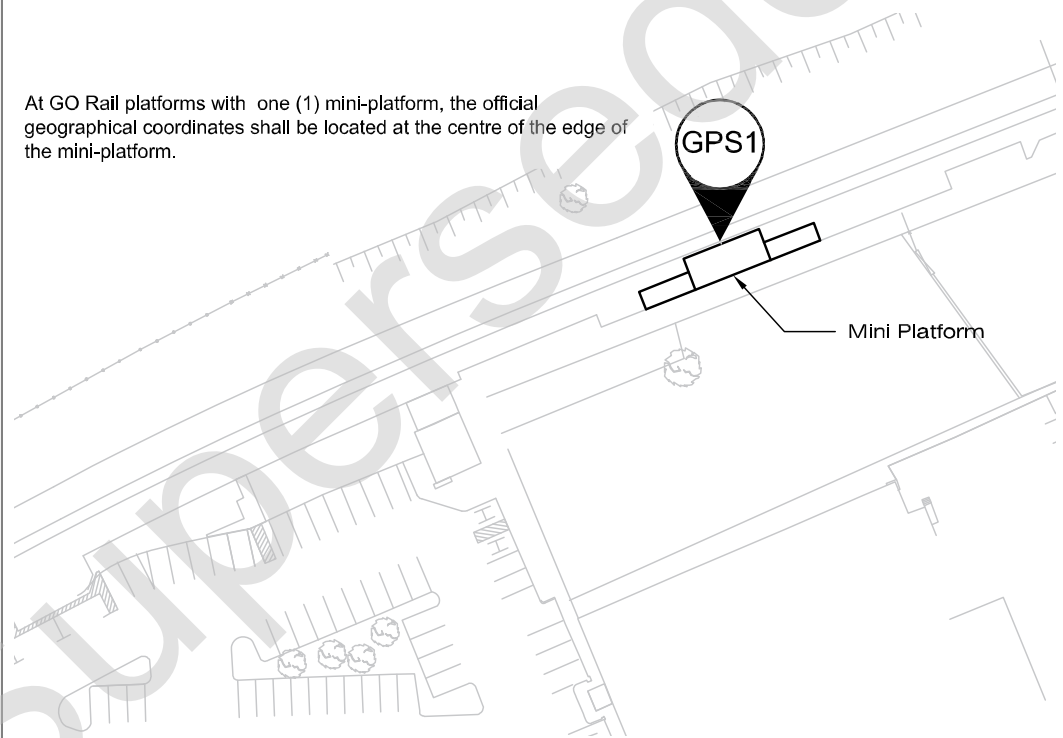
For GO Stations, the official geographical coordinates are to be located at the centre of the edge of the mini platform as outlined in figure - Geographical Coordinate Placement at Mini-Platforms:

**SECTION:**  
Tab 2: Site Design and Development

**FIGURE:**  
Geographical Coordinate Placement at Mini-Platforms

**GO Rail Stations with One (1) Mini-Platform**

At GO Rail platforms with one (1) mini-platform, the official geographical coordinates shall be located at the centre of the edge of the mini-platform.





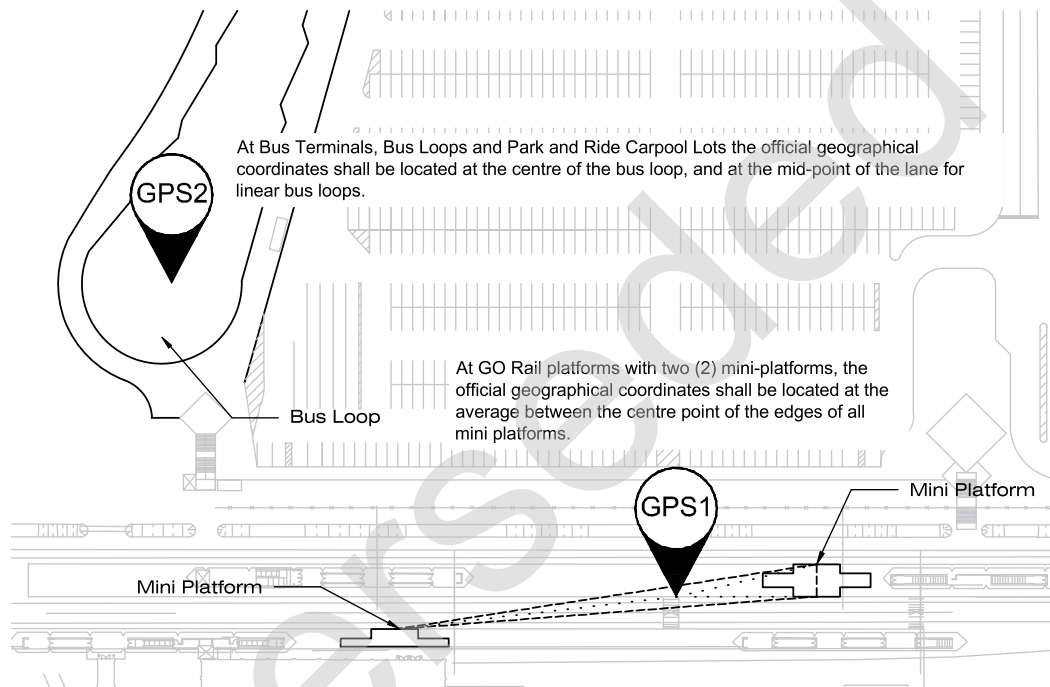
CI-0205

**TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**  
Civil Works

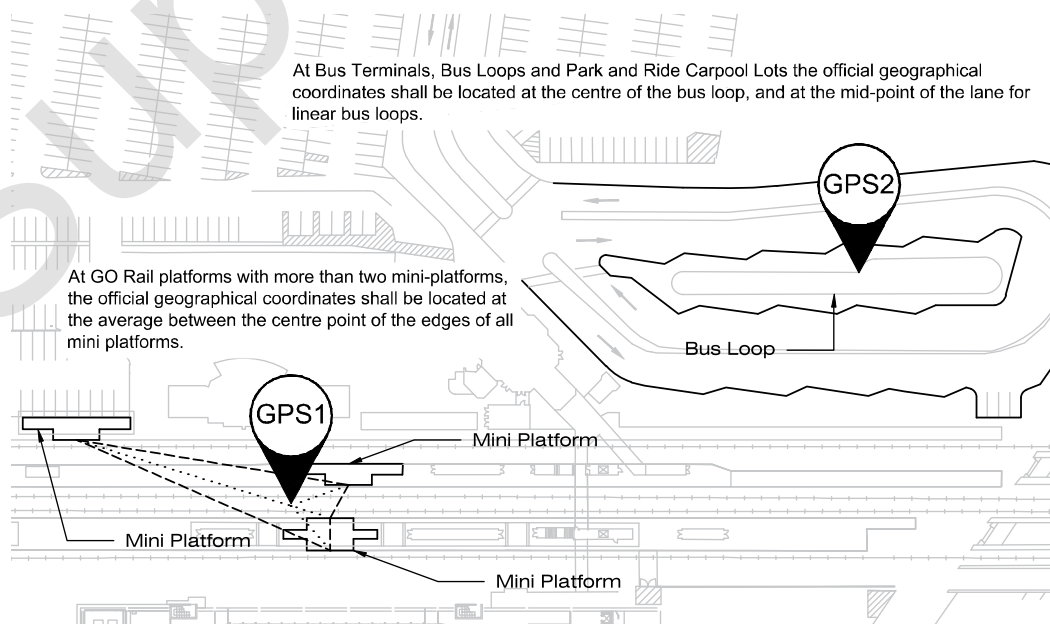
**SECTION:**  
Tab 2: Site Design and Development

**FIGURE:**  
Geographical Coordinate Placement at Mini-Platforms

**GO Rail Stations with Two (2) Mini-Platforms and a Bus Loop**



**GO Rail Stations with More than Two (2) Mini-Platforms and a Bus Loop**





CI-0205

### TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT Civil Works

#### **PROJECTION SYSTEM**

The following Reference Datums and Grid System shall be used, in accordance with: the MTO's Engineering Survey Manual dated October 2006:

- > **Map Projection:** 3-degree Modified Transverse Mercator (MTM).
  - o MTM Zone 10
- > **Horizontal Reference Datum:** North American Datum (NAD) 1983, using the NAD83 Canadian Spatial Reference System (CSRS) adjustment.
  - o Horizontal Datum / Ellipsoid: NAD83 CSRS v.6 (epoch 2010.0) / GRS80
- > **Vertical Reference Datum:** Canadian Geodetic Vertical Datum (CGVD) 1928.
  - o Orthometric Elevation: CGVD1928:78 Adjustment

#### **THREE-DIMENSIONAL GEODETIC CONTROL POINTS**

- > All GO Stations, Bus Terminals and Park and Ride Carpool Lots shall have three-dimensional geodetic control points installed with both Vertical and Horizontal known measurements.
- > Along the rail corridors, three-dimensional geodetic control points shall be installed and the monuments placed on fixed and stable structures including: bridges, abutments, retaining walls and grade separations.
- > Control points shall be placed on a fixed and stable structure, including, station buildings, parking structures, tunnels, bridges or abutments.
- > The horizontal coordinates may be derived by suitable technologies including RTK GPS, Photogrammetry or Total Station surveys.
- > At locations with existing geodetic control points, benchmarks shall be removed and replaced during construction.
- > For new construction or expansion, geo-reference plans need to be created or updated.
- > Accuracy:
  - o Horizontal Control Points:
    - Network Accuracy of 4 cm (95% Confidence Interval) for Northing, Easting and Ellipsoid Elevation relative to the Active Control Stations.





CI-0205

**TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**

Civil Works

- Local Accuracy of 2 cm (95% Confidence Interval) for Northing, Easting, Ellipsoid Elevation relative to the adjoining station baselines at each location.
- Vertical Control Points:
  - Elevation values of all installed monuments to be established by precise leveling. Methodology, equipment and procedures shall comply with “Vertical Control Survey Specifications”, MTO, May 2011. Vertical accuracy shall be 1st Order.
  - Level loops to begin and end on an existing 1st Order vertical benchmark. For each existing benchmark used, a stability check shall be done prior to commencement of leveling. All existing 1st Order geodetic benchmarks adjacent to a GO station must be measured.
  - In cases where stable 1st Order benchmarks do not exist in areas adjacent to a GO station, other benchmarks may be used subject to authorization and instructions from the GO lead surveyor

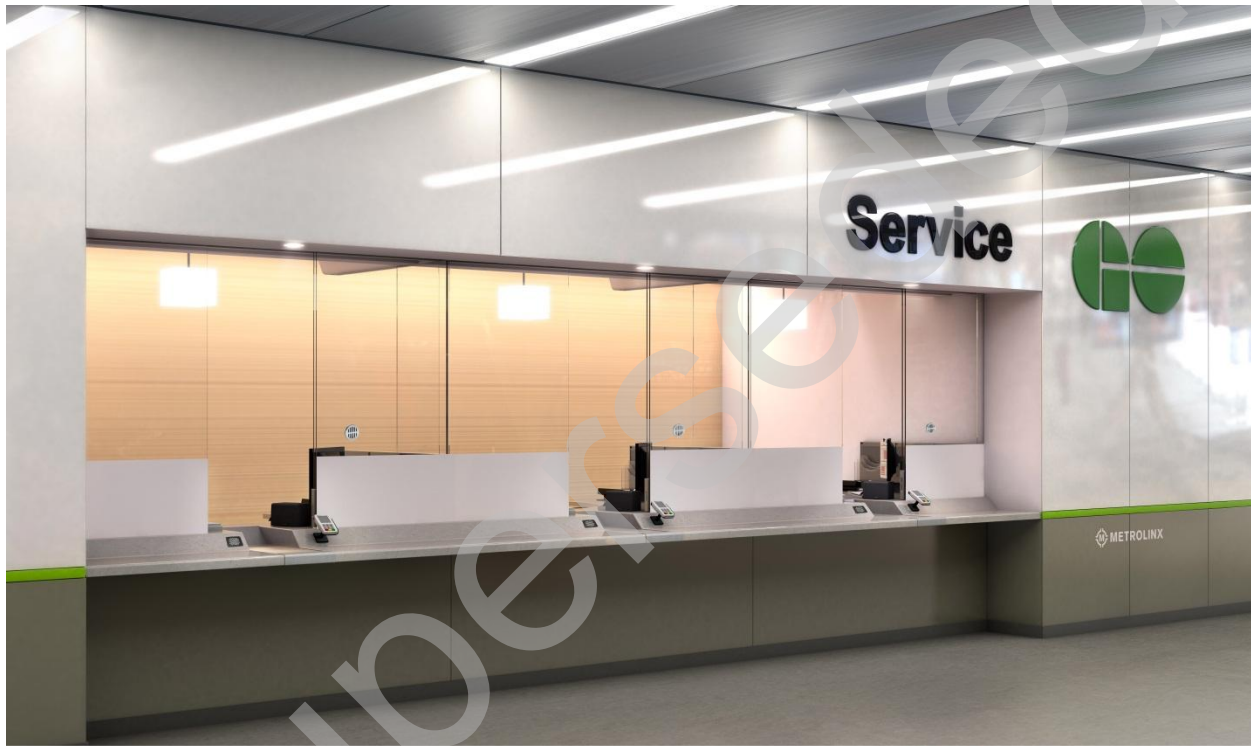


CI-0401

**TAB 4: STATION INFRASTRUCTURE**  
Station Buildings

SERVICE AREA

Feature	Description
---------	-------------



Overview	<ul style="list-style-type: none"> <li>&gt; The <i>GO Service Area</i> consists of the <i>GO Service Counter</i>, the <i>Back Storage Wall</i>, and the <i>Back of House</i> area. This Section will discuss requirements for each.</li> </ul>
Service Area  Service Counters	<ul style="list-style-type: none"> <li>&gt; Refer to the <i>GO Service Counter Standard Drawings</i> for design details and equipment requirements on the modular <i>Service Counter</i> within a larger <i>GO Service Area</i> for <i>Line Stations</i> in the <i>GO Transit</i> network.</li> </ul> <p><b>Service Counter Design Intent</b></p> <ul style="list-style-type: none"> <li>&gt; The design shall bias right-hand users with the majority of <i>Customer</i> interaction and tasks at the centre and to the right; support and operational functions and variable tasks to the left.</li> </ul>



CI-0401

**TAB 4: STATION INFRASTRUCTURE**  
Station Buildings

SERVICE AREA

Feature	Description
	<ul style="list-style-type: none"> <li>&gt; Curved desk on <i>Station Attendant</i> side for ease of rotation in movement and accessibility.</li> <li>&gt; Asymmetrical working space, bifurcated tasks: Right hand (Presto) and Left hand (Corporate PC).</li> <li>&gt; Large work surface to accommodate various working tasks.</li> <li>&gt; Centre glass opening for unassisted audible communication; lockable sliding glass panel for security.</li> <li>&gt; Provisions for combination intercom and audio loop systems to be included as alternate means of communication when glass is in closed position, as well as a passive speak through device with spit guard.</li> <li>&gt; Canted counter fascia on <i>Customer</i> side across length of counter for incorporation of future electronic innovations and privacy of <i>Customer</i> transaction procedures exclusive to each booth.</li> <li>&gt; Optional variable direction and volume individually controlled airflow below <i>Station Attendants'</i> work surfaces for individual comfort control.</li> <li>&gt; The <i>Service Counters</i> have been designed for standalone or linear modular array.</li> <li>&gt; <b>Special Requirement:</b> In stations with 4 or more <i>Service Counters</i>, and at the discretion of GO Transit, provide light-up counter, <i>Station Attendant</i> operated, to indicate an available service position. Number shall be mounted in front of the glass at each sales position, motion sensor, number to flash when a service position is available, remain on solid when an attendant is serving a customer, and turned off when the service position is unavailable/unmanned. Typeface to match Service counter signage is white text on grey background.</li> </ul>



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**TAB 4: STATION INFRASTRUCTURE**  
Station Buildings

SERVICE AREA

Feature	Description
General Service Area Requirements	<p><b>Service Area Requirements</b></p> <ul style="list-style-type: none"><li>&gt; Primary door into service area from public space should not have glazing.</li><li>&gt; Door into service area requires 'spy hole' to verify whether door opening is appropriate.</li><li>&gt; Door into service area to be operable with security wired pin pad.</li><li>&gt; Fire Extinguisher to be installed by primary service area door.</li><li>&gt; Intercom AI Phone (wall mounted in close proximity to the attendant).</li><li>&gt; Provide a network digital clock within direct sightlines of the Station Attendant either within the Service Area or in the adjacent waiting area.</li><li>&gt; One-way glass is required for any exterior windows looking into the service area other than the front customer facing counter glazing.</li></ul>
Service Area Back Storage Wall	<p><b>Back Storage Wall Design Intent</b></p> <ul style="list-style-type: none"><li>&gt; The wall behind the Service Counter is to be full-height cabinetry, finished with a birch wood look, flush with adjacent walls, doors, and door frames.</li><li>&gt; Cabinetry will have discreet pull door hardware, typical cabinet width to store extra supplies and specific devices; locked keyed alike.</li><li>&gt; Millwork doors in excess of 600mm (24") in width to have heavy duty hardware.</li><li>&gt; Provide adequate gable supports as required at midpoint of each shelf to prevent warping / deflection when loaded with supplies.</li></ul> <p>It will house the following equipment:</p>



CI-0401

**TAB 4: STATION INFRASTRUCTURE**  
Station Buildings

SERVICE AREA	
Feature	Description
	<p><b>Multi-Functional Printer</b> (MFP; in an open alcove)</p> <p><b>Courier Box</b> (Outgoing &amp; interoffice mail)</p> <p><b>First Aid Kit</b> (270x400x70mm)</p> <p><b>Translation Phone</b> (communal storage when not in use, requires power for charge station).</p> <p><b>Flashlights</b> (communal storage for flashlights, requires power for recharging batteries).</p> <p><b>Storage Area for Lost &amp; Found</b></p> <p><b>Shelving and drawers for storage</b> (below MFP alcove)</p>
Service Area Security	<ul style="list-style-type: none"> <li>&gt; Coordinate CCTV camera locations with CCTV section of DRM. Consider camera placement to avoid visual conflicts, such as with the pendant light fixtures.</li> <li>&gt; A CCTV monitor mounted within the <i>GO Service Area</i> showing live camera feeds of the station shall be in direct sightline to <i>Station Attendant</i> but not to Customers. Monitor need only be mounted at one end of Service Counter when 1 or 2 service positions are provided. For a <i>GO Service Area</i> containing 3 or more Service positions, 2 or more monitors are required. The following equipment must be housed in proximity to the CCTV monitor at a usable counter height:               <ul style="list-style-type: none"> <li><b>CPU</b> (675x400mm; cable to monitor max 3.9m)</li> <li><b>Keyboard &amp; Mouse</b></li> </ul> </li> </ul>



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**TAB 4: STATION INFRASTRUCTURE**  
Station Buildings

SERVICE AREA

Feature	Description
Back of House Count Room	<p><b>Count Room Requirements</b></p> <ul style="list-style-type: none"><li>&gt; Coat closet with louvered doors.</li><li>&gt; Open, adjustable shelves.</li><li>&gt; Bank of drawers for storage.</li><li>&gt; Workstation for counting and populating tills; provide knee space below.</li><li>&gt; Corporate PC, monitor, keyboard, mouse.</li><li>&gt; 2 Legal size filing cabinets.</li><li>&gt; 2 - Half Sized Lockable Lockers (pad lock) per service position. When lockers cannot be in back of house, consider oblique views when locating lockers behind counter so that they are out of public sight.</li><li>&gt; Float Safe with 300mm raised base (shall not be visible to the customers).</li><li>&gt; Water cooler.</li><li>&gt; Exterior windows in back of house to be limited to transom height and with One-way glass.</li></ul>
Back of House Kitchenette	<p><b>Kitchenette</b></p> <ul style="list-style-type: none"><li>&gt; Single stainless steel sink</li><li>&gt; Mini fridge</li><li>&gt; Microwave</li><li>&gt; Waste and recycling bins</li><li>&gt; 2 - 15 Amp GFI receptacles</li></ul>



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**TAB 4: STATION INFRASTRUCTURE**  
Station Buildings

SERVICE AREA	
Feature	Description
	<ul style="list-style-type: none"><li>&gt; Upper and lower cabinets for storage</li></ul>
Back of House Service Attendant Washroom	<p>Service Attendant Washroom</p> <ul style="list-style-type: none"><li>&gt; Shall be designed to barrier free standards</li><li>&gt; Vanity with sink</li><li>&gt; Floor mounted tank toilet</li><li>&gt; Soap Dispenser</li><li>&gt; Coat hook</li><li>&gt; Wall mounted air freshener</li><li>&gt; Single Roll toilet paper dispenser</li><li>&gt; Stainless Steel Recessed Paper towel dispenser</li><li>&gt; Waste receptacle</li></ul>



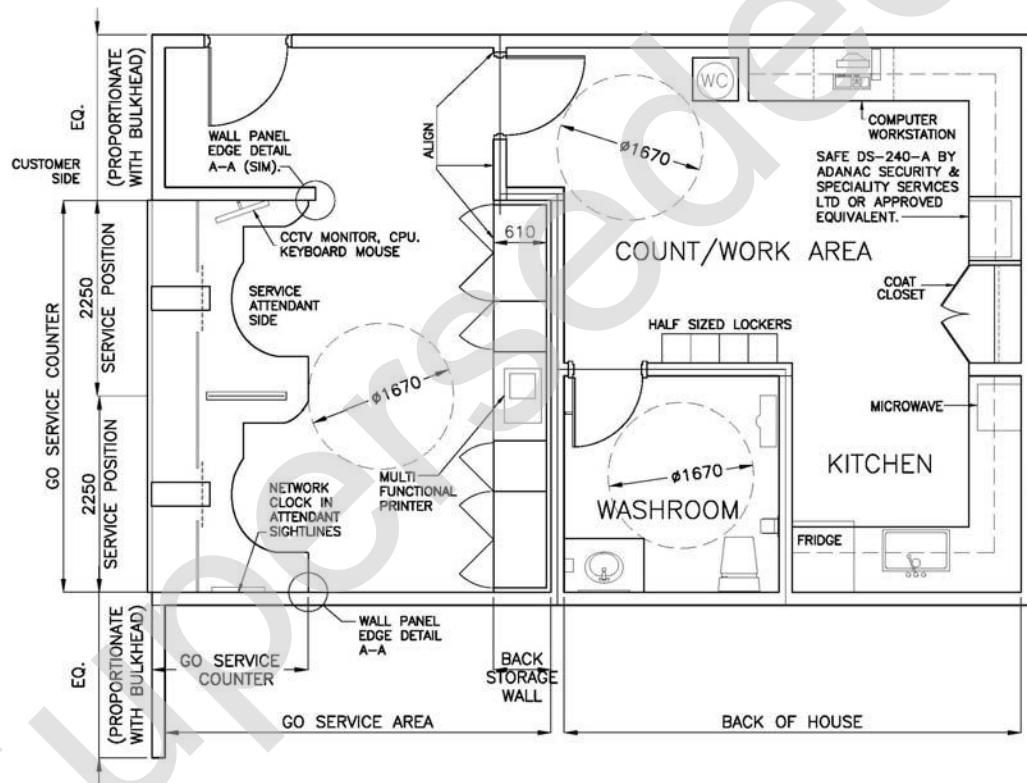
CI-0401

**TAB 4: STATION INFRASTRUCTURE**  
Station Buildings

FIGURE: OVERALL SERVICE AREA

SECTION:  
Tab 4 Station  
Buildings

FIGURE:  
Overall  
Service Area  
Plan Example



OVERALL SERVICE AREA PLAN EXAMPLE





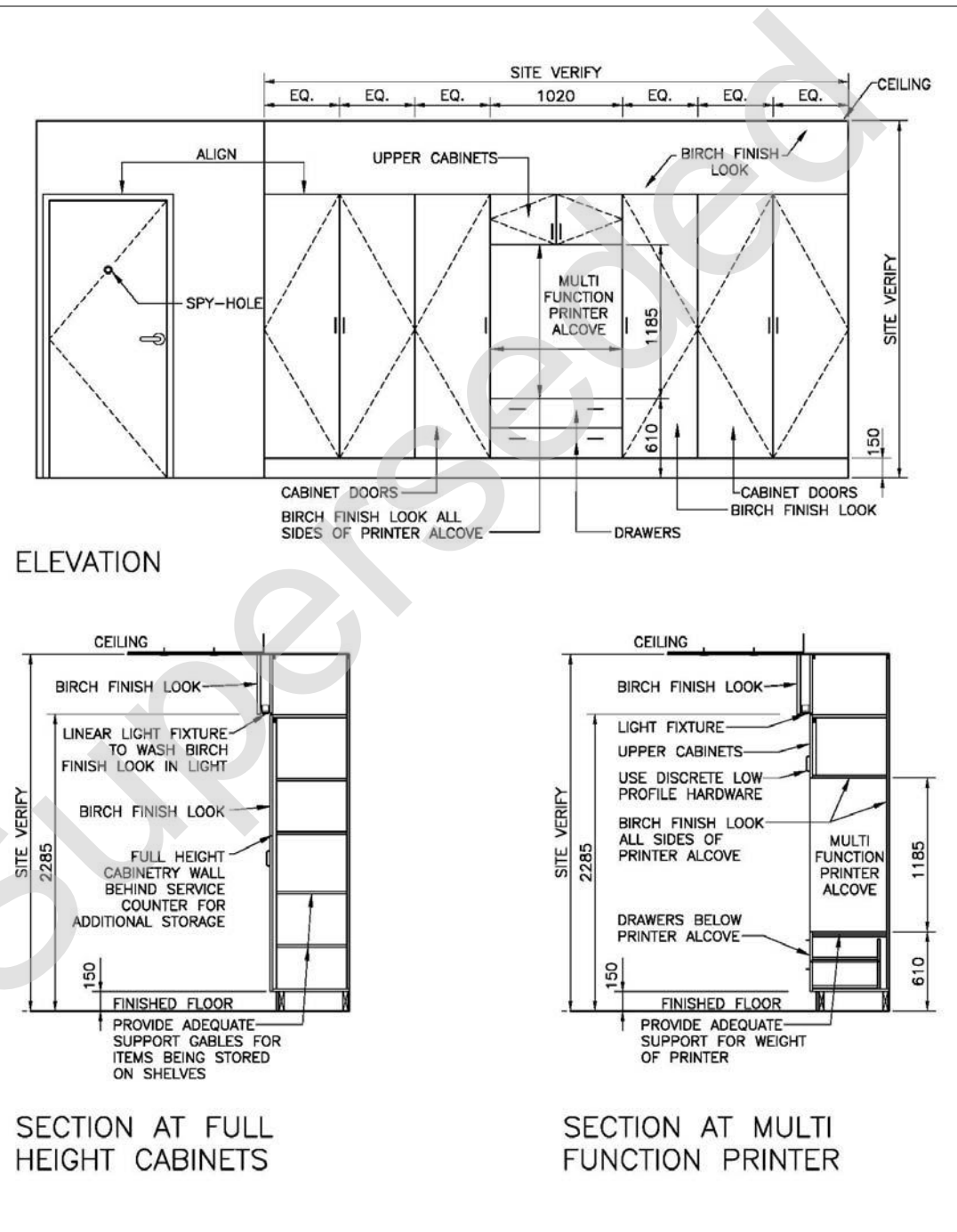
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**TAB 4: STATION INFRASTRUCTURE**  
Station Buildings

FIGURE: BACK STORAGE WALL

SECTION:  
Tab 4 Station  
Buildings

FIGURE:  
Back Storage  
Wall –  
Elevation and  
Section





CI-0401

**TAB 4: STATION INFRASTRUCTURE**  
Station Buildings

**MATERIAL PALETTE**

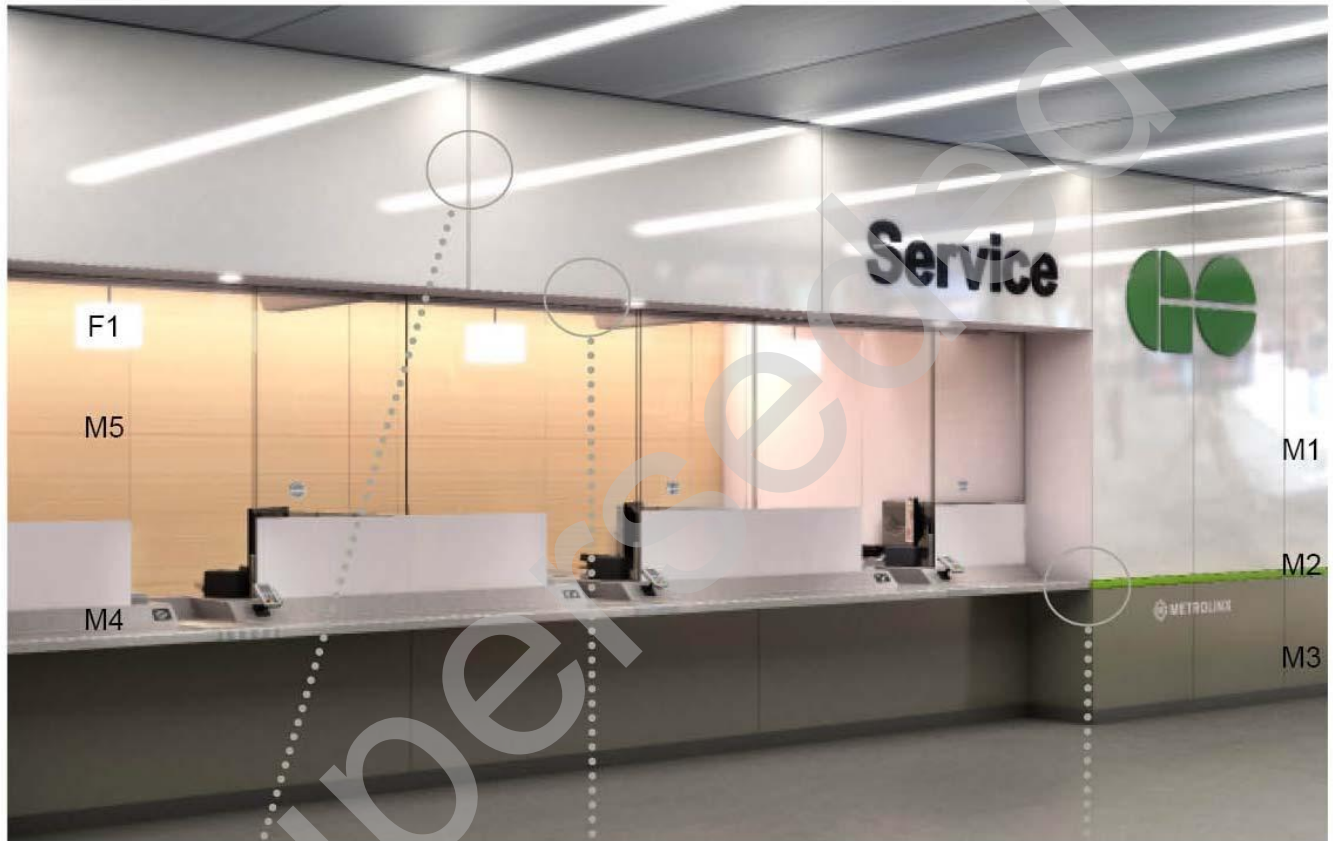
<p><b>M1</b></p> <p><b>MATERIAL</b> - large format dimensional panels</p> <p><b>FINISH &amp; COLOUR</b> - non-porous, smooth finish  - colour to match white RAL 9016c</p> <p><b>USE</b> - GO Service elevation above glass and flanking walls, above M2 -no horizontal joints</p> <p><b>FEATURES</b> - durable for public applications, easy to maintain, fire and chemical resistant, VOC free - high recycled content material (optional)</p>	<p><b>M2</b></p> <p><b>MATERIAL</b> - alternate material than adjacent materials M1 &amp; M3 (such as - anodized metal strip)</p> <p><b>FINISH &amp; COLOUR</b> - smooth, glossy or polished finish - colour to match light green Pantone 376c</p> <p><b>USE</b> - GO Service elevation between white and grey/green panels</p> <p><b>FEATURES</b> - flush with adjacent wall materials - width of strip to match thickness of countertops, align with countertop edge.</p>	<p><b>M3</b></p> <p><b>MATERIAL</b> - large format dimensional panels</p> <p><b>FINISH &amp; COLOUR</b> - non-porous, smooth finish  - colour to match green/grey Pantone 417c</p> <p><b>USE</b> - GO Service elevation below countertop and flanking walls, below M2 - match joint lines of M1</p> <p><b>FEATURES</b> - durable for public applications, easy to maintain, fire and chemical resistant, VOC free - high recycled content material (optional)</p>
<p><b>M4</b></p> <p><b>MATERIAL</b> -Solid polymer surfacing</p> <p><b>FINISH &amp; COLOUR</b> -non-porous, smooth, polished finish -colour to match 'Corian Dove'</p> <p><b>USE</b> -countertop in GO Service Areas</p> <p><b>FEATURES</b> -ensure all edges or aprons are sufficiently rounded</p>	<p><b>M5</b></p> <p><b>MATERIAL</b> - wood, wood veneer</p> <p><b>FINISH &amp; COLOUR</b> - birch wood look</p> <p><b>USE</b> - back Service Wall cabinetry doors, and any millwork visible to the customer - adjacent walls, doors, door frames where applicable</p> <p><b>FEATURES</b> - door frame(s), door(s), and walls, to be flush with full-height cabinetry</p>	<p><b>F1</b></p> <p><b>FIXTURE</b> - 200mm cube, LED light fixture with closed bottom</p> <p><b>FINISH &amp; COLOUR</b> - matte - colour to match white RAL 9016 - stainless steel finished metal on hanging rod</p> <p><b>USE</b> - above each service position</p> <p><b>FEATURES</b> - durable for public applications, easy to maintain, fire and chemical resistant, VOC free - high recycled content material (optional)</p>



CI-0401

**TAB 4: STATION INFRASTRUCTURE**  
Station Buildings

**GO SERVICE COUNTER MATERIAL INTENT**



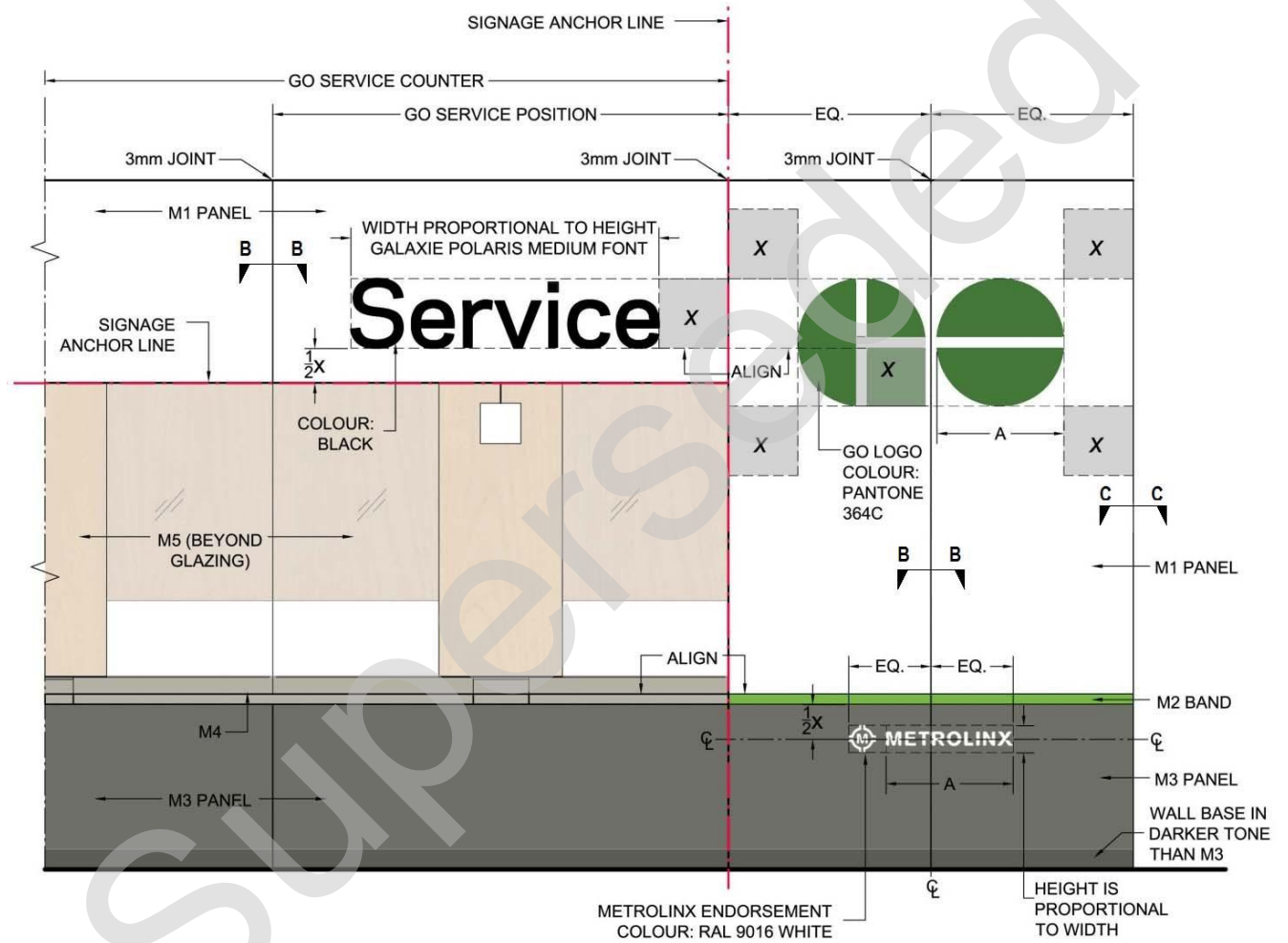
SEE DETAILS A-A, B-B & C-C FOR PROVISIONS OF ALUMINUM TRIMS TO VERTICAL JOINTS IN M1 AND M3 - IF USING PORCELAIN LARGE FORMAT DIMENSIONAL PANELS



CI-0401

**TAB 4: STATION INFRASTRUCTURE**  
Station Buildings

**GO SERVICE COUNTER SIGNAGE INTENT**



Note: This is the preferred layout. Dimensions and layout may vary depending on site conditions.

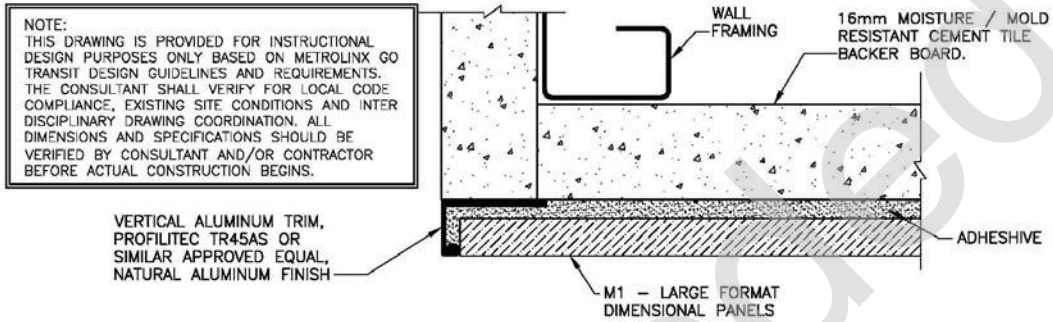




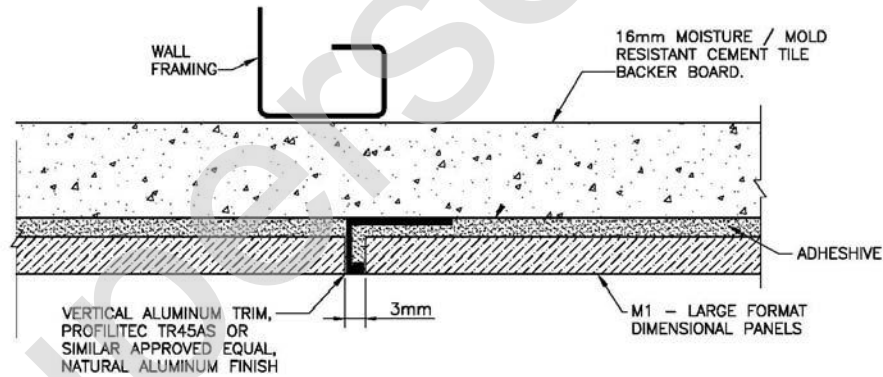
CI-0401

**TAB 4: STATION INFRASTRUCTURE**  
Station Buildings

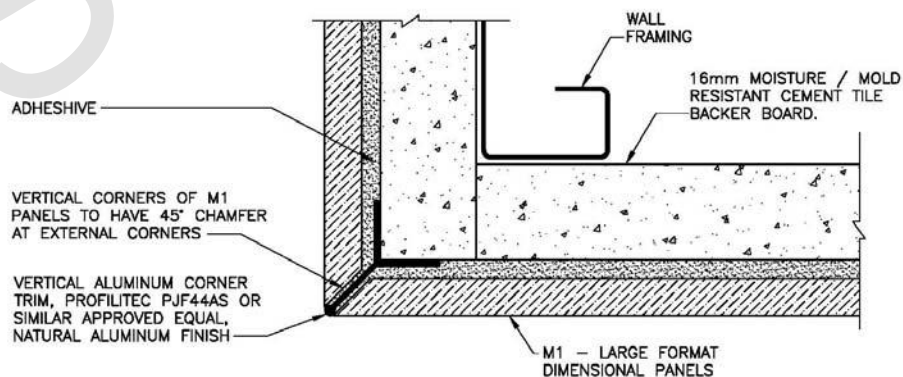
**GO SERVICE COUNTER LARGE FORMAT PANEL TRIM DETAILS**



VERTICAL DETAIL A-A INSIDE WALL JAMBS ADJACENT TO ATTENDANTS



VERTICAL DETAIL B-B EXTERNAL VERTICAL JOINTS



VERTICAL DETAIL C-C EXTERNAL VERTICAL CORNERS



CI-0204

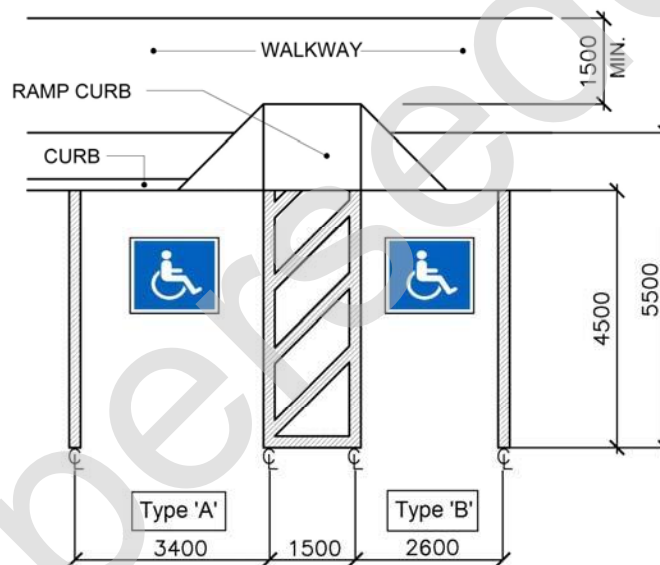
**TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**  
Pavement and Line Markings

FIGURE: DESIGNATED PARKING - CONFIGURATION FOR TWO OR LESS PARKING SPOTS

**SECTION:**  
Tab 2: Site Infrastructure and Development

**FIGURE:**  
Designated Parking – Configuration for Two or Less Parking Spots

**DESIGNATED PARKING CONFIGURATION FOR TWO OR LESS PARKING SPOTS**



**NOTES:**

- RECOMMENDED UNOBSTRUCTED ACCESSIBLE ROUTE SHALL BE MINIMUM 1500 mm WIDE
- SEE ALSO LINE MARKING FOR CROSSWALKS

COLOR : LINE MARKING : REFER TO TAB 2: SECTION C1-0204 LINE MARKINGS CHART .  
WHEELCHAIR SYMBOL: REFER TAB 2, SECTION C1-0203 BARRIER FREE PARKING STALLS FOR COLOUR SCHEME

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS



CI-0407

**TAB 4: STATION INFRASTRUCTURE**  
Rail Platforms and Corridors

**Platform Design Criteria**

These criteria are based on CN Rail data, applicable also to CP Rail, for preliminary design. Detail design shall be reviewed by the appropriate railway authority and GO Transit, at which time some dimensions may be defined more precisely.

CRITERIA	SPECIFICATIONS
Track centres, centre line to centre line, new station facilities only	4.27 m
Centre line of track to edge of platform	1.632 m
Width of island platform	7.4 m
Width of side platform	3.6 m-4.9 m
Length of platform	315 m
Centre line to centre line of tracks serving island platform	(35 feet even) 10.668 m
Passenger and Freight Operations, maximum height of platform A.T.R.	0.127 m
Exclusive GO Transit tracks, maximum height of platform A.T.R.	0.25 m
Passenger circulation zone, edge of platform to platform structures (shelters/stair enclosures, etc.)	2.44 m
Lateral clearance to major and elevated platform structures, centre line of track to canopies, roof overhangs, etc.	3.35 m
Lateral clearance from centre line of track to mini-platforms	1.98 m
Maximum height of mini-platform A.T.R.	0.559 m
Yellow Detectable Tile at Platform Edge	0.61 m
Tunnel (pedestrian underpass) clearance, top of tunnel roof membrane overlay to underside of rail, minimum approximately. (This is based on 300 mm sub-ballast, 300 mm ballast to bottom of ties and 178 mm ties).	0.8 m



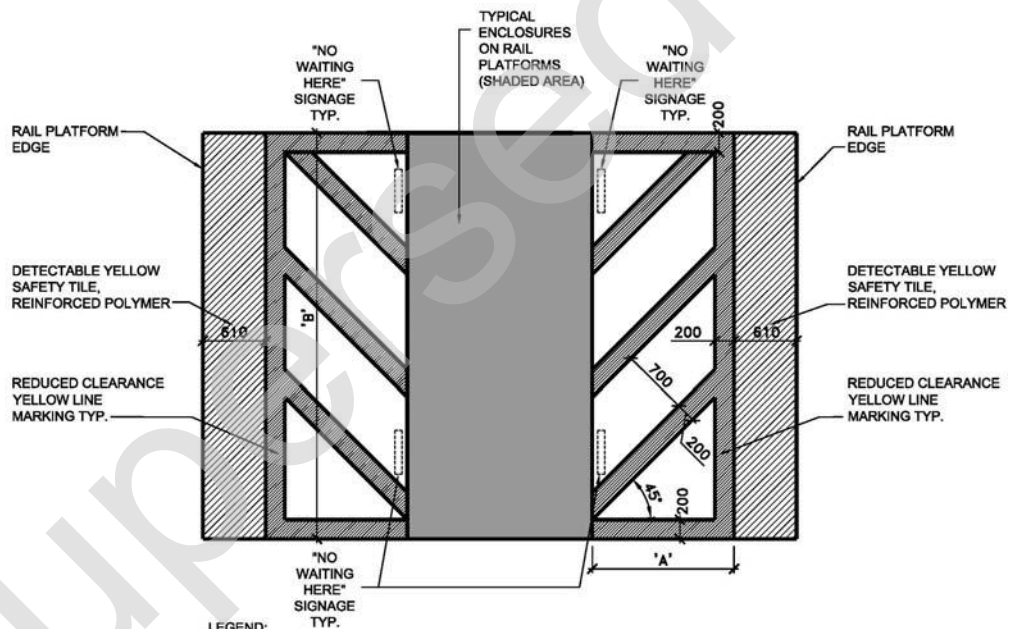
CI-0407

**TAB 4: STATION INFRASTRUCTURE**  
Rail Platforms and Corridors

FIGURE: REDUCED PLATFORM WIDTH

**SECTION:**  
Tab 4:  
Station  
Infrastructure

**FIGURE:**  
Platform  
Reduced  
Width Plan



**LEGEND:**

'A' VARIES PER REDUCED CLEARANCE AT RAIL PLATFORM. REFER DRM CHART FOR SIZES.

'B' VARIES TO SUIT

ALL DIMENSIONS SHOWN ARE IN MILLIMETRES





CI-0103

**TAB 1: GUIDING PRINCIPLES**

Accessibility

- > Ramps
- > Stairs
- > Tunnel/Overpass
- > Mini Platform
- > Designated Waiting Area
- > Ticket Vending Machine (TVM)
- > Signage
- > Wayfinding
- > Trailblazing
- > At Grade Pedestrian Crossings



**EASIER ACCESS DESIGN FEATURES**

Easier Access Design Features are consistent with GO's goals for quality service with value-added amenities for all customers, and is not necessarily limited to the needs of customers with mobility disabilities.

All Easier Access Design Features are to be considered at all new and renovated GO Rail Line Stations, Bus Terminals and Facilities, as appropriate, and are to be implemented in the design on a case-by-case basis. Performance requirements and associated details, as applicable, can be found throughout the Manual in their respective sections. These features are inherent in the DRM and are equal to or exceed existing industry standards and 'best practices'.

The Easier Access Design Features include:

1. Delineated Pedestrian crosswalks and pavement markings;
2. Designated accessible parking spaces and loading areas;
3. Sidewalks with curb cuts to accommodate barrier-free access;
4. Benches in stations and designated shelters on Train and Bus platforms and Park and Ride and Kiss N Ride areas;
5. Stairways with accessible features, such as colour contrasted, non-slip stair nosing, handrails and detectable tactile flooring in advance of stairs, photoluminescent guidance strip system.;



CI-0201

**TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**

Station Sites

cuts should be provided from the accessible parking spaces and accessible drop-off and pick-up location to the station building, and continue throughout the station facility.

- > Station egress should be designed to mitigate the peak volumes of vehicles leaving the site after arrival of a busy train; multiple egress points should be provided where feasible, and intersection design should reflect the high peak volumes.
- > Provisions shall be made for access by emergency vehicles. Designated fire access routes shall meet OBC and local fire department requirements.



**ACCESSIBLE ROUTE**

The accessible route is defined as a continuous unobstructed external and internal path connecting all accessible elements and spaces to enable personal barrier free mobility. At GO facilities, the accessible route is identified as the travel path to/from/between the barrier free parking or drop off area, to the rail mini platform / bus platform. Features on the accessible route are to meet the conditions listed above and be accompanied with appropriate signage. Exterior accessible routes elements include parking access aisles, curb ramps, crosswalks at vehicular ways, walks and ramps at a minimum. Interior accessible routes elements include corridors, floors, ramps, elevators and clear floor space at fixtures.



**REDUNDANT SECONDARY ACCESS**

Provide a second means of access/egress for customers to a platform or other station areas reached by elevators, ramps, or at grade crossings.

- > All island platforms shall be equipped with two elevators connecting to an underground pedestrian tunnel or an overhead pedestrian bridge.
- > Side platforms can have a combination of ramps, elevators, or at grade crossings to achieve secondary redundant access.



**SITE ENTRANCE**

An accessible pedestrian route(s), path(s) and sidewalks wide enough to accommodate wheelchairs, scooters, or other mobility devices and be connected with accessible municipal sidewalks, signals, crossings, etc.

- > The accessible routes shall not be obstructed by poles, plants, bicycle racks, etc.



CI-0203

**TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**  
Parking Infrastructure -

**Parking stalls & Floor level colours**

Floor 6 Bright Orange Pantone 151C			
Floor 5 Berry Pantone 2617C			
Floor 4 Dark Yellow Pantone 1235C			
Floor 3 Red Pantone 485C 2X			
Floor 2 Cool Blue Pantone Process Blue C			
Floor 1 Yellow Green Pantone 369C			
Ground Floor Half Level Grey Pantone Cool Gray 7C			
Tunnel Level Grey Pantone Cool Gray 10C			

Image 5: Parking stall and floor level colours



CI-0203

**TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**  
Parking Infrastructure -

## 6. WALL MOUNTED INFORMATION SIGNS

The major goal for designing and using these signs is to provide an easier, cleaner and more comprehensive wayfinding system for customers. Instead of having all the signs individually, and all over the place, a prefabricated design can convey the same message but in a simpler way. They are easy to be applied to the wall, and create a consistent look to the whole environment. When existing signage requires replacement or new signage is required, please refer to the appropriate section and examples for guidance.

### 6.1 ELEVATOR LOBBY DESIGN A

**Location:** At each elevator lobby, right above the elevator button or the nearest wall to the elevator's door.

**Description:**

- > Non-illuminated
- > Single-sided
- > Wall-mounted

**Note:** this sign type is directed specifically to pedestrians.

This sign is specifically designed for elevator lobbies, and it includes a directory sign, showing which level you are at and an "In Case of Fire" sign.

**Note:** Under no circumstances should the layout of the sign change.



CI-0203

**TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**  
Parking Infrastructure -



Typical Design A, Elevator Lobby Signs

Image 48: Signs

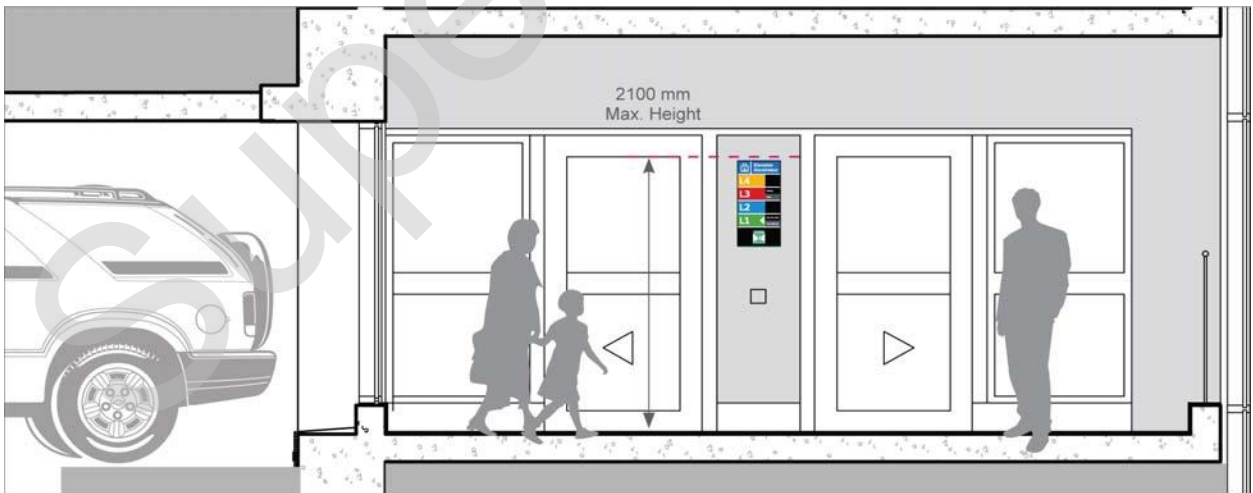


Image 49: Position



CI-0701

**TAB 7: TECHNICAL DISCIPLINES**  
Architectural

ELEVATORS

**BASIS OF CRITERIA**

The purpose of these guidelines is to encourage a standard approach to the provision of vertical transportation systems provided for GO Transit facilities. Included in the guidelines are elevator related considerations that are important to the realization of GO's design objectives and are therefore expected to be incorporated into the design of all GO platform and parking garage projects.

The guidelines do not constitute a project specification. Each project shall have its own specification based upon the master elevator performance specification prepared on a detailed basis and reflect the individual project's unique and comprehensive requirements.

It is recognized that strict adherence to specific guideline elements may not be appropriate to all project designs. However, deviation from these guidelines is discouraged and variance approval rests solely with GO Transit. Variance requests shall be supported by an explanation of the reason for the deviation and detailed information on the proposed alternative.

Refer to Elevator Performance Specification for additional information.

Refer to GO Standard Drawings for elevator cab button array information.

**DESIGN REQUIREMENTS**

**PLANNING AND DESIGN OBJECTIVES**

GO Transit's key design objectives shall apply to considerations relating to vertical transportation and include development of appropriate project specific designs that incorporate:

- > Highest degree of safety,
- > Functionality for use by persons with physical disabilities,
- > Passenger security,
- > Service reliability,
- > Effective, efficient operations and maintenance.
- > Use of non-proprietary tools, equipment and knowledge.

Elevator design, construction, installation and maintenance must be in strict conformance with CAN/CSA-B-44 Elevator Safety Code (latest edition) and all other codes and regulations that may apply.



CI-0701

**TAB 7: TECHNICAL DISCIPLINES**

Architectural

Provide car enclosure / door arrangement with interior dimensions suitable to accommodate a prone stretcher 2010 mm (79") long by 610 mm (2'-0") wide.

In the event of a loss of Utility Power, standby power shall be provided to permit continued operation of the elevator(s). All elevators shall be provided with a traction elevator emergency power device that will automatically move the elevator to a pre-determined floor in the event of a power failure.

All elevator rotating equipment shall be provided with protective measures to minimize pinching and related hazards as required by the Occupational Health and Safety Act and Regulations for Industrial Establishments.

All elevators shall be provided with battery powered emergency lighting and two speed ventilation fans. Glass elevator hoistways and car enclosures shall be supplied with HVAC systems that will provide climate control of the hoistway and limit the interior cab temperature to  $\leq 26$  degree C. Provide car enclosure ventilation systems which satisfy CAN/CSA B-44 requirements for such conditions.

**BARRIER FREE DESIGN**

All elevators shall be designed to contribute to the provision of a barrier free path of access and conform to the requirements of the latest applicable edition of the Ontario Building Code (OBC). Elevators shall also be considered to ensure that a secondary point of access/egress is available for redundant secondary access to and from each rail platform.

Elevator configuration shall feature "flow through" designs to permit loading and unloading of persons in wheelchairs or, employing other mobility assist devices, without requiring a change in direction in the path of travel. Design shall allow sufficient discharge space to permit ease of access and transfer.

All elevators shall satisfy accessibility standards indicated in the CAN/CSA-B44 Safety Code for Elevators, Appendix E "Elevator Requirements for Persons with Physical Disabilities" (latest update).

Car Operating Panel shall be located on the side wall of the car enclosure to permit parallel approach to panel. Operating panel shall incorporate oversized buttons with appropriate markings in a vertical array allowing for wayfinding information to be included next to the button.

**SAFETY AND SECURITY**

Elevator shaft, car enclosure and entrance doors shall be constructed with the maximum amount of glazing to provide internal and external site lines.

Elevators shall include provisions in the Car Operating Panel for installation of Elevator Code compliant, hands-free, emergency two way communications device (provided by GO Transit's Communication Contractor) as well as interface connections between the activation buttons and indicators in the COP. Two-way information communication devices shall also be located in the elevator vestibule at every level/floor served by elevator.

Travelling cable provisions shall be provided by Elevator Contractor for wiring between the car enclosure and control room. Communications Contractor to provide two- way communication connections between the elevator controller room and GO Transit's monitoring service central station.





CI-0701

### TAB 7: TECHNICAL DISCIPLINES

Architectural

Provide wiring and interface for installation of CCTV within the car enclosure.

Monitoring System Contractor (Chubb Security) to provide continuous monitoring of signals related to the elevator and other sensing devices located in the elevator hoistway and controller room.

Elevator must be designed to operate within unrestricted areas. Its signals, fixtures, car enclosure finishes and doors shall be of vandal proof design. Installations and equipment installed shall conform to latest safety codes and shall not be easily damaged or abused.

As elevators are generally installed in unattended areas, the equipment must be sensitive to certain security concerns, including high visibility into and out from elevator cars; therefore, car and shaft walls must be glazed with safety glass in stainless steel frames.

#### **ELEVATOR NUMBERING CONVENTIONS**

- > All elevator numbers on site must be arranged in sequential order, starting at number 1
- > Elevators north of the tracks shall be assigned numbers first. Where track runs north/south the elevators on the east side of track shall be assigned numbers first
- > Elevators serving platforms shall be numbered in a sequence following platform numbers being served (i.e. platform one first, followed by subsequent platforms)
- > Elevator groups serving a parking structure to be numbered in one sequence
- > Elevator numbering shall be coordinated with signage, Chubb Security, and system safety at the time of construction

#### **RELIABLE OPERATION**

Use only components which can be shown to have performed satisfactorily and proven reliable for a minimum period of at least two (2) years. The use of prototype or first time installation equipment, component combinations or equipment mixes is not acceptable.

Elevator shaft and control room shall be provided with means of maintaining hoistway and control room temperatures between 10 and 27 degree C, under all seasonal conditions.

#### **OPERATIONS AND MAINTENANCE**

Elevators shall be designed to operate within unrestricted areas. Its signals, fixtures, car enclosure finishes and doors shall be of vandal resistant design.

Stainless steel shall have a No. 4 brushed finish, with final selection and grain direction being confirmed by the Architect, at time of shop drawing reviews.





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**TAB 7: TECHNICAL DISCIPLINES**

Architectural

Elevator equipment shall not contain proprietary features, which limit the Owner's ability to engage a qualified elevator maintenance contractor, other than the original manufacturer/installer, for provision of maintenance services.

Elevators shall be continually maintained under a comprehensive, planned, preventative maintenance program designed to maximize equipment availability, ensure operational reliability and sustain equipment performance at optimum levels. The program shall include regular component replacement, as recommended by the original equipment manufacturer (OEM), to extend equipment life.

Provide two (2) year warranty for new elevators from date of substantial completion of Elevator Trade Contractors Work and acceptance of unit(s) by GO Transit.

Provide 24 month warranty period maintenance service from date equipment is taken over and accepted by GO Transit, coinciding with Warranty period. Maintenance shall include comprehensive full coverage maintenance services as provided under the elevator contractor's standard program for full maintenance services, including overtime callback services at no additional charge.

**COMMUNICATIONS**

CCTV cameras and wiring shall be provided as required. All elevators shall have CCTV camera mounted inside elevator cab.

Camera mounted in vestibules and lobbies shall view inside and outside of each elevator at each level where possible. If the elevator has doors on two sides then CCTV cameras must be placed to view both lobbies/vestibules.

CCTV Cameras connectivity and monitoring must adhere to GO standards and security concerns. Lighting in elevators will consider the usage of CCTV cameras, interior or external.

**EQUIPMENT AND CONSTRUCTION CONSIDERATIONS**

**Heating**

- > Fan forced heater with built-in thermostat, mounted on elevator pit wall.
- > Heat Pump with hyper heating capability down to -25°C.
- > If possible, Heat Pump should be ducted type and located outside the elevator hoistway.

**Ventilation or Air Conditioning**



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**TAB 7: TECHNICAL DISCIPLINES**

Architectural

- > Ventilation via axial, wall mounted, shuttered exhaust fan with thermostatic control mounted at top of hoistway.
- > Air Conditioning via Heat Pump with low ambient cooling.
- > If possible, Heat Pump should be ducted type and located outside the elevator hoistway.

**Hoistway**

- > Glazed construction above ground with solar control window film on South and West exposures.
- > Glazed construction below ground adjacent to elevator entrances, no window film.

**Floor Grille**

Floor grille shall be capable of capturing and retaining crystalline ice melting products in winter and road grit and gravel during all seasons. Its shall be constructed from stainless steel and shall be designed for cleanout by one person, unaided.

**Window Film**

Window film shall be selected to balance a reduction in heat build-up with minimizing any reduction in visibility.

**PROJECT SPECIFIC PROVISIONS**

To ensure adherence to these standards and guidelines, a qualified vertical transportation consulting firm shall be retained to provide design, specification and construction review services. A comprehensive project specification outlining requirements for both the elevator trade and related work to be provided by other trades to interface with the elevator shall be prepared for review and approval by GO.

Utilize only Machine-Room-Less (MRL) type traction equipment.

Unless prevented by specific project site conditions, provide elevator 1814kg (4000 lb) elevator capacity, arranged in a service car configuration (i.e. cab interior more narrow than deep), utilizing 1220mm (4'-0") wide two speed side opening doors. Refer to general arrangement of cab configuration as reflected GO Transit's Outline Performance specifications.

Car controls shall be located on the car side wall. Control panel shall include a separate cabinet enclosure to house the hands-free emergency two way communication system (to be provided by GO's Communication Contractor). Elevator Contractor to provide activation button and LED indicator.

Where site or other project specific conditions require elevator solutions that are not in full conformance with these guidelines and GO Transit's outline specification, prior approval of alternate elevator provisions shall be obtained from GO Transit at the project's 50% Design Development stage



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**TAB 7: TECHNICAL DISCIPLINES**  
Architectural

**GO ELEVATOR INSTALLATION PLANNING CHECKLIST**

Element	Design Criteria
Vestibule Orientation:	Quadrant spanning South through East.
Floor grille:	Inside entrance door, arranged to capture foot-borne debris.
Entrance door:	Mandatory, power operated barrier free accessibility compliant.
<i>At Tunnel Level:</i>	
Elevator vestibule	Optional below ground level.
Slope of concrete floor	Maximum slope away from elevator entrance, as permitted by applicable codes.
<i>At Intermediate Level:</i>	
Elevator vestibule	Optional below ground level.
Slope of concrete floor	Mandatory at ground level or above ground level. Away from elevator entrance.
<i>At Overhead Walkway/Platform Level:</i>	
Elevator Vestibule	Mandatory. Away from elevator entrance.
Slope of concrete floor	
Hoistway heating:	Fan forced heater or heat pump with hyper heating.
Hoistway ventilation or air conditioning	Exhaust Fan with fresh air louver or Heat Pump with low ambient cooling.
Hoistway construction	Glazed above ground.
Pit drain	Mandatory.
Elevator Controller Cabinet: Location	Per manufacturer's requirements (typically in corridor or vestibule adjacent to elevator hoistway at upper landing).
HVAC	Provide heating and ventilation equipment necessary to maintain controller cabinet within the recommended manufacturer's temperature range.

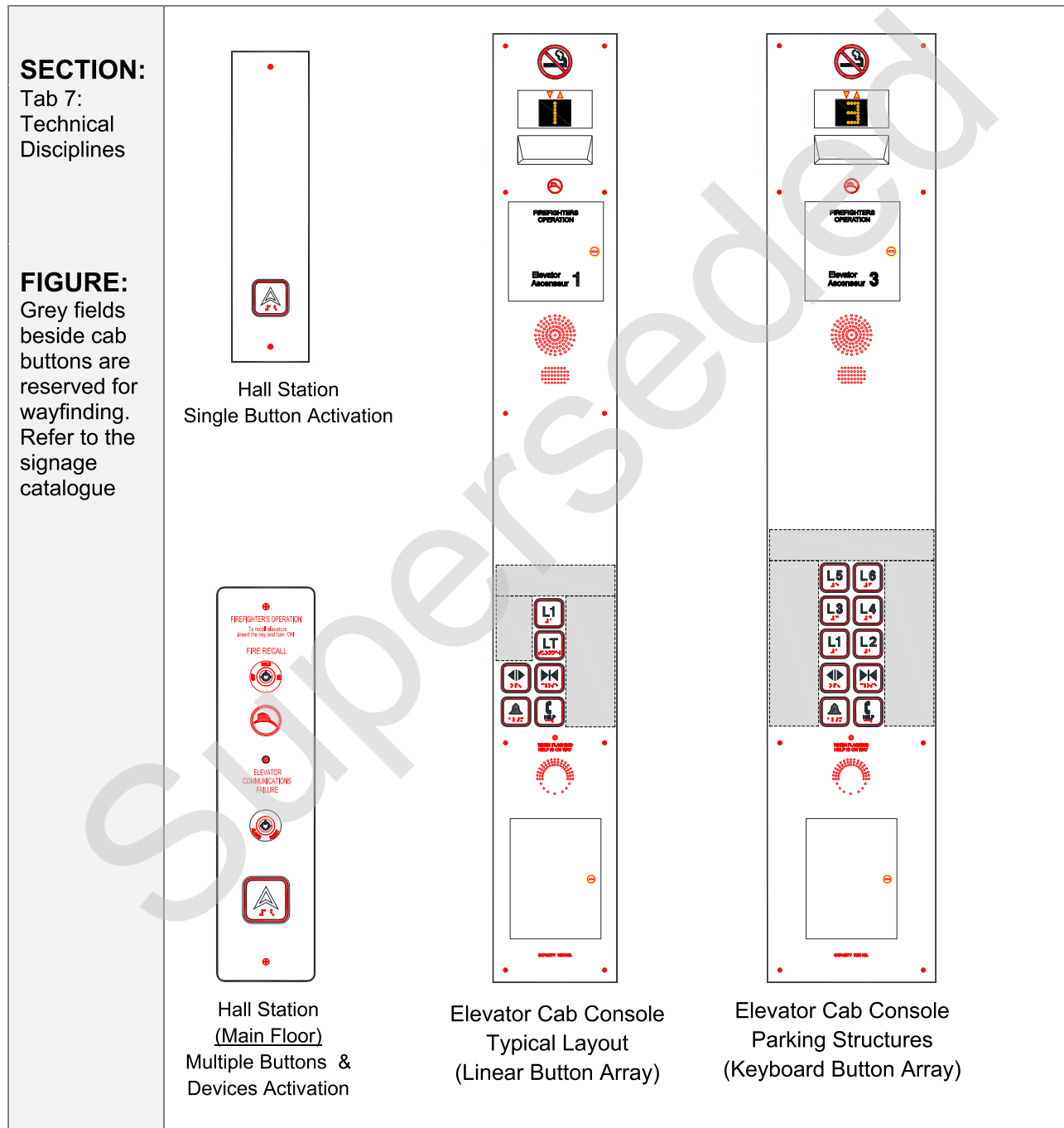


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TAB 7: TECHNICAL DISCIPLINES

Architectural

FIGURE: SAMPLE ELEVATOR CAR ENCLOSURE ARRANGEMENT





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**TAB 6: WAYFINDING AND SIGNAGE**

Static Signage

**STATION ID SIGNAGE SUITE**

Station ID signs are to be provided at all GO Rail, Bus and Park and Ride Facilities as per the chart below.

- > Technical drawings as per GO Standard Drawings.
- > For GO logo, typeface and GO pictograms placement/artwork refer to the GO Static Signage Catalogue.

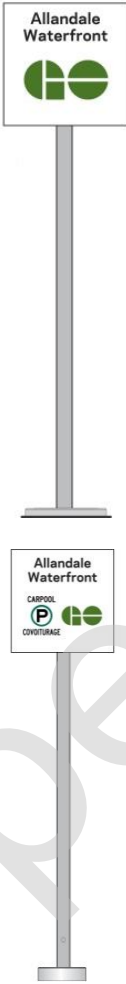
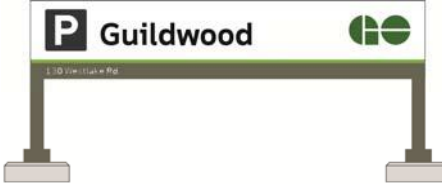
ID Sign Type	Image	Placement Guidelines	Sign Content
<p><b>Type 1-Primary Totem</b></p> <ul style="list-style-type: none"> <li>•Main Station Identifier</li> <li>•Main Vehicular Entrance</li> </ul>		<ul style="list-style-type: none"> <li>•To be located at main vehicular entrance to station, perpendicular to public road.</li> <li>•Mandatory 1 totem sign at primary municipal address location only.</li> <li>•Additional totems are permitted for sites with multiple addresses. To be determined on a site by site basis.</li> <li>•Location of the sign is not to interfere with daylight triangles and sightlines for vehicular traffic. Grade at sign location to be taken into account when locating signs. Sizes and location of daylight triangles to be verified on a site by site basis.</li> <li>•Additional totems are permitted at stations with property on either</li> </ul>	<ul style="list-style-type: none"> <li>•Station Name</li> <li>•GO Logo</li> <li>•Station Address</li> <li>•Additional Carriers (hierarchical order-as required )</li> <li>○UP Express (100% scale to GO)</li> <li>○VIA (100% scale to GO Logo)</li> <li>○Bus Icon (for other carriers) 75% scale – (90% Process black)</li> </ul>



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**TAB 6: WAYFINDING AND SIGNAGE**

Static Signage

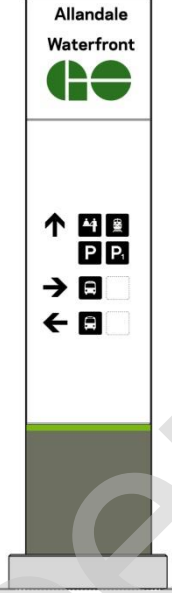
		side of the tracks.	
<p><b>Type 2 Pylon ID</b></p> <ul style="list-style-type: none"> <li>•Beacon to the site.</li> </ul>		<ul style="list-style-type: none"> <li>•Located at Park and Ride/Carpool Lots</li> <li>•Located at sites where Primary totem would not be visible in addition to Primary Totem sign.</li> <li>•To be placed to maximize distance viewing.</li> <li>•Orientation to maximize exposure and accommodating site conditions.</li> <li>•Location of the sign is not to interfere with daylight triangles and sightlines for vehicular traffic. Grade at sign location to be taken into account when locating signs. Sizes and location of daylight triangles to be verified on a site by site basis.</li> </ul>	<ul style="list-style-type: none"> <li>•Station Name</li> <li>•GO Logo</li> <li>•limited to 1 additional Carrier logo; UP Express or MTO Carpool logo (side by side alignment)</li> </ul>
<p><b>Type 3 Blade Sign-Secondary Vehicular</b></p> <ul style="list-style-type: none"> <li>•Secondary vehicular entrances</li> </ul>		<ul style="list-style-type: none"> <li>•To be located at remote parking lot vehicular entrances.</li> <li>•Perpendicular to public road.</li> <li>•Location of the sign is not to interfere with daylight triangles and sightlines for vehicular traffic. Grade at sign</li> </ul>	<ul style="list-style-type: none"> <li>•Station Name</li> <li>•GO Logo</li> <li>•GO parking Icon (90% Process Black)</li> <li>•Remote Parking Lot Name Identifier (refer to station services parking lot manifest)</li> </ul>



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**TAB 6: WAYFINDING AND SIGNAGE**

Static Signage

		<p>location to be taken into account when locating signs. Sizes and location of daylight triangles to be verified on a site by site basis.</p>	
<p><b>Type 4 Pedestrian Totem</b></p> <ul style="list-style-type: none"> <li>•Pedestrian entrances at edge of site.</li> </ul>		<ul style="list-style-type: none"> <li>•To be located at secondary pedestrian entrances to station site.</li> <li>•Orientation of totem to be perpendicular to traffic flow.</li> </ul>	<ul style="list-style-type: none"> <li>•Station Name</li> <li>•GO Logo</li> <li>•Wayfinding Icons and Arrows (90% Process Black) within site to major station areas including:             <ul style="list-style-type: none"> <li>• Rail Service</li> <li>• Bus Service</li> <li>• Parking</li> <li>• Kiss and Ride</li> <li>• Service Counter</li> </ul> </li> </ul>



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**TAB 6: WAYFINDING AND SIGNAGE**

Static Signage

**Facility ID Signs**

Facility ID signs are to be provided at all GO Rail, Bus and Park and Ride Facilities as per the chart below.

- > For GO logo, typeface and GO pictograms placement/artwork refer to the GO Static Signage Catalogue.

ID Sign Type	Sign Type	Placement Philosophy	Content
<p><b>Type A–Main ID Sign</b></p> <ul style="list-style-type: none"> <li>•Main Station Identifier</li> <li>•Main Vehicular Entrance</li> </ul>		<ul style="list-style-type: none"> <li>•To be located at main vehicular entrance to Facility</li> <li>•Perpendicular to the direction of travel; consideration to be given to the “daylight triangle”. View for exiting or incoming vehicles not to be obstructed.</li> </ul>	<ul style="list-style-type: none"> <li>•GO logo-First</li> <li>•Facility Name-Second</li> <li>•Facility Type-Third</li> <li>•Address-Fourth</li> </ul>
<p><b>Type B –Gate ID Sign</b></p> <ul style="list-style-type: none"> <li>•Interior Wayfinding Sign</li> </ul>		<ul style="list-style-type: none"> <li>•At the decision points within the property or interior gates as required.</li> <li>•Perpendicular to the direction of travel.</li> <li>•Consideration to be given to the view for exiting or incoming vehicles not to be obstructed.</li> </ul>	<ul style="list-style-type: none"> <li>•GO logo – first</li> <li>•Location and facility name – second</li> <li>•Gate number - third</li> <li>•Directions - fourth</li> </ul>



## Power Outlets

Each communications equipment rack shall be fed from two independent tray mounted twist lock L-20R single receptacles. Each such receptacle shall be fed from a dedicated circuit. Refer the IT telecommunications and Systems document for detailed specifications.

See Presto subsection under Fare Handling Systems section for power requirements.

Provide a minimum of three (3) normal power 5-20R 120 V duplex receptacles, powered from three dedicated circuits, for maintenance and identified as such. These receptacles shall be wall mounted and not located on cable tray or cable ladders, as not to be confused with communication-dedicated receptacles.

Provide a power bar for the equipment mounted on the plywood backboard. Each connection on the power bar shall have nameplates to provide power tracing ease. The power bar shall be a multi-outlet raceway. All equipment connecting to the power bar shall have nameplates indicating model, capacity, and electrical data. Install equipment in accordance with manufacturer's recommendations.

## Illumination

### Lighting Design

This section addresses interior and exterior illumination and lighting design strategy for GO site and building facilities. The intent is to provide good uniform quality lighting design strategy that meets the locations application. The Lighting design strategy shall be applied as a sequential overlay of Guiding Principles; followed by lighting design considerations, lighting typology applications and selection criteria and individual lighting design requirements.

Lighting Design Guiding Principles → Design Considerations → Typologies → Design Requirements

### Lighting Design Guiding Principles

- A cohesive and adaptable hierarchy of lighting
  - Provide a consistent and flexible lighting approach across all sites will promote intuitive wayfinding

- Utilize built site elements with internal lighting as beacons to support wayfinding
- Associate lighting types with the same conditions/activities at each element, to provide a recognizable visual language.
- The hierarchy of lighting is identified as:
  - Areas of transition and boarding of GO services that are highlighted to enhance the experience of movement
  - Illuminated built structures that serve as lanterns and aid wayfinding throughout the site
  - Pedestrian scaled illumination for areas of rest and waiting that promote comfort
  - Areas of vehicular movement and parking
- Durable and adaptable design with sustainable maintenance and operational efficiencies
  - Use LED technology for its low energy consumption and long lifecycle
  - Integrate control systems and sensors to assist energy management and contribute to sustainable practices.
- Shall guide customers through the sequence of unique customer journey touchpoints at a site
  - Use lighting to articulate each site element's sense of place
  - Highlight areas of transition to heighten the experience of movement
  - Reinforce site order and hierarchy by emphasizing important zones with light
- Deliver an engaging, comfortable, and safe experience for the customer
  - Use a variety of lighting types to create ambiance and provide comfort
  - Highlight significant edges of site elements—thresholds—to create a dynamic and engaging experience
  - Provide lighting levels that ensure visual and physical comfort of customers
  - Use light sources with good colour rendering and colour temperature to support comfort and well-being

- Highlight edges of train platforms and curbs to provide a high level of safety and legibility

### Lighting Design Considerations

- The levels and quality of lighting for the various types of areas shall be as outlined in the latest edition of the Illuminating Engineering Society of North America (IES) Lighting Handbook, as modified here and as required to accommodate the Ontario Building Code and Ontario Electrical Safety Code. They shall take into consideration the aging population and the needs for accessibility of all groups (e.g. CNIB recommendations)
- Illumination systems shall require minimal maintenance, and shall be energy efficient and readily accessible, designed for passenger safety and security
  - Illumination shall be designed to provide visual comfort and minimum glare for GO staff and passengers.
  - The illumination systems shall be compatible with CCTV systems
- Building luminaires in public areas shall be integrated with the architecture
  - Luminaires shall be in locations designed by the architect, complementing daylight sources
  - All luminaires must be accessible for maintenance and lamp replacement without having to construct special means of approaching the fixture
- Urban light fixtures for each station site shall be selected from one fixture family and matched to the uses and lighting types called for at each site element
- Wayfinding through each station site shall be supported by using fixtures that are common to the scale of the user wherever possible
  - For example, for pedestrian areas, a common lamppost design and scale shall be used throughout the site to identify pedestrian areas
- Light fixture design shall be simple, elegant and contemporary

- Site lighting controls, including sensors and timers, shall be provided for all site element lighting where appropriate, and shall be integrated into the station building automation system
  - Lighting controls shall support daylight harvesting where applicable
- Photosensors are to be located so that there is a direct view of the sun and that no shadows or obstructions will interfere with readings
- Occupancy sensors are to be provided in the following areas: Parking garage lobbies
- Photosensors shall be provided for site lighting in the following areas
  - Bus platforms, including shelters
  - Surface parking lots
  - Station plaza
  - Rail platforms
  - Open bridges, including stairways
  - Closed bridges

Refer GO Standard specifications for detailed requirements

- Lighting in enclosed stairways and parking garages shall remain on at all times, unless otherwise noted
- Lighting fixtures and ballasts shall be selected and installed to ensure ease of access for servicing and ease of maintenance
- All light fixtures shall be LED with the following criteria:
  - CRI (Colour Rendering Index) to be a minimum of 80 unless otherwise noted
  - Colour temperature to be 4000K unless otherwise noted
  - Exterior luminaires to have CSA or CUL Wet Location labels
- Use light fixtures equipped with industry standard LED light engines that are equal or better in performance and build quality to Bridgelux or Xecato or equivalent

- Specify light fixtures that limit glare and uplight, and support dark sky policy
- Specify light fixtures that are locally distributed and serviced
- Lighting fixtures to have a minimum 5-year warranty
- Negotiate longer warranties where option is offered by the manufacturer
- Where accessible by the public, light fixtures are to have vandal resistant features
- The underside of ceiling mounted fixtures is to be a minimum of 2750mm above the finished floor
- Glare: Adjacent properties shall be shielded from glare or light trespass. There shall be no interference with railroad signal or operations systems due to glare. The discomfort Glare Rating shall have a Visual Comfort Probability (VCP) of 65% or greater for interior lighting. Station attendants and passengers at service counters shall be able to see each other 100% when the sliding glass panel is in the closed position. Luminaries in this location shall have parabolic egg crate lenses, with all illumination directed vertically down to the task. Passengers and station attendants shall be capable of seeing out to the exterior at night. All glass shall be clear and not tinted, for maximum visibility of the interior. Luminaries' placement shall take into account viewing angles and fields of view of close circuit television cameras. Luminaries shall not present a source of glare to surveillance cameras.
- Exit lights shall be of the fully self-contained and low energy LED type
- Emergency lighting shall be in accordance with the OBC, the Ontario Electrical Safety Code, and the latest CSA standards
- Daylight—Particular attention shall be directed to parking structure, rail station and bus terminal entrance/ exit areas, especially on large projects. Illumination shall provide for a visually comfortable transition from outdoors to facility entry areas during all hours of system operation. Illumination levels will likely have to be graduated during the daylight hours to minimize otherwise abrupt changes from outdoors to indoors, and vice versa. Photoelectric cells for the automatic operation of additional lighting fixtures may be utilized
- Sundry: All rail platform poles shall be hinged to avoid flagman services. Hinged poles shall be installed in such a manner to avoid obstructions when lowered. Hinging shall be always parallel to the track. CCTV camera(s) shall have dedicated split pole(s). PA speakers can be installed on existing lighting poles only if they are split. High-mast lighting poles shall have no objects attached onto (e.g. parking identification, PA speakers, etc.) to avoid obstruction of the lowering device
- Standard Light Pole Drawings: Digital drawing files (AutoCAD 2012) are available for 3 and 6 metre hinged pole, 6 metre, 12 metre and 30 meter (high mast) pole under PMPS GO Standard Drawings
  - Uniformity Ratio:
    - Maximum to minimum: 4:1 or better
    - Average to minimum: 3:1 or better
  - Where lighting is of a complex or unique nature or if required by GO, the Consultant shall engage the services of a qualified Illumination Designer
  - Design photometric digital file in PDF or DWG format, complete with printouts using recognized computer lighting design software, shall be provided for GO review of design illumination levels. These photometric files shall be included in the As-built drawings

## Lighting Design Typology

- The following Design Typology shall be adapted to applicable site configurations to provide a consistent approach for the illumination of site elements

### *Graphic*

- Visually distinct from its context
- Linear, geometric or curvilinear
- Animates and provides a visual cue, supporting wayfinding
- Defines edges or thresholds and suggests movement and direction
- Can be created by a line of luminaires viewed from a distance

### *Integrated*




- Recessed (integrated) or concealed within an architectural element or object
- Can provide direct or indirect illumination
- Accentuates form and volume
- Creates ambiance

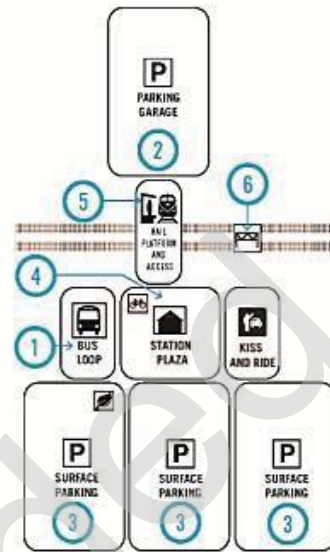
### *Object of Light*

- Emanates from a surface of a defined form or area
- Light becomes a form in itself
- Can be the result of lighting that comes from a built structure, creating a lantern effect

# Lighting Typology–Selection Matrix

## SITE ELEMENTS LIGHTING TYPES

			
	GRAPHIC	INTEGRATED	OBJECT OF LIGHT
1 Bus Loop	X	X	X
2 Parking Garage	X	X	
3 Surface Parking		X	
4 Station Plaza	X	X	X
5 Rail Platform	X	X	X
6 Bridges	X	X	X



The site lighting strategy is adaptable to various site layouts and identifies a consistent approach for the illumination of site elements.

Figure F-3: Site Elements Lighting Types

## LIGHT FIXTURE TYPES

	Lamppost - High Head	Lamppost - Low Head	Lamppost - Ambient	Recessed / Semi Recessed Linear	Direct / Indirect Industrial Grade	Direct / Indirect Linear	Handrail
1 Bus Loop	X	X					
2 Parking Garage				X	X		
3 Surface Parking	X	X					
4 Station Plaza	X	X	X				
5 Rail Platform		X		X			X
6 Bridges					X	X	X

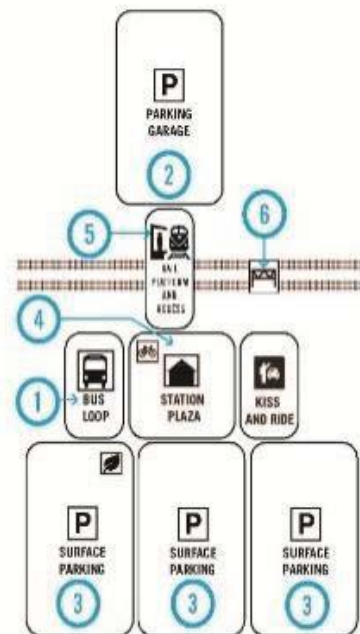


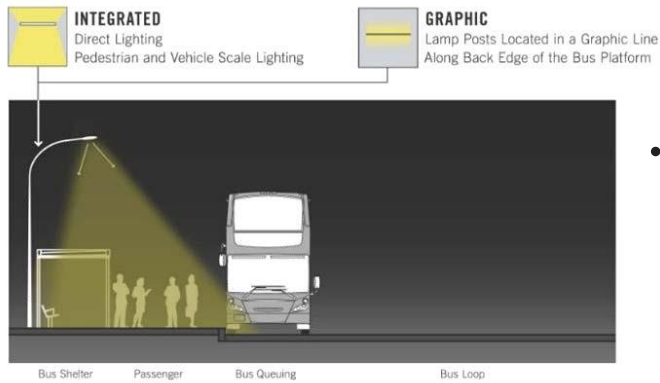
Figure F-4: Light Fixtures Types



## Lighting Design Requirements

### Bus Loops:

- General illumination for bus platform shall be provided by a line of full cut-off single-headed downlights on lampposts aligned with the back of bus shelters
- Lamppost height shall be kept to a minimum, based on site layout and context



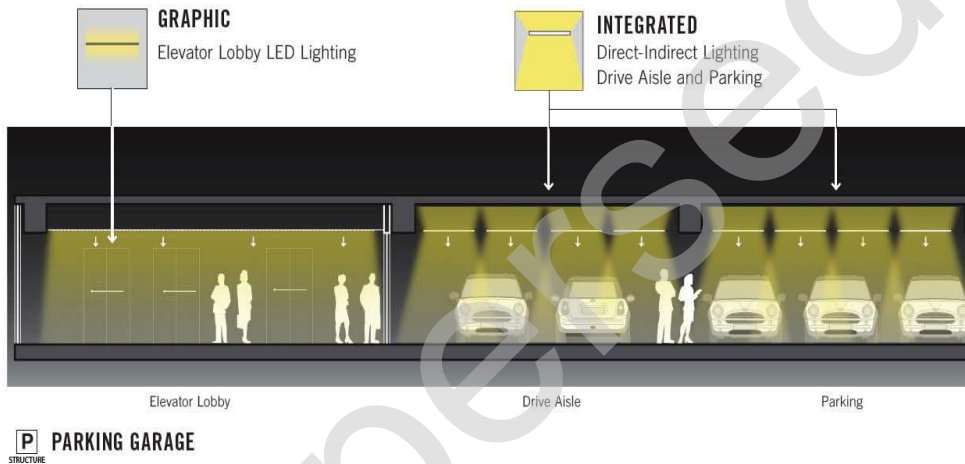
**Figure F-5: Lighting Design Requirements- Bus Loops**

- Lamppost height shall be kept to a minimum, based on site layout and context
- Pedestrian scale fixture head shall be between 3.5 and 4.5 metres above the plaza surface
- Lighting of the bus shelter, while not within the scope of site lighting, shall be taken into Consideration in calculations and overall balance of lighting design
- Minimum average maintained illumination levels shall be:

- General illumination for bus platforms with pedestrian walkways behind shelters shall be provided by a line of full cut-off double-headed downlights on lampposts aligned with the back of bus shelters
- One head will provide platform lighting; the other head will provide pedestrian scale lighting on the pedestrian walkway behind the shelter
  - Bus Platform Boarding Area: 100 lux horizontal and 50 lux vertical
  - Bus Platform: 50 lux horizontal, 25 lux vertical
- Colour temperature shall be 3500K and shall be confirmed through testing with site materials.

**Parking Garage:**

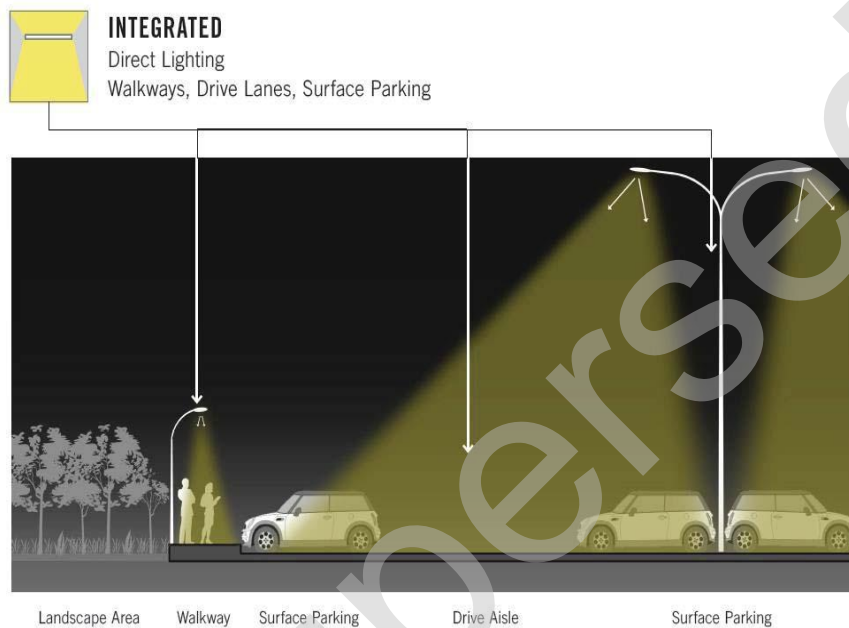
- The lighting in the parking area of the garage shall be provided by direct/indirect fixtures positioned above the bottom edge of structural beams
- The lighting in the elevator lobby shall be provided by graphic direct LED fixtures positioned parallel to the elevator doors
- In cases where the design and layout of the garage permit, use graphic direct LED fixtures to highlight key pedestrian areas and promote wayfinding within the garage
- Minimum average maintained illumination levels shall be:
  - General Parking and Pedestrian Areas: 55 lux horizontal
  - Ramps and Corners: 110 lux horizontal
  - Elevator Lobbies: 200 lux horizontal
  - Parking Garage Entrance Areas– Nighttime: 110 lux horizontal, 55 lux vertical
  - Parking Garage Entrance Areas– Daytime: 550 lux horizontal, 275 lux vertical
- Colour temperature–4000K preferred, 3500K minimum
- CRI–80 preferred, 70 minimum



**Figure F-6: Lighting Design Requirements-Parking Garage**

### Surface Parking:

- The lighting in the parking and drive aisle areas shall be provided by full cut-off single and double-headed downlights on lampposts
  - Lamppost height shall be kept to a minimum, based on site layout and context
- The lighting in the pedestrian walkways shall be provided by full cut-off single-headed lighting fixtures on lampposts
  - Fixture head shall be between 3.5 and 4.5 metres above the walkway surface
- Minimum average maintained illumination levels shall be:
  - Parking Lot: 20 lux horizontal, 10 lux vertical
  - Pedestrian Walkways: 20 lux horizontal
- Colour temperature—4000K preferred, 3500K minimum
- CRI—80 preferred, 70 minimum



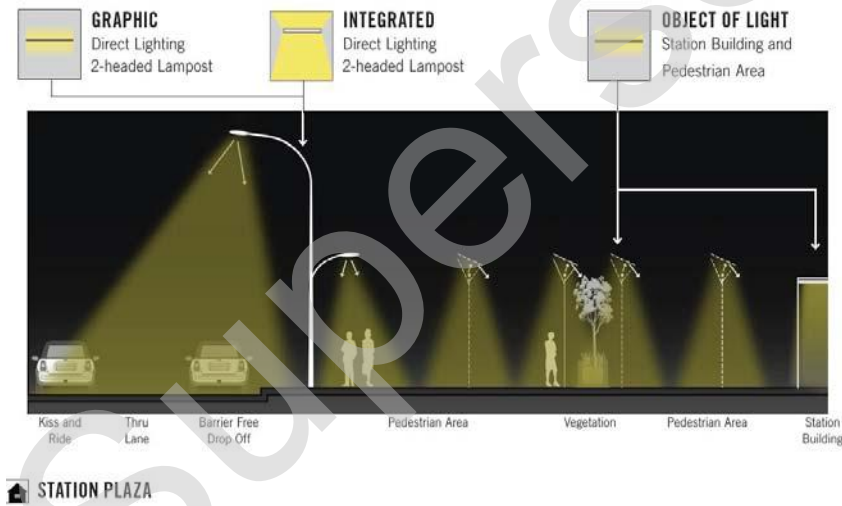
### **P** SURFACE PARKING

**Figure F-7: Lighting Design Requirements-Surface Parking**



**Station Plaza:**

- Lighting along the Plaza Edge/Drop Off and Pick-up Area shall be provided by full cut-off double-headed downlights on lampposts aligned parallel to edge of plaza
  - One head will provide roadway lighting, the other head will provide pedestrian scale lighting on the plaza
  - Lamppost height shall be kept to a minimum, based on site layout and context
- Lighting of the station building shall be taken into consideration in calculations and overall balance of lighting design
- Minimum average maintained illumination levels shall be:
  - Plaza Edge/Drop Off and Pick-up Area: 50 lux horizontal, 25 lux vertical
  - Pedestrian scale fixture head shall be between 3.5 and 4.5 metres above the plaza surface
- Lighting within the plaza shall be provided by indirect light lampposts aligned parallel to the station building and integrated with the planting zone if one exists
  - Pedestrian scale fixture head shall be between 3.5 and 5 metres above the plaza surface
  - Plaza: 50 lux horizontal
- Colour temperature shall be:
  - Plaza Edge/Drop Off and Pick-up Area: 4000K preferred, 3500K minimum
  - Plaza: 3500K



**Figure F-8: LightingDesignRequirements-StationPlaza**

## Rail Platforms:

- The lighting of the platform area and its stair and elevator access points shall be provided by direct/indirect lighting fixtures that produce a graphic effect, aligned parallel to the platform edge
- At platforms without roof soffits, lighting is to be provided by direct full cut-off lighting on 2 headed lampposts
  - Each head will illuminate one side of the platform
  - Lamp post height shall be kept to a minimum, based on site layout and context
- Stairwells and their handrails shall have integrated lighting
  - Avoid placing lights in the ceiling above stairs
- Minimum average maintained illumination levels shall be:
  - Platform Boarding Area: 100 lux horizontal, 50 lux vertical
  - Platform: 50 lux horizontal, 25 lux vertical
  - Stairwells: 200 lux horizontal
- Colour temperature shall be 3500K

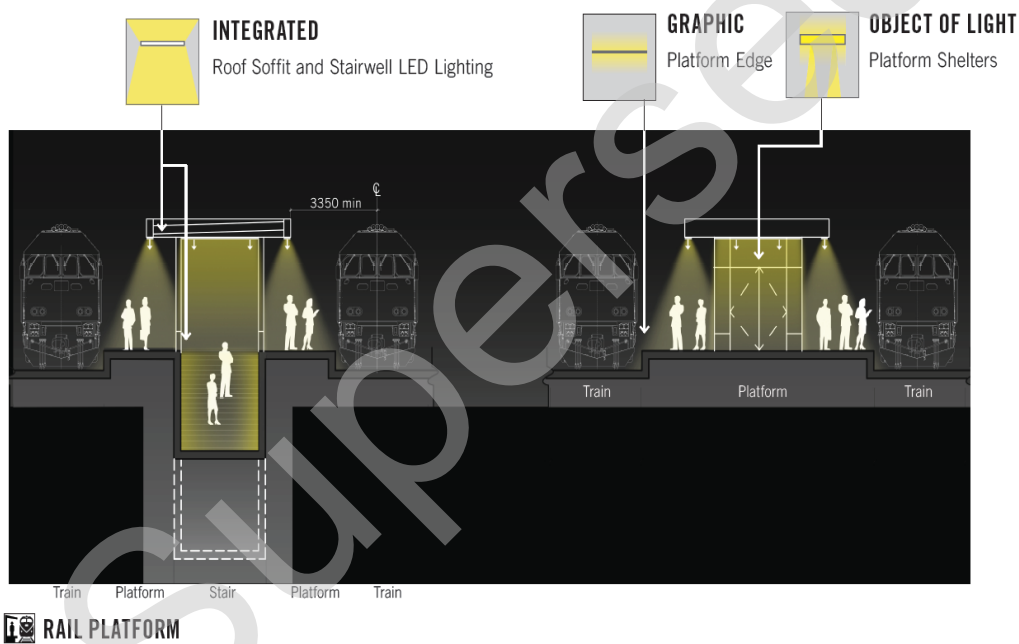
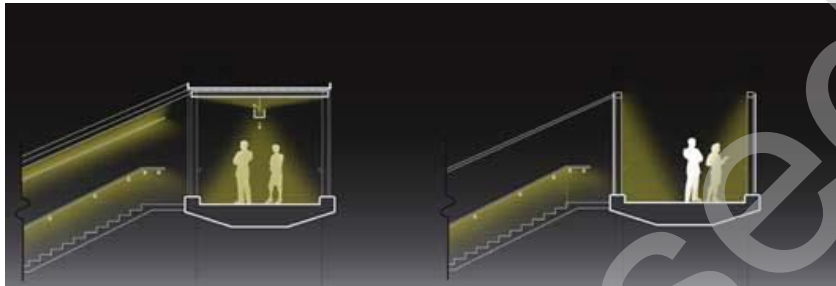


Figure F-9: Lighting Design Requirements-Rail Platform

**Bridges:**

- Enclosed bridges shall have ceiling integrated direct/indirect lighting that produces a graphic effect
- Open bridges shall have lighting integrated on the interior, into side elements such as structure, handrails and guards
- Light sources shall not to be visible from the point of view of train conductors
- Enclosed stairs to bridges shall have lighting integrated into side walls above head height, and lighting integrated into handrails
- Open stairs to bridges shall have lighting integrated into handrails
- Minimum average maintained illumination levels shall be:
  - Enclosed and Open Bridges: 150 lux horizontal, 75 lux horizontal
  - Enclosed and Open Stairs: 200 lux horizontal
- Colour temperature shall be 3500K



**Figure F-10: Lighting Design Requirements - Bridges**

## F.4 Fixtures and Furnishings

Fixtures and furnishings provide information, convenience, and comfort to GO passengers along their journey.

Detailed specification sheets for Fixtures and Furnishings can be found in the standard suite of performance specs on MyLinx. The following itemized list covers fixtures and furnishings to be planned for and placed along integral customer journey points:

**Table F-30: Fixtures and Furnishings**

Fixture or Furnishing	Location
Automated Teller Machine	<ul style="list-style-type: none"> <li>• Station Building interior (waiting area)</li> <li>• Station Building exterior</li> </ul>
Automated External Defibrillator	<ul style="list-style-type: none"> <li>• Station Building interior ( waiting area)</li> </ul>
Benches	<ul style="list-style-type: none"> <li>• Rail Platform–in shelters</li> <li>• Rail Platform - standalone</li> <li>• Bus Platform–in shelters</li> <li>• Bus Platform - standalone</li> <li>• Station Building interior ( waiting area)</li> <li>• Station Building plaza</li> <li>• Park and Ride lots - in shelters</li> <li>• Refer GO Standard Cut sheet for bench selection and order form.</li> </ul>
EV Charging device	<ul style="list-style-type: none"> <li>• Parking structure</li> </ul>
Shelters	<ul style="list-style-type: none"> <li>• Rail Platform</li> <li>• Bus Platform</li> <li>• Park and Ride lots</li> <li>• Remote/Ancillary parking lots</li> <li>• On Street</li> </ul>
Two-Way Intercom	<ul style="list-style-type: none"> <li>• At each elevator lobby on site including tunnels, pedestrian bridges and parking structures</li> <li>• In the vicinity of the Mini platform (to replace existing Bell telephones)</li> <li>• In all universal washrooms</li> <li>• Secure entrance points for GO Operational Facilities</li> <li>• In each elevator cab</li> </ul>

## General Placement Guidelines

- Shall be laid out to facilitate convenient access to services and information along the passenger's journey
- Locate with clear visibility to encourage intuitive wayfinding, passenger safety, and passive surveillance of adjacent environments
- Minimum clearance of 500 mm between two adjacent furnishings or devices shall be maintained
- Ensure clearance is provided for barrier-free paths and approach
- Provide queueing areas that will not interfere with pedestrian/passenger traffic
- Ensure that each seating area provides a clear space for side approach and side transfer to a seat
- Cluster devices where possible to clearly identify points of passenger service, information and efficiently utilize station infrastructure
- Installation tolerances and operational requirements shall be provided to facilitate ease of ongoing site operations and maintenance
- Materials and assemblies shall have a robust design and durable materials to ensure longevity
- Fare handling devices shall be placed to avoid work within the Structure Clearance Envelope on/or beside Railway Track

## Shelters

Because GO is primarily a commuter system, operating in accordance with timetables, most passengers arrive on platforms to coincide with train or bus departures.



Sheltered areas for customer comfort integrated within the canopy on the rail or bus platform are the preference for application of the sheltered areas.

Sheltered areas should typically provide the following amenities:

- Heaters
- Digital Information Walls
- GO Standard Benches
- Wi fi
- Charging Receptacles

Fare Systems (only in certain applications at car pool lots and or remote station access locations or where there is no station building)

Where the integrated sheltered option is not available, standalone shelters shall be provided within the GO Standard suite of shelters, comprising of:

- Passenger Shelters
- Car Pool Shelters

Number of sheltered areas on a bus or rail platform are determined such that each shelter would accommodate approximately a bus-load of passengers or two rail shelters would accommodate approximately a half coach-load of passengers.

## Digital Signs at Line Stations, Terminals and Carpool Lots

### Suite of sign types

- Digital Departure Signs (Train and/or Bus)
- Digital Platform Specific Signs (Train or Bus)
- Digital Parking Counter
- Digital Way finding Interactive Kiosks(TBD)
- Infotainment

### Digital Departure Signs (Train and/or Bus)

#### Location Criteria

- Digital Departure Sign (Train and/or Bus) shall be located at:
  - Inside Station/Terminal buildings, adjacent to waiting area; mounted at barrier free height as per OBC and AODA regulations
  - At Rail Platform Access Points (platform access area, entrances to tunnels, bridges, parking structures,

- side platforms – via ramp and/or walk-on)
- At Primary Bus Loop Access Point(s)
- At Car Pool Lots shall be located at:
- At remote parking lot locations (at GO's discretion)

### **Placement & Appearance Criteria**

- Placement to be perpendicular to path of travel; avoid disruption of pedestrian traffic flow that may be caused by queuing.
- Do not place departure signs above doors.
- Co-locate access points where possible
- Co-locate Digital Departure Sign (Train and/or Bus) with Fare Systems (Ticket Vending Machine, Add Value Machine), and GO marketing, integrated into Information and/or Service Modules
- Consider passenger flow and intuitive wayfinding in establishing Information and Service Modules
- Where multiple modes and/or transit agencies are provided, co-locate signage and fare systems
- Establish one common point if multiple access points and station building /terminal waiting areas are in close proximity
- Use static signage if required to way find to Information and Service Modules
- Information and Service Modules to be used for interior and exterior applications, with modules adjusted as required, based on site conditions (in consultation with GO)
  - For exterior applications, integrate within building envelope where possible and provide weather protection i.e. building canopy
  - Provide independent weather protection if integration with building canopy is not possible (in consultation with GO).
  - Where an Information or Service Module cannot be established due to site conditions, consider suspending the screen from underside of canopy. At remote locations consider implementing the concept of the suite of shelters.

- At car pool lots, integrate into car pool shelter
- Where possible recess eye-level digital signs into walls to prevent potential injuries. Install such that face of screen is flush with adjacent surfaces. Ensure entire screen is visible from all angles. Conceal all conduits, connections and infrastructure

### **Monitor Size**

- Use current I&IT standard

### **Number of Monitors**

- Minimum one Digital Departure Sign for Train, plus one for Bus, or one combination Train and Bus Digital Sign (confirm with GO).
- For larger sites with significant service, confirm number of monitors for each of the above with GO.

### **Mounting Height**

- Barrier free height as per OBC and AODA regulations, as noted in location criteria, and
  - 2.134 m (7'-0") minimum clearance to u/s of monitor (interior application)
  - 2.438 m (8'-0") minimum clearance to u/s of monitor/housing where maintenance and snow clearing equipment is used

### **General Mounting Bracket Requirements**

- Monitor mounting bracket to be stainless steel weldment system and stainless steel hardware.
- Bracket to be vandal proof, corrosion resistant and exterior grade with a minimum safe loading capacity of 500kg.
- Tilt capability (20 degrees).
- No exposed fastening.
- Required bracket mounting configurations:
  - Ceiling mounted
  - Wall mounted
  - Pole mounted
- Back to back, side to side and double back to back mounting options required.
- Ability to support attachment of NEMA enclosure.



- Monitor mounting bracket to be stainless steel weldment system and stainless steel hardware



**Figure F-11: Conceptual Digital Service Module**



**Figure F-12: Conceptual Information Module**



**Figure F-13: Digital Departure sign in Car Pool Shelter**

## Digital Platform Specific Signs (Train or Bus)

### Location Criteria - Rail

- Island Platforms: three sets of back to back Digital Platform Specific Signs (Train) at each track used by GO.
- Side Platforms: three sets of back to back Digital Platform Specific Signs (Train) at each track used by GO.
- Avoid clustering of digital signs in close proximity; Digital Departure Sign locations take precedence over Digital Platform Specific Signs.
- Always locate one set of Digital Platform Specific Signs at mini platform and the other two equally spaced.
- Digital Platform Specific Signs should be mounted to underside of rail platform canopy.
- Ensure digital screens are outside of train envelopes.

### Location Criteria - Bus

- At each bus platform at Line Stations, But Terminals and Car Pool Lots: one set of back to back Digital Platform Specific Signs (Bus).
- Locate digital signs consistently at driver end of each platform, outside of road envelope.
- Mount Digital Platform Specific Signs from underside of canopy, where possible. If not possible, use standard GO pole. Ensure poles are away from the barrier-free path of travel.

### Placement & Appearance Criteria

- Follow GO standard drawings for poles and canopy mounts.
- At rail platforms, place static platform number on track side.
- At bus platforms, place static platform number on road side.

### Monitor Type/Size

- LED type (Use current I&IT standard)

### Number of Monitors

- Set of two screens, back-to-back, at each location

### Mounting Height

- 2.438 m (8'-0") minimum clearance to u/s of screen/housing



Figure F-14: Conceptual Digital Platform – Canopy and Pole mounted modules

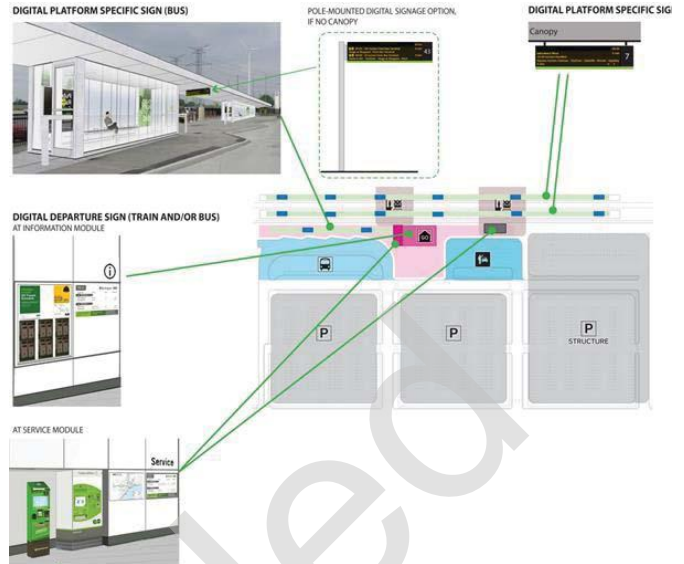


Figure F-16: Conceptual Typical Application of Digital Signs at a Rail Line Station

### Digital Parking Counter

#### Location Criteria

- At vehicular entrance(s) to parking structures, visible when approaching by road

#### Appearance

- Follow look and feel below. Integrate with GO Station ID Totem suite

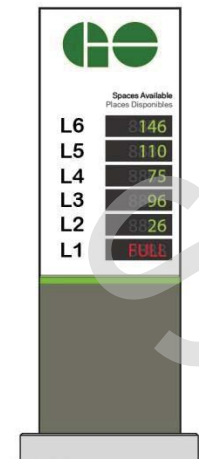


Figure F-15: Conceptual Digital Parking Counter Totem

### Technical Requirements

#### Process

- The digital signs will be supplied, commissioned and maintained by Information and Information Technology (I&IT), except for the Digital Parking Counter. I&IT will install the PCs, routers, and switches in the communications room
- Capital Project Delivery will perform the physical installation of the monitor, power cabling, and data cabling to the monitors from the communications rooms
- Screens and digital media players (DMP's), CPU's to be provided by IT and installed by the Contractor. Pick up from storage to be by Contractor.
- Transceivers, cabling terminations, communication room racks, and all civil work (conduits, pulling of wiring, pole footings, pole structure, mountings, NEMA boxes, etc.) to be by the Contractor.
- Fully installed and tested solution by the Contractor.
- Commissioning by the Contractor in coordination with IT and Station Operations.



**Technical Design Requirements**

- Each Digital Sign location must be shown on the electrical drawings and must include data and electrical outlet locations as well as any enclosures or other infrastructure associated with these signs
- Monitors: (Use current IT standard)
- Digital Media Player (DMP):(Use current IT standard)
- Contractor to provide transceivers/receivers, associated with cabling type and the balance of digital sign components. Provide receivers with minimal profile; by Extron or approved equivalent – reference products:
- Extron DTP HDMI 4K 330 Transmitter/ Receiver for shielded cable
- Extron HFX 100 Transmitter/Receiver for fiber
- Poles and mounting standards – refer to digital signage guidelines; GO pole conceptual design drawings under development. Shop drawings to be developed by the Contractor in coordination with digital signage equipment.

**Connectivity**

- Each of these devices requires a minimum of one CAT6 network outlet. These network outlets are to be cabled back to the nearest telecommunications room network rack and terminated as per the copper horizontal cabling standard.
- CAT6 shielded cable for devices placed within 90m from the Communications (Hub) Room.
- Multimode 6 strand fiber for installation beyond the 90m mark.

**NEMA Enclosure**

- NEMA enclosures shall be provided for receivers and fiber terminations at digital screens.
- NEMA/EEMAC Type 4X IP-65 with solid door capable to accept box lock requested by IT Field Services, and physically separated into two compartments to isolate power from communications devices.

- BEL R SS Series EEMAC/NEMA 4-4x-12 / IP-65 or Hoffman CONCEPTTM Type 4x or any other box meeting NEMA Type 4X IP-65, physical separation capabilities and box lock requirements.
- The enclosure size selection shall be based on the electrical and electronic equipment to be housed inside the box.
- All NEMA enclosures to be concealed within poles or finishes adjacent to screens. Visible NEMA boxes shall not be accepted. Provide access to concealed NEMA boxes. Do not drill or perforate the integrity of the NEMA box in any manner.

**Conduit**

- One 53mm conduit for power and separate 53mm conduit for data from the communications (hub) room all the way to the last pull point before the device; from the last pull use 25mm conduit to the device.
- Follow DRM in terms of conduit selection (PVC for buried conduit, RGSEC (Rigid Galvanized Steel Epoxy Coated at the factory) for all exposed locations such as tunnels, etc); 53mm liquid-tight conduits from the NEMA enclosure to the monitor mounting bracket. Provided with drip loops and easy release on the NEMA enclosure side.
- All conduits and connections to be concealed within poles or adjacent finishes.

**Power**

- Dedicated single 20amp duplex receptacles shall be used.
- Outdoor locations require sizing based on external enclosure and screen power draws. All receptacles must be GFI Type which may be reset at the NEMA enclosure. This is to be coordinated at time of design and must adhere to DRM.
- All devices shall be UPS backed-up. If the existing UPS does not provide enough capacity or if there is no UPS whatsoever, provide a Surge Protection Device in the local panel where the monitor and DMP is fed from. This device shall be appropriate for the specific panel at each location.

**Data**

- DMP's to be placed in Communication (Hub) Rooms.
- Assume one DMP per digital display. (confirm with IT)
- For design assumptions, use Cisco Interactive Experience Client 4650.

**Fare Systems**

Fare handling machines are proprietary equipment and will be provided and installed by the appropriate supplier. Consultants shall meet with GO Transit staff to ensure the required facilities needed to operate these machines, e.g., power, are provided.

The following equipment identified below are typical fare handling devices:

- "Interac", etc. (including data polling, Station Control Computer (SCC), Debit and Credit equipment)
- Smart Card equipment PRESTO
- Ticket Vending Machines (TVMs)

**PRESTO Overview**

Presto Fare Handling System is a smartcard-based fare payment system designed to support the use of one common fare card for fare payment on various participating public transit systems.

PRESTO equipment is proprietary, provided, and installed by the appropriate supplier, and comprises:

- SPOS (Station Point of Sale)–located on the Service Counters
- SFTP (Station Fare Transaction Processor)
- CQD (Card Query Device)
- HCR (Handheld Card Reader) and the HCR Cradles–located in Safety Systems Offices
- WAP (Wireless Access Points)–located at bus facilities
- CC (Concentrator Complex)–installed in main racks
- AVM's (Add Value Machines)

**Location**

Devices may be located either in the station building, on the platforms, at access points to platforms (tunnels, pedestrian bridges, walkways, stairs, ramps, etc)

**General Placement Criteria**

- Placement of devices and way-finding signage is site specific
- Devices shall be placed to avoid work within the Structure Clearance Envelope on/or beside Railway Track
- Bus Terminal locations require CQDs and SPOSs and TVM's; all fare collecting equipment is located on the bus
- Minimum clearance of 500 mm between two adjacent devices shall be maintained.
- Devices shall not impede accessible clearances and accessible routes.

**SFTP Placement Criteria**

- Devices shall be placed at all rail platform access points. Devices shall be placed maximum 75 m apart at locations with direct parking lot to rail platform access.
- Devices shall be placed along passenger natural flow, at clear and visible locations, and shall be readily accessible by Cardholders for fare payment.
- Remote locations shall be provided with two (2) devices on different circuits, to provide redundancy in case of power failure.

**CQD Placement Criteria**

- Shall be located outside the passenger flow, near TVM and/or Information Board/Digital Station Information Signs.

Refer to Standard Drawings for Presto System Architecture and installation details.

**Ticket Vending Machines (TVM) at Line Stations, Terminals and Carpool Lots****Placement Philosophy:**

- Each Rail Line Station and GO Bus Terminal shall provide, when possible a minimum of 2 TVM at the following mandatory locations

**Data**

- DMP's to be placed in Communication (Hub) Rooms.
- Assume one DMP per digital display. (confirm with IT)
- For design assumptions, use Cisco Interactive Experience Client 4650.

**Fare Systems**

Fare handling machines are proprietary equipment and will be provided and installed by the appropriate supplier. Consultants shall meet with GO Transit staff to ensure the required facilities needed to operate these machines, e.g., power, are provided.

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- HCR (Handheld Card Reader) and the HCR Cradles–located in Safety Systems Offices
- WAP (Wireless Access Points)–located at bus facilities
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**CQD Placement Criteria**

- Shall be located outside the passenger flow, near TVM and/or Information Board/Digital Station Information Signs.

Refer to Standard Drawings for Presto System Architecture and installation details.

**Ticket Vending Machines (TVM) at Line Stations, Terminals and Carpool Lots****Placement Philosophy:**

- Each Rail Line Station and GO Bus Terminal shall provide, when possible a minimum of 2 TVM at the following mandatory locations

- 1 TVM located within the vicinity of the station building
  - If no station building is provided, 1 TVM will be placed at main entrance to platform (as per site conditions) along the Barrier free path of travel in such a way that the path remains barrier free
- 1 TVM to be located at an additional platform access point
- Additional TVM's locations to be considered at the following pedestrian access points for the following areas within Rail Line and Bus Station sites:
  - Main Bus Loop/Platform
  - Parking Structure
  - Pedestrian bridge, mid span, as site conditions allow
  - Satellite surface parking lot
  - Any additional areas as determined by GO Design Standards staff
  - Park and Ride Facilities may be provided 1 TVM located on passenger platform adjacent to the shelter where power and communication infrastructure is available
- Preference is for a shelter over the TVM
- TVM's are to utilize sunshade top (both large and smaller sized sunshades) as site conditions warrant where a full shelter is not possible
- A minimum queuing space in front of TVM shall be three customers
- Queuing space shall be increased based on historical peak station demand information provided by GO staff
- Placement and orientation of TVM's and queuing areas shall not adversely impact the main flow of customers
- TVM concrete base installation details as per GO Standard Drawings TVM-001, TVM-002 and TVM-003
- TVM Electrical and Communication details as per F.1 Electrical and F.2 Communications

## Two Way Intercom

### Design Requirements–General

The Two Way communication device is a customer service amenity, which assists customers with inquiries at rail station site to provide an enhanced customer service amenity at our platforms, elevators, parking structures, universal washrooms and maintenance facilities.

Two Way Communication Devices shall be placed at the following locations at a typical GO Rail station site:

#### ***TVM Configuration Criteria***

- When site configuration allows, it is encouraged to locate TVM's that satisfy both mandatory and preferred locations. The intention is to maximize TVM accessibility and convenience to customers with the use of a single TVM. The TVM must be visible from main entrance and located where there is a high volume of passengers. Ensure that placement does not block major egress locations
- Location of TVM to be coordinated with the location of CDQ tower, S4 Digital Information Sign, and the SFTP tower where possible
- When a cluster of all 4 devices is possible, the TVM and CQD shall be placed adjacent to each other
- A minimum 500 mm horizontal clearance is required between the CQD and the TVM
- TVM to be weather sheltered where possible

- At each elevator lobby on site including tunnels, pedestrian bridges and parking structures (new device technology to address current technical and operational issues)
- In the vicinity of the Mini platform (to replace existing Bell telephones):
- In all universal washrooms:
- Secure entrance points for GO Operational Facilities;
- In each elevator cab;
- At each Carpool/Park and Ride site;

The Call flow shall be:

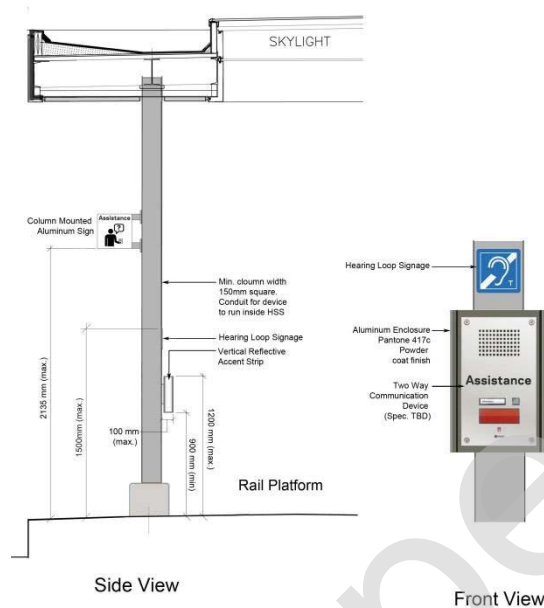
Call made to service attendant with call backup available 24/7 by Transit Safety.

Enhanced Accessibility Features include:

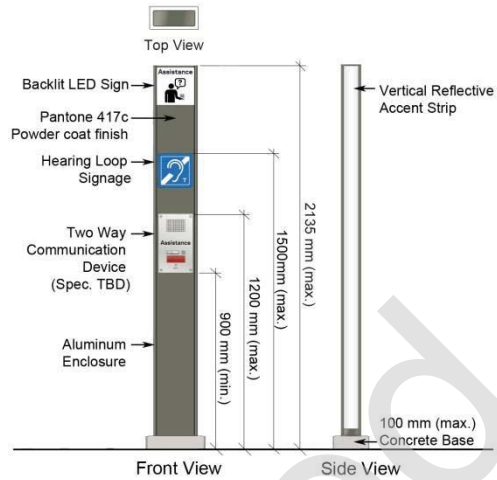
- Localized Hearing Loop to support tele-coil wireless technologies,
- Clear, barrier free identification using standard signage, colours and graphics in accordance with the principles outlined in the GO Transit Static Signage Catalogue, AODA and FLSA requirements.

Refer GO Standard Guideline Performance specifications for detailed two way communication device requirements.

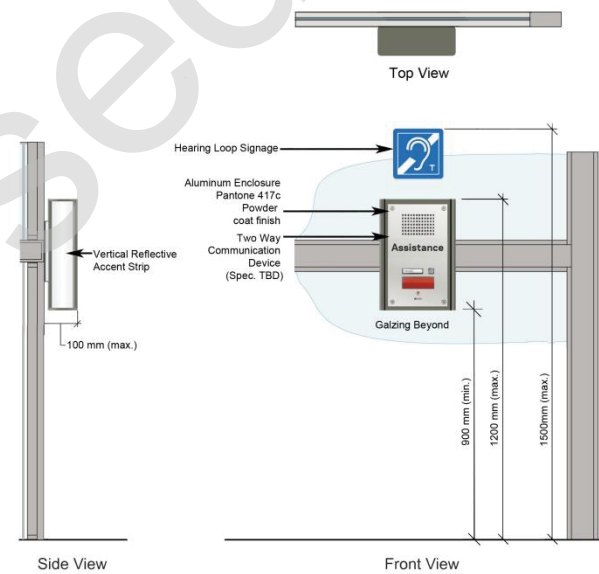
**Appearance**



**Figure F-17: Conceptual two-way intercom column support application (At Mini Platform Area)**



**Figure F-18: Conceptual two-way intercom free standing application**



**Figure F-19: Conceptual window Mullion Application**



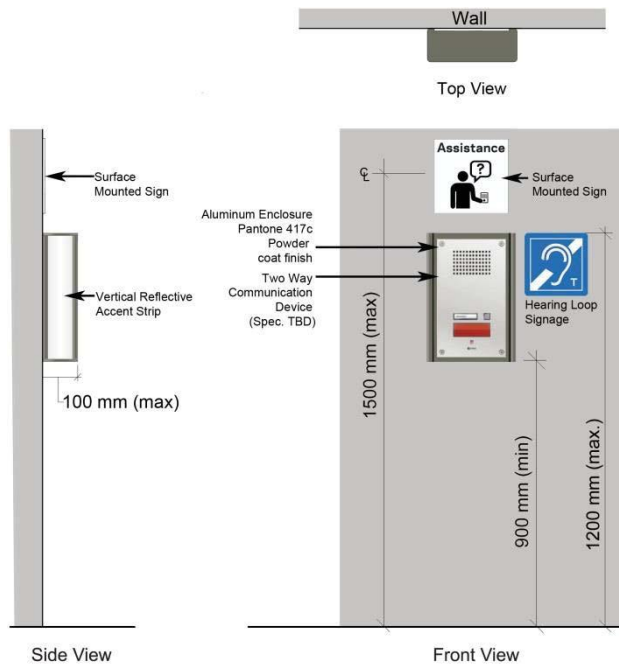
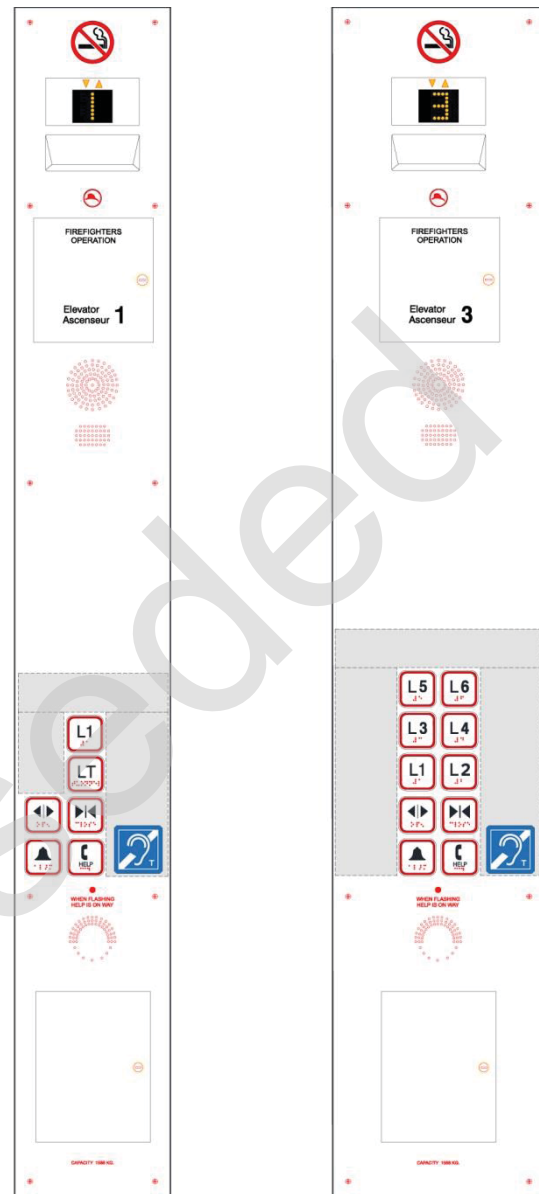


Figure F-20: Conceptual Wall mounted Application (Tunnels)



Elevator Cab Console  
Typical Layout  
(Linear Button array)

Elevator Cab Console  
Parking Structures  
(Keyboard button array)

Figure F-21: Conceptual Interior Elevator Cab Application (Diagram only)

## F.5 Finishes and Materials

### Design Requirements—General

**Materials selected shall:**

- Be visually and tactilely pleasing

## E.1 Station Buildings

The interior planning and design of the station building shall be integrated with the site environment to facilitate safe and convenient intermodal transfer, based on intuitive wayfinding and the customer journey. Intuitive wayfinding is based on the concept of aspect and prospect views.

**Aspect** can be described as a facade design that is open and welcoming on the customer approach to the station building, with clear sight lines into the station interior.

**Prospect** is about setting up clear sight and panoramic views from key customer journey activity points, with privileged views from the Service and Waiting areas of the station out to the Kiss N Ride and bus loop.

The customer journey, which is the way a customer circulates through GO sites, shall be the primary placement strategy used when laying out the interior programs. The customer journey can be broken down into four key types of activities:



### Decision Space

Purpose: prioritizing passenger decisions, key customer orientation points  
Characteristics: clear sight lines, wayfinding and signage, free of visual clutter

---



### Circulation Space

Purpose: prioritizing clear connections to program areas that are unobstructed  
Characteristics: unobstructed lines of movement respecting customer desire lines

---



### Opportunity Space

Purpose: emphasis on passenger comfort and amenities  
Characteristics: welcoming, comforting, safe, clear sight lines

---



### Support Space

Purpose: key point of customer interface and service  
Characteristics: welcoming, open, pleasant

### Figure E-2: Customer Journey Key Activities

These activities are points along the customer journey and are the tools in framing the critical adjacencies within the station building between program areas. They shall be arranged to suit specific site constraints, while maintaining the appropriate adjacencies required.

Along with the concept of aspect and prospect views, the customer journey and intuitive wayfinding contribute to a holistic approach to the design of stations, making the site and station experience comfortable and easy.

The interior design shall establish visual relationships to particular site features and promote the following:

- Establish sight lines to adjacent transit modes
- Establish sight lines to key station building amenities
- Promote customer safety and comfort

- Promote natural daylighting

## Key Sustainability Accommodations

- Apply passive means of reducing energy where it does not conflict with other customer service and operational design requirements
- Maximize the use of natural light coupled with photocells, motion sensors and controls to activate lighting when necessary
- Reduce energy consumption and emissions at all buildings. Use heat recovery to conserve energy for heating and cooling
- Design sites using Crime Prevention Through Environmental Design (CPTED) principles to provide natural surveillance and safe travel through the site for all. This includes safe routes for pedestrians and cyclists. Provide thermal comfort for staff and customers with protection from weather via canopies and shelters

## Station Program Areas and Building Sizing

Building Type	Size "A" (large)	Size "B" (medium)	Size "C" (small)
Building Size	>500m <sup>2</sup>	300-500m <sup>2</sup>	< 300m <sup>2</sup>
Average Customer Weekday Traffic	>8000 persons	2000-8000 persons	up to 2000 persons
Program Area	% of Total Size	% of Total Size	% of Total Size
<b>I. Platform Access Area</b>	<b>40%</b>	<b>20%</b>	<b>30%</b>
Circulation			
Self-Service Area			
<b>II. Waiting Area</b>	<b>10%</b>	<b>10%</b>	<b>10%</b>
Dedicated Seating			
<b>III. Service Area (1)</b>	<b>5%</b>	<b>10%</b>	<b>10%</b>
Customer Service			
Staff Back-of-house			
Staff W/C			
<b>IV. Public Washrooms</b>	<b>10%</b>	<b>5%</b>	<b>15%</b>
Women W/C			
Mens W/C			
Universal W/C			
<b>V. Retail/ Concession</b>	<b>10%</b>	<b>10%</b>	<b>10%</b>
including storage			
<b>VI. Ancillary</b>	<b>15%</b>	<b>25%</b>	<b>25%</b>
Mechanical (min 45m <sup>2</sup> )			
Electrical (min 15m <sup>2</sup> )			
Communication (min 10m <sup>2</sup> )			
Maintenance Rm (min 7m <sup>2</sup> )			

Station buildings with additional facilities such as Retail, GO Staff Room with universal washroom(s), Bus Driver Room with universal washroom(s), Bus Dispatcher Room, and Transit Security Room will be in addition to the station building size determined above.

<sup>2</sup>Small buildings do not require multi-use washrooms. Provide two universal washrooms, which can be used by either sex.

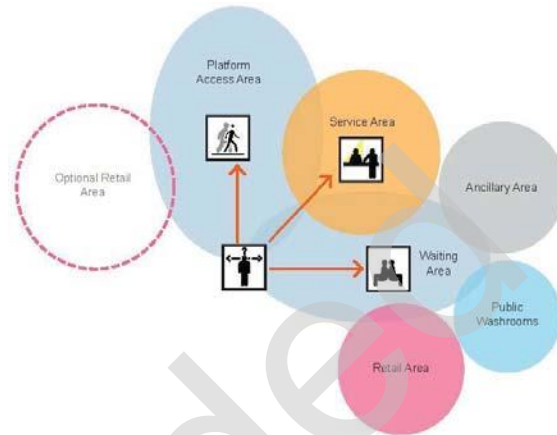
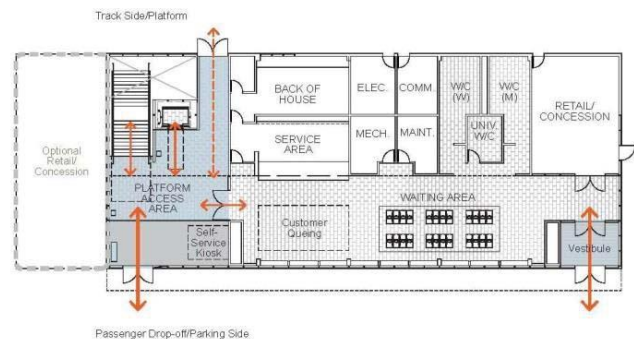


Figure E-3: Station Building Program Areas

## Station Building Interior Design: Program Areas Platform Access Area




Figure E-4: Rendering of Platform Access Area





### Figure E-5: Schematic of Platform Access Area

#### Feature Elements

- Linear light fixtures in varying lengths, suspended from the ceiling, positioned lengthwise in the direction of travel.
- Floor Finish: light grey ceramic tile
- Ceiling Finish: suspended metal pan ceiling
- Wayfinding Band placed perpendicular to direction of travel
- Self-Service Kiosk which includes fare devices, digital signage, and marketing communications
-  Refer the Fixtures and Furnishings section of the DRM for details on Digital Signage.

#### Key Fixtures and Furnishings

- Fare devices
- Seating
- Recessed walk-off mats at all exterior doors
- Waste receptacles
- Third party advertising

#### Lighting Strategy

- Shall be illuminated by a downlight linear suspended LED fixtures
- Fixtures must to be suspended at a consistent height, just above the wayfinding
- Provide a mix of 1220mm long and 2440mm long fixtures suspended in a random pattern, suspended from the ceiling with stems.
- Fixtures are not to be located over stairs except at landings

## Waiting Area



Figure E-5: Rendering of Waiting Area

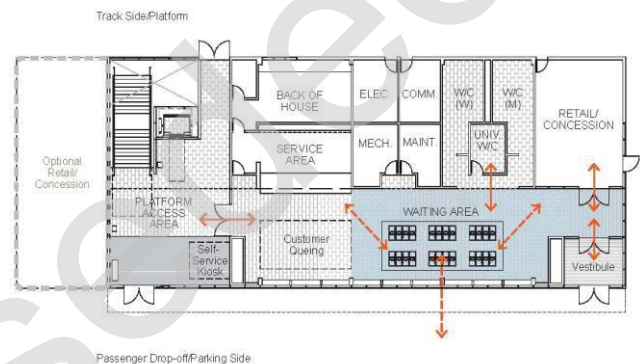



Figure E-6: Schematic of Waiting Area

#### Design Requirements


- Finish ceiling height shall be between 3600 to 4000 mm maximum
- Do not combine a circulation path within a seating zone
- Ensure accessibility seating requirements are met by providing a clear area designated for wheeled mobility aids (WMAs), outside of the circulation path

#### Feature Elements

- Linear light fixture in waiting area outside of the delineated seating zone
- Drum light fixture, suspended from coffered ceiling over the delineated seating zone
- Floor Finish: Light grey ceramic field tile; dark grey ceramic tile at dedicated seating zone
- Ceiling Finish: Suspended modular wood grille ceiling system

- Wayfinding Band placed parallel with circulation path
- Self-Service Kiosk (at stations where deemed necessary, such as hub stations)
-  Refer the Fixtures and Furnishings section of the DRM for details on Digital Signage.

**Other Elements: Fixtures and Furnishings**

- Fare devices
- Digital signage (service information, infotainment, 3<sup>rd</sup> party advertising)
-  Refer the Fixtures and Furnishings section of the DRM for details on Digital Signage.
- Static information signs
- Seating (both integrated and free standing)
- Charging stations (power receptacles with USB plug-in)
- Waste receptacles
- Recessed walk-off mats at all exterior doors
- Pay phone
- Retail (where applicable): fixtures and furnishings as per retail strategy guidelines

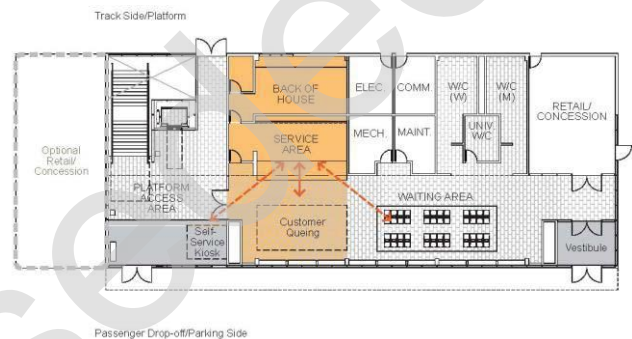
**Lighting Strategy**

- Provide linear light fixtures between the suspended modular wood grill ceiling system, outside of the delineated seating zone
- Provide a custom drum-shaped suspended light fixture over the delineated seating zone
  - The drum fixture is to be equipped with multiple light sources
- The number of drum fixtures depends on the size of the seating zone

**Service Area**



**Figure E-7: Rendering of Service Area**




**Figure E-8: Schematic of Service Area**

**Design Requirements**

- Service Counters and Self-Service Kiosks shall be designed to be barrier-free. Queuing areas shall be wide enough for people using mobility aids including electric wheelchairs and scooters
- Minimum clear space in front of Service Counter shall be 5-7 customers per attendant, which includes barrier-free accommodation
- Minimum clear space in front of Self-Service Kiosk shall be 2-3 customers per kiosk, which includes barrier-free accommodation
- Refer GO Standard Guideline Specifications and Drawings for detailed requirements.

**Feature Elements**

- Service Counter

-  Refer the Fixtures and Furnishings section of the DRM for details on Digital Signage.

### Lighting Strategy

- Semi-recessed slot lighting system around the perimeter of the finish ceiling system to be used to create a soft front illumination on the fascia and customer side of the counter, and lengthwise along the walls of the adjacent spaces
- Adjustable recessed pot lights to be provided on the customer side in the bulkhead of the Service Counter
- Task eyeball lights provided at ceiling level on either side of the station attendant work area, with light direction concentrated at the centre of the attendant work surface, minimizing glare off desk surface
- Puck light at underside of station attendant counter for servicing with built in on/off controls
- 200mm cube pendant light above each station attendant service position to be individually programmed to indicate whether service position is open (ON), or closed (OFF)
  - This is an ambient light, not a task light. Consider placement of CCTV cameras to avoid conflict with pendant lights

### Public Washrooms

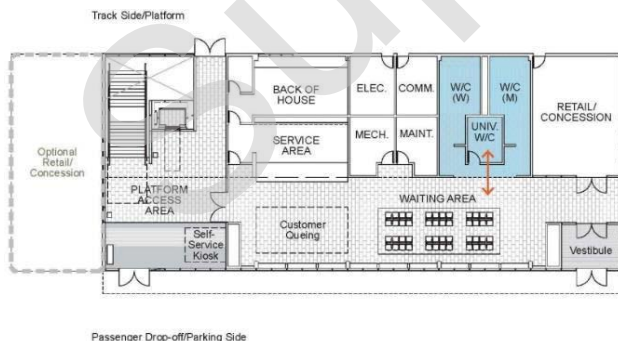


Figure E-9: Schematic of Public Washrooms

### Design Requirements (In addition to all code requirements)

- Entrances into multi-use washrooms (i.e. female/male) shall be door-less
- All plumbing fixtures to be located on interior walls
- One standard infant change table/unit shall be provided in each washroom
- Floor drains shall not be in pedestrian or wheelchair paths
- The door swing into the universal washroom shall screen and partially obstruct the line of vision to the lavatory
  - It shall be equipped with a power operator
  - The door hardware shall be a lever handle passage set, with a latch operable from the interior, to display “vacant” or “occupied”
- An emergency two-way call system shall be provided and follow the same call flow as the two-way intercoms outside elevators (i.e. call directed to Station Attendant first, then Transit Safety, etc.)

### Feature Elements

- Feature wall tile at Washroom entry to be different in colour from the general station wall finish
  - Use of smaller format tile with distinct pattern is supported
- Refer to Materials + Finishes Performance Specifications for additional information

### Other Elements: Fixtures and Furnishings

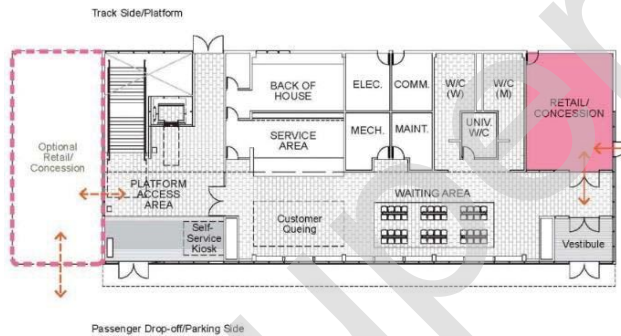
- Partitions
- Lavatories (toilets/urinals), wall hung, lever handle faucets, wrist-blade type
- Sinks, wall-hung (barrier-free)
- Tilt mirrors, stainless steel frames (barrier-free)
- Electric Hand Dryers

- Toilet Paper Dispenser, surface mounted, multi-roll vertical type, lockable, commercial grade
- Waste Receptacles, wall-mounted, stainless steel, vertical type with a capacity of 20L minimum, commercial grade
- Soap dispensers, wall-mounted, commercial grade, room deodorizers, feminine Napkin Disposal Bin, free-standing (supplied by GO)
- Coat Hooks, two: one at standard height, one at barrier-free height

**Lighting Strategy**

- Use linear LED lighting in the ceiling cove at back wall of washroom stalls to create a soft uniform glow in the space
- Use recessed LED fixtures for the rest of the washroom area
- Provide a perimeter ceiling cove and linear lighting along the wall within the female/male washroom stalls

**Retail/Concession**



**Figure E-10: Schematic of Retail/Concession**

**Design Requirements**

- Provide Retail/Concession area to be located in close proximity to the Public Washrooms
- Provide direct access from building exterior for after-hour access, when possible
- Provide mechanical, electrical, plumbing, and communication rough-ins to accommodate retail functions
- Detailed retail typology allocations, service offerings, footprint selection, building access and mechanical/electrical service

requirements can be found in the GO Standard Retail base building requirements.

**Lighting Strategy**

- Base building fit-out as per retail strategy guidelines

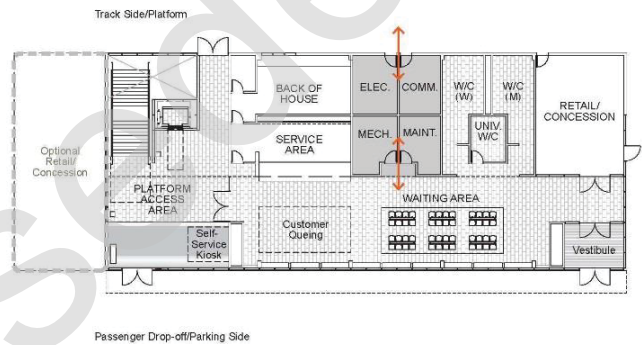
**Feature Elements**

- None

**Other Elements: Fixtures and Furnishings**

- Base building fit-out as per retail strategy guidelines

**Ancillary Spaces**



**Figure E-11: Schematic of Ancillary Spaces**

**Design Requirements**

- Ancillary area includes Maintenance Room, Mechanical Room, Electrical Room, and Communications Room
- Service structures to house boilers, garbage bins, or generators, shall be consolidated where possible to reduce the amount of structures obstructing wayfinding and sightlines on site
- Provide direct access to the Maintenance Rooms from the building interior
- Ensure the Maintenance Room is adjacent to the Public Washrooms, and no meters, water tanks, or other intrusions are placed in this room.
  - It shall be dedicated for maintenance equipment and storage only
- Ensure the Maintenance Room door is an in-swinging door. It shall be an extra wide



heavy duty hollow metal double door with a single 34" leaf and a second 12" latching section, for a total opening of 46"

- Provide a minimum of four (4) butt hinges per door
- If required, provide roof access hatch with a wall mounted ladder in the Maintenance Room for rooftop mechanical equipment access
- Provide direct access to the Electrical and Communication Rooms from building exterior for after-hour access
- Ensure spare wall space for future equipment due to additions or renovations is provided in the Electrical Room
- Ensure the Communications Room is located adjacent to Service Counter and near the Electrical Room, when possible

### Lighting Strategy

- Base building fit-out
- Refer to Lighting Performance Specifications for additional information

### Feature Elements

- None

### Other Elements: Fixtures and Furnishings

- (Refer to Electrical and Mechanical sections of DRM for technical requirements and specifications)
- In Maintenance Room:
  - 4-6 power receptacles with 208V and 110v supply and 60-amp service.
  - Floor mounted slop sink with easy access clean out for slop sink P trap
  - Faucets and floor drains
  - Exhaust fan
  - Open shelving and mop hooks
  - Mop and broom hangers, floor sweepers
  - Four (4) staff lockers, full height with vented louvers at base
  - Metal storage cabinet, lockable

- Desk and chair
- Key fob access

- In Mechanical Room:

- Power receptacles
- Floor drains
- Spare and additional filters, etc.
- Storage shelves and/or cabinets

### Feature Elements at Station Building

Feature Elements are key infrastructure pieces that are designed to be the same at every station—in application, form, function, and finish. The intent is that these feature elements portray a consistent presence and brand at our stations, making the customer experience intuitive, familiar, and comfortable. There are four feature elements that are intended to ensure the GO Brand and identity is strong and immediately identifiable across all applications. These are identified in the example station layout below, along with the specified ceiling material finish:

- Service Counter
- Self-Serve Kiosk
- Delineated Seating Area
- Wayfinding Band

These four feature elements can be adapted with ease at different locations across the network as an integral part of the overall interior design language. Based on the station plan and design, the location of the feature elements may differ from the Example Station shown. The feature elements shall not be placed based off a previous station building design, but be assessed based on the customer journey and strategically placed using the guidelines outlined in this section. The following diagrams use existing station buildings and illustrate where feature elements would be placed at different locations based on the customer

journey.

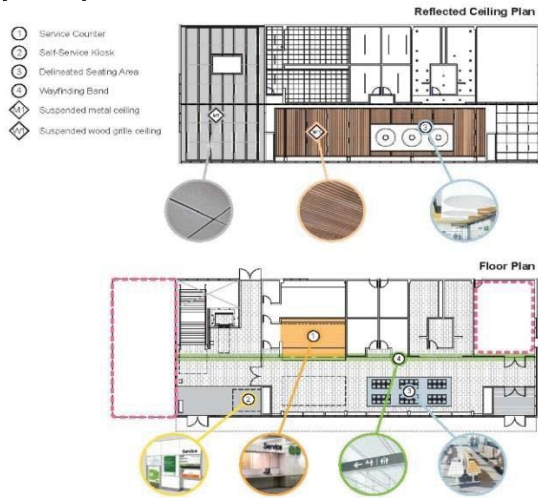


Figure E-12: Feature Elements

**Feature Element: Self Service Kiosk**



Figure E-13: Self Service Kiosk Rendering



Figure E-14: Info Wall in Station Waiting area Rendering

**Purpose**

To create a self-serve area for fare dispensing and service information, clustering essential amenities needed to use the GO service.

**Requirements**

The kiosk shall be designed with three distinct sections:

- Section 1: GO ticketing (fare dispensing interface)
- Section 2: GO marketing and information (static interface)
- Section 3: GO Schedules and trip planning (customer interactive interface)

Each section can be multiplied as many times as needed to meet service demands, or it can be deleted if deemed not required. It is meant to be flexible and scalable for its location and projected use. Note that Sections 1 and 3 are located at the ends to encourage “interactive” use, while Section 2 is centered between to encourage a more “static” viewing-only use, creating a buffer between the interactive interfaces.

The kiosk shall, be integrated with the architecture of the building as much as possible, creating an uncluttered and organized environment resulting in an easier and intuitive way of using the service and improved the customer experience.

The shell of the kiosk shall be white, referencing the “system” wall used at the Customer Service Counter, making it distinguishable both in brand and amenity type.

The material finish shall have a high gloss finish, be resilient, durable, and vandal resistant.

Access shall be provided from the front using flip maintenance doors, as much as possible. Where station conditions permit, access from the back is acceptable.

All Platform Access Program Areas shall be equipped with at least one Self Service Kiosk. It shall be placed just off the main circulation path. Ensure a minimum clear space for 2-3 customers in front of kiosk is provided, which includes barrier-free accommodation.

At exterior platform access points where the entrance is not enclosed, a kiosk shall be placed by the entrance just off the circulation path,

protected against the elements by a canopy or shelter.

Where deemed required, waiting areas can also be accommodated with a Self Service Kiosk, in addition to the platform access points. These additional locations shall be based on the station size, ridership demand, limited service stations, or where a Service Counter is not provided.



Refer the Fixtures and Furnishings section of the DRM for details on Digital Signage.

## Feature Element: Delineated Seating Area

### Purpose

To provide a comfortable delineated touchdown area for customers with added amenities such as charging stations

### Requirements

Integrated seating shall be designed as an architectural element of the station, typically located along the length of a wall (not fixed in the middle of the space). It shall be provided throughout the station where designed for.

When additional seating is provided, it shall be delineated as a distinct zone, reinforced and highlighted by a darker floor tile finish and coffered ceiling above featuring a pendant drum light fixture, giving the space a more intimate, comfortable human scale. This delineated seating zone shall be within the waiting area, away from but adjacent to the circulation path, and in close proximity to GO information and retail, when these amenities are provided. The seating provided shall consist of stand-alone benches and other non-fixed furnishings.



Figure E-15: Rendering of Delineated Seating Zone

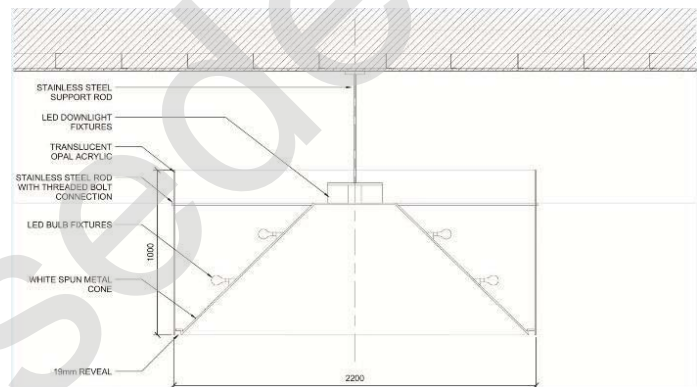


Figure E-16: Lighting Configuration of Delineated Seating Zone

## Feature Element: Wayfinding Band

### Purpose

To provide wayfinding information in stations, improving navigation by identifying services and amenities.

### Requirements

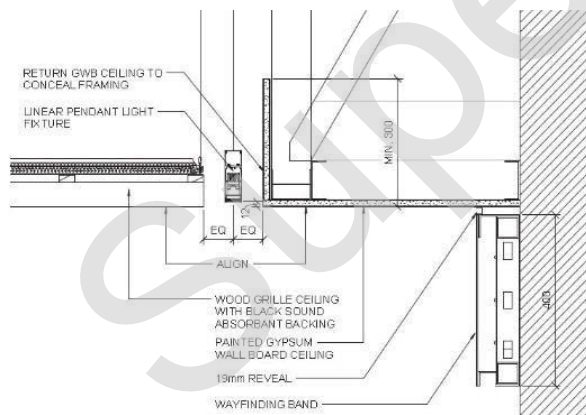
The information on the wayfinding band shall be of program areas (such as Service Counter, Public Washrooms, etc.), excluding ancillary spaces. For information on the graphics and icons, refer to the Signage Catalogue.

The wayfinding band shall be continuous in application, extending wall to wall where it is placed. The placement of the wayfinding band shall be assessed station-by-station, working with the circulation and decisions spaces of each station. The band shall typically be seen on approach, perpendicular with the decision point

along the customer journey, informing customers where they need to go. As such, the band will not always be in the same location at every station (i.e. above the Customer Service Counter)—it shall be designed and placed according to the customer journey.



**Figure E-17: Wayfinding Band**



**Figure E-18: Wayfinding Band Conceptual Details**

## E.2 Bus Terminals

Building Program for Terminals follows the Station Building requirements with the exception of the following areas provided in addition:

### Dispatcher Room

The bus dispatcher room, where required, shall be elevated to permit the dispatcher in a seated position to have sight lines of all buses. It shall be located strategically for visibility of bus bays, particularly of arriving buses, where possible. The usual location is on an external wall, but it may also be located within the waiting room. Generally, it shall be adjacent to the driver room and shall have access from the driver room.

Both rooms may also be adjacent to the station attendant room, in which case a staff room may be provided in common for the dispatcher, drivers, and station attendants, with shared washroom and kitchenette facilities. Depending on the size of the facility, separate male and female staff/driver washrooms may be required.

The floor shall be elevated a minimum of 570 mm above the waiting room floor level and platform level, equivalent to a minimum 3-riser stair requirement. The seated dispatcher's eye level will then be approximately 1.69 m above platform level, over the heads of most passengers. Other design requirements include:

- Desk-height counter with insulated glazing above, knee-space below
- Side and/or back counters to be typical counter height with task lighting from wall-hung cabinets
- Wall hung cabinets with adjustable shelves and lockable doors
- Non-glare recessed LED luminaries with 12 x 12 x 12 mm parabolic egg-crate lenses; if the room is on an exterior wall, insulating glass shall be fully tempered tinted low-E glass
- Interior locations to have fully tempered 10 mm clear glazing
- Where a dispatcher room is adjacent to a driver room, but has a separate entrance, a pass-through sliding-glass window shall be provided between them, operable by the dispatcher, for receiving driver reports and direct communications
- Where a dispatcher room is in a waiting room, the pass-through window may be required into the waiting room



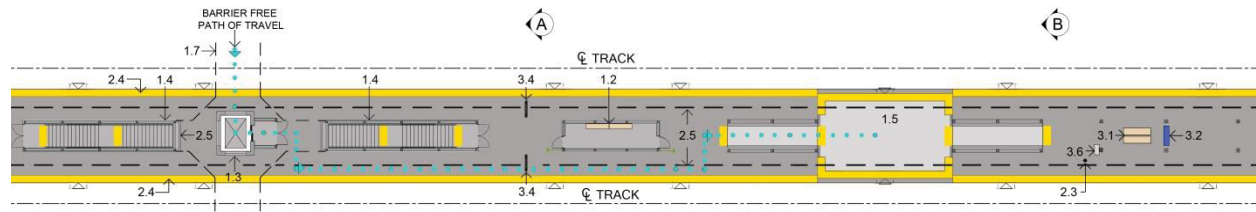


Figure D-5: Typical Rail Platform Configuration

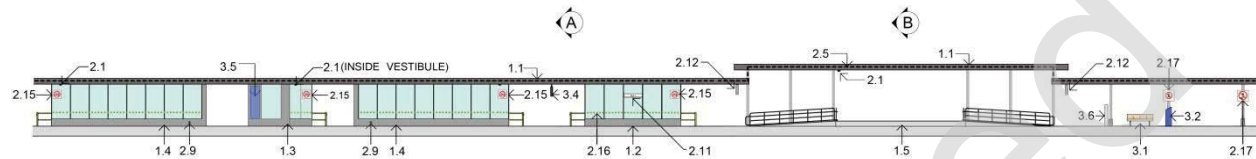


Figure D-6: Typical Rail Platform Elevation

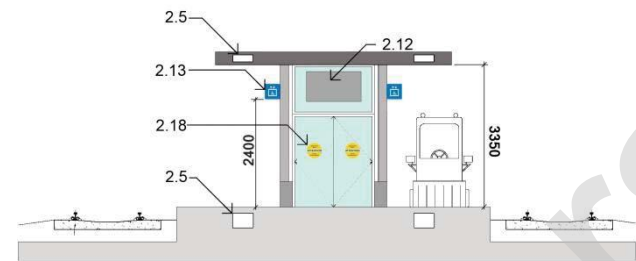


Figure D-7: Section A

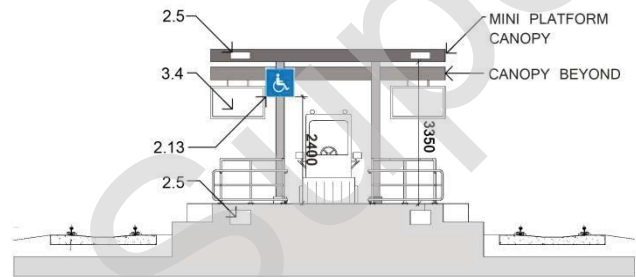


Figure D-8: Section B

**LEGEND**

- |                                 |   |                               |
|---------------------------------|---|-------------------------------|
| 1.1 Continuous Platform Canopy  | 2.1 CCTV                                | 3.1 Platform Bench / Seating  |
| 1.2 Integrated Platform Shelter | 2.2 PA (not shown)                      | 3.2 Waste Containers          |
| 1.3 Elevator and Vestibule      | 2.3 Snowmelt System w/ Platform Sensors | 3.3 Information Board         |
| 1.4 Stair Access and Vestibule  | 2.4 Detectible Platform Edge Tile       | 3.4 Platform Digital Monitors |
| 1.5 Mini Platform               |   | 3.5 Advertising (TBD)         |

1.6 Platform Lighting (not shown)	2.5 Platform/Canopy/Vertical Raceway	3.6 Two Way Communication Devices
1.7 Tunnels	2.6 Corridor Raceways (TBD)	3.7 Wi-Fi (not shown)
1.8 At Grade Pedestrian Crossings (not shown)	2.7 Drainage (not shown)	
1.9 Pedestrian Bridges (not shown)	2.8 IT Node/Cluster Infrastructure (not shown)	
1.10 Poles (PA and CCTV-not shown)	2.9 Hose Bib	
1.11 Ramps (not shown)	2.10 Fencing (Not Shown)	
	2.11 Platform Sign ID	
	2.12 Directional / Way finding Signs	
	2.13 Accessibility Signage	
	2.14 Amenity Signage	
	2.15 Regulatory Signage	
	2.16 Safety Signage	
	2.17 Warning Signage	
	2.18 Operational Signs	

## Rail Platform Canopies

Canopies on all rail platforms with integrated shelters and accesses such as elevator and stair enclosures and related amenities shall be provided.

The canopy shall be continuous and should extend to provide maximum coverage (at least 85% of platform cover) over the rail platforms.

Canopies to contain two (2) separate raceways along the full length - one for data, the other for power.

Height max. 3350 mm from t/o platform to u/s canopy.

Min. 400mm high concrete pier at each support column.

Integrate canopy lighting and other fixtures and amenities such as CCTV, digital signage etc in the canopy ceiling structure.

## Rail Platform Access— Tunnels/Ramps/Stairs

Provide a network of barrier-free pedestrian pathways that connects all of the station components to facilitate easy intermodal transit connections.

Connect the station site with adjacent communities via sidewalks, local pathways, or

bridges to maximize the pedestrian access to the site and minimize walking distances.

Provide direct pedestrian paths, continuous from the closest local road to at least two of the barrier-free platform access points.

When side platforms are used, provide direct walk on platform paths to maximize access to each platform.

At least one barrier-free rail platform access must be as close as possible to the mini-platform.

Connect one of the rail access tunnels with the station building to provide additional convenience and customer service.

Consider whether the tunnels or bridges connecting to the platforms can also act as barrier-free community connection points on either side of the tracks. If so, ensure each community connection point can remain open when the station needs to be closed.

Platform access shall be visually discernible from site access points to encourage intuitive site navigation to the rail platform.

Provide redundant means of barrier-free access to island platforms by means of two elevators.

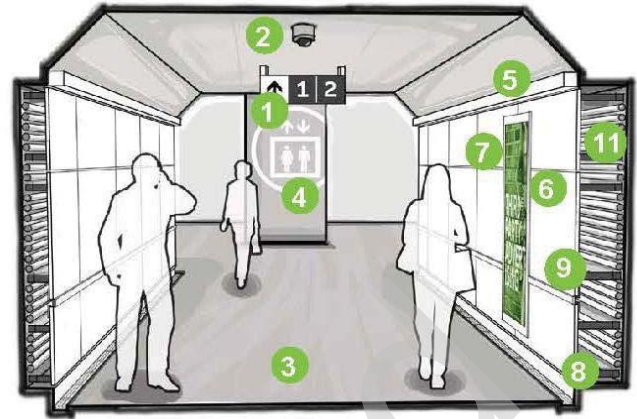
This section covers platform access structures including but not limited to:

- Pedestrian Tunnels
- Stairs and Stair enclosures

- Ramps
- Elevators
- Bridges and Pedestrian Overpasses
- At Grade Pedestrian Crossings

**Pedestrian Tunnels**

- Platform access pedestrian tunnels must be linked to the station building or remotely located, as determined by site layout
- Location of conduit, including location of raceways and crossovers must be coordinated
- For wall cladding, final panel to wall attachment details & dimensions to be coordinated and verified with porcelain panel fabricator
- Vertical chases for conduit to be cast-in-place in tunnel transitions to stairways and elevators to be provided
- Conduit shall be designed within floor of the tunnel or in dedicated duct bank



**Figure D-9: Pedestrian Tunnels Design Elements**

**Legend**

1. Wayfinding signage
2. CCTV ceiling mount
3. Smooth finish concrete floor
4. Supergraphics applied to elevator shaft wall
5. Concealed continuous LED light fixture in aluminum valance, with down (70%)- and up (30%)-lights on both sides
6. Porcelain removable panels (hinged access preferred) at pull box locations for maintenance access
7. Digital advertising box (Note: Consultant to coordinate mounting details with porcelain panel supplier)
8. Metal grate over gutter secured to floor with removable retaining clips
9. Photoluminescent emergency egress strip mounted on metal trim at porcelain panel joint line, Installed to be flush with porcelain panel
10. Full-height cast-in-place conduit raceway with appropriate crossovers

**Pedestrian Tunnel Design Criteria**

**Table D-2: Tunnel Design Criteria**

Criteria	Specifications
Height	<ul style="list-style-type: none"> <li>• Compatible with CCTV requirements</li> <li>• Overhead signs shall not obscure the field view of CCTV</li> <li>• Min. height shall be 2.7 m inclusive of concrete floor topping</li> </ul>
Width	3.66 m under the tracks
Slope	Min: 0.30% for drainage
Conduits	Located behind porcelain panels
Drainage	<ul style="list-style-type: none"> <li>• Side-gutters 40 mm deep by 80 mm wide</li> <li>• NOT to be located at the bottom of stairs or in front of service doors or</li> </ul>

	elevator doors <ul style="list-style-type: none"> <li>• Provide pump rooms with pits</li> </ul>
Construction	Concrete construction in accordance with railway requirements and structural site needs
Raceways	<ul style="list-style-type: none"> <li>• Integrated into walls and floors</li> <li>• Located behind porcelain panels</li> </ul>
Clearance	From top to base of rail min of 0.508 m
Corners	<ul style="list-style-type: none"> <li>• 45° angled (300 mm x 300 mm minimum corner cuts at 45 degrees)</li> <li>• Convex mirror units at internal 90° corners and angled wall corners at directional changes</li> </ul>
Photoluminescent Strips	<ul style="list-style-type: none"> <li>• Tunnel walls (both sides)</li> <li>• Surface mounted</li> <li>• Integrated within wall panel system</li> <li>• Installed continuously along entire length of tunnel transitioning in a continuous manner to all stairwells</li> </ul>
Digital Signs	Installed at tunnel entrances (in accordance with overall digital sign placement requirements)
3rd Party Advertising	Advertising signs integrated within wall paneling system
Vertical Clearance	800 mm top of tunnel roof membrane overlay to underside of rail (This is based on 300 mm sub-ballast, 300 mm ballast to bottom of ties and 178 mm ties)
Wall and Floor	Walls: Porcelain wall system, Floor: Smooth finish, no advertising to be placed on floor of tunnels

## Ramps

Where there is an opportunity to provide direct access, or ramped access, as an alternative to stairs, ramps shall be explored.

Provide pedestrian ramps with access from grade to side platforms. Adverse weather can cause slippery conditions on exterior ramps; based on the infrastructure availability at the location, heat the pedestrian ramp surface or cover the ramp.

The colour and tonal contrasting requirements of ramp elements shall all be designed and provided in accordance with the current Ontario Building Code and industry standards on accessibility. Ramps shall have a 100 mm painted line-marking indicator at the start and finish of a ramp slope. Design vehicular ramps with excessive slopes with a snow melting system.

## Rail Platform Stairs and Enclosures

Stair systems not only provide a means of access and egress to and from rail platforms, but also provide means of vertical travel for many people with disabilities, children, seniors, parents with strollers etc.

Stairs shall be/have:

- Easy to find
- Clearly identified with wayfinding
- Located near the major circulations routes
- Offset from the direct route of travel so that they are not a hazard
- Uniform riser heights and tread depths
- Nosings, handrails, landings, etc. and all other regulatory and barrier free requirements

## D.1 Site Planning and Organization

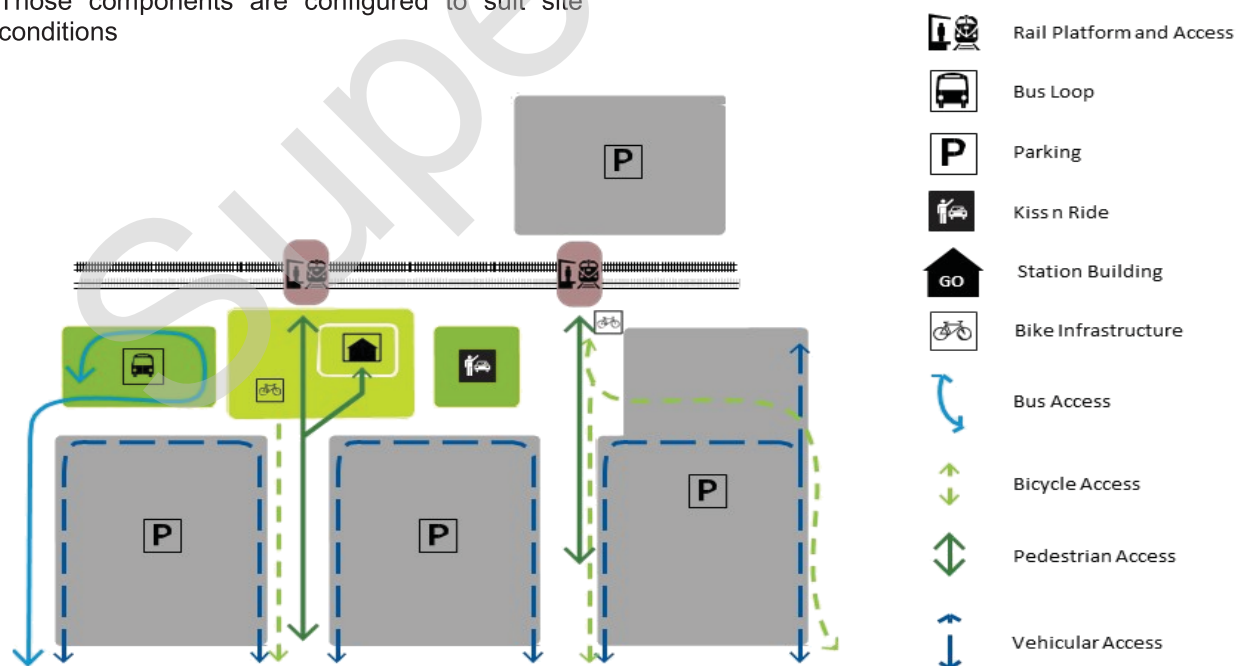
Station site planning consists of a system of components that support the GO transit service.

Key principles in planning and organizing GO sites include:

- Separate modes of travel
- Connectivity to community pathways, walkways and transit
- Plan for future/flexibility
- Intuitive wayfinding to major elements
- Maximization of barrier free routes
- Network and pedestrian pathways
- Use of sustainable materials and technologies
- Integration with local communities and municipalities

### Site Components and Typical Schematic Layout

Each station site consists of a system of components that support the GO transit service. Those components are configured to suit site conditions



FigureD-2: Diagram–Station Site Components

### Accessible Route

The accessible route is defined as a continuous unobstructed external and internal path connecting all accessible elements and spaces to enable personal barrier free mobility.

At GO facilities, the accessible route is identified as the travel path to/from/between the barrier free parking or drop off area, to the rail mini platform / bus platform.

### Redundant Access

Provide a secondary barrier-free means of access/egress from the rail platform to the station building or pick-up area.

All island platforms shall be equipped with two elevators connecting to an underground pedestrian tunnel or an overhead pedestrian bridge.

- Side platforms shall have various direct access points where covered ramps are the preferred means of egress



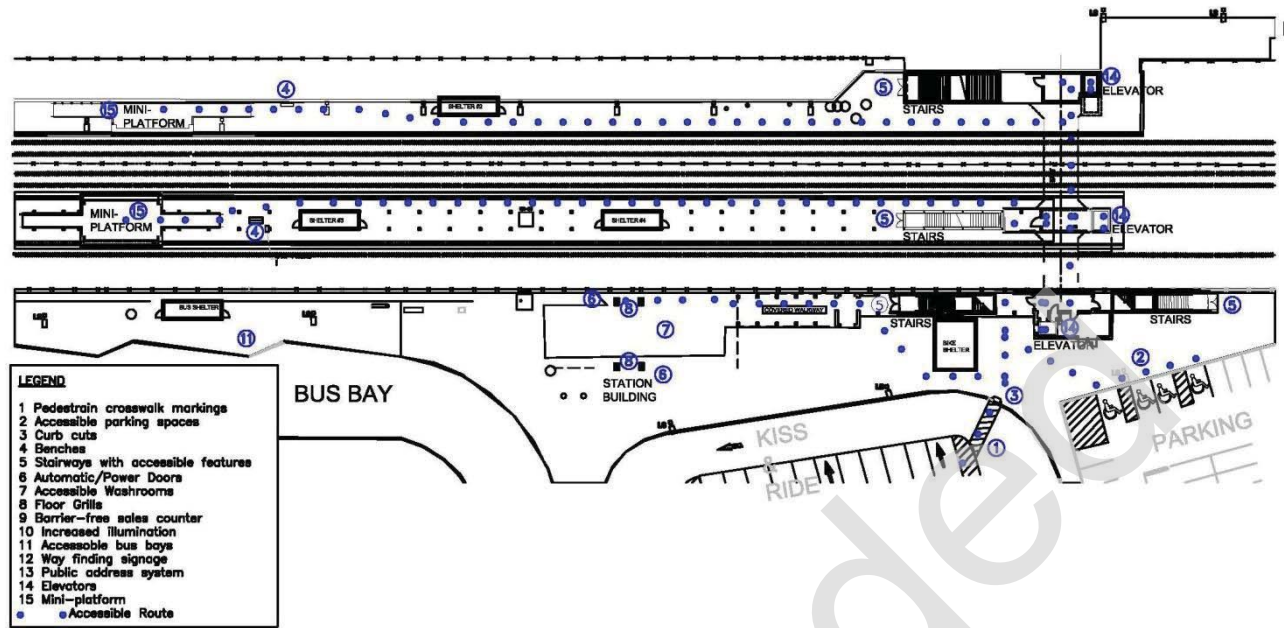


Figure D-3: Diagram-Accessible Route

### Mini-Platform

Barrier-free access to the trains is provided by an accessible elevated “mini-platform” which is aligned with the designated accessible rail car. Refer to Standard Drawings for mini-platform details.

### Designated Waiting Area (DWA)

The Designated Waiting Area (DWA) at GO stations is to be located on the rail mini-platform.

It is intended to be a convenience feature, whereby a customer can expect to avail assistance and have a reasonable sense of safety.

The DWA has augmented functionality and visibility at the station mini-platform. Key features include:

- Enhanced lighting
- Dedicated CCTV coverage
- DWA ID signs
- Two-way communications (telephone)
- PA system
- Overhead cover (canopy)

- Bench seating on rail platform in the proximity of the DWA
- Enhanced accessibility features in the mini-platform design
- Wayfinding signs on the accessible route
- Station ID sign
- Minimum horizontal and vertical clearances as mandated by functionality; and advanced warning identifiers

### D.2 Rail Platform and Platform Access

Refer to respective GO rail standards for track infrastructure standards.

Rail platforms are a foundational item to GO rail stations. Their orientation, design, alignment, geometry, and site conditions are the framework around all other site components are configured.

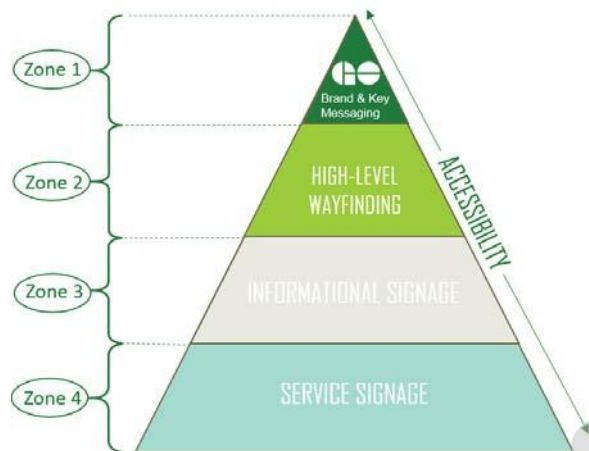
- The use of side platforms are preferred
- Island platforms to allow for multiple points of access and egress
- Locate the platforms to minimize travel distances to adjacent transit modes
- Maximize barrier-free travel

# C WAYFINDING AND SIGNAGE

## Overview

There is a hierarchy to GO communications, which provides direction for all GO signage, to ensure brand consistency and proper execution throughout the customer journey.

There are four defined “Zones” of Communication that a customer experiences.



**Figure C-1: Communication Hierarchy Zones**

These types of communication occur within, and increase with frequency, as a customer progresses through GO Transit's fourteen Customer Journey Sections as illustrated and noted to the right.

Four Key High Level Principals Regarding Zone Communication Types:

### Brand and Key Messaging

Locating Brand and Key Messaging takes precedent. The established GO Brand Guidelines must be adhered to so that consistency across the GO system is created and maintained. The consultant must implement the established Station ID and Signage Standards to provide consistency across the system.

### High-Level Wayfinding

High-Level Wayfinding Signage must be clear, easy to comprehend from a distance, and in alignment with GO Brand Guidelines and established GO Static Signage Standards.

## Informational Signage

Informational Signage must be grouped in central locations within station exterior and interiors, indicating an understanding of site specific customer paths of travel to ensure messages are communicated clear, consistent and consolidated manner so that over-signing and unnecessary visual clutter is avoided. Third-Party Advertising must be suitably located and if possible integrated within the overall consolidated signage group.

## Service and Regulatory Signage

Reduce and consolidate Service and Regulatory Signage to eliminate repetition and reduce visual clutter. Place notices in the proper location, and for safety, doorways should be kept clear of unnecessary signage.

## GO Customer Journey Sections

- |                       |                    |
|-----------------------|--------------------|
| 1. Property Entrance  | 8. Teamways        |
| 2. Parking            | 9. Train Platforms |
| 3. Station Exterior   | 10. Bus Platforms  |
| 4. Station Interior   | 11. Train Exterior |
| 5. Service GO         | 12. Train Exterior |
| 6. Information Boards | 13. Bus Exterior   |
| 7. Tunnels / Bridges  | 14. Bus Interior   |

The **five criteria** informing the design and placement within the Customer Journey are:

**Experience**—GO customer experience shall be easy and efficient.

**Consistency**—In alignment with GO Brand Standards, Design Requirements Manual and Static Signage Catalogue.

**Location**—Placed in ideal location in Customer Journey to best serve customers

**Scale**— Signage is clear and legible

**Quantity**—Do not over sign, and seek potential efficiencies to achieve same message

The consultant must reference and implement established GO Static Signage Standards where applicable and adhere to the dimensional and technical information regarding their fabrication and installation located within the Design Requirements Manual and GO Static Signage Catalogue.

The GO Passenger Charter will be given a prominent location in Station Interior adjacent waiting areas and onboard vehicles to emphasize its importance. It may not be located on the exterior of station buildings.

Digital Signage is discouraged from being placed within tunnels and bridges to prevent congestion in customer paths of travel. For Digital Signage content please refer the relevant Design Requirements Manual section.

Physical Information and Service Messages are prohibited from being placed on the glass partitions of Service GO Message Centres.

The supporting GO Communications Hierarchy Ideal State Renderings located in the Design Requirements Manual do not capture all site and station conditions. It is understood that signage design and placement may need to be adapted to suit specific site and station conditions to ensure wayfinding legibility and clear, consolidated information and service messaging.

In all instances regarding location, placement and housing, considerations of safety and accessibility should take precedent.

**Figure C-2: Property Entrances-Ideal State**

**PARKING: IDEAL STATE**



**Figure C-3: Parking-Ideal State**

**STATION INTERIOR: IDEAL STATE**



**Figure C-4: Station Interior-Ideal State**

**TRAIN PLATFORM: IDEAL STATE**



**Figure C-5: Train Platform-Ideal State**

**PROPERTY ENTRANCES: IDEAL STATE**





**BUS PLATFORM: IDEAL STATE****Figure C-6: Bus Platform-Ideal State**

The GO overall wayfinding and signage program requirements and guidelines are the tools that we provide to our customers, which enable them to navigate easily throughout a GO site.

The key principles of the overall wayfinding and signage guidelines are:

- To provide a philosophical guide on “what” are our expectations for developing a comprehensive wayfinding and signage program including trailblazing during the design of a GO site, station, and facility
- To address typical signage, methodology, application and placement and installation including signage that is temporary in nature

It is intended that all wayfinding and signage plans be developed with these basic principles, incorporate appropriate corporate colours and contrast, defined French Language treatment, minimize the use of text, and increase the use of icons

## C.1 Wayfinding

The Wayfinding Signage program shall be designed to aid the customer to navigate the site with ease while addressing the functionality in these spaces. Key services and amenities located within a site shall be identified within the wayfinding program. It shall be well thought out, easy to use, aid in self-orientation and to enable a seamless trip journey by creating an inclusive, excellent customer experience for all types of users.

Early application of wayfinding design, comprising of elements for Information, Confirmation, and Identification for planning the customer journey and an understanding of the needs of various user groups, provide the framework for an effective wayfinding system.

Considerations include at a minimum, the positioning of entrances and exits, the use of colour contrasting, pattern direction on floors or walls, tactile markings, the arrangement of architectural features such as walls or columns, acoustics, and lighting to help direct people to their intended destination.

A consistent appearance or theme shall be presented throughout the facility. Signage for entrances and directions shall be clear and kept at appropriate driver’s eye levels.

Coordinate with related disciplines, e.g., Architectural, Structural, Electrical, etc., for placement of signage requirements (i.e., locations).

Provide power, communication, feeder, and conduit to facilitate the installation of dynamic and/or back/top lit signage.

Directional signs shall always be located at decision points.

Where possible, signs shall be located perpendicular, not parallel, to the visitor’s line of sight and movement.

At facilities with multiple lots, where one or more parking areas may not all be connected to the accessible route, trailblazing is required at the local street level to provide direction to the proper lot.

## C.2 Signage

There are two main types of mediums for signage typically used at GO stations, terminals, facilities etc.:

- Static Signage
- Digital Signage

Static and digital signage within the GO system serves four (4) primary functions:

- Identify–Site and entrance
- Direct–Vehicular and pedestrian movements
- Inform–Maps etc.

- Regulate—Governing bodies

Detailed information on sign templates and design files are located in the GO Static Signage Standards.

Digital Signage uses digital media for display of information such as schedule/service information, GO Marketing, Third Party Advertising, and other customer service amenities.



Refer the Fixtures and Furnishings section of the DRM for details on Digital Signage.

Program signage that is designed to be read in close proximity at standard reading height, such as a washroom sign, shall also include braille.

Supergraphics shall be used as a secondary means of signage, where the space is ample and the destination and corresponding supergraphics can be seen from far away.

Signage design, placement and layout shall take into account the varying mobility and cognitive skills of potential customers.

## C.3 Placement and Installation

Safety clearances shall be observed at all times.

Support and mounting structure shall be designed as an integrated part of the architecture: recessed in walls, or part of a self-service kiosk organization.

Signage shall be strategically located and grouped with other information/ advertising, consistently placed where customers could have clear visibility and access to this information.

### Stations and Tunnels

Typically wall mounted or mounted on customized bracketing and hardware, or adhesive tapes/backing film

### Rail and Bus Platforms

Utilize structures and supports. Where a stand-alone support is required, driven U-Channel posts are typical.

### Parking lots and access lanes

Banding to light stands, where possible or driven U-Channel post and related brackets and hardware

Installation at GO facilities is typically accomplished through use of the following methods:

- Bolted to driver Post (U-Channel, PT 4" x 4" or 6" x 6" wooden post, galvanized solid and perforated 2" x 2" square steel and 3" round poles
- Banding and brackets
- Pressure-sensitive adhesive tapes and backing films
- Exclusive use of high quality non-staining fasteners (typically, stainless steel)
- Avoid plastic ZIP tabs fasteners except for temporary construction signs
- Avoid mounting signs on posts/poles that house CCTV Cameras
- Wall-mounted signs are facilitated by stainless steel screws in either drilled and tapped or anchor plugged holes, or with double-sided pressure sensitive adhesive tapes
- Fence-mounted signs use fence blocks or signs are mounted back-to-back with appropriate sized nut bolts and washers
- Use double side pressure sensitive adhesive tapes for signs mounted to a structure's glazing or on doors
- Decals applied to structural glazing and doors will use pressure sensitive adhesive backing films with blockout film so message is seen from appropriate direction only.

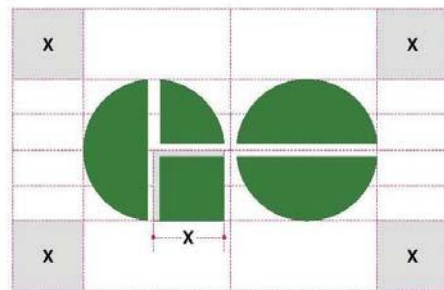


### GO Logo and Station Name

The GO logo is five individual elements with a negative space.

The negative space shall be open, showing the background material making the "T"

Two shapes for the GO logo are not permitted.



Typical Signage Layout Grid, Clearance zone

**Figure C-7: GO Logo**

Permitted colors = Pantone 364C or Black

- Any material variation to integrate with building massing to be approved by GO Transit
- The GO Logo shall be used sparingly, and not applied to every façade of a building
- The GO Logo and/or Station Name are typically not to be placed on bridges (pedestrian, rail, vehicular, etc.) or on elevator overrun shafts
- GO Logo and Station Name shall ideally be mounted on a solid background
- Recommended materials:
  - UV stabilized Polycarbonate
  - Flex face for larger, high mounted items (mounted at least 3m above grade)
  - Backlit signs to be illuminated with LED targeting white 6500 to 7,000K colour temperature
  - Illuminated sign may not be placed on a building or structure facing rail traffic

## B.2 Customer Service

The GO customer journey is a series of sections that is identified with an integrated, seamless, harmonized, customer-focused approach with related key brand touch points of interaction in station design.

The mission of GO Transit is to deliver an easy and delightful passenger experience.

The five strategic priorities include:

- Design Excellence
- Delight and eliminate barriers
- Promote seamless travel
- Strong partnerships and offerings
- Communications

It shall be easy in every way for the passenger allowing them to travel stress free and intuitively. Through design, comfort, and amenities, we will make GO the preferred choice for customers. With the customer experience at the forefront of responsive, GO Transit's corporate brand and identity shall be extended throughout the GO Transit System by application of the latest GO logo and colour to all stations consistent with the requirements defined in this Manual.

## B.3 Sustainable Design

GO has adopted American Public Transportation Association's (APTA's) framework for approaching transit sustainability with supporting Guiding Principles relevant to GO's infrastructure.

### Smart Land Use and Livable Neighbourhoods

- Encourage neighbourhood integration and connectivity and the provision of green amenities
- Reduce heat island effect
- Increase soft landscaping are key drivers

### Materials & Construction / Operations Optimization

- Flexibility and longevity
- Green construction practices and materials

- Address easy long term maintenance and adaptability/conversion

### Energy and Resource Efficiency

- Lower the energy consumption and carbon footprint
- Operational and maintenance cost savings (i.e. energy harvesting, conservation/recovery and efficiency)

### Quality of Ambient Environment and Health

- Provide a comfortable, healthy and safe environment

### Emissions and Pollution Control

- Contribute to reduced air emissions and wastewater discharges
- Strategies for waste reduction and water conservation

## Corporate Policies

Implement corporate policies that support green operations throughout the life of the facility, such as Green Cleaning, Solid Waste Management, and Green Education, and select LEED credits for certification.

As the industry evolves and new certifications become relevant to GO, they too can be explored, upon approval from Metrolinx.

### GO LEED Credits

All buildings, terminals, and facilities are to achieve LEED Gold certification. Specifically, select credits (Appendix B) have been identified to ensure that only LEED credits that bring value to GO Transit's goals of energy efficiency and reduced operating and maintenance costs are targeted.

## B.4 Integrated Design

The holistic and integrated design of stations shall enhance the customer experience by providing a consistent experience across the GO Transit System that is dependable, smart, caring, and responsive.

Planning for integrated design requires identified station components of a typical GO Station

# APPENDIX A–AMENDMENT RECORD

**Table 0-1: Appendix A–Amendment Record**

Date	Section Ref.	Description
April 4, 2016	Section B.3: Guiding Principles - Sustainable Design	Added Guiding Principles <ul style="list-style-type: none"> <li>• Page B-4</li> </ul>
April 4, 2016	Section C: Wayfinding and Signage	Added Communication Hierarchy related to Signage <ul style="list-style-type: none"> <li>• Pages C-6 to C-10</li> </ul>
April 4, 2016	Section D.1: Site Planning and Organization	Added Site Components and Typical Schematic Layout <ul style="list-style-type: none"> <li>• Page D-1 to D-2</li> </ul>
April 4, 2016	Section D.2: Rail Platform and Platform Access	Added Rail Platform and Platform Design <ul style="list-style-type: none"> <li>• Pages D-5 to D-8</li> </ul>
April 4, 2016	Section E.1: Station Buildings	Added Interior Station Design (includes Retail) <ul style="list-style-type: none"> <li>• Pages E-1 to E-10</li> </ul>
April 4, 2016	Section F: Technical Requirements	Added Illumination <ul style="list-style-type: none"> <li>• Pages F-62 to F-72</li> </ul> Added Fixtures and Furnishings Table <ul style="list-style-type: none"> <li>• Table F-30</li> </ul> Added Digital Signage <ul style="list-style-type: none"> <li>• Pages F-121 to F-126</li> </ul> Added Fare System Placement <ul style="list-style-type: none"> <li>• Page F-126</li> </ul> Added Two-Way Communication and Device Guidance <ul style="list-style-type: none"> <li>• Pages F-127 to F-129</li> </ul>
April 4, 2016	Union Pearson Express (UPE) Formerly CI-0410: (Pages 342-349)	Removed Contents

April 4, 2016	Station ID Signage Suite Formerly CI-0601 (Pages 417-429)	Removed Contents
April 4, 2016	Drawings Standards Formerly CI-0705 (Pages 621-643)	Removed Contents
April 4, 2016	Heavy Rail Formerly CI-0801 (Pages 644 to 690)	Removed Contents

# G HEAVY RAIL

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~~For Heavy Rail, the reference should be made to the GO Transit Track Standards, and GO Transit Track Standard Plans. For all Heavy Rail, standard requirements comply with CNETS, CN Recommended Methods, or CN Capital Standard Plans (unless otherwise directed) for all capital construction and maintenance queries.~~

Superseded



- Access to windows for cleaning shall not be obstructed except where absolutely necessary (required structural member, etc.)
  - Windows above ground level shall be placed such that they can be accessed from below using a lift, and accessing windows for cleaning shall not require getting into traffic or onto tracks
- If cleaning or replacing windows or maintaining a structure requires access by rappelling down the side of the structure, then safety tie-off anchors shall be provided per code

### **Bird Control**

- The term 'bird control' applies to reducing habitation but also should apply to bird strike prevention (usually achieved through the application of a UV film on glass surfaces).
- The requirements for bird control shall be applicable to all Metrolinx facilities and buildings, including parking structures, maintenance facilities, canopies, station buildings, etc;

### **Unit Size**

- Units shall be large enough to reduce the number of joints yet small enough to facilitate replacement if damaged
- Standardized grids shall be designed wherever possible to accommodate for standardized glazing for windscreens and vertical elements of shelters
- All specified floor materials shall be resistant to damage from common deicers

### **Installation and Application**

- Materials shall be detailed and specified to be installed in accordance with industry standards and manufacturers printed directions for long life, low maintenance, and compliance with warranty requirements
- All materials shall be installed using tested and proven methods, in accordance with established trade standards
- All materials, hardware, and fasteners shall be able to withstand the anticipated pressures of ground-borne vibration, as well

as air pressure changes generated by wind and by the passage of the GO Transit vehicle

- All materials shall be secured in a manner which deters and prevents tampering and vandalism
- Installation of materials shall generally facilitate their removal without affecting the integrity of adjacent materials

### **Colour, Pattern, Tonal Contrast and Texture**

- Colours shall exclude dedicated corporate and signing colours except for those purposes
- Use noticeably different colours to distinguish the different key building elements. The recommended colour and brightness contrasts of key building elements by the Accessibility Standards Is 70% or more
- Integral and applied colours shall be selected which resist undue fading in the environment in which they are used
- Textures shall not conflict with those used in the information and guidance system
- Materials with staining and colour shall have through-colour properties and non-fading characteristics
- Finishing of steel shall be appropriate to the location of the material, i.e. exterior vs. interior
- All interior finish steel (such as handrails) shall be stainless steel unless otherwise noted
- Powder coating of steel is not acceptable
- All exterior finish steel shall be stainless steel or galvanized
- Anchors and fasteners as required shall match with fixture
- Mixing of materials is not recommended
- Finishing of steel in the field shall be kept to a minimum by designing structures that can be shop fabricated in sections, primed, and finished in the shop, and bolted together on site



## General Placement Guidelines

- Shall be laid out to facilitate convenient access to services and information along the passenger's journey
- Locate with clear visibility to encourage intuitive wayfinding, passenger safety, and passive surveillance of adjacent environments
- Minimum clearance of 500 mm between two adjacent furnishings or devices shall be maintained
- Ensure clearance is provided for barrier-free paths and approach
- Provide queueing areas that will not interfere with pedestrian/passenger traffic
- Ensure that each seating area provides a clear space for side approach and side transfer to a seat
- Cluster devices where possible to clearly identify points of passenger service, information and efficiently utilize station infrastructure
- Installation tolerances and operational requirements shall be provided to facilitate ease of ongoing site operations and maintenance
- Materials and assemblies shall have a robust design and durable materials to ensure longevity
- Fare handling devices shall be placed to avoid work within the Structure Clearance Envelope on/or beside Railway Track

## Shelters

Because GO is primarily a commuter system, operating in accordance with timetables, most passengers arrive on platforms to coincide with train or bus departures.



Sheltered areas for customer comfort integrated within the canopy on the rail or bus platform are the preference for application of the sheltered areas.

Sheltered areas should typically provide the following amenities:

- Heaters
- Digital Information Walls
- GO Standard Benches
- Wi fi
- Charging Receptacles

Fare Systems (only in certain applications at car pool lots and or remote station access locations or where there is no station building)

Where the integrated sheltered option is not available, standalone shelters shall be provided within the GO Standard suite of shelters, comprising of:

- Passenger Shelters
- Car Pool Shelters (sizing shall be determined by the Capital Projects Bus Rapid Transit Program)

Number of sheltered areas on a bus or rail platform are determined such that each shelter would accommodate approximately a bus-load of passengers or two rail shelters would accommodate approximately a half coach-load of passengers.

## Digital Signs at Line Stations, Terminals and Carpool Lots

### Suite of sign types

- Digital Departure Signs (Train and/or Bus)
- Digital Platform Specific Signs (Train or Bus)
- Digital Parking Counter
- Digital Way finding Interactive Kiosks(TBD)
- Infotainment

### Digital Departure Signs (Train and/or Bus)

#### Location Criteria

- Digital Departure Sign (Train and/or Bus) shall be located at:
  - Inside Station/Terminal buildings, adjacent to waiting area; mounted at barrier free height as per OBC and AODA regulations
  - At Rail Platform Access Points (platform access area, entrances to

Compressed Air Dryers, Drainage Interceptors, Layover Systems (Sand, Fuel, Air, Track Load).		
--	--	--

Provide sub-metering for panels and sub-panels with remote communication capability from IT Central Gathering Centre. The system shall be able to store data for a minimum of three (3) years.

The local BAS shall be able to communicate and send information to an IT Central Gathering Centre.

The location of the BAS control panel and location of the outlets is to be included on the electrical drawings. Refer to the Building Automation Systems performance specification for additional information.

## Radiant Heating and Snowmelt

### Design Requirements

#### *Rail Station*

Full width hydronic snow melting shall be installed on all rail platforms

#### *Bus Facilities*

Radiant Heating shall be installed in all Bus Facilities.

Partial snow melting shall be provided at bus facility ramped and entrances.

For detailed specifications and drawings, refer to the GO Standard Drawings Specifications section.

## Plumbing and Drainage

### Design Requirements

This Section deals with cold and hot water distribution, building storm and sanitary drainage, and special applications within the immediate vicinity of any building. Typical Applications include:

- Distribution
- Elements
- Fixtures
- Storm and Sanitary Drainage
- Special Applications
- Staff washrooms
- Public washrooms
- Tenant and vending premises

- Bus and rail maintenance facilities
- Hose bibs at buildings, tunnels and on platforms
- Sump pits for tunnels, elevators and buildings (if applicable)

Specialized installations include:

- vehicle wash equipment
- Progressive maintenance bays (PMBs) for locomotive and coach water supply and sewage disposal, and wells and septic systems or holding tanks at rural sites, if required

## Distribution

### Hotwater

Where gas is available, and tempering is not required, a standard DHW tank is to be used.

Where gas is not available, service hot water shall be provided at station and terminal washbasins in washrooms tempered to 40°C. Shops, maintenance and garage facilities may have higher temperatures if required. A re-circulation system normally is not required in a typical GO Station building.

Hot water heaters in stations/terminals shall be located in janitor rooms, ceiling-hung to suit space requirements. Relief valves shall be piped to floor drains with air break. A gas fired tankless type hot water system may be used where approved by GO, to minimize piping.

### Landscape Water

Buried water supply piping systems shall be provided for the manual watering of landscaping only if specifically requested by GO. If requested, they shall consist of PVC piping and

- Exposed conductive parts of electrical equipment
- Extraneous conductive parts
- Building main ring electrode

The design of the ground system shall be based on:

- Ground resistivity data
- Ground resistance of the whole system and its components
- Ground potential rise
- High ground resistance
- Systems fault currents and their duration
- Conductor ratings

The design calculations shall show that the fault currents and DC stray currents will not damage the grounding system.

## Soil and Survey Calculations

A ground resistivity survey shall be carried out at each site. The weather conditions prior to and at the time of the surveys shall be recorded in the report and an assessment made of the seasonal variations in resistivity based on meteorological data for the area.

## System Requirements

Grounding system components include:

- Ground electrode
- Main grounding terminals or bars
- Grounding conductors
- Protective conductors
- Equipotential bonding conductors
- Electrically independent ground electrodes for special systems (clean ground)

Shared neutral is not allowed. Ground electrode total combined resistance value shall not exceed ~~0.5~~ 5.0 ohm, during any season of the year and before interconnection to other grounded systems or grounding means.

Protective conductors shall not to be formed by conduit, trunking or ducting. Ground Fault Loop Impedance for complete circuits shall be recorded. Supplementary Equipotential Bonding: Connect all extraneous conductive parts of the buildings such as metallic conduit and raceways, cable trays and cable armour to nearest grounding terminals by equipotential bonding conductors.

A Ground Inspection Chamber shall be provided for each ground rod where connected to a grounding conductor and shall extend 150 mm below top of ground rod.

## Transformer Grounding

Transformer body grounding terminal shall be connected to MV main grounding bar by insulated copper grounding conductor not less than 3 AWG per 100 kVA of transformer rating, with a minimum of 2 AWG.

Transformer neutral (star point) shall be connected by insulated grounding conductor (colour White) directly to independent grounding electrode. Neutral grounding conductor shall be sized for maximum ground fault current for 5 seconds.

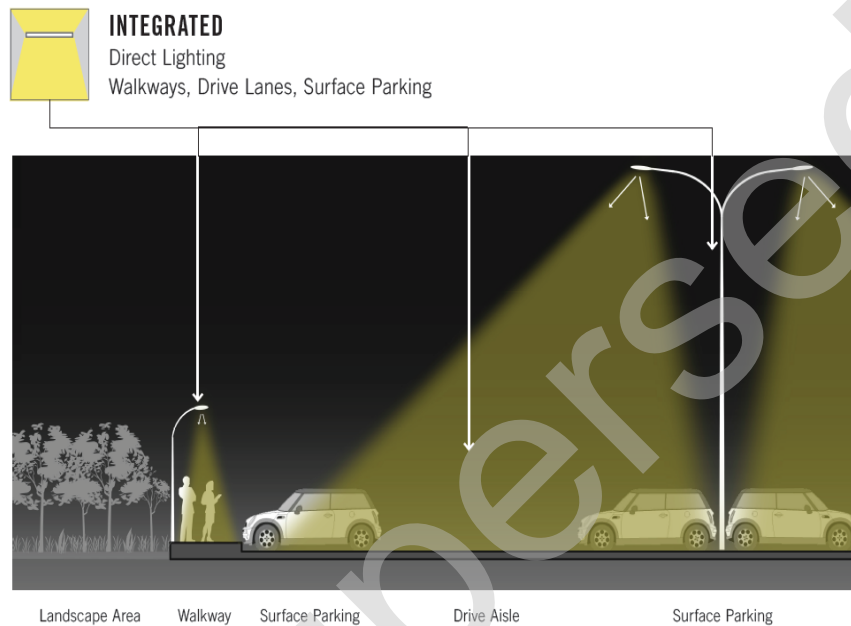
<b>Architectural Finishes</b>	
Shop and Garage Area Floors	Minimum 4.88 kg/m <sup>2</sup> trap rock, water cure, and liquid densifying sealer. Floor sealant shall provide necessary traction to avoid bus skidding at storage/service area/garage area.
Interior Painted Lines	Interior painted lines shall be provided along Safety Area around electrical panels and fire hoses and at hoist bays, pits and all shops. Epoxy based line painting shall be provided in all bus storage and maintenance areas.
Stock Room Counter	Shall be stainless steel with wood backing
Touch Zone	Up to 3m of the maintenance and storage facilities shall be epoxy coated to allow for pressure washing.

**Table E-9: Fixtures**

<b>Fixtures</b>	
<b>Feature</b>	<b>Design Requirements</b>
Toilet Partitions and Urinal Screens	Toilet partitions and urinal screens shall be stainless steel, ceiling, or wall mounted.
Sloped Top Lockers	Top lockers shall be pre-finished, sloped top, located on concrete base.
Coat and Hat Racks	Coat and hat racks shall be provided in administration areas.
Foot Grilles	Foot grilles shall be vinyl surfaced, recessed type, in extruded 6063-T52 aluminum alloy framing.
Roller Shades	Roller shades shall be provided for all windows in the Administration Building.
Meeting Rooms	Meeting rooms shall be equipped with ceiling mounted motorized projection screen, projectors, and speakers.
Kitchen	Kitchens shall be commercial quality, energy star compliant. Kitchens shall include refrigerators, ovens with a range ventilation hood to the outside, built-in or counter top microwaves, and dishwashers.
Dual Burner Coffee Makers	Coffee makers shall have an in-line water filter and be provided in the Training Centre and Administration Lunch Room
TVs	<del>TVs shall all be LCD or Plasma and provided</del> <u>TV's shall be provided</u> to suit the Lunch Room size.
Countertops	Countertops in all kitchens, washrooms, and dispatch areas shall be solid surfacing 12 or 13 mm thick with a backsplash—6 mm thick.
Pop and Snack Dispenser	One (1) pop and snack dispenser each shall be located in the lunch area.

**Surface Parking:**

- The lighting in the parking and drive aisle areas shall be provided by full cut-off single and double-headed downlights on lampposts
  - Lamppost height shall be kept to a minimum, based on site layout and context
- The lighting in the pedestrian walkways shall be provided by full cut-off single-headed lighting fixtures on lampposts
  - Fixture head shall be between 3.5 and 4.5 metres above the walkway surface
- Minimum average maintained illumination levels shall be:
  - Parking Lot: 20 lux horizontal, 10 lux vertical [Refer to table F-9](#)
  - Pedestrian Walkways: 20 lux horizontal
- Colour temperature—4000K preferred, 3500K minimum
- CRI—80 preferred, 70 minimum



**P SURFACE PARKING**

**Figure F-7: Lighting Design Requirements-Surface Parking**

## Natural or Propane Gas Engine (For Standby Generators ≤ 150 kVA)

Include liquid cooled, spark ignition engine.

Furnish engine and cooling system capable of driving generator at specified load for minimum of 120 minutes, taking into account fuel type and altitude duration and at maximum ambient temperature of 122 °F (50 °C).

Isochronous Governor: Speed regulation plus or minus 0.25 cycle from no load to full load with two-second recovery to steady state.

Integral 10-amp system battery charging system, unit mounted to maintain emergency system batteries at required charge levels.

### Listed Fuel Systems

Include CSA Certified Listed Natural Gas regulator for 7-14" water column gas pressure entering, complete with the following cUL Listed installation accessories:

- Flexible engine connection fuel line
- Electric fuel solenoid valve
- Fuel line strainer

### Dual Fuel Systems

~~Include the following:~~

~~cUL Listed Natural gas regulator for 7-14" water column gas pressure entering complete with the following cUL Listed installation accessories:~~

- ~~• Flexible engine connection fuel line~~
- ~~• Electric fuel solenoid valve~~
- ~~• Fuel line strainer~~

~~cUL Listed LP vapour regulator complete with the following cUL listed installation accessories:~~

- ~~• Flexible engine connection fuel line~~
- ~~• Electric fuel solenoid valve~~
- ~~• Fuel line strainer~~

### Accessories

Include replaceable type oil filters, dry type air cleaners, automatic choke, lubricating oils, greases, and coolant.

### Alternator

The alternator (generator) shall be 120/208 or 347/600 Volt, 3 phase, 4 wire, 60 Hz AC, drip

proof, rotating field type with an integral exciter of the brushless or static type and a static voltage regulator utilizing silicon rectifiers on solid state amplifiers.

Voltage regulation shall be within plus or minus 2% of rated voltage for all loads from no load to full load. Output voltage shall be manually adjustable over a range of plus or minus 5% of rated voltage.

Rotors shall be salient pole type with amortisseur windings. The generator shall include for 300% short circuit capability for 10 seconds.

### Engine-Generator Mounting

The engine and generator shall be aligned and mounted on a common fabricated steel base of sufficient rigidity to maintain adequate alignment. Approved adjustable steel spring vibration isolators shall be supplied with such set by the set manufacturer.

### Control Panel

Environmentally sealed, solid state, microprocessor-based module for engine control, monitoring, protection, and metering.

The controller shall meet the CSA (Z462). The controller shall be listed under ULC and UL-508. Set-mounted controller capable of facing right, left, or rear shall be vibration isolated on the generator enclosure. Remote-mounted controller shall also be supplied.

The microprocessor control board shall be moisture proof and capable of operation from -40° C to 85° C. Relays will only be acceptable in high-current circuits.

The unit must be able to interface easily to provide remote monitoring and control capabilities over the Metrolinx Windows based Network. Monitoring shall include, but not be limited to, the following:

- Dual range voltmeter +/- 2% accuracy
- Maximum demand ammeter +/- 2% accuracy
- Voltmeter-ammeter 3 phase selector switch
- Battery charging voltmeter and AMP
- Coolant temperature reading
- Oil pressure reading
- Running time



<b>Architectural Finishes</b>	
Shop and Garage Area Floors	Minimum 4.88 kg/m <sup>2</sup> trap rock, water cure, and liquid densifying sealer. Floor sealant shall provide necessary traction to avoid bus skidding at storage/service area/garage area.
Interior Painted Lines	Interior painted lines shall be provided along Safety Area around electrical panels and fire hoses and at hoist bays, pits and all shops. Epoxy based line painting shall be provided in all bus storage and maintenance areas.
Stock Room Counter	Shall be stainless steel with wood backing
Touch Zone	Up to 3m of the maintenance and storage facilities shall be epoxy coated to allow for pressure washing.

**Table E-9: Fixtures**

<b>Fixtures</b>	
<b>Feature</b>	<b>Design Requirements</b>
Toilet Partitions and Urinal Screens	Toilet partitions and urinal screens shall be stainless steel, ceiling, or wall mounted.
Sloped Top Lockers	Top lockers shall be pre-finished, sloped top, located on concrete base.
Coat and Hat Racks	Coat and hat racks shall be provided in administration areas.
Foot Grilles	Foot grilles shall be vinyl surfaced, recessed type, in extruded 6063-T52 aluminum alloy framing.
Roller Shades	Roller shades shall be provided for all windows in the Administration Building.
Meeting Rooms	Meeting rooms shall be equipped with ceiling mounted motorized projection screen, projectors, and speakers.
Kitchen	Kitchens shall be commercial quality, energy star compliant. Kitchens shall include refrigerators, ovens with a range ventilation hood to the outside, built-in or counter top microwaves, and dishwashers.
Dual Burner Coffee Makers	Coffee makers shall have an in-line water filter and be provided in the Training Centre and Administration Lunch Room
TVs	<del>TVs shall all be LCD or Plasma and provided</del> <u>TV's shall be provided</u> to suit the Lunch Room size.
Countertops	Countertops in all kitchens, washrooms, and dispatch areas shall be solid surfacing 12 or 13 mm thick with a backsplash—6 mm thick.
Pop and Snack Dispenser	One (1) pop and snack dispenser each shall be located in the lunch area.

**Table E-3: Landscaping**

<b>Landscaping</b>	
<i>Feature</i>	<i>Design Requirements</i>
Design	Landscape design shall ensure ease of maintenance. Materials shall be durable (e.g., salt resistant) and resistant to vandalism. Snow storage shall be taken into consideration. Landscape design shall respect the form, scale, and materials of both the surrounding area and proposed development. Circulation, comfort and safety, environment and crime protection (CPTED) shall also be considered in the choice of landscaping elements
Native Plant Material	Native plant material as appropriate is encouraged. Patio areas with coloured concrete are preferable
Lawn Sprinkler Systems	Lawn Sprinkler systems, if required, shall be provided with timer (plus manual override)
Future Expansion	Landscape shall be able to accommodate future expansion with minimal disruption or disturbance.

**Table E-4: Landscaping Signage**

<b>Signage</b>	
<i>Feature</i>	<i>Design Requirements</i>
Signage	Refer to GO's Signage Catalogue

**Table E-5: Clearance and Circulation**

<b>Clearance and Circulation</b>	
<i>Feature</i>	<i>Design Requirements</i>
Heights	Coordinate clear building heights with actual heights of buses, equipment, and the like. Maintain minimums provided and as required for full and complete operation of the facility.
Features	Design the facility to accommodate ample clearance requirements in plan and elevation of all current GO buses and equipment and GO standard vehicle turning radius' and sweep paths with allowable safety factors.



heavy duty hollow metal double door with a single 34" leaf and a second 12" latching section, for a total opening of 46"

- Provide a minimum of four (4) butt hinges per door
- If required, provide roof access hatch with a wall mounted ladder in the Maintenance Room for rooftop mechanical equipment access
- Provide direct access to the Electrical and Communication Rooms from building exterior for after-hour access
- Ensure spare wall space for future equipment due to additions or renovations is provided in the Electrical Room
- Ensure the Communications Room is located adjacent to Service Counter and near the Electrical Room, when possible

### Lighting Strategy

- Base building fit-out
- Refer to Lighting Performance Specifications for additional information

### Feature Elements

- None

### Other Elements: Fixtures and Furnishings

- (Refer to Electrical and Mechanical sections of DRM for technical requirements and specifications)
- In Maintenance Room:
  - 4-6 power receptacles with 208V and 110v supply and 60-amp service.
  - Floor mounted slop sink with easy access clean out for slop sink P trap
  - Faucets and floor drains
  - Exhaust fan
  - Open shelving and mop hooks
  - Mop and broom hangers, floor sweepers

- Four (4) staff lockers, full height with vented louvers at base
- Metal storage cabinet, lockable
- Desk and chair
- Key fob access

### ● In Mechanical Room:


- Power receptacles
- Floor drains
- Spare and additional filters, etc.
- Storage shelves and/or cabinets

### Feature Elements at Station Building

Feature Elements are key infrastructure pieces that are designed to be the same at every station—in application, form, function, and finish. The intent is that these feature elements portray a consistent presence and brand at our stations, making the customer experience intuitive, familiar, and comfortable. There are four feature elements that are intended to ensure the GO Brand and identity is strong and immediately identifiable across all applications. These are identified in the example station layout below, along with the specified ceiling material finish:

- Service Counter
- Self-Serve Kiosk
- Delineated Seating Area
- Wayfinding Band

These four feature elements can be adapted with ease at different locations across the network as an integral part of the overall interior design language. Based on the station plan and design, the location of the feature elements may differ from the Example Station shown. The feature elements shall be not be placed based off a previous station building design, but be assessed based on the customer journey and strategically placed using the guidelines outlined in this section. The following diagrams use existing station buildings and illustrate where feature elements would be placed at different locations based on the customer journey.

-  Refer the Fixtures and Furnishings section of the DRM for details on Digital Signage.

### Lighting Strategy

- Semi-recessed slot lighting system around the perimeter of the finish ceiling system to be used to create a soft front illumination on the fascia and customer side of the counter, and lengthwise along the walls of the adjacent spaces
- Adjustable recessed pot lights to be provided on the customer side in the bulkhead of the Service Counter
- Task eyeball lights provided at ceiling level on either side of the station attendant work area, with light direction concentrated at the centre of the attendant work surface, minimizing glare off desk surface
- Puck light at underside of station attendant counter for servicing with built in on/off controls
- 200mm cube pendant light above each station attendant service position to be individually programmed to indicate whether service position is open (ON), or closed (OFF)
  - This is an ambient light, not a task light. Consider placement of CCTV cameras to avoid conflict with pendant lights

### Public Washrooms

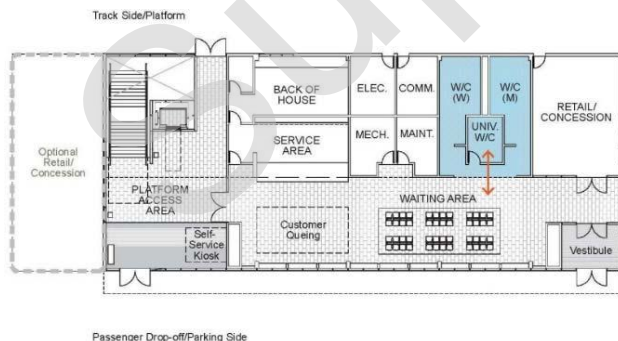


Figure E-9: Schematic of Public Washrooms

### Design Requirements (In addition to all code requirements)

- Entrances into multi-use washrooms (i.e. female/male) shall be door-less
- All plumbing fixtures to be located on interior walls
- One standard infant change table/unit shall be provided in each washroom
- Floor drains shall not be in pedestrian or wheelchair paths
- The door swing into the universal washroom shall screen and partially obstruct the line of vision to the lavatory
  - It shall be equipped with a power operator
  - The door hardware shall be a lever handle passage set, with a latch operable from the interior, to display "vacant" or "occupied"
- An emergency two-way call system shall be provided and follow the same call flow as the two-way intercoms outside elevators (i.e. call directed to Station Attendant first, then Transit Safety, etc.)

### Feature Elements

- Feature wall tile at Washroom entry to be different in colour from the general station wall finish
  - Use of smaller format tile with distinct pattern is supported
- Refer to Materials + Finishes Performance Specifications for additional information

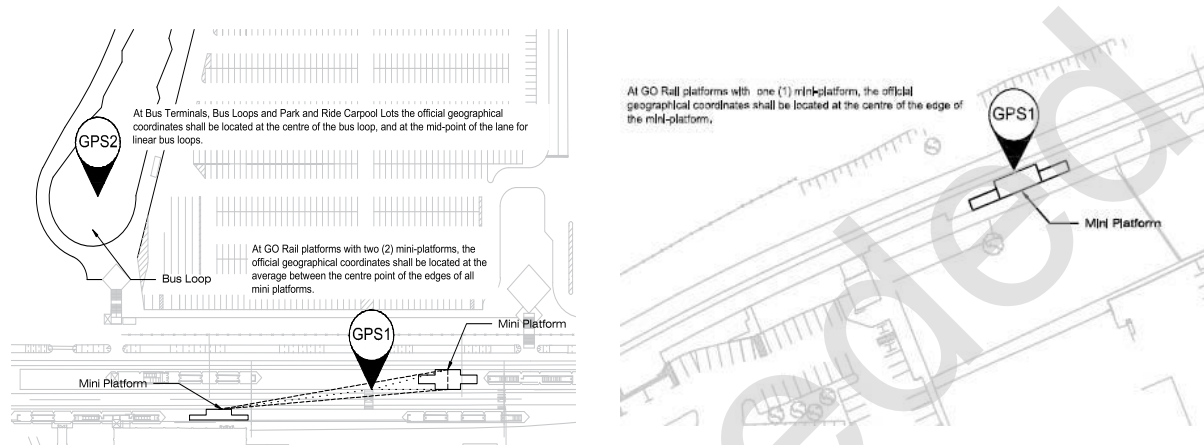
### Other Elements: Fixtures and Furnishings

- Partitions
- Lavatories (toilets/urinals), wall hung, lever handle faucets, wrist-blade type
- Sinks, wall-hung (barrier-free)
- Tilt mirrors, stainless steel frames (barrier-free)
- Electric Hand Dryers

## D.12 Geodetic Reference Station Geographical Coordinates

### Station Geographical Coordinates

For GO Stations, the official geographical coordinates are to be located at the centre of the edge of the mini platform as outlined in figure—Geographical Coordinate Placement at Mini-Platforms.



**Figure D-28: Geographical Coordinate Placement**

### Projection System

The following Reference Datums and Grid System shall be used, in accordance with the MTO's Engineering Survey Manual dated October 2006:

<b>Map Projection</b> →	3-degree Modified Transverse Mercator (MTM)
MTM Zone 10	
<b>Horizontal Reference Datum</b> →	North American Datum (NAD) 1983, using the NAD83 Canadian Spatial Reference System (CSRS) adjustment
Horizontal Datum / Ellipsoid:	NAD83 CSRS v.6 (epoch 2010.0) / GRS80
<b>Vertical Reference Datum</b> →	Canadian Geodetic Vertical Datum (CGVD) 1928
Orthometric Elevation:	CGVD1928:78 Adjustment

### Three-Dimensional Geodetic Control Points

- All GO Stations, Bus Terminals and Park and Ride ~~Carpool Lots~~ Car Pool lots shall have three-dimensional geodetic control points installed with both Vertical and Horizontal known measurements
- Along the rail corridors, three-dimensional geodetic control points shall be installed and the monuments placed on fixed and stable structures including: bridges, abutments, retaining walls and grade separations
- Control points shall be placed on a fixed and stable structure, including, station buildings, parking structures, tunnels, bridges or abutments

- All gates must be lockable, single, or double locks if required by the Railway, Hydro, or other users
- Grounding and bonding is required for metal gates

## Site Furnishings

### Garbage and Recycling Storage Areas

The Consultant shall verify garbage and recycling bin sizing with station, local municipality and/or service provider to validate garbage enclosure dimensions prior to design. At a minimum, garbage enclosures must be large enough to conceal two 6-yard bins.

The following criteria shall be considered when deciding on a location for a garbage enclosure:

- Garbage truck access
- Staff access / proximity to station
- Place on surplus land (land which cannot be used for anything else)
- Keep away from pedestrian paths and waiting areas
- Keep out of direct view when entering the site
- Where required, gates shall be equipped with "No Parking" signage to ensure accessibility is always maintained (for "No Parking" signage please refer to the Static Signage Standards)
- Consultant to verify signage sizing with GO prior to proceeding

### Exterior Bollards

- Shall be integrated with station and bus terminal area design.
- Bollards shall be approximately 200 mm in diameter and fabricated from 304 grade stainless steel with a satin finish.
- The bollards shall project 1000-1200 mm above grade, with a minimum of 300 below grade.
- Bollards shall have a 50 mm contrasting reflective band (or approved equivalent) around the circumference of the bollard at a

designated recessed space (to ensure durability), 80 mm below top surface.

- Areas requiring additional safety, such as bus plazas with roll over curbs, shall have 200 mm diameter galvanized steel pipe, concrete filled, and protected with a 304 grade stainless steel cover of minimum 3 mm thickness and two 50 mm contrasting reflective bands around the circumference of the bollard.
- The bollard shall project 1.2 m above grade and set minimum 1.2 m into concrete pier
- At bus fuel storage areas, rail and bus maintenance facilities etc., provide bollards to protect electrical equipment locations and impact protection to hydrants and any other structures or equipment installed within 2.0m of vehicle traffic areas
- These bollards shall be 250 mm diameter concrete filled bollards. See Section E – Building Program, Maintenance Facilities requirements for details
- ~~Shall be 200 mm diameter galvanized steel pipe, concrete filled, and protected with 3 mm minimum thick high density polyethylene 'safety yellow' (or other colour as specified by GO) coloured cover, projecting 1.2 m above grade and set minimum 1.2 m into concrete pier~~
- ~~At bus fuel storage areas, provide 250 mm diameter concrete filled bollards~~
- ~~Provide bollards to protect electrical equipment locations~~

### Interior Bollards

- When located in maintenance facilities shall be 150 mm diameter galvanized steel pipe
- Concrete filled
- Protected with 3 mm minimum thick high density polyethylene 'safety yellow' (or other colour as specified by GO) coloured cover
- Projecting 1.2 m. above floor
- Cast with welded plate and 4 anchors into concrete slab

- The bollards shall be equipped with pole sleeve covers
- Interior bollards when located in stations and bus terminals shall be 200 mm in diameter and fabricated from 304 grade stainless steel with a satin finish and shall project 1000-1200 mm above grade, with a minimum of 300 below grade.

### Removable Bollards

- Permanently installed receiver below grade, with a top that is flush with the pavement and a cap to prevent dirt accumulation while the post is removed
- Removable post that can be manually lifted out of the receiver to allow access
- Exposed locking mechanism, with a padlock keyed to the station master
- Dimensions, covers and color schemes shall meet Exterior and Interior Bollard's requirements above

## Civil Works

### Storm Drainage

The design flood criteria for all sites shall comply with the MOE Storm Water Management Practices, Planning and Design Manual, the OPSD and MTO Drainage Manuals, as well as Regional and/or Municipal Storm Water Management requirements. Oil and grit separators and inlet control devices.

Generally surface water flow shall be directed from landscape areas to parking lot catch basins. Catch basins in landscape areas shall be avoided if possible.

### Catch Basins

Catch basins shall be located upstream of pedestrian crossing areas, and 1500 mm clear of any driveway curb depressions. Grates shall be diagonal type. Catch basins shall not be located in the path of bus wheels, especially in bus loops.

Retention ponds and catch basin flow restrictors shall be provided in accordance with Storm Water Management requirements. Catch basins shall not be located on walkways and/or in front of building doors.

### Gutter Drainage

Gutter drainage shall be restricted to access roads if required to prevent storm run-off onto adjacent property. Road and gutter gradients shall not exceed Fire Access Route requirements.

### Ditch Drainage

Where a storm sewer system is not available, or where an "interim" type of development is desired, ditches and related culverts may be used to carry the drainage down one or both sides of the paved areas. Culverts shall have safety grilles at ends, and ditches subject to substantial ponding shall be fenced, for safety, or filled with riprap, and topped with geotextile fabric and granular topsoil and sod.

### Grading

Grading shall be designed to avoid excessive slopes and shall be integrated with surrounding landforms to provide slope stabilization and positive flows to the drainage system.

Where existing landforms, or vegetation, are to be preserved, appropriate protection and construction controls shall be designed.

### Retaining Wall

The Consultant shall select the optimum permanent retaining method (wood shall not be used for retaining walls). Where concrete retaining walls are in proximity to the public, they shall be sandblasted. Low retaining walls shall be precast concrete units. Gabion walls may be used in non-public areas. Where retaining walls are adjacent to buildings, the material shall be compatible with the architecture.

### Stormwater Management

Manage rainwater and snowmelt on-site with designs that encourage infiltration, evapotranspiration and water re-use:

- Sustainable materials paving for parking surface, drive aisles, overflow parking, snow storage areas and other hard surfaces in the parking lot
- Provide a planting medium, composed of good quality soil, with a minimum depth of 0.6m and at least 0.9m depth if trees are planted



## D.10 At Grade Pedestrian Crossings

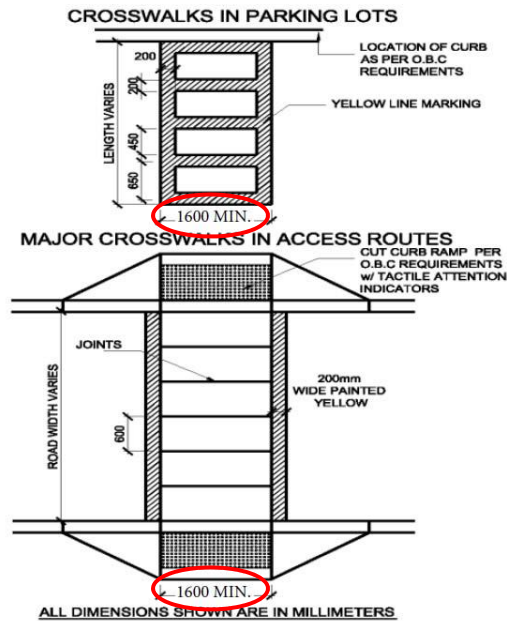


Where at grade rail pedestrian crossing is required, in addition to adhering to Transport Canada regulations, approval must be obtained from Railway Corridors and System Safety at Metrolinx.

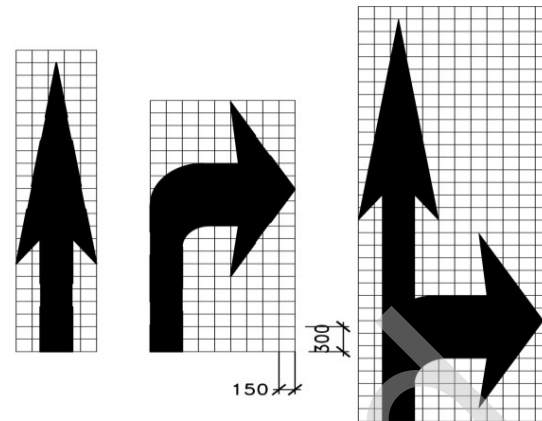
Table D-10: At Grade Pedestrian Crossings

Element	Design Requirement
Flangeway Gap	<ul style="list-style-type: none"> <li>The flangeway width may not be less than 65 mm and shall not exceed 75 mm</li> <li>Extend rail seal and taper asphalt at least 254 mm beyond edge of crossing surface</li> <li>Material: Use rubber rail seal to match the rail size and profile</li> <li>Use 3048 mm lengths and specify a flangeway width of "2 ½ inches"</li> </ul>
Crossing Width	<ul style="list-style-type: none"> <li>The total crossing width including the 254 mm tapered shaller of the crossing shall be a minimum of 3048 mm</li> <li>The total crossing surface width, level from shaller to shaller, shall be a minimum of 2540 mm</li> <li>The travelled or usable crossing surface width, which represents the minimum clearance distance for two wheel chairs to pass between the pavement marking lines, shall be no less than 1829 mm</li> <li>The width of the approaching walkway, where there is one, shall be designed so that the crossing width shall extend a minimum of 500 mm beyond the shaller of the approaching walkway</li> </ul>
Crossing Surface	<ul style="list-style-type: none"> <li>Material: Asphalt 150-200 mm HL3A to match top of rail</li> <li>Geotextile to be placed directly on ties and ballast and must continue to top of rubber rail seal</li> <li>Construction tolerance between crossing surface and top of rail—3mm</li> <li>Grade between rails: match elevations of top of rail</li> </ul>
Crossing Approach	<p>Material:</p> <ul style="list-style-type: none"> <li>Asphalt 200 mm HL3A (typical)</li> <li>Subgrade: 150 mm granular "A"</li> <li>Gradient (Accessibility Standard)</li> <li>The gradient shall not exceed a ratio of 1:20 (5%)</li> <li>A gradient exceeding 1:20 (5%) would require the approach to be designed as a ramp</li> </ul> <p>In accordance with the Ontario Building Code, ramps can have a maximum gradient of 1:12 (8.3%).</p> <p>Furthermore, ramps require a handrail on both sides; therefore, this application would only be possible outside of the clearance envelope.</p>

Element	Design Requirement
	<p>Crossing approach shall be detectable at the boundary between the platform and the crossing to identify a safe stopping location outside of the clearance envelope.</p>
Crossing Location	<p>Where a train will not occupy the crossing during a regular Station stop the inside edge of the crossing shall be located no less than: 6 metres from the front of the facing cab-car.</p> <ul style="list-style-type: none"> <li>• Fencing shall be installed to prevent pedestrians from crossing the tracks between a locomotive/cab-car and a designated level crossing</li> <li>• Rail joints shall not be located within the crossing</li> </ul>
Guide Rails	<p>Guide rails are required for gate application only for the purposes of:</p> <ul style="list-style-type: none"> <li>• Providing a means to close-off the counter weights and mechanism, thereby providing a protective barrier for pedestrians</li> <li>• Guiding pedestrians and closing off access to the corridor when the gates are down, i.e. the gate arm shall "slot" into the guide rails</li> </ul>
Z-Barrier (Maze Barrier) (non-accessibility standard)	<p>Consider specific application depending on approach, e.g. not envisaged on platforms but may have a use on the parking side of the tracks where there is a large/lengthy approach and e.g. poor sightlines. The application would be used to slow down and control pedestrians so as to focus direction (sightlines) and attention to the crossing, or to force cyclists to dismount e.g. when using steps on approach.</p> <p>The following shall be considered for application only if required as per Transport Canada RTD-10 Technical Standards Manual:</p> <ul style="list-style-type: none"> <li>• Flashing Lights and Bell: Only to be considered if maximum permissible train speed exceeds 60 mph</li> <li>• The maximum permissible train speed exceeds 15 mph and there are two or more tracks at the grade crossing where trains may be passing one another</li> <li>• Specification: Mechanical or electrical <del>Bell</del> bell as per AREMA</li> </ul> <p>Gates:</p> <ul style="list-style-type: none"> <li>• Only to be considered where grade crossing warning systems are installed and the maximum permissible train speed is 50 mph or more</li> <li>• There are two or more tracks where trains may be passing one another</li> <li>• When the sightlines along the railway right of way for a pedestrian stopped at the grade crossing are not at least equal to the minimum requirements as per RTD-10 Specification</li> <li>• Short arm gates as per AREMA</li> </ul> <p>Active Warning Devices as above will require standard control equipment as per AREMA, e.g., solid state crossing controller, event recorder, track circuits, bungalow, batteries and chargers, etc. and installation shall conform to AREMA and RTD-10.</p>



**Figure D-26: Crosswalks in Parking Lots and Major Crosswalks on Access Routes**



**AS PLACED ON THE PAVEMENT**



**AS SEEN BY THE MOTORIST**

**NOTES:** GRID MODULE IS 150mmx150mm  
COLOR - LINE MARKING: YELLOW

**Figure D-27: Line Marking-Pavement Arrows**

## D.9 Park and Ride Lots

Park & Ride lots are intermodal transfer facilities. They provide a location for travelers to transfer between the auto mode and transit or between the single occupant vehicle (SOV) and other higher occupancy vehicle (HOV or carpool) modes.

All requirements from applicable sections apply, specifically:

- Site Plan Layout & Organization
- Bus Loops
- Vehicular Access and Accommodations

Park & Ride Lots are typically on MTO property and operated by GO Transit. The lots are serviced by GO transit and may be used by other local and regional carriers.

Carpool Lots Car Pool lots are owned by the regions or MTO, whose standards govern. They may be serviced by GO Transit and other transit agencies.



## D.8 Pavement and Line Markings

Table D-7: Slopes

Slopes				
Location	Longitudinal		Cross Slopes	
	Pref.	Max	Pref.	Max
Walks	0%	4%	OPSD	OPSD
Platforms (Rail & Bus)	0%	1%	1%	2%
Parking Lots	1%	3%	1%	3%
Fire Access Routes	Slopes to suit OBC fire access route criteria.			

Table D-8: Line Markings

Line Marking	
Location	Colour
Parking stalls, parking restricted areas and islands	Yellow
Directional dividing lines	Yellow
Rail Platform safety line	Yellow (tactile tile)
Lane lines, stop lines and arrows	Yellow
Pedestrian crosswalk lines	Yellow

Table D-9: Line Marking (Parking Structures Only)

Line Marking (Parking Structures Only)	
Location	Colour
Parking stalls, parking restricted areas and islands	Yellow
Directional dividing lines	White with reflectorizing glass beads
Lane lines, stop lines and arrows	White with reflectorizing glass beads
Lane lines, stop lines and arrows	White with reflectorizing glass beads
Pedestrian crosswalk lines	White with reflectorizing glass beads
Barrier Free Parking Symbol	White and Blue (Pantone 300)

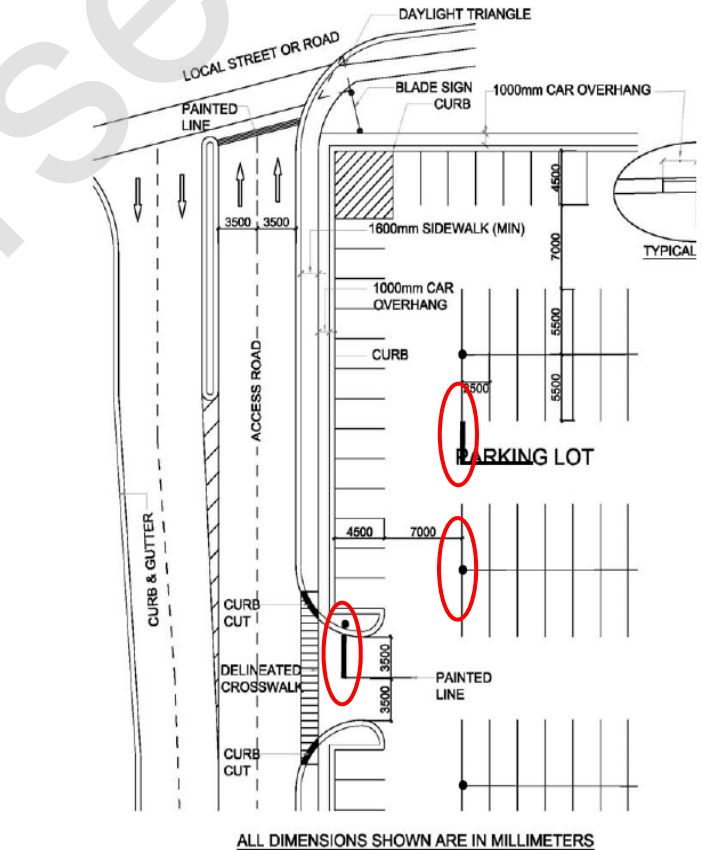
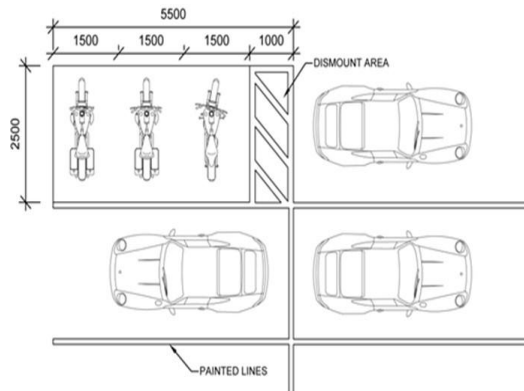
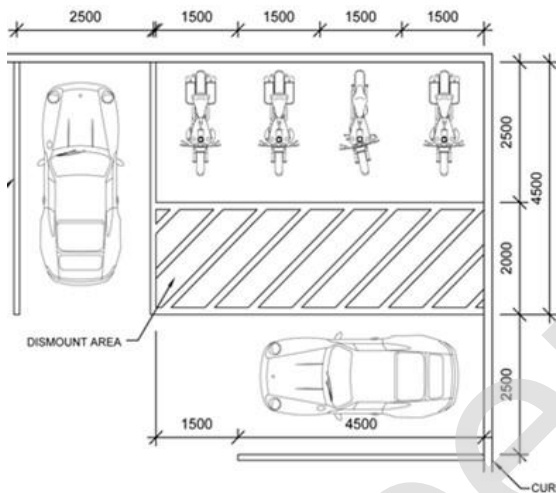


Figure D-21: Vehicular Parking Diagram



**Figure D-19: Motorcycle End of Parking Row Configuration**

- [See EV Charging Station Electrical details in Section F- Technical Requirements.](#)



**Figure D-20: Motorcycle Corner/Dead Space Configuration**

## Carpool to GO Parking

- 1% of total parking spaces in proximity to barrier free parking
- Carpool to GO Signage includes: Carpool to GO Introduction and Information Billboard sign, Banner signs, parking stall marker signs
- Signage shall be provided at each carpool parking space location (Refer to Figure Carpool to GO Installation Details)

## EV Charging Station

- EV charging stations shall be placed indoors if a parking structure exists
- EV Charging Stations Spaces

### Signage

**!** For signage design requirements at Parking garages refer the GO Standard Parking Garage Signage Requirements

	be provided at appropriate intervals
Cross slopes	maximum slope of 2%

## D.7 “Green Zone”

The “Green Zone” is part of the Smart Commute program that identifies a variety of modal options that promote sustainable station access such as cycling, local service integration, carpool, electric vehicles, walking, etc.

### Bicycle Infrastructure

Connect the cyclist pathways on site with local cyclist infrastructure via roadways and community trails.

Ensure a direct and delineated system of bike paths leading from the local access points to the bike storage locations on site.

**!** Sheltered bike areas integrated with the station design such as canopies and overhangs shall be placed in highly visible locations in vicinity of platform access points.

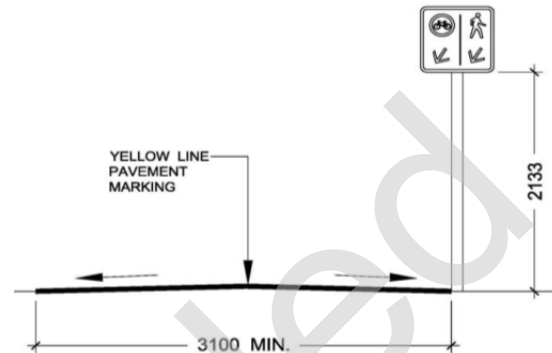
Only, where there are no opportunities for an integrated sheltered approach, standalone bike shelters shall be used. Refer [to GO Standard Drawings drawings](#) and specifications.

Shared paths are to be implemented in conjunction with and leading to sheltered bicycle areas.

### Shared Bike Path Design Requirements

**Table D-6: Shared Bike Path Design Requirements**

Criteria	Specifications
Yellow Line	100 mm solid, standard yellow, painted centreline
Width	minimum 3100 mm wide
Surface	hard and sustainable level materials that are stable, and slip-resistant
Grades	maximum slope of 4% Level landings or rest areas shall



**Figure D-18: Typical Cross Section for Shared Pedestrian/Cyclist Path**

A “shared path” is considered a single lane of travel, delineated for pedestrians and a single lane of travel delineated for cyclists.

The shared path shall have a centreline pavement marking, to reduce the cyclists’ perception of freedom to maneuver between lanes.

Key features include bike shelter, trail access points, grade, cross-slope, street crossings, curb cuts design, railings, and signage.

### Motorcycle/Scooter Parking

Motorcycle/Scooter parking is located in parking areas that would otherwise not be useable for standard vehicular parking. Each parking space shall be a minimum of 1500 mm wide by 2500 mm long. Individual stalls are not required

The parking area shall have a concrete base with steel reinforcing.

A designated dismount area is to be provided

# Accessible Parking Space Requirements

**Table D-5: Accessible Parking Space Requirements**

Accessible Parking Space Requirements			
Total Number of Parking Spaces	Number of Designated Spaces		
	Percentage (%)	Min. Spaces (Type A) minimum width of 3400 mm by a depth of 5500 mm	Min. Spaces (Type B) minimum width of 2600 mm by a depth of 5500 mm
		1500 mm wide barrier free access aisle is required adjacent to space	
1-100	4	1	1
101-200	3	2	2
201-500	2	3	3
501-1,000	1.5	4	4
1,001 +	1	5	5

If the total number of accessible spaces is an even number, the types required are divided equally. If the total number of accessible spaces is an odd number, the one remaining 'odd-numbered' space may be a Type B.

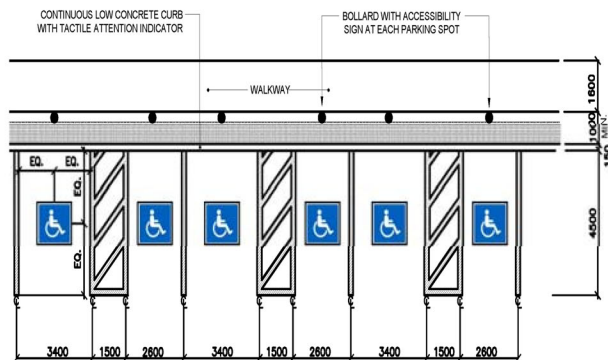
- Each Barrier Free Parking space shall be clearly marked with a sign bearing the International Symbol of Accessibility
- Where the location of designated accessible parking spaces is not obvious, directional signage incorporating the International Symbol of Access shall be placed along the

route leading to the designated parking spaces

- If there are more than three (3) designated spaces adjacent to each other, there shall be continuous low curb with a tactile attention indicator along the entire length of multiple designated spaces (no curb ramp for each unloading area)



**Figure D-16: Designated Parking Configuration for Two or Less Parking Spots**

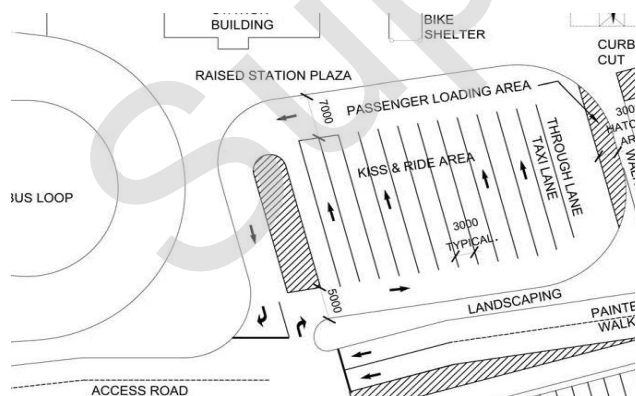


**Figure D-17: Designated Parking Configuration for Multiple Parking Spots (More than two)**

## D.4 Kiss & Ride

GO provides short-term parking facilities called Kiss & Ride's for passengers being dropped-off and picked-up. "Kiss & Rides" shall be designed to:

- Locate on the shortest possible accessible route to the station or tunnel entrance
- Provide capacity of a **minimum 2-3 %** of total parking spaces
- Allow space 3000 mm wide by 6000 mm long for each vehicle
- Be visible from enclosed passenger waiting areas
- Typically shorter lanes are more desirable than longer lanes
- Have pedestrian movement parallel with the flow of traffic, minimizing the conflict between cars and people
- Include a 3000 mm wide hatched area for loading/unloading to be located on the right to discharge passengers at the curb or walkway
- Ensure a barrier-free drop-off zone, complete with curb cuts and dedicated loading area
- Allow physical separation through a 2500 mm, raised curb or landscaped buffer between vehicles and pedestrians



**Figure D-15: Typical Kiss & Ride Configuration**

## D.5 Pedestrian Connections

### Walkways

Accessible curbs (curb cuts) shall be provided where pedestrian paths intersect with vehicular roads, at barrier-free parking spaces, and wherever there is change in level along a barrier-free path of travel.

- Use dedicated and continuous routes, throughout the station and connections to surrounding areas
- Create separation from vehicular traffic, whenever possible
- Make walkways a minimum 1600 millimeters (mm) wide
- When a pedestrian entrance is provided from a recreational trail, provide a clear opening between 850 mm and 1,000 mm, whether the entrance includes a gate, bollard, or other barrier
- Raised and constructed of hard and sustainable level materials that are slip resistant
- Smooth with few joint and visually distinct from surrounding areas

### Delineated Crosswalks

Shall be installed in conjunction with signs and accessible crosswalk markings provide guidance for pedestrians and alert road users of a designated pedestrian crossing point by defining and delineating paths.

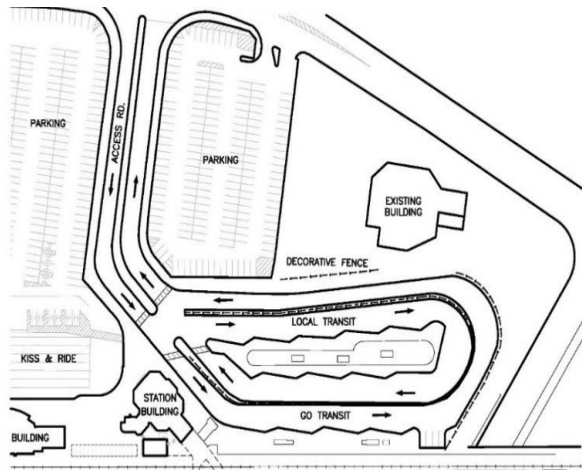
## D.6 Vehicular Access & Accommodations

Provide a complete system of vehicular roads and access points that promotes efficient circulation and maintains fluid access and egress to and from local streets.

Maximize the number of vehicular access points, in particular egress lanes, to mitigate the congestion.

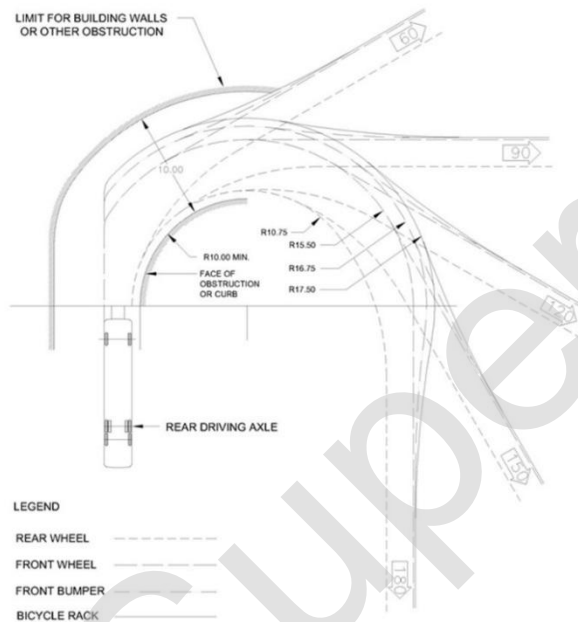
Design of vehicular access roads shall passively encourage speed reduction.





**Figure D-13: D. Bi-Directional Bus Loop Configuration and Traffic Flow**

## Bus Radii



**Figure D-14: Bus Radii Turning Template**

The following criteria shall be considered when using the turning template guidelines:

- Design Vehicle GO Bus Model MCA<sup>1</sup>D4500
- Bus speed–15 km/h
- Bicycle rack deployed
- Steering wheel turned all of the way to the Right stop
- Lateral clearance of 500 mm

- Bus turn does not begin until the rear wheels have reached the Tangent–Curve (TC) point of the inside face of curb or other obstruction

The design bus turning template shall be used where the operating speed of the bus is low, 15 km/h, and sharp short turns can be made without rider discomfort, for the design of surface features such as: Straight and saw-toothed platforms; Bus bay entrances; Bus loops; Entrance roads; and Bus maintenance and storage facilities.

## Bridges and Overpasses

### Open Overpasses

Open overpasses shall not have solid guards.

### Enclosed Overpasses

Enclosed overpasses and stairs shall have windows/skylights, including at the ends. Overpasses connecting platforms shall have unobstructed interior barrier-free routes and turn-around spaces. Corridors shall be free of overhead and protrusion hazards. Stair center handrails shall terminate at landings to permit crossover.

### Pedestrian Bridges

Pedestrian bridges over tracks shall be single-span structures with supports beyond the operating right-of-way, to the approval of the Railway. Intermediate supports are not allowed. Pedestrian bridges connecting platforms shall have unobstructed interior barrier-free routes and turn-around spaces. Corridors shall be free from protruding hazards.

### Bridges at Public Thoroughfares

Bridges at public thoroughfares may have intermediate supports, subject to the approval of the authority having jurisdiction.

### Bridge Structure

Where pedestrian overpasses over the ROW have stairs/elevators down to an island platform, the bridge structure shall be cable-stayed to uphold the bridge in case of derailment.

## D.3 Bus Loops

- Bus Loops shall provide separate access for bus, segregated from other vehicular, bicycle and pedestrian traffic
- Decorative Fencing and / or Landscaping is to be used to control pedestrian traffic and limit pedestrian access through the bus loop
- Bus access and egress must allow clearances necessary to accommodate coaches
- Passenger waiting bus platform shall be hard, level materials

- Concrete Curbs to be painted yellow (top and side) along the entire length of the bus loop
- [Refer to GO Standard Drawings Bus Bay Guidelines for straight and sawtooth platform details.](#)

## Bus Loop Configuration Traffic Flow

The configuration for a bus loop is to be selected based on-site constraints and optimal traffic flow patterns (vehicle, cyclists, local services, and connections). The following guidelines provide standard requirements and details for each of these options. Refer to the Bus Loop Configuration and Traffic Flow figures for examples of each.

- Figure D-10: Linear Configuration—Linear Traffic Flow (Preferred)
- Figure D-11: Island Configuration—Clockwise Traffic Flow
- Figure D-12: Teardrop Configuration—Counter-Clockwise Traffic Flow
- Figure D-13: Bi-Directional Configuration—Clockwise and Clockwise Traffic Flow

### Linear Configuration—Linear Traffic Flow (Preferred)

The linear configuration has a platform along the passenger side of the bus loop where passengers have access to the bus. In linear bus loops, buses follow a linear flow of traffic to circulate the loop.

Proceed to Island Configuration (B) if:

- Anticipate significant volume of bus service (both GO and Municipal) as linear loops have limited [space for platform expansion and accessibility concerns \(lengthy distances\) for bus to bus transfers.](#)
- [Space for platform expansion and accessibility concerns \(lengthy distances\) for bus to bus transfers](#)

~~Stairs shall be clearly marked, located near the major circulations routes and offset from the direct route of travel so that they are not a hazard~~

~~and easy to find. Stairs shall have uniform riser heights and tread depths with nosings, handrails, landings, etc.~~

## Rail Platform Stair Design Requirements

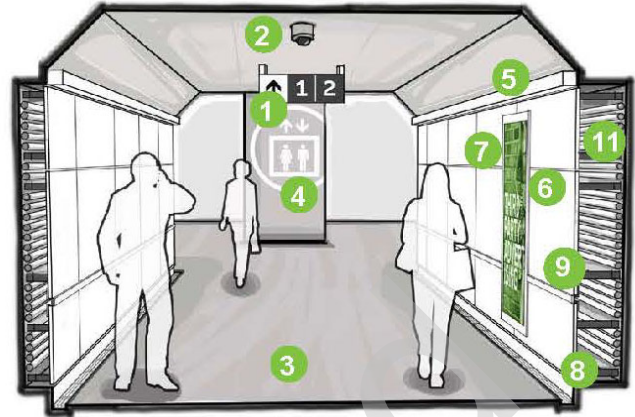
Table D-3: Rail Platform Stair Design Requirements

Criteria	Specifications
Walls	Fully glazed, clear, fully-tempered, designed for local wind loads, and high speed train turbulence
Photoluminescent Strips on Walls	<ul style="list-style-type: none"> <li>Surface mounted at 300 mm above stair nosing's and landings</li> <li>Installed continuously along entire length of stairwell wall transitioning in a continuous manner at tunnel level</li> </ul>
Stairwell Openings	Extended across tunnels for day-lighting and to reduce the apparent tunnel lengths
Handrails	<ul style="list-style-type: none"> <li>Stair centre handrails shall terminate at landings to permit crossover.</li> <li>Material, anchorage and fittings = stainless steel or rust resistant finish</li> </ul>
Stair Enclosures	Stair enclosures can be stand alone or combined with elevator enclosures, where applicable
Floor Elevation	Floor elevation to be set to provide positive slope from the doors to the platform
Tactile Attention Indicators	<ul style="list-style-type: none"> <li>At each landing, extended full width of the stair</li> <li>Depth of 610 mm (24 in) commencing one tread depth from the edge</li> <li>Color and texture contrasted with the adjacent surfaces</li> </ul>
Floor	Concrete floor, broom finished, sealed
Wall Base	<ul style="list-style-type: none"> <li>Concrete wall base, to be sandblasted finish, and sealed, no paint</li> <li>Base shall be 600 mm high (minimum) above the rail platform</li> <li>Top of the base shall slope on the exterior as a sill, away from the glazing</li> </ul>
Enclosure Structure	<ul style="list-style-type: none"> <li>Fully glazed enclosures with stainless steel framing system</li> <li>Frameless with silicone butt-joint glazing, with top and bottom stainless steel glazing channels</li> <li>Contained within the building envelope</li> <li>All exposed structural steel framing, including all anchors and fasteners, shall be non-corrosive</li> <li>Provide appropriate protective coatings or cover plates as required</li> </ul>
Cladding	Designed to minimum 1.0 kPa Reference Wind Pressure, with appropriate gust factor and wind pressure coefficients applied to the railway platform.
Guardrails	<ul style="list-style-type: none"> <li>Stainless steel guardrails shall be provided behind the window walls of</li> </ul>



### Pedestrian Tunnels

- Platform access Pedestrian tunnels must be linked to the station building or remotely located, as determined by site layout
- Location of conduit, including location of raceways and crossovers must be coordinated
- For wall cladding, final panel to wall attachment details & dimensions to be coordinated and verified with porcelain panel fabricator
- Vertical chases for conduit to be cast-in-place in tunnel transitions to stairways and elevators to be provided
- Conduit shall be designed within floor of the tunnel or in dedicated duct bank



**Figure D-9: Pedestrian Tunnels Design Elements**

#### Legend

1. Wayfinding signage
2. CCTV ceiling mount
3. Smooth finish concrete floor
4. Supergraphics applied to elevator shaft wall
5. Concealed continuous LED light fixture in aluminum valance, with down (70%)- and up (30%)-lights on both sides
6. Porcelain removable panels (hinged access preferred) at pull box locations for maintenance access
7. Digital advertising box (Note: Consultant to coordinate mounting details with porcelain panel supplier)
8. Metal grate over gutter secured to floor with removable retaining clips
9. Photoluminescent emergency egress strip mounted on metal trim at porcelain panel joint line, Installed to be flush with porcelain panel
10. Full-height cast-in-place conduit raceway with appropriate crossovers

### Pedestrian Tunnel Design Criteria

**Table D-2: Tunnel Design Criteria**

Criteria	Specifications
Height	<ul style="list-style-type: none"> <li>• Compatible with CCTV requirements</li> <li>• Overhead signs shall not obscure the field view of CCTV</li> <li>• Min. height shall be 2.7 m inclusive of concrete floor topping</li> </ul>
Width	3.66 m under the tracks
Slope	Min: 0.30% for drainage
Conduits	Located behind porcelain panels
Drainage	<ul style="list-style-type: none"> <li>• Side-gutters 40 mm deep by 80 mm wide</li> <li>• NOT to be located at the bottom of stairs or in front of service doors or</li> </ul>

	<p>elevator doors</p> <ul style="list-style-type: none"> <li>• Provide pump rooms with pits</li> </ul>
Construction	Concrete construction in accordance with railway requirements and structural site needs
Raceways	<ul style="list-style-type: none"> <li>• Integrated into walls and floors</li> <li>• Located behind porcelain panels</li> </ul>
Clearance	<a href="#">From top to base of rail min of 0.508 m Refer to Table D-1</a>
Corners	<ul style="list-style-type: none"> <li>• 45° angled (300 mm x 300 mm minimum corner cuts at 45 degrees)</li> <li>• Convex mirror units at internal 90° corners and angled wall corners at directional changes</li> </ul>
Photoluminescent Strips	<ul style="list-style-type: none"> <li>• Tunnel walls (both sides)</li> <li>• Surface mounted</li> <li>• Integrated within wall panel system</li> <li>• Installed continuously along entire length of tunnel transitioning in a continuous manner to all stairwells</li> </ul>
Digital Signs	Installed at tunnel entrances (in accordance with overall digital sign placement requirements)
3rd Party Advertising	Advertising signs integrated within wall paneling system
Vertical Clearance	800 mm top of tunnel roof membrane overlay to underside of rail (This is based on 300 mm sub-ballast, 300 mm ballast to bottom of ties and 178 mm ties)
Wall and Floor	Walls: Porcelain wall system, Floor: Smooth finish, no advertising to be placed on floor of tunnels

## Ramps

Where there is an opportunity to provide direct access, or ramped access, as an alternative to stairs, ramps shall be explored.

Provide pedestrian ramps with access from grade to side platforms. Adverse weather can cause slippery conditions on exterior ramps; based on the infrastructure availability at the location, heat the pedestrian ramp surface or cover the ramp.

The colour and tonal contrasting requirements of ramp elements shall all be designed and provided in accordance with the current Ontario Building Code and industry standards on accessibility. Ramps shall have a 100 mm painted line-marking indicator at the start and finish of a ramp slope. Design vehicular ramps with excessive slopes with a snow melting system.

## Rail Platform Stairs and Enclosures

Stair systems not only provide a means of access and egress to and from rail platforms, but also provide means of vertical travel for many people with disabilities, children, seniors, parents with strollers etc.

Stairs shall be/have:

- Easy to find
- Clearly identified with wayfinding
- Located near the major circulations routes
- Offset from the direct route of travel so that they are not a hazard
- Uniform riser heights and tread depths
- Nosings, handrails, landings, etc. and all other regulatory and barrier free requirements

2.1 CCTV

2.17 Warning Signage

2.2 PA (not shown)

2.18 Operational Signs

## Rail Platform Canopies

Canopies on all rail platforms with integrated shelters and accesses such as elevator and stair enclosures and related amenities shall be provided.

The canopy shall be continuous and should extend to provide maximum coverage (at least 85% of platform cover) over the rail platforms.

Canopies to contain two (2) separate raceways along the full length - one for data, the other for power.

Height max. 3350 mm from t/o platform to u/s canopy.

The underside of canopy height shall be determined such as to accommodate digital screens suspended from the underside of canopy; ensuring adequate weather protection below canopy and maintaining all horizontal and vertical clearances including a minimum vertical clearance of 2440 mm below all obstructions (including digital signage) for snow clearing and other equipment.

Min. 400mm high concrete pier at each support column.

Integrate canopy lighting and other fixtures and amenities such as CCTV, digital signage etc in the canopy ceiling structure.

## Rail Platform Access— Tunnels/Ramps/Stairs

Provide a network of barrier-free pedestrian pathways that connects all of the station components to facilitate easy intermodal transit connections.

Connect the station site with adjacent communities via sidewalks, local pathways, or bridges to maximize the pedestrian access to the site and minimize walking distances.

Provide direct pedestrian paths, continuous from the closest local road to at least two of the barrier-free platform access points.

When side platforms are used, provide direct walk on platform paths to maximize access to each platform.

At least one barrier-free rail platform access must be as close as possible to the mini-platform.

Connect one of the rail access tunnels with the station building to provide additional convenience and customer service.

Consider whether the tunnels or bridges connecting to the platforms can also act as barrier-free community connection points on either side of the tracks. If so, ensure each community connection point can remain open when the station needs to be closed.

Platform access shall be visually discernible from site access points to encourage intuitive site navigation to the rail platform.

Provide redundant means of barrier-free access to island platforms by means of two elevators.

This section covers platform access structures including but not limited to:

- Pedestrian Tunnels
- Stairs and Stair enclosures
- Ramps
- Elevators
- Bridges and Pedestrian Overpasses
- At Grade Pedestrian Crossings

Static Signage Manual

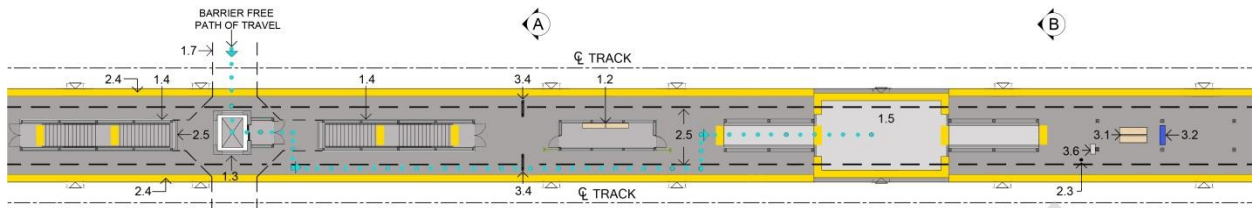


Figure D-5: Typical Rail Platform Configuration

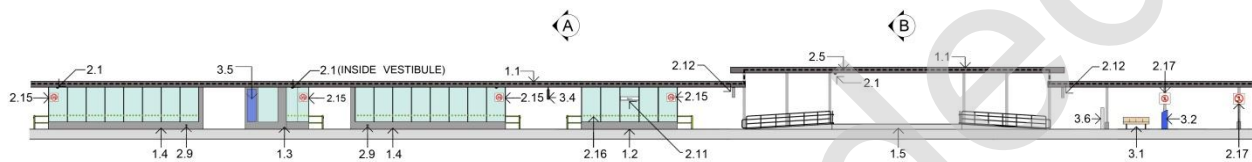


Figure D-6: Typical Rail Platform Elevation

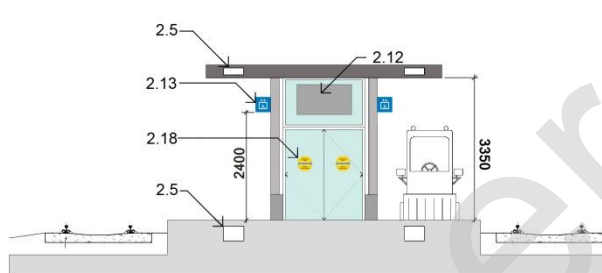


Figure D-7: Section A

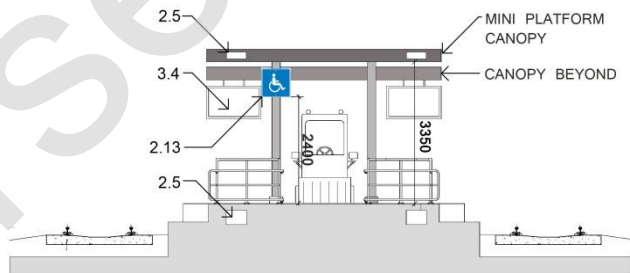


Figure D-8: Section B


LEGEND

- |   |  |                                   |
|---|--|-----------------------------------|
| 1.1 Continuous Platform Canopy                | 2.3 Snowmelt System w/ Platform Sensors        | 2.13 Accessibility Signage        |
| 1.2 Integrated Platform Shelter               | 2.4 Detectible Platform Edge Tile              | 2.14 Amenity Signage              |
| 1.3 Elevator and Vestibule                    | 2.5 Platform/Canopy/Vertical Raceway           | 2.15 Regulatory Signage           |
| 1.4 Stair Access and Vestibule                | 2.6 Corridor Raceways (TBD)                    | 3.1 Platform Bench / Seating      |
| 1.5 Mini Platform                             | 2.7 Drainage (not shown)                       | 3.2 Waste Containers              |
| 1.6 Platform Lighting (not shown)             | 2.8 IT Node/Cluster Infrastructure (not shown) | 3.3 Information Board             |
| 1.7 Tunnels                                   | 2.9 Hose Bib                                   | 3.4 Platform Digital Monitors     |
| 1.8 At Grade Pedestrian Crossings (not shown) | 2.10 Fencing (Not Shown)                       | 3.5 Advertising (TBD)             |
| 1.9 Pedestrian Bridges (not shown)            | 2.11 Platform Sign ID                          | 3.6 Two Way Communication Devices |
| 1.10 Poles (PA and CCTV-not shown)            | 2.12 Directional / Way finding Signs           | 3.7 Wi-Fi (not shown)             |
| 1.11 Ramps (not shown)                        | 2.16 Safety Signage                            |                                   |

## Rail Platform

These criteria are based on CN Rail data, applicable also to CP Rail, for preliminary design. Detail design shall be reviewed by the appropriate railway authority and GO Transit, at which time some dimensions may be defined more precisely

**Table D-1: Rail Platform Design Criteria**

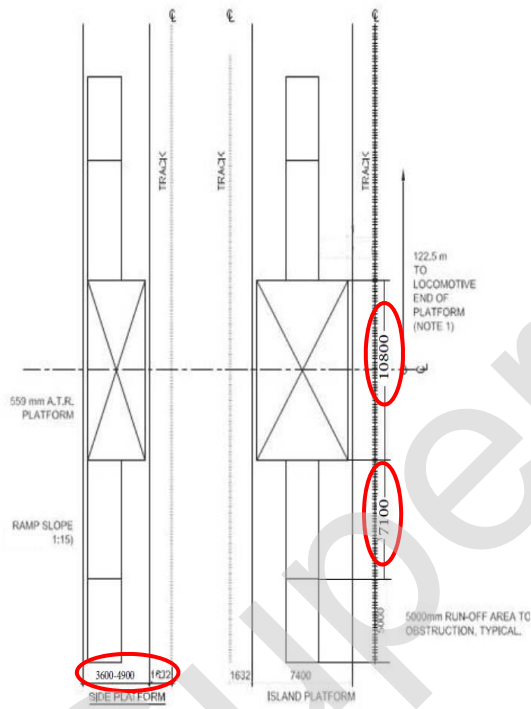
Rail Platform Design Criteria	Specifications
Track centres, centre line to centre line, new station facilities only	4.273.97 m
<del>Centre line of track to edge of platform</del>	1.632 m
Width of island platform	7.4 m
Width of side platform	3.6 m–4.9 m
Length of platform	315 m
Centre line to centre line of tracks serving island platform	10.668 m
<del>Passenger and Freight Operations, maximum height of platform A.T.R.</del>	0.127 m
<del>Exclusive GO Transit tracks, maximum height of platform A.T.R.</del>	0.25 m
Passenger circulation zone & usable platform area, edge of platform-to-platform structures (shelters/stair enclosures, etc.)	2.44 m ( <u>Exclude the width of the tactile attention indicators when calculating usable platform space; and Consider specific points of congestion (e.g., no standing zones) when determining the extent of platform crowding</u> )
Maximum height of mini-platform A.T.R.	0.559 m
Yellow Tactile attention indicators Tile at Platform Edge	0.61 m
<b>SLOPES</b>	
Island platform cross	2% maximum
Side platforms	Drain away from the tracks
Where platforms slope longitudinally: <ul style="list-style-type: none"> <li>Tracks, elevator floor, stair enclosure and shelter buildings shall be raised</li> <li>Transitionally adjusted at door locations to prevent water entry</li> </ul>	1% maximum
<b>CLEARANCES</b>	
Minimum horizontal (from track CL)	2.546 m
Minimum vertical clearance (A.T.R)–end of line, terminus, low speeds	6.7 m
Lateral clearance from centre line of track to mini-platforms	1.98 m
Lateral clearance to major and elevated platform structures, centre line of track to canopies, roof overhangs, etc.	3.35 m
Tunnel (pedestrian underpass) clearance, top of tunnel roof membrane overlay to underside of rail, minimum approximately	0.8 m
 Additional pavement markings and signage are required for reduced platform clearances (Refer	

- Where there are reduced width locations, include warning pavement markings and signage (refer the GO Static Signage Catalogue for “No Standing” and “Reduced Platform Clearance” signage requirements)

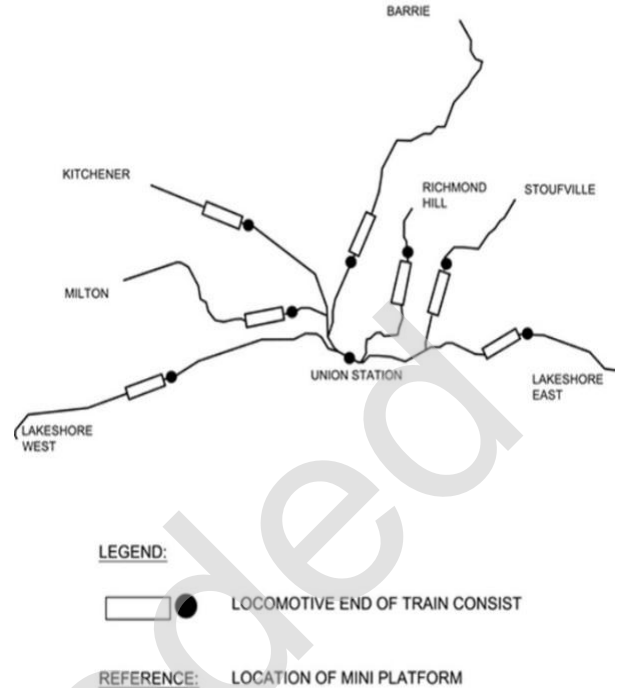
When locating and orienting the mini\_ platform the steps outlined below shall be followed:

Step 1–Orient mini\_ platform, with an understanding of train consist orientation and operation

Step 2–Locate mini\_ platform and rail platform dimension, dependent on island vs. side platform configuration in accordance with criteria and specifications and subsequent tables.



**Figure D-3: Typical Configuration of Mini Platforms**



**Figure D-4: Typical Orientation of Locomotive end to locate Mini Platforms**



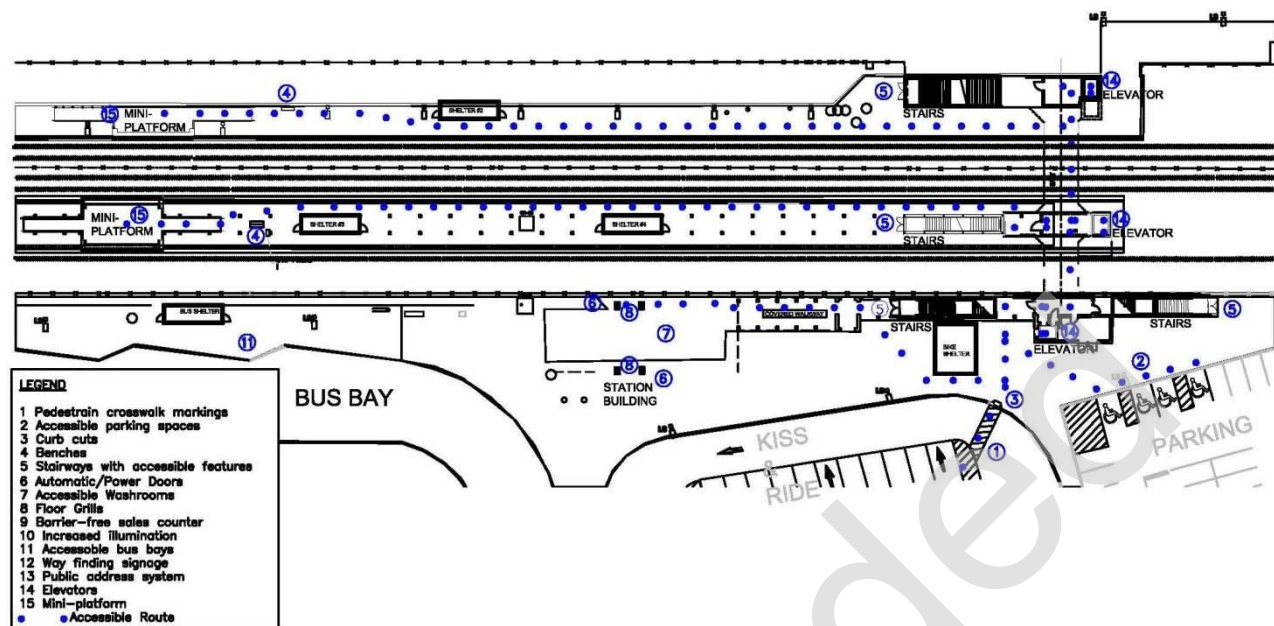


Figure D-3: Diagram-Accessible Route

## Mini-Platform

Barrier-free access to the trains is provided by an accessible elevated “mini-platform” which is aligned with the designated accessible rail car. Refer to Standard Drawings for mini-platform details.

## Designated Waiting Area (DWA)

The Designated Waiting Area (DWA) at GO stations is to be located on the rail mini-platform.

It is intended to be a convenience feature, whereby a customer can expect to avail assistance and have a reasonable sense of safety.

The DWA has augmented functionality and visibility at the station mini-platform. Key features include:

- Enhanced lighting
- Dedicated CCTV coverage
- [Signage DWA ID signs](#)
- Two-way communications [device \(telephone\)](#)
- PA system
- Overhead cover (canopy)

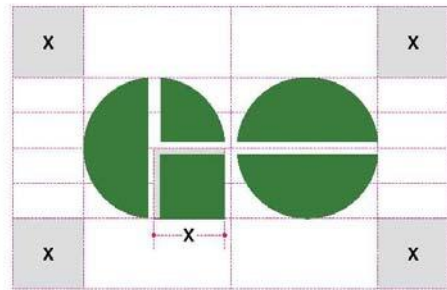
- Bench seating on rail platform in the proximity of the DWA
- Enhanced accessibility features in the mini-platform design
- Wayfinding signs on the accessible route
- Station ID sign
- Minimum horizontal and vertical clearances as mandated by functionality; and advanced warning identifiers

## D.2 Rail Platform and Platform Access

Refer to respective GO rail standards for track infrastructure standards.

Rail platforms are a foundational item to GO rail stations. Their orientation, design, alignment, geometry, and site conditions are the framework around all other site components are configured.

- The use of side platforms are preferred
- Island platforms to allow for multiple points of access and egress
- Locate the platforms to minimize travel distances to adjacent transit modes
- Maximize barrier-free travel



Typical Signage Layout Grid, Clearance zone

**Figure C-7: GO Logo**

Permitted colors = Pantone 364C or Black

- Any material variation to integrate with building massing to be approved by GO Transit
- The GO Logo shall be used sparingly, and not applied to every façade of a building

- The GO Logo and/or Station Name are typically not to be placed on bridges (pedestrian, rail, vehicular, etc.) or on elevator overrun shafts
- GO Logo and Station Name shall ideally be mounted on a solid background
- On parking structures, the GO logo should be  $\pm 10\%$  of the overall façade height. Size can vary to suit site context with GO approval.
- Recommended materials:
  - UV stabilized Polycarbonate
  - Flex face for larger, high mounted items (mounted at least 3m above grade)
  - Backlit signs to be illuminated with LED targeting white 6500 to 7,000K colour temperature
  - Illuminated sign may not be placed on a building or structure facing rail traffic



## C.2 Signage

There are two main types of mediums for signage typically used at GO stations, terminals, facilities etc.:

- Static Signage
- Digital Signage

Static and digital signage within the GO system serves four (4) primary functions:

- Identify—Site and entrance
- Direct—Vehicular and pedestrian movements
- Inform—Maps etc.
- Regulate—Governing bodies

Detailed information on sign templates and design files are located in the GO Static Signage Standards.

Digital Signage uses digital media for display of information such as schedule/service information, GO Marketing, Third Party Advertising, and other customer service amenities.



Refer the Fixtures and Furnishings section of the DRM for details on Digital Signage.

Program signage that is designed to be read in close proximity at standard reading height, such as a washroom sign, shall also include braille.

Supergraphics shall be used as a secondary means of signage, where the space is ample and the destination and corresponding supergraphics can be seen from far away.

Signage design, placement and layout shall take into account the varying mobility and cognitive skills of potential customers.

## C.3 Placement and Installation

Safety clearances shall be observed at all times.

Support and mounting structure shall be designed as an integrated part of the architecture: recessed in walls, or part of a self-service kiosk organization.

Signage shall be strategically located and grouped with other Information/ advertising,

consistently placed where customers could have clear visibility and access to this information.

### Stations and Tunnels

Typically wall mounted or mounted on customized bracketing and hardware, or adhesive tapes/backing film

### Rail and Bus Platforms

Utilize structures and supports. Where a stand-alone support is required, appropriate post selection for type, size and installation method is paramount. Bus Bays and locations where multiple signs are installed on a single pole, must utilize a minimum standard of 2" x 2" galvanized square tube post. driven U Channel posts are typical.

Parking lots and access lanes

Banding to light stands, where possible or driven U-Channel post and related brackets and hardware

Installation at GO facilities is typically accomplished through use of the following methods:

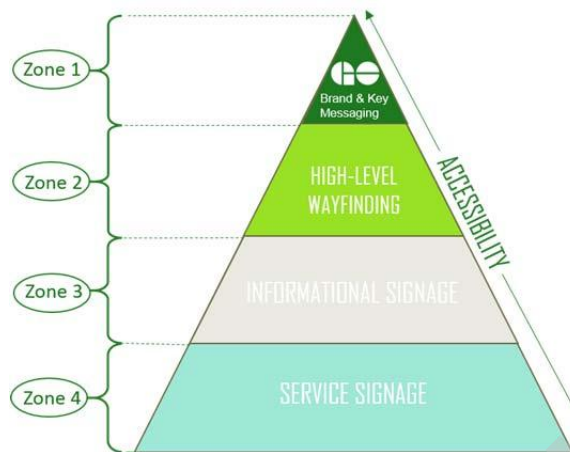
- Bolted to driver Post (U-Channel, PT 4" x 4" or 6" x 6" wooden post, galvanized solid and perforated 2" x 2" square steel and 3" round poles
- Banding and brackets
- Pressure-sensitive adhesive tapes and backing films
- Exclusive use of high quality non-staining fasteners (typically, stainless steel)
- Avoid plastic ZIP tabs fasteners except for temporary construction signs
- Avoid mounting signs on posts/poles that house CCTV Cameras
- Wall-mounted signs are facilitated by stainless steel screws in either drilled and tapped or anchor plugged holes, or with double-sided pressure sensitive adhesive tapes
- Fence-mounted signs use fence blocks or signs are mounted back-to-back with appropriate sized nut bolts and washers

# C WAYFINDING AND SIGNAGE

## Overview

There is a hierarchy to GO communications, which provides direction for all GO signage, to ensure brand consistency and proper execution throughout the customer journey.

There are four defined “Zones” of Communication that a customer experiences.



**Figure C-1: Communication Hierarchy Zones**

These types of communication occur within, and increase with frequency, as a customer progresses through GO Transit's fourteen Customer Journey Sections as illustrated and noted to the right.

Four Key High Level Principals Regarding Zone Communication Types:

### Brand and Key Messaging

Locating Brand and Key Messaging takes precedent. The established GO Brand Guidelines must be adhered to so that consistency across the GO system is created and maintained. The consultant must implement the established Station ID and Signage Standards to provide consistency across the system.

### High-Level Wayfinding

High-Level Wayfinding Signage must be clear, easy to comprehend from a distance, and in alignment with GO Brand Guidelines and established GO Static Signage Standards.

## Informational Signage

Informational Signage must be grouped in central locations within station exterior and interiors, indicating an understanding of site specific customer paths of travel to ensure messages are communicated clear, consistent and consolidated manner so that over-signing and unnecessary visual clutter is avoided. Third-Party Advertising must be suitably located and if possible integrated within the overall consolidated signage group.

## Service and Regulatory Signage

Reduce and consolidate Service and Regulatory Signage to eliminate repetition and reduce visual clutter. Place notices in the proper location, and for safety, doorways should be kept clear of unnecessary signage.

## GO Customer Journey Sections

- |                       |                                |
|-----------------------|--------------------------------|
| 1. Property Entrance  | 8. Teamways                    |
| 2. Parking            | 9. Train Platforms             |
| 3. Station Exterior   | 10. Bus Platforms              |
| 4. Station Interior   | 11. Train Exterior             |
| 5. Service GO         | 12. Train<br>Exterior/Interior |
| 6. Information Boards | 13. Bus Exterior               |
| 7. Tunnels / Bridges  | 14. Bus Interior               |

The **five criteria** informing the design and placement within the Customer Journey are:

**Experience**—GO customer experience shall be easy and efficient.

**Consistency**—In alignment with GO Brand Standards, Design Requirements Manual and Static Signage Catalogue.

**Location**—Placed in ideal location in Customer Journey to best serve customers

**Scale**— Signage is clear and legible

**Quantity**—Do not over sign, and seek potential efficiencies to achieve same message

The consultant must reference and implement established GO Static Signage Standards where applicable and adhere to the dimensional and technical information regarding their fabrication and installation located within the Design Requirements Manual and GO Static Signage Catalogue.

The GO Passenger Charter will be given a prominent location in Station Interior adjacent waiting areas and onboard vehicles to emphasize its importance. It may not be located on the exterior of station buildings.

Digital Signage is discouraged from being placed within tunnels and bridges to prevent congestion in customer paths of travel. For Digital Signage content please refer [to](#) the relevant Design Requirements Manual section.

Physical Information and Service Messages are prohibited from being placed on the glass partitions of Service GO Message Centres.

The supporting GO Communications Hierarchy Ideal State Renderings located in the Design Requirements Manual do not capture all site and station conditions. It is understood that signage design and placement may need to be adapted to suit specific site and station conditions to ensure wayfinding legibility and clear, consolidated information and service messaging.

In all instances regarding location, placement and housing, considerations of safety and accessibility should take precedent.

### PROPERTY ENTRANCES: IDEAL STATE



Figure C-2: Property Entrances-Ideal State

### PARKING: IDEAL STATE



Figure C-3: Parking-Ideal State

### STATION INTERIOR: IDEAL STATE



Figure C-4: Station Interior-Ideal State

**TRAIN PLATFORM: IDEAL STATE****Figure C-5: Train Platform-Ideal State****BUS PLATFORM: IDEAL STATE****Figure C-6: Bus Platform-Ideal State**

The GO overall wayfinding and signage program requirements and guidelines are the tools that we provide to our customers, which enable them to navigate easily throughout a GO site.

The key principles of the overall wayfinding and signage guidelines are:

- To provide a philosophical guide on “what” are our expectations for developing a comprehensive wayfinding and signage program including trailblazing during the design of a GO site, station, and facility
- To address typical signage, methodology, application, and placement and installation including signage that is temporary in nature

It is intended that all wayfinding and signage plans be developed with these basic principles, incorporate appropriate corporate colours and contrast, defined French Language treatment,

minimize the use of text, and increase the use of icons

## C.1 Wayfinding

The Wayfinding Signage program shall be designed to aid the customer to navigate the site with ease while addressing the functionality in these spaces. Key services and amenities located within a site shall be identified within the wayfinding program. It shall be well thought out, easy to use, aid in self-orientation and to enable a seamless trip journey by creating an inclusive, excellent customer experience for all types of users.

Early application of wayfinding design, comprising of elements for Information, Confirmation, and Identification for planning the customer journey and an understanding of the needs of various user groups, provide the framework for an effective wayfinding system.

Considerations include at a minimum, the positioning of entrances and exits, the use of colour contrasting, pattern direction on floors or walls, tactile markings, the arrangement of architectural features such as walls or columns, acoustics, and lighting to help direct people to their intended destination.

A consistent appearance or theme shall be presented throughout the facility. Signage for entrances and directions shall be clear and kept at appropriate driver’s eye levels.

Coordinate with related disciplines, e.g., Architectural, Structural, Electrical, etc., for placement of signage requirements (i.e., locations).

Provide power, communication, feeder, and conduit to facilitate the installation of dynamic and/or back/top lit signage.

Directional signs shall always be located at decision points.

Where possible, signs shall be located perpendicular, not parallel, to the visitor’s line of sight and movement.

At facilities with multiple lots, where one or more parking areas may not all be connected to the accessible route, trailblazing is required at the local street level to provide direction to the proper lot.



- Defined interrelationships between the component
- Functional requirements
- Customer amenities and furnishings
- Signage and wayfinding

## GO Design Excellence

Design excellence refers to the successful interplay between FUNCTIONALITY, DURABILITY, BEAUTY, and VALUE.

GO Design Excellence Guidelines define architectural and landscape intent to produce more consistency in quality, look and feel, and identifiable signature architectural elements.

Further details on the evaluation and review process are available with your Metrolinx Delivery Team.

### Integrated Art

Metrolinx defines Integrated Art as:

- The product of a creative process led by professional artists which replaces standard facility finishes or fixtures, or is integrated into standard facility finishes or fixtures;
- Any type of integrated physical, visual or audiovisual artwork that goes above and beyond the base expression of a building or open space;
- Is incorporated into the functional design of infrastructure elements and landscapes and
- Is permanent.

Integrated art may take many forms within the built infrastructure, including:

- Interior or exterior architectural station or terminal elements;

- Works integrated into at-grade stops or shelters;
- Works integrated into the design of sites, buildings and landscapes in publicly accessible and visible areas of a site;
- Works integrated into infrastructure elements and along rights-of-way;
- Landscape elements; and
- Digital artwork forms including video, film or new media works displayed on digital screens or projected on surfaces, and works commissioned or purchased to be installed in new or pre-existing screens.

### Integrated Art Design Guiding Principles

Metrolinx's principles for integrated art are conditioned by a desire to link architectural expression to art in a way that is meaningful for riders, and to provide works that complement and enhance the public's experience. These principles are also informed by underlying values of sustainable design, and the overarching functional imperative for operational performance required by transit facilities.

Integrated public art should retain an interpretative, creative and innovative aspect and authorship, as determined by the artist, and not be a mere extension of the design of the architecture, landscape architecture, or interior design of the basic building.

Integration of art should be incorporated as early as possible into the design process and construction schedule via a collaborative team approach, encouraging creative problem-solving. Integration is intended to ensure that there is no interference with customer service, little or no premium for operational costs, and no safety issues. Refer the Standard Drawings and Specifications found for details on the integrated Art Process and related requirements.

## B.2 Customer Service

The GO customer journey is a series of sections that is identified with an integrated, seamless, harmonized, customer-focused approach with related key brand touch points of interaction in station design.

The mission of GO Transit is to deliver an easy and delightful passenger experience.

The five strategic priorities include:

- Design Excellence
- Delight and eliminate barriers
- Promote seamless travel
- Strong partnerships and offerings
- Communications

It shall be easy in every way for the passenger allowing them to travel stress free and intuitively. Through design, comfort, and amenities, we will make GO the preferred choice for customers. With the customer experience at the forefront of responsive, GO Transit's corporate brand and identity shall be extended throughout the GO Transit System by application of the latest GO logo and colour to all stations consistent with the requirements defined in this Manual.

## B.3 Sustainable Design

GO has adopted American Public Transportation Association's (APTA's) framework for approaching transit sustainability with supporting Guiding Principles relevant to GO's infrastructure.

### Smart Land Use and Livable Neighbourhoods

- Encourage neighbourhood integration and connectivity and the provision of green amenities
- Reduce heat island effect
- Increase soft landscaping are key drivers

### Materials & Construction / Operations Optimization

- Flexibility and longevity
- Green construction practices and materials

- Address easy long term maintenance and adaptability/conversion

### Energy and Resource Efficiency

- Lower the energy consumption and carbon footprint
- [Look for Operational operational](#) and maintenance cost savings (i.e. energy harvesting, conservation/recovery and efficiency)

### Quality of Ambient Environment and Health

- Provide a comfortable, healthy and safe environment

### Emissions and Pollution Control

- Contribute to reduced air emissions and wastewater discharges
- Strategies for waste reduction and water conservation

## Corporate Policies

Implement corporate policies that support green operations throughout the life of the facility, such as Green Cleaning, Solid Waste Management, and Green Education, and select LEED credits for certification.

As the industry evolves and new certifications become relevant to GO, they too can be explored, upon approval from Metrolinx.

### GO LEED Credits

All buildings, terminals, and facilities are to achieve LEED Gold certification. Specifically, select credits (Appendix B) have been identified to ensure that only LEED credits that bring value to GO Transit's goals of energy efficiency and reduced operating and maintenance costs are targeted.

## B.4 Integrated Design

The holistic and integrated design of stations shall enhance the customer experience by providing a consistent experience across the GO Transit System that is dependable, smart, caring, and responsive.

Planning for integrated design requires identified station components of a typical GO Station

- [Ontario Provincial Standards](#)

## Drawings Standards

[Refer to GO Standard Drawings and Specifications for Drawing Standards.](#)

### Document Amendment Record

The Amendment Record identifies revisions, by subject category and date. Consultants,

designers, and contractors shall use the Amendment Record to ensure they are working from the latest version. An e-mail notification is issued whenever a revision/addition has been made to the Design Requirements Manual. The revision/addition is noted on the Amendment Record and immediately posted on our intranet and external website by the Standards team. The Amendment Record can be found in the DRM as Appendix A.

Superseded

## Overview

GO Transit is an inter-regional public transit system in Southern Ontario who primarily serves the GTHA, with operations extending to several communities in the Greater Golden Horseshoe. GO Transit operates commuter rail and coach bus services that connect with other regional transit providers such as VIA Rail Canada, the Toronto Transit Commission (TTC), and local municipal bus services.

This GO Design Requirements Manual (DRM) is a document that outlines the Guiding Principles and technical details for the infrastructure requirements to design and build GO stations, terminals, and facilities.

This Manual balances and harmonizes corporate objectives, stakeholder requirements, and industry best practice by defining a performance-based set of technical requirements and guidelines used as detailed instructions for designers and users.

## Ownership and Location

GO Transit owns this Manual, in both printed and/or digital form, and will keep a record of issuance, and forward amendments to all consultants, designers, and contractors registered with us as Manual Holders.

Manual Holders may reproduce the contents of this DRM for use as required during a project assignment from GO Transit, and is responsible to ensure that the most recent version, and all its requirements, is used at the time the assigned project.

## How to use the DRM

The DRM is the starting point of infrastructure design for GO Stations, Terminals, and Facilities.

It is a combination of guidelines and requirements that are performance based and exceed industry regulations and codes.

The DRM does not absolve the designer of record from current regulations and codes or professional duty of care.

Information is in the order of design development, starting with identification of program elements, site planning, to architectural design and wayfinding, and then to technical details such as electrical, mechanical, communications, etc.

Design requirements are performance-based and expected to be used as the starting point for design development. The DRM is part of a suite of products that shall be used to inform the design.

The suite of products also includes:

- Standard Static Signage Catalogue
- Standard Drawings
- Standard Specifications & Guidelines
- [GO Transit Track Standards](#)

## Codes and Regulations

It is required that consultants design in accordance with all applicable standards, regulations, and codes to the approval of all authorities having jurisdiction.

Where design alternatives will provide substantially equivalent or where conflicts exist between the requirements of this Manual and standards or legislation enacted by the federal or provincial governments, the most stringent requirements shall apply.

Consultants for specific projects shall define codes as applicable and list them in the contract tender documents.

Other codes and regulations, imperative to the business that must be adhered to include but not limited to:

- Ontarians with Disabilities Act
- Railway Safety Act (RSA)
- Transport Canada Grade Crossing Regulations
- Canadian Road/Railway Grade Crossing Detailed Safety Assessment Field Guide
- Transport Canada RTD-10 Technical Standards Manual; RTD-10 will govern requirements for active warning system
- AREMA (American Railway Engineering and Maintenance of Way Association) Communications and Signals Manual
- Existing Railway Corridors Standard and Specifications for Crossing Warning Systems
- Manual of Uniform Traffic Control Devices for Canada



# GO Design Requirements Manual

January 2017 April 2016

GO-DRM-STD-2017-Rev1



**METROLINX**

An agency of the Government of Ontario

# **GO Design Requirements Manual**

GO-DRM-STD-2017-Rev1

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# PREFACE

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This is the 30<sup>th</sup> edition of the, GO Design Requirements Manual.

The purpose of the GO Design Requirements Manual is to serve as a reference tool for consultants, designers, and contractors. The GO Design Requirements manual consist of Guiding Principles and technical details for the infrastructure requirements to design and build GO Stations, terminals and facilities.

The GO Design Requirements Manual provide design standards for GO station, terminal and facility location, size, clearances, functional relationships, site development, architectural features, mechanical, and electrical systems. The GO Design Requirements Manual is applicable to new construction and retrofit capital infrastructure programs.

The GO Design Requirements combine the corporate objectives, stakeholder requirements and industry best practices by defining a performance base set of technical requirements and guidelines used as detailed instructions for users. The GO Design Requirements Manual incorporates the valuable feedback we have received from numerous users since the introduction of the reformatted DRM launched in April 2016. For further information, see amendment record.

January 2016

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Superseded

- Access to windows for cleaning shall not be obstructed except where absolutely necessary (required structural member, etc.)
  - Windows above ground level shall be placed such that they can be accessed from below using a lift, and accessing windows for cleaning shall not require getting into traffic or onto tracks
- If cleaning or replacing windows or maintaining a structure requires access by rappelling down the side of the structure, then safety tie-off anchors shall be provided per code

### **Bird Control**

- The term 'bird control' applies to reducing habitation but also should apply to bird strike prevention (usually achieved through the application of a UV film on glass surfaces).
- The requirements for bird control shall be applicable to all Metrolinx facilities and buildings, including parking structures, maintenance facilities, canopies, station buildings, etc;

### **Unit Size**

- Units shall be large enough to reduce the number of joints yet small enough to facilitate replacement if damaged
- Standardized grids shall be designed wherever possible to accommodate for standardized glazing for windscreens and vertical elements of shelters
- All specified floor materials shall be resistant to damage from common deicers

### **Installation and Application**

- Materials shall be detailed and specified to be installed in accordance with industry standards and manufacturers printed directions for long life, low maintenance, and compliance with warranty requirements
- All materials shall be installed using tested and proven methods, in accordance with established trade standards
- All materials, hardware, and fasteners shall be able to withstand the anticipated pressures of ground-borne vibration, as well

as air pressure changes generated by wind and by the passage of the GO Transit vehicle

- All materials shall be secured in a manner which deters and prevents tampering and vandalism
- Installation of materials shall generally facilitate their removal without affecting the integrity of adjacent materials

### **Colour, Pattern, Tonal Contrast and Texture**

- Colours shall exclude dedicated corporate and signing colours except for those purposes
- Use noticeably different colours to distinguish the different key building elements. The recommended colour and brightness contrasts of key building elements by the Accessibility Standards Is 70% or more
- Integral and applied colours shall be selected which resist undue fading in the environment in which they are used
- Textures shall not conflict with those used in the information and guidance system
- Materials with staining and colour shall have through-colour properties and non-fading characteristics
- Finishing of steel shall be appropriate to the location of the material, i.e. exterior vs. interior
- All interior finish steel (such as handrails) shall be stainless steel unless otherwise noted
- Powder coating of steel is not acceptable
- All exterior finish steel shall be stainless steel or galvanized
- Anchors and fasteners as required shall match with fixture
- Mixing of materials is not recommended
- Finishing of steel in the field shall be kept to a minimum by designing structures that can be shop fabricated in sections, primed, and finished in the shop, and bolted together on site

Identification Devices: A single type of identification product for each application category. Use colors prescribed by these guidelines.

- Name plates and labels
- Wire and cable markers
- Conduit markers
- Panel & race way identification
- Pull and junction box identification
- Receptacle identification
- Fire Alarm identification
- End of line resistances
- Communication cabinets identification
- Manhole and handhole markers
- Underground warning tapes
- Labelling nomenclature

Electrical Rooms are to have a framed Single Line Drawing of the Electrical Distribution System, which is to be updated with any addition or deletion of part of the system.

### ARC Flash

Electrical Arc Flash hazard levels to be designed for minimum hazard risk. Preliminary Electrical Arc Flash hazard level study will indicate possible hazard. The equipment selection will be done to minimize the Hazard prior to equipment purchase. The final arc flash study will verify the Levels. At the completion of work, all equipment in the space at the site shall be labeled and floors permanently marked showing boundaries for all hazard levels above level 0.

Labels are to be located in a conspicuous location on the front doors of equipment, or if no door is provided, clearly visible on the panel. Refer to the Static Signage Catalogue "W" Warning Signs for label details.

### Wire Markers

Locations: Each conductor in a panel board, pull boxes, outlet and junction boxes, patch panel, rack and each connection.

Wire Identification Materials. Use one of the following:

- Heat shrink sleeves, blank

- Clear plastic tape wrap on strips with white writing section
- Wrap on strips, pre numbered
- Slip on identification bead markers or sleeves, blank or pre numbered
- Power and Lighting Circuits: Branch circuit/feeder number indicated on drawings
- Control Circuits: Control wire number indicated on schematic and interconnection diagrams on drawings and shop drawings

### Nameplate Identification of Equipment

What are the things that require nameplate/label/ID?

- List table
- Equipment
- Sand board
- Comms. cable and equipment
- Wiring
- Conduits/boxes/splitters
- Voltage equipment
- Fuel and tax
- Receptacles/five alarm/duct
- Wpg vanity tapes
- Man/hand hole marker
- Panels

### Nomenclature Appendix

Identify equipment with lamicoid nameplates as indicated in Equipment Identification Schedule.

- Engraved three layer laminated plastic, black letters on white background
- Lamicoid Nameplates:
  - 3 mm thick plastic engraving sheet
  - Black face
  - White core
  - Mechanically attached
  - Sizes as per the following table:

System	Utilization	Voltage
Heating	Greater than 5 kW 5 kw or less	600/347 V 3 phase 120/208 V 1 phase
Life Safety Fire Pumps		600/347V or 208/120 V 3 phase interior, + Life safety emergency power
Motors	Greater than ½ HP ½ HP or less	120/208V, or 600/347V 3 phase 120V 1 phase
Elevators	Motors and Controls	120/208V, or 600/347V 3 phase + emergency power
P.A.		120V 1 phase + emergency power
Telephone System		120V 1 phase + emergency power
CCTV		120V 1 phase + emergency power to each exterior camera
Security/Alarm		120V 1 phase + emergency power
Passenger Information		120V 1 phase + emergency power
Fire Alarm		120V 1 phase + Life safety emergency power
Proof-of-Payment Fare Collection System		120V 1 phase + emergency power
Electronic Payment		120V 1 phase + emergency

System	Utilization	Voltage
Systems		power
Intercom		120V 1 phase + Life safety emergency power
Video Transmission		120V 1 phase + emergency power
Digital Clock System (network)		120V 1 phase + emergency power
Signage and Display System		120V 1 phase + emergency power
Wayside Power System:		600V 3 phase
Building Automation System		120V 1 phase + emergency power
Computers		120V 1 phase + emergency power
Fuel Management Systems		120/208V, or 600/347V 3 phase + emergency power
Sand Distribution Systems		120/208V, or 600/347V 3 phase + emergency power
Electric Vehicle Charging Systems		120V/208 1 phase
Car counting Systems		120V1 phase + emergency power

### Backup Power Systems

This subject describes the functional requirements for Metrolinx facilities backup power system. The power generated by the backup system shall be either true sinusoidal 60 Hz or DC, depending on the requirements.

The intent is to ensure the continuing operation of essential equipment and services, and to

effectively move passengers from station buildings and train platforms to outside parking areas in the event of a sustained power failure.

The final design of the backup power system must include an as-built schematic drawing of the system distribution. It shall also include a checklist for commissioning, operation, and maintenance, respectively.

Back-up power generators shall be installed in accordance with the Electrical Safety Authority (ESA), Technical Standards and Safety Authority (TSSA) and the regulations of the electrical inspection agency having jurisdiction. The back-up power generator shall be protected from surface deterioration caused by exposure to conditions (i.e: condensation, weather and winter maintenance) producing corrosion. Flat surfaces which may retain water are not permitted.

Provide safe access around the equipment (min 1 m). Necessary environmental controls are required.

~~Back-up power generators are a mandatory requirement, for providing the majority of our operational elements/ systems for 8 hours system operational duration (and additional 16 hours of testing capacity), in the event of a power failure at the following GO facilities:~~

- ~~• GO Rail Line Stations (including Parking Structures)~~
- ~~• GO Bus Terminals (facilities with a station building only)~~
- ~~• GO Rail Layover Facilities~~
- ~~• GO Operational Support Facilities (i.e. Wofsdale, GTCC, Middlefield)~~
- ~~• GO Bus Maintenance Facilities~~
- ~~• GO Rail Maintenance Facilities~~

**Backup Required Time**

Back-up power generators are a mandatory requirement, for providing the majority of our operational elements/ systems for 48 hours system operational duration (and additional 16 hours of testing capacity), in the event of a power failure at the following GO facilities:

- GO Rail Line Stations (including Parking Structures)
- GO Bus Terminals (facilities with a station building only)
- GO Rail Layover Facilities
- GO Operational Support Facilities (i.e. Wofsdale, GTCC, Middlefield)
- GO Bus Maintenance Facilities
- GO Rail Maintenance Facilities

Backup Power System's design can include components such as Generator, UPS, Inverter, Rectifier, etc. As a minimum, the backup Power System shall include diesel or natural gas generator complete with UPS systems having a minimum of 30-minute duration or UPS systems with 90-minute minimum duration if there is no diesel/natural gas generator set.

In each case, the UPS shall be double conversion continuous duty type to provide the electronic communications systems with clean sine wave power. The UPS shall be rated for life safety applications and shall be provided with signals for indication of UPS general alarms and with dial in remote monitoring control, plus a remote alarm to the station alarm system.

Diesel is the preferred fuel for backup generators. Where site and operational conditions do not allow for the use of diesel fuel, natural gas fuel powered generators are acceptable with GO approval.

Rectifiers shall be used for backup DC power in maintenance and layover facilities where required.

**Design Requirements**

The following table shows a list of items that are considered essential. The table shows both backup power system conditions (i.e. Generator + UPS or UPS only) and provides an estimated power draw for each item. The actual power draws shall be considered in the detail design and specification must be verified on a project-by-project basis.

Table F-3: Backup Power Systems–Design Requirements

Backup Power Systems–Design Requirements				
Essential Load	Estimated Power Draw (Watts)	WITH Generator		No Generator
Life Safety		Diesel Generator	UPS System	UPS System
Exit signs–buildings, tunnels and similar structures (LED type)	100	x		x + Life Safety
Public Address System	2,000	x	x	x
CCTV System	2,000	x	x	x
Any additional rack in the Comms. Room	2,000 ea	x	x	x + Life Safety
GO Transit telephone system	500	x	x	x
All Passenger Elevators and shafts	4,500 ea	x		
Elevator controls	2,000	x		
Alarm Monitoring Systems	400	x	x	x + Life Safety
<b>Lighting</b>				
Tunnels, bridges and stairwell illumination (at least 1 fixture on normal power)	2,000	x		x + Life Safety
Electrical Room Illumination (at least 1 fixture on normal power)	100	x	x	x
Communications Room Illumination (at least 1 fixture on normal power)	100	x	x	x
Service Area Illumination	300	x		x
Waiting Area Illumination–minimal	1,000	x		x + Life Safety
Platform Lighting (Train and Bus)	9,000	x		
Main Parking Lots (Surface Parking)	Project Specific	x		
Parking Structures	Project Specific	x		
Kiss n Ride (PPUDO)	Project	x		



<b>Backup Power Systems–Design Requirements</b>				
(Passenger Pick up and Drop off)	Specific			
Bus Loop Lighting	Project Specific	x		
<b>Systems</b>				
Ticket Sales Equipment	3,000	x	x	x
Communications Equipment (White board, Pins etc.)				
Presto	4,500	x		
Door Operators (Building, Vestibules, Shelters)	Project Specific			
<b>Mechanical</b>				
Sump/Sanitary Pump	3,000	x		
HVAC for electrical & communication room	7,500	x		
HVAC for Service Counter and Waiting Area	Project Specific			
Water Heater Equipment	Project Specific			
HVAC and Exhaust of Elevator Shafts	Project Specific			
<b>Estimated Total Power Draw In Watts</b>		<b>44,000</b>	<b>15,000</b>	<b>13,500</b>

## Diesel Generators

The generator shall be provided as a factory tested single unit and rated kW, 120/208 or 347/600 Volts, 3-phase, 4-wire, 60Hz, 1800 rpm. The generator shall be certified to CSA C22.2 No. 100, EEMAC MG1-22.40, and NEMA MG1, and shall meet the requirements of Ontario Electrical Safety Code, ESA, EPA, MOE, TSSA, along with all applicable local codes and regulations.

The generator shall be self-ventilated and shall be a single bearing type direct coupled to the engine. Under short circuit conditions, the generator shall be capable of delivering sufficient current to enable protective breakers to trip.

- Ambient working temperature: -35°C to 40°C
- Acceptable noise level: MOE standards or as per table below at 7 °C or whichever is the most stringent

## Noise Matrix Table

**Table F-4: Generators Noise Levels**

<b>kW</b>	<b>dB(A)</b>	<b>Metres</b>
<b>≤ 150</b>	<b>65</b>	<b>7.0</b>
175 to 500	75	7.0
600 to 1200	80	7.0

## Diesel Engine

The engine shall be EPA compliant with maximum NOx plus HC of  $3.87 \frac{g}{kW/hr}$ .

ULC/CSA labelled double wall construction sub-base mounted steel fuel tank with an enough storage capacity to run the generator set at full load for 24 hours without refueling. The tanks and fueling system has to be accepted by TSSA and equipped with fuel paddling system.

## Natural or Propane Gas Engine (For Standby Generators ≤ 150 kVA)

Include liquid cooled, spark ignition engine.

Furnish engine and cooling system capable of driving generator at specified load for minimum of 120 minutes, taking into account fuel type and altitude duration and at maximum ambient temperature of 122 °F (50 °C).

Isochronous Governor: Speed regulation plus or minus 0.25 cycle from no load to full load with two-second recovery to steady state.

Integral 10-amp system battery charging system, unit mounted to maintain emergency system batteries at required charge levels.

### Listed Fuel Systems

Include CSA Certified Listed Natural Gas regulator for 7-14" water column gas pressure entering, complete with the following cUL Listed installation accessories:

- Flexible engine connection fuel line
- Electric fuel solenoid valve
- Fuel line strainer

### Dual Fuel Systems

~~Include the following:~~

~~cUL Listed Natural gas regulator for 7-14" water column gas pressure entering complete with the following cUL Listed installation accessories:~~

- ~~• Flexible engine connection fuel line~~
- ~~• Electric fuel solenoid valve~~
- ~~• Fuel line strainer~~

~~cUL Listed LP vapour regulator complete with the following cUL listed installation accessories:~~

- ~~• Flexible engine connection fuel line~~
- ~~• Electric fuel solenoid valve~~
- ~~• Fuel line strainer~~

### Accessories

Include replaceable type oil filters, dry type air cleaners, automatic choke, lubricating oils, greases, and coolant.

### Alternator

The alternator (generator) shall be 120/208 or 347/600 Volt, 3 phase, 4 wire, 60 Hz AC, drip

proof, rotating field type with an integral exciter of the brushless or static type and a static voltage regulator utilizing silicon rectifiers on solid state amplifiers.

Voltage regulation shall be within plus or minus 2% of rated voltage for all loads from no load to full load. Output voltage shall be manually adjustable over a range of plus or minus 5% of rated voltage.

Rotors shall be salient pole type with amortisseur windings. The generator shall include for 300% short circuit capability for 10 seconds.

### Engine-Generator Mounting

The engine and generator shall be aligned and mounted on a common fabricated steel base of sufficient rigidity to maintain adequate alignment. Approved adjustable steel spring vibration isolators shall be supplied with such set by the set manufacturer.

### Control Panel

Environmentally sealed, solid state, microprocessor-based module for engine control, monitoring, protection, and metering.

The controller shall meet the CSA (Z462). The controller shall be listed under ULC and UL-508. Set-mounted controller capable of facing right, left, or rear shall be vibration isolated on the generator enclosure. Remote-mounted controller shall also be supplied.

The microprocessor control board shall be moisture proof and capable of operation from -40° C to 85° C. Relays will only be acceptable in high-current circuits.

The unit must be able to interface easily to provide remote monitoring and control capabilities over the Metrolinx Windows based Network. Monitoring shall include, but not be limited to, the following:

- Dual range voltmeter +/- 2% accuracy
- Maximum demand ammeter +/- 2% accuracy
- Voltmeter-ammeter 3 phase selector switch
- Battery charging voltmeter and AMP
- Coolant temperature reading
- Oil pressure reading
- Running time

- Direct reading frequency meter 0.5% accuracy on 45 to 65 Hz

**System Protection**

Circuitry to shut down the engine when signal for high coolant temperature, low coolant level, low oil pressure, or over speed is received. Circuitry shall be of plug-in design for quick replacement. Controller shall be equipped to accept a plug-in device capable of allowing maintenance personnel to test controller performance without operating the engine. The controller shall include:

- Indicating Lights to signal
- Standard (Not-in-Auto [flashing red])
- Equipment (Over crank [Red])
- UPS + Generator Stop [Red]
- High Engine Temperature (Red)
- Over speed (Red)
- Low Oil Pressure (Red)
- Air Damper (Red)
- Battery Charger Malfunction (Red)
- Low Battery Voltage (Red)
- Low Fuel (Red)
- Auxiliary Pre-alarm (Yellow)

**Exterior Enclosure**

**Table F-5: Exterior Enclosure**

Exterior Enclosure	
Exterior Weatherproof Enclosure:	<ul style="list-style-type: none"> <li>• <u>Owner's</u> Common keyed <a href="#">pad-lockable doors</a></li> <li>• Compliant with CSA Standard</li> <li>• Sound Attenuated</li> <li>• Capable of withstanding 150mph sustained winds</li> <li>• Designed to resist rainfall angles of up to 45 degrees without interior flooding</li> <li>• Enclosure to be rodent and serpent proof</li> </ul>
Construction:	<ul style="list-style-type: none"> <li>• Aluminum panel construction</li> <li>• Power baked paint</li> </ul>
Roof:	<ul style="list-style-type: none"> <li>• One piece pitched roof designed to prevent water accumulation</li> </ul>

- Auxiliary Fault (Red)
- System Ready (Green)
- Optional (Pre-alarm High Engine Temp. [Yellow])
- Anticipatory (Pre-alarm Low Oil Pressure [Yellow])
- Group (Low Coolant Temp. [Red])
- Push to test button for indicating lights
- Alarm horn with silencer switch per CSA (Z462)

Note: Terminals shall be provided for each signal in above, plus additional terminals for common fault and common pre-alarm

**Minimum Required Accessories**

- Line circuit breakers
- Dedicated load bank of 100% capacity for each generator (On Site)

There shall be a load bank for testing available on site rather than bringing a load bank onto site and connecting and disconnecting it. This load bank shall be able to be added in steps for testing up to 110 of the generators capacity. The controller shall have provisions for disconnecting a load bank (during exercise) if there is a loss of normal power by an Electrical and Mechanical interlock through ATS.

Exhaust System:	<ul style="list-style-type: none"> <li>Internally mounted muffler and sound insulating Panels</li> <li>Catalytic Converter: Include catalytic converter when defined by local codes</li> </ul>
Doors:	<ul style="list-style-type: none"> <li>Door Hardware:</li> <li>Corrosion resistant, zinc plated or stainless steel</li> <li>Hardware locks to be keyed the same</li> <li>Door drip caps designed to keep moisture accumulation off the top of doors</li> <li>Doors hinged to allow 180 degree opening</li> </ul>
Sound Attenuation:	<ul style="list-style-type: none"> <li>Generator to be sound attenuated</li> <li>Average dB level, <del>measured at 7 meters from generator center, at full load, not to exceed 73 dB</del> refer to Table F-4</li> </ul>
Block Heater:	<ul style="list-style-type: none"> <li>1500 watt <u>minimum</u></li> </ul>
Space Heater:	<ul style="list-style-type: none"> <li>Include inside enclosure, thermostatically controlled to maintain 10 °C, except when engine is running, in accord with CSA C282, 208v</li> </ul>
Motorized Louvers:	<ul style="list-style-type: none"> <li>Include on air intake to meet CSA C282, level 2 sound attenuated</li> </ul>
Emergency Lighting:	<ul style="list-style-type: none"> <li>Include inside enclosure, 50 lumens, DC battery powered, two hour operation, in accord with CSA C282</li> </ul>
Engine Fluid Containment Pan:	<ul style="list-style-type: none"> <li>Sized to 110 percent of available fluid in accord with CSA C282</li> </ul>

# APPENDIX B–LEED MANDATORY CREDITS

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## Guidance on How to Use the GO LEED Mandatory Credit Checklist

Mandatory credits have been established for each building type to ensure that credits that are important to GO Transit's goals of energy efficiency and reduced operating and maintenance costs are targeted, integrated into the design early and achieved.

Designers are to incorporate LEED [Gold certification](#) and the GO Transit Mandatory credits into each project's scope of work. [For projects pursuing certification under LEED v.4, Gold certification is preferred, Silver certification is the minimum requirement and shall follow LEED v.4 mandatory credit tables. Projects that qualify for LEED 2009 shall attain LEED Gold certification and follow LEED 2009 mandatory credit tables.](#) LEED has five key areas under which credits are obtained. These are:

- Sustainable Sites;
- Water Efficiency;
- Energy & Atmosphere;
- Materials & Resources and
- Indoor Environmental Quality.

Each area has Prerequisites that the project must achieve in order to consider going for LEED certification, these are non-negotiable. There is also an Innovation & Design section where innovative systems not accounted for elsewhere, exemplary performance and operational procedures can be considered for a credit. Each credit is worth anywhere from one to nineteen points, the number of points obtained determines the LEED rating achieved.

In order to achieve LEED Gold certification, anywhere between sixty (60) and seventy nine (79) points must be granted by the Canadian Green Building Council (CaGBC). It is recommended that sixty five points are targeted on each project pursuing Gold certification since the CaGBC is the final arbiter on which points are granted, so some points may be lost.

The GO LEED credit checklist that follow indicate the Prerequisites and GO Transit Mandatory credits which must be targeted and achieved. There are additional columns indicating optional points for consideration from which the shortfall can be made, credits that are not to be pursued are also identified in the checklist.

## LEED v.4 Mandatory Credits

Table 0-1: Appendix B–LEED v.4 Mandatory Credits for GO Stations

Mandatory	Optional	Not to be Pursued	Project Totals (pre-certification estimates): 110 Points Certified: 40-49 points Silver: 50-59 points Gold: 60-79 points Platinum: 80 points and above	Available Points
39	51	20		110
0	1	0	INTEGRATIVE PROCESS (IP)	1
0	1	0	Integrative Process	1
0	14	2	LOCATION AND TRANSPORTATION (LT)	16
0	0	16	LEED for Neighborhood Development Location	16
0	1	0	Sensitive Land Protection	1
0	2	0	High-Priority Site	2
0	5	0	Surrounding Density and Diverse Uses	5
0	5	0	Access to Quality Transit	5
0	0	1	Bicycle Facilities	1
0	0	1	Reduced Parking Footprint	1
0	1	0	Green Vehicles	1
1	9	0	SUSTAINABLE SITES (SS)	10
			PREREQUISITE Construction Activity Pollution Prevention	
0	1	0	Site Assessment	1
0	2	0	Site Development - Protect or Restore Habitat	2
0	1	0	Open Space	1
0	3	0	Rainwater Management	3
0	2	0	Heat Island Reduction	2
1*	0	0	Light Pollution Reduction	1
6	3	2	WATER EFFICIENCY (WE)	11
			PREREQUISITE Outdoor Water Use Reduction	
			PREREQUISITE Indoor Water Use Reduction	
			PREREQUISITE Building-Level Water Metering	
2	0	0	Outdoor Water Use Reduction	2
3	3	0	Indoor Water Use Reduction	6
0	0	2	Cooling Tower Water Use	2
1	0	0	Water Metering	1

\* recognition that in some situations this is not applicable. If credit not targeted, consultant to demonstrate why it cannot be achieved.

Mandatory	Optional	Not to be Pursued	Project Totals (pre-certification estimates): 110 Points Certified: 40-49 points Silver: 50-59 points Gold: 60-79 points Platinum: 80 points and above	Available Points
39	51	20		110
15	8	10	<b>ENERGY &amp; ATMOSPHERE (EA)</b>	<b>33</b>
			PREREQUISITE Fundamental Commissioning and Verification	
			PREREQUISITE Minimum Energy Performance	
			PREREQUISITE Building Level Metering	
			PREREQUISITE Fundamental Refrigerant Management	
6	0	0	Enhanced Commissioning	6
7	3	8	Optimize Energy Performance	18
1	0	0	Advanced Energy Metering	1
0	0	2	Demand Response	2
0	3	0	Renewable Energy Production	3
1	0	0	Enhanced Refrigerant Management	1
0	2	0	Green Power and Carbon Offsets	2

5	3	5	<b>MATERIALS &amp; RESOURCES (MR)</b>	<b>13</b>
			PREREQUISITE Storage & Collection of Recyclables	
			PREREQUISITE Construction and Demolition Waste Management Planning	
0	3	2	Building Life-Cycle Impact Reduction	5
1	0	1	Building Product Disclosure and Optimization - Environmental Product Declarations	2
1	0	1	Building Product Disclosure and Optimization - Sourcing of Raw Materials	2
1	0	1	Building Product Disclosure and Optimization - Material Ingredients	2
2	0	0	Construction and Demolition Waste Management	2

8	7	1	<b>INDOOR ENVIRONMENTAL QUALITY (EQ)</b>	<b>16</b>
			PREREQUISITE Minimum Indoor Air Quality Performance	
			PREREQUISITE Environmental Tobacco Smoke (ETS) Control	
0	2	0	Enhanced Indoor Air Quality Strategies	2
2	1	0	Low-Emitting Materials	3
1	0	0	Construction IAQ Management Plan	1
0	2	0	Indoor Air Quality Assessment	2
1	0	0	Thermal Comfort	1
2	0	0	Interior Lighting	2
2	0	1	Daylight	3
0	1	0	Quality Views	1



Mandatory	Optional	Not to be Pursued	Project Totals (pre-certification estimates): 110 Points Certified: 40-49 points Silver: 50-59 points Gold: 60-79 points Platinum: 80 points and above	Available Points
<b>39</b>	<b>51</b>	<b>20</b>		<b>110</b>
0	1	0	Acoustic Performance	1
<b>4</b>	<b>2</b>	<b>0</b>	<b>INNOVATION (IN)</b>	<b>6</b>
3	2	0	Innovation	5
1	0	0	LEED Accredited Professional	1
<b>0</b>	<b>4</b>	<b>0</b>	<b>REGIONAL PRIORITY (RP)</b>	<b>4</b>
0	4	0	Regional Priority Credit	4

**Table 0-2: Appendix B–LEED v.4 Mandatory Credits for GO Maintenance Facilities**

Mandatory	Optional	Not to be Pursued	Project Totals (pre-certification estimates): 110 Points Certified: 40-49 points Silver: 50-59 points Gold: 60-79 points Platinum: 80 points and above	Available Points
<b>38</b>	<b>61</b>	<b>11</b>		<b>110</b>
0	1	0	<b>INTEGRATIVE PROCESS (IP)</b>	<b>1</b>
0	1	0	Integrative Process	1
<b>1</b>	<b>15</b>	<b>0</b>	<b>LOCATION AND TRANSPORTATION (LT)</b>	<b>16</b>
0	0	16	LEED for Neighborhood Development Location	16
0	1	0	Sensitive Land Protection	1
0	2	0	High-Priority Site	2
0	5	0	Surrounding Density and Diverse Uses	5
0	5	0	Access to Quality Transit	5
0	1	0	Bicycle Facilities	1
0	1	0	Reduced Parking Footprint	1
1	0	0	Green Vehicles	1
<b>2</b>	<b>8</b>	<b>0</b>	<b>SUSTAINABLE SITES (SS)</b>	<b>10</b>
PREREQUISITE			Construction Activity Pollution Prevention	
0	1	0	Site Assessment	1

Mandatory	Optional	Not to be Pursued	Project Totals (pre-certification estimates): 110 Points Certified: 40-49 points Silver: 50-59 points Gold: 60-79 points Platinum: 80 points and above	Available Points
<b>38</b>	<b>61</b>	<b>11</b>		<b>110</b>
0	2	0	Site Development - Protect or Restore Habitat	2
1	0	0	Open Space	1
0	3	0	Rainwater Management	3
0	2	0	Heat Island Reduction	2
1	0	0	Light Pollution Reduction	1

5	6	0	WATER EFFICIENCY (WE)	11
PREREQUISITE			Outdoor Water Use Reduction	
PREREQUISITE			Indoor Water Use Reduction	
PREREQUISITE			Building-Level Water Metering	
2	0	0	Outdoor Water Use Reduction	2
2	4	0	Indoor Water Use Reduction	6
0	2	0	Cooling Tower Water Use	2
1	0	0	Water Metering	1

15	15	3	ENERGY & ATMOSPHERE (EA)	33
PREREQUISITE			Fundamental Commissioning and Verification	
PREREQUISITE			Minimum Energy Performance	
PREREQUISITE			Building Level Metering	
PREREQUISITE			Fundamental Refrigerant Management	
6	0	0	Enhanced Commissioning	6
7	8	3	Optimize Energy Performance	18
1	0	0	Advanced Energy Metering	1
0	2	0	Demand Response	2
0	3	0	Renewable Energy Production	3
1	0	0	Enhanced Refrigerant Management	1
0	2	0	Green Power and Carbon Offsets	2

5	3	5	MATERIALS & RESOURCES (MR)	13
PREREQUISITE			Storage & Collection of Recyclables	
PREREQUISITE			Construction and Demolition Waste Management Planning	
0	3	2	Building Life-Cycle Impact Reduction	5
1	0	1	Building Product Disclosure and Optimization - Environmental Product Declarations	2

Mandatory	Optional	Not to be Pursued	Project Totals (pre-certification estimates): 110 Points Certified: 40-49 points Silver: 50-59 points Gold: 60-79 points Platinum: 80 points and above	Available Points
<b>38</b>	<b>61</b>	<b>11</b>		<b>110</b>
1	0	1	Building Product Disclosure and Optimization - Sourcing of Raw Materials	2
1	0	1	Building Product Disclosure and Optimization - Material Ingredients	2
2	0	0	Construction and Demolition Waste Management	2

6	7	3	INDOOR ENVIRONMENTAL QUALITY (EQ)	16
PREREQUISITE			Minimum Indoor Air Quality Performance	
PREREQUISITE			Environmental Tobacco Smoke (ETS) Control	
0	2	0	Enhanced Indoor Air Quality Strategies	2
2	1	0	Low-Emitting Materials	3
1	0	0	Construction IAQ Management Plan	1
0	2	0	Indoor Air Quality Assessment	2
1	0	0	Thermal Comfort	1
1	1	0	Interior Lighting	2
1	0	2	Daylight	3
0	0	1	Quality Views	1
0	1	0	Acoustic Performance	1

4	2	0	INNOVATION (IN)	6
3	2	0	Innovation	5
1	0	0	LEED Accredited Professional	1

0	4	0	REGIONAL PRIORITY (RP)	4
0	4	0	Regional Priority Credit	4

## LEED 2009 Mandatory Credits

**Table 0-3: Appendix B–LEED 2009 Mandatory Credits for GO Stations**

Mandatory	Optional	Not to be Pursued	Project Totals (pre-certification estimates): 110 Points Certified: 40-49 points Silver: 50-59 points Gold: 60-79 points Platinum: 80 points and above		Available Points
47	57	8			110
-	-	-			-
<b>7</b>	<b>17</b>	<b>2</b>	<b>SS</b>	<b>SUSTAINABLE SITES</b>	<b>26</b>
PREREQUISITE			SSp1	Construction Activity Pollution Prevention	
	1		SSc1	Site Selection	1
	5		SSc2	Development Density & Community Connectivity	5
	1		SSc3	Brownfield Redevelopment	1
6			SSc4.1	Alternative Transportation, Public Transportation Access	6
		1	SSc4.2	Alternative Transportation, Bicycle Storage & Changing Rooms	1
	3		SSc4.3	Alternative Transportation, Low-Emitting & Fuel Efficient Vehicles	3
	2		SSc4.4	Alternative Transportation Parking Capacity	2
	1		SSc5.1	Site Development, Protect or Restore Habitat	1
		1	SSc5.2	Site Development, Maximize Open Space	1
	1		SSc6.1	Stormwater Design, Quantity Control	1
	1		SSc6.2	Stormwater Design, Quality Control	1
	1		SSc7.1	Heat Island Effect, Non-Roof	1
1			SSc7.2	Heat Island Effect, Roof	1
	1		SSc8	Light Pollution Reduction	1
<b>7</b>	<b>3</b>	<b>0</b>	<b>WE</b>	<b>WATER EFFICIENCY</b>	<b>10</b>
PREREQUISITE			WEp1	Water Use Reduction	
4			WEc1	Water Efficient Landscaping	4
	2		WEc2	Innovative Wastewater Technologies	2
3	1		WEc3	Water Use Reduction	4
<b>14</b>	<b>17</b>	<b>4</b>	<b>EA</b>	<b>ENERGY &amp; ATMOSPHERE</b>	<b>35</b>
PREREQUISITE			EAp1	Fundamental Commissioning of Building Energy Systems	
PREREQUISITE			EAp2	Minimum Energy Performance	
PREREQUISITE			EAp3	Fundamental Refrigerant Management	
7	12		EAc1	Optimized Energy Performance	19
	3	4	EAc2	On-Site Renewable Energy	7
2			EAc3	Enhanced Commissioning	2
2			EAc4	Enhanced Refrigerant Management	2

Mandatory	Optional	Not to be Pursued	Project Totals (pre-certification estimates): 110 Points Certified: 40-49 points Silver: 50-59 points Gold: 60-79 points Platinum: 80 points and above		Available Points
47	57	8			110
3			EAc5	Measurement & Verification	3
	2		EAc6	Green Power	2

7	6	1	MR	MATERIALS & RESOURCES	14
PREREQUISITE			MRp1	Storage & Collection of Recyclables	
	3		MRc1.1	Building Reuse: Maintain Existing Walls, Floors, Roof	3
	1		MRc1.2	Building Reuse: Maintain Interior Non-Structural Elements	1
2			MRc2	Construction Waste Management	2
	2		MRc3	Materials Reuse	2
2			MRc4	Recycled Content	2
2			MRc5	Regional Materials	2
		1	MRc6	Rapidly Renewable Materials	1
1			MRc7	Certified Wood	1

8	6	1	EQ	INDOOR ENVIRONMENTAL QUALITY	15
PREREQUISITE			EQp1	Minimum Indoor Air Quality Performance	
PREREQUISITE			EQp2	Environmental Tobacco Smoke Control	
	1		EQc1	Outdoor Air Delivery Monitoring	1
		1	EQc2	Increased Ventilation	1
1			EQc3.1	Construction IAQ Management Plan, During Construction	1
	1		EQc3.2	Construction IAQ Management Plan, Before Occupancy	1
1			EQc4.1	Low Emitting Materials, Adhesives & Sealants	1
1			EQc4.2	Low Emitting Materials, Paints and Coatings	1
1			EQc4.3	Low Emitting Materials, Flooring Systems	1
1			EQc4.4	Low Emitting Materials, Composite Wood & Laminate Adhesives	1
	1		EQc5	Indoor Chemical & Pollutant Source Control	1
1			EQc6.1	Controllability of System: Lighting	1
	1		EQc6.2	Controllability of System: Thermal Comfort	1
1			EQc7.1	Thermal Comfort, Design	1
	1		EQc7.2	Thermal Comfort, Verification	1
1			EQc8.1	Daylight & Views, Daylight	1
	1		EQc8.2	Daylight & Views, Views	1

4	4	0	ID	INNOVATION & DESIGN PROCESS	6
1			IDc1.1	Innovation in Design: Green Housekeeping	1

Mandatory	Optional	Not to be Pursued	Project Totals (pre-certification estimates): 110 Points Certified: 40-49 points Silver: 50-59 points Gold: 60-79 points Platinum: 80 points and above		Available Points
47	57	8			110
1			IDc1.2	Innovation in Design: Solid Waste Management Policy	1
1			IDc1.3	Innovation in Design: Green Education	1
	1		IDc1.4	Innovation in Design: Low Mercury Lamps	1
	1		IDc1.5	Innovation in Design: Exemplary Performance SSc4.1 or other	1
	1			Innovation in Design: Process Water Reuse, vehicle wash (if applicable)	
	1			Innovation in Design: TBD	
1			IDc2	LEED AP	1

0	4	0	RP	REGIONAL PRIORITY	4
	1		RP1	Durable Building	1
	1		RP2.1	Regional Priority Credit 1	1
	1		RP2.2	Regional Priority Credit 2	1
	1		RP2.3	Regional Priority Credit 3	1

## LEED Mandatory Credits for Maintenance Facilities

Table 0-24: Appendix B-LEED 2009 Mandatory Credits for GO Maintenance Facilities

Mandatory	Optional	Not to be Pursued	Project Totals (pre-certification estimates): 110 Points Certified: 40-49 points Silver: 50-59 points Gold: 60-79 points Platinum: 80 points and above		Available Points
47	57	8			110
-	-	-			-
8	17	1	SS	SUSTAINABLE SITES	26
PREREQUISITE			SSp1	Construction Activity Pollution Prevention	
	1		SSc1	Site Selection	1
	5		SSc2	Development Density & Community Connectivity	5
	1		SSc3	Brownfield Redevelopment	1
3	3		SSc4.1	Alternative Transportation, Public Transportation Access	6
1			SSc4.2	Alternative Transportation, Bicycle Storage & Changing Rooms	1
3			SSc4.3	Alternative Transportation, Low-Emitting & Fuel Efficient Vehicles	3
	2		SSc4.4	Alternative Transportation Parking Capacity	2
	1		SSc5.1	Site Development, Protect or Restore Habitat	1

Mandatory	Optional	Not to be Pursued	Project Totals (pre-certification estimates): 110 Points Certified: 40-49 points Silver: 50-59 points Gold: 60-79 points Platinum: 80 points and above		Available Points
47	57	8			110
		1	SSc5.2	Site Development, Maximize Open Space	1
	1		SSc6.1	Stormwater Design, Quantity Control	1
	1		SSc6.2	Stormwater Design, Quality Control	1
	1		SSc7.1	Heat Island Effect, Non-Roof	1
1			SSc7.2	Heat Island Effect, Roof	1
	1		SSc8	Light Pollution Reduction	1

7	3	0	WE	WATER EFFICIENCY	10
PREREQUISITE			WEp1	Water Use Reduction	
4			WEc1	Water Efficient Landscaping	4
	2		WEc2	Innovative Wastewater Technologies	2
3	1		WEc3	Water Use Reduction	4

14	17	4	EA	ENERGY & ATMOSPHERE	35
PREREQUISITE			EAp1	Fundamental Commissioning of Building Energy Systems	
PREREQUISITE			EAp2	Minimum Energy Performance	
PREREQUISITE			EAp3	Fundamental Refrigerant Management	
7	12		EAc1	Optimized Energy Performance	19
	3	4	EAc2	On-Site Renewable Energy	7
2			EAc3	Enhanced Commissioning	2
2			EAc4	Enhanced Refrigerant Management	2
3			EAc5	Measurement & Verification	3
	2		EAc6	Green Power	2

7	6	1	MR	MATERIALS & RESOURCES	14
PREREQUISITE			MRp1	Storage & Collection of Recyclables	
	3		MRc1.1	Building Reuse: Maintain Existing Walls, Floors, Roof	3
	1		MRc1.2	Building Reuse: Maintain Interior Non-Structural Elements	1
2			MRc2	Construction Waste Management	2
	2		MRc3	Materials Reuse	2
2			MRc4	Recycled Content	2
2			MRc5	Regional Materials	2
		1	MRc6	Rapidly Renewable Materials	1
1			MRc7	Certified Wood	1



Mandatory	Optional	Not to be Pursued	Project Totals (pre-certification estimates): 110 Points Certified: 40-49 points Silver: 50-59 points Gold: 60-79 points Platinum: 80 points and above		Available Points
47	57	8			110
<b>7</b>	<b>6</b>	<b>2</b>	<b>EQ</b>	<b>INDOOR ENVIRONMENTAL QUALITY</b>	<b>15</b>
			PREREQUISITE	EQp1	Minimum Indoor Air Quality Performance
			PREREQUISITE	EQp2	Environmental Tobacco Smoke Control
		1	EQc1	Outdoor Air Delivery Monitoring	1
		1	EQc2	Increased Ventilation	1
1			EQc3.1	Construction IAQ Management Plan, During Construction	1
	1		EQc3.2	Construction IAQ Management Plan, Before Occupancy	1
1			EQc4.1	Low Emitting Materials, Adhesives & Sealants	1
1			EQc4.2	Low Emitting Materials, Paints and Coatings	1
1			EQc4.3	Low Emitting Materials, Flooring Systems	1
1			EQc4.4	Low Emitting Materials, Composite Wood & Laminate Adhesives	1
	1		EQc5	Indoor Chemical & Pollutant Source Control	1
1			EQc6.1	Controllability of System: Lighting	1
	1		EQc6.2	Controllability of System: Thermal Comfort	1
	1		EQc7.1	Thermal Comfort, Design	1
	1		EQc7.2	Thermal Comfort, Verification	1
1			EQc8.1	Daylight & Views, Daylight	1
	1		EQc8.2	Daylight & Views, Views	1
<b>4</b>	<b>4</b>	<b>0</b>	<b>ID</b>	<b>INNOVATION &amp; DESIGN PROCESS</b>	<b>6</b>
1			IDc1.1	Innovation in Design: Green Housekeeping	1
1			IDc1.2	Innovation in Design: Solid Waste Management Policy	1
1			IDc1.3	Innovation in Design: Green Education	1
	1		IDc1.4	Innovation in Design: Low Mercury Lamps	1
	1		IDc1.5	Innovation in Design: Exemplary Performance SSc4.1 or other	1
	1			Innovation in Design: Process Water Reuse, vehicle wash (if applicable)	
	1			Innovation in Design: TBD	
1			IDc2	LEED AP	1
<b>0</b>	<b>4</b>	<b>0</b>	<b>RP</b>	<b>REGIONAL PRIORITY</b>	<b>4</b>
	1		RP1	Durable Building	1
	1		RP2.1	Regional Priority Credit 1	1
	1		RP2.2	Regional Priority Credit 2	1
	1		RP2.3	Regional Priority Credit 3	1



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**TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**

Site Design and Development

**GARBAGE AND RECYCLING STORAGE AREAS**

- > The Consultant shall verify garbage and recycling bin sizing with station, local municipality and/or service provider to validate garbage enclosure dimensions prior to design. At a minimum, garbage enclosures must be large enough to conceal two 6 yard bins.
- > The following criteria shall be considered when deciding on a location for a garbage enclosure:
  - Garbage truck access
  - Staff access / proximity to station
  - Place on surplus land (land which cannot be used for anything else)
  - Keep away from pedestrian paths and waiting areas
  - Keep out of direct view when entering the site
- > Where required, gates shall be equipped with “No Parking” signage to ensure accessibility is always maintained (for “No Parking” signage please refer to Static Signage Catalogue). Consultant to verify signage sizing with GO prior to proceeding.



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**TAB 2: SITE INFRASTRUCTURE AND DEVELOPMENT**  
Site Design and Development

FIGURE: GARBAGE AND RECYCLING STORAGE AREA GUIDELINE

**SECTION:**  
Tab 2: Site Design and Development

**FIGURE:**  
Garbage and Recycling Storage Area Diagram

