



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.



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TAB 5: RAIL AND BUS OPERATIONAL FACILITIES
Bus Operational Facilities

COMMUNICATIONS

Feature	Design Requirements
	<ul style="list-style-type: none"><li data-bbox="597 581 834 611">> Security system<li data-bbox="597 646 1409 709">> Building Automation System (BAS). Refer to Building Automation Systems performance specification for details.<li data-bbox="597 745 1036 774">> Tank and Fuel Card Lock System<li data-bbox="597 810 808 840">> CCTV system<li data-bbox="597 875 786 905">> Signal lights

MECHANICAL

Feature	Design Requirements
Guidelines	<ul style="list-style-type: none"><li data-bbox="597 1211 1382 1308">> Guidelines for the design, specification and installation of mechanical equipment are to be used in conjunction with GO's Design Requirements Manual.<li data-bbox="597 1344 1317 1407">> The Consultant shall ensure that all applicable codes and standards are included in the construction documents.<li data-bbox="597 1442 1365 1505">> Fire suppression systems should be provided in all applicable areas.<li data-bbox="597 1541 1279 1604">> Domestic hot water will be supplied by natural-gas fire instantaneous hot water heaters.<li data-bbox="597 1640 1419 1745">> 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 data-bbox="597 1780 1403 1810">> Control Flow of roof drainage with heat tracing shall be provided.<li data-bbox="597 1845 1317 1875">> Stand pipe system for type "A" facilities shall be provided.



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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	



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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:

UTILIZATION VOLTAGES		
System	Utilization	Voltage
Lighting	LED	347V or 120 V 1 phase interior, 347 V or 120 V 1 phase for all



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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.



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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">> Use CSA approved plumbing fixtures in all washrooms, showers, lunchrooms and kitchenettes and wherever else applicable.> Provide gravity drainage systems wherever possible.> Comply with code requirements for indoor air quality.> Ensure proper maintenance of repair garages, inspection pits, service lanes and storage garages.> High level ducted exhaust shall be provided.> Unit heaters or radiant heating system shall be provided at every external door location.> Central hot water generating and distribution system shall be provided.> Bus engine exhaust and bus auxiliary heater exhaust system, battery charging areas, lube room and hazardous materials storage, shall be provided.> Insulate ductwork and piping shall be provided as specified.> Piping materials which are compatible with environmental conditions shall be used.> Valves, thermometers, pressure gauges shall be installed as detailed.> Complete building automation system shall be provided. Refer to Building Automation Systems performance specification for details.> Where applicable, provide fuel storage and dispensing system which shall be designed and certified by a licensed engineer.> Provide gas fired, heated, multi-station pressure washer systems.> Provide vehicle wash systems as specified by GO standards.