Electrical Design Concept Report

825 Pacific Street

Prepared for:

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EXECUTIVE SUMMARY

Integral Group has been engaged to provide electrical consulting engineering services for the proposed building located at 825 Pacific Street, Vancouver.

The intent of this report is to describe the building design parameters and the electrical design concept, along with the selection process for the project. This report focuses on the major components of the building systems that require a significant level of coordination with other disciplines from the earliest stage of the design. Minor and conventional systems components that do not require the same level of coordination are not discussed in detail as part of this report. Nevertheless, these systems are not being omitted from the scope; they are required for proper building operation and will be included in the final systems design.

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1. INTRODUCTION

The intent of this report is to summarize the main electrical system design criteria for the proposed electrical systems at the new building at 825 Pacific Street, Vancouver. These systems will be further developed into the final design through an “integrated design process” involving all relevant disciplines and project participants. An innovative and creative design approach focuses on identifying a system configuration that best meets the client’s needs in providing optimal indoor environmental quality and energy efficient performance in an ecologically sound development.

This report focuses on the major components of the building systems that require a significant level of coordination with other disciplines from the earliest stage of the design. Minor and conventional systems components that do not require the same level of coordination are not discussed in detail as part of this report. Nevertheless, these systems are not being omitted from the scope; they are required for proper building operation and will be included in the final systems design.

This document is provided for coordination within the consultant team and the client, Grosvenor Americas.

2. PROJECT DESCRIPTION

This project involves the construction of a new 7 storey commercial office building in the heart of downtown Vancouver. The building will be located on the northwest corner of the intersection of Howe Street and Pacific Street. The above grade floor area will be approximately 2000m^2 and the building is considered a high building. The new building will feature exhibition space at ground floor level and open plan office space on the floors above. There will one basement level where bicycle storage and main mechanical / electrical service rooms will be located.

The project will be designed to the Passive House standard.

3. OBJECTIVES

The main objective is to provide a new office building at 825 Pacific Street meeting the following set of electrical system design and performance criteria:

1. Electrical systems will be strategically organized, standardized and where possible, integrated to provide a building-wide approach to systems.
2. Provide the users with safe, efficient, aesthetic, low-maintenance, flexible and easy-to-use systems.
3. Consideration will also be made in the selection of electrical systems and components to complement the building architectural features.
4. Energy efficient operation and low operating cost.
5. Maximum possible number of sustainable system features and components that can be incorporated within the project budget.
6. Optimal life cycle of equipment and ease of operation requiring minimal recommissioning to maintain efficient, controllable operation.
7. Maximize passive building features as a first priority in saving energy consumption (Passive House).

4. APPLICABLE CODES

The electrical systems will be designed and installed by following principles of good engineering practice and meeting or exceeding requirements of all applicable codes, including but not limited to the following list of codes, ordinances and guidelines:

4.1 BUILDING CODES (mandatory compliance)

1. Vancouver Building By-Law 2014
    1. By extension, this requires conformance with ASHRAE 90.1-2010 Energy Standard for Buildings or Model National Energy Code of Canada for Buildings.

2. CSA C22.1 – 15 Canadian Electrical Code
    1. CAN/ULC S-524 Standard for the Installation of Fire Alarm System
    2. British Columbia Fire Code 2012

4.2 INDUSTRY STANDARDS (as required or where stipulated for relevant equipment, materials, and systems)

1. Canadian Standards Association (CSA)
2. American Standards for Testing and Materials (ASTM)
3. American National Standards Institute (ANSI)
4. Worksafe BC Occupational Health and Safety Regulations
5. IESNA Lighting Handbook (latest edition)
6. TIA/EIA Communication Standards
7. Underwriters Laboratories of Canada (ULC)
8. Passive House V9.6

5. ELECTRICAL DESIGN CRITERIA

5.1 Electrical Code Load Summary

Description	Connected Load (kW)	Demand Factor	Demand Load (kW)
Storage*	4	70%*	2.7
Office / Auxiliary*	99	90%*	78.1
Electric Heating	58	100%/75%	46
Mechanical	111	80%	88.8
Elevators	60	95%	57
Miscellaneous Equipment	20	75%	15
Future Expansion (10%)			32.4
Total (kW)			321.5
Total @ 0.95 p.f. (kVA)			338.4
System Voltage: 347/600V 3PH – Service Size (Amps)			326.0

** Demand and Code values are based on the C.E.C. Table 14.*

1. Voltage drop on conductors is required to meet the following:
    1. Feeder connections, maximum 2% voltage drop
    2. Branch circuit conductors, maximum 3% voltage drop
    3. Overall system, maximum 5% voltage drop

5.2 Lighting Design Criteria

1. Lighting energy target: 30% better than ASHRAE 90. 2010 requirements
2. All luminaires shall be high efficacy (lumens/watt)
3. Lamp color temperatures that will be utilized

Space Type/Area	Color Temperature (K)

Office & Meeting Spaces	4100
Storage Spaces	4100
Circulation Spaces	4100
Washrooms	4100
Service Room	4100
Exterior Spaces	3500

6. ELECTRICAL SYSTEMS

The following electrical system options have been identified as the most feasible and practical solutions for the building;

6.1 Electrical Distribution System

1. The main incoming service is planned to enter the building from the existing Hydro 600V distribution which is running along the rear lane. It is anticipated that the new incoming service will be 400A, 347/600V, 3PH from Hydro. The 2 x 4" incoming ducts will be required to be drained prior to entering the building.
2. The service will enter into the Basement Electrical Room, where the main distribution and utility meter will be located. All electrical equipment installed on the lowest level shall be mounted on 4" concrete housekeeping pads.
3. From the main incoming 400A fused disconnect switch, after the utility metering a 300kVA floor mounted dry type transformer, K-13 rated 600V – 120/208V, min 5% impedance shall be installed that shall feed the 120/208 Main Distribution Board '2DP-A' 1200A 22kAIC. The board will serve the following loads:
    1. Panels '2P1A' – 60-circuit panel board, 400A bus (400A/3P Breaker) – To serve basement and ground floor loads.
    2. Panels '2L2A' – 60-circuit panel board, 400A bus (400A/3P Breaker) – 2nd floor panel.
        1. From the panel 125A/3P breakers will be routed to serve the other level Panels '2L3A' & '2L4A' – 60-circuit panel board, 225A bus – 3rd and 4th floor panel.
    3. Panels '2L5A' – 60-circuit panel board, 400A bus (400A/3P Breaker) – 5th floor panel.
        1. From the panel 125A/3P breakers will be routed to serve the other level Panels '2L6A' & '2L7A' – 60-circuit panel board, 225A bus – 6th and 7th floor panel.
    4. ATS #1 – Emergency Panel '2EA' – 300A/3P breaker (200A/3P Breaker).
    5. Panel '2EA' – 42-circuit panel board, 400A bus – To serve building emergency loads.
4. Main distribution board will complete with surge protection device, breaker space for future capacitor.
5. A central riser near the elevator core is where we are looking to have electrical services to run up the building to serve the floor panels. This riser area would be intended for the communication services and space for a fire rated riser for emergency system services.
6. Branch circuit electrical panels shall be installed with main breakers c/w branch circuit digital metering. Loads in each panel that will require metering CT's (all lighting and mechanical branch circuits). Digital metering panel modules to be interconnected together via 1" conduits and wiring and shall run back to the main electrical room.
7. Aluminum main feeders to panels will be allowed, downstream branch circuit wiring shall be copper. Voltage drop of feeders to be max 2%.
8. Wires and Cables:
    1. Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.
    2. Conductors shall be XLPE RW90 with 1000V insulation. Conductors to be sized based on 75 degree C temperature rating.

3. Armoured Cables could be used connections to vibrating equipment, final connection to luminaires and receptacle outlets. No runs of type AC90 cable shall exceed 6 meters in length. AC90 where used shall be provided with an integral insulated ground wire.
4. Wire and conduit shall be provided for all services for this project. EMT or RGS conduits shall be used to.

9. Allowances for the City of Vancouver Bylaws – Bike Storage duplex receptacles, 1 per 2 stalls.
10. General purpose power to be placed through the building to suit the final building requirements. Mechanical connections will be provided, starters/controls will be provided as required based on the final mechanical requirements.
11. An arc flash and coordination study will be required for the project.

6.2 Lighting Systems

1. Lighting for the building will be LED for all interior and exterior lights. Lighting will be designed to achieve min. 30% savings compared to ASHRAE 90.1 2010 LPD requirements.
2. Open Office Area will have suspended linear with direct and indirect component and complete with 0-10V dimming capability.
3. Back of house area will LED T-bar recessed or industrial type luminaires.
4. Lighting controls for the building will utilize a low voltage lighting control panel that shall be able to:
    1. Control each space in the building.
    2. Exterior lighting control.
    3. Occupancy sensors, local control switches to be provided per ASHRAE 90.1 2010 requirements.
    4. Bi-level stair lighting control.

6.3 Life Safety Systems

1. As the building is considered a high building, an emergency generator will be required to be installed on site to provide a minimum of 2-hours of emergency power. Fire rated shaft will be required to house the main elevator feeders, fire alarm riser and require emergency raceways.
2. The diesel emergency generator will be:
    1. CSA C282 compliance.
    2. Rated at 100kW, 120/208V, 3PH.
    3. C/W sub-base belly tank with a minimum of 8-hrs of runtime of fuel.
    4. Will be installed on the roof level in an outdoor enclosure.
    5. Generator and enclosure shall have critical grade acoustic treatment.
    6. Generator shall be MTU 4R0120 DS100 series or equivalent.
3. Generator shall be tied into the building fire alarm system and to the building management system. Monitoring, generator run alarm, generator trouble, and low fuel (50% fuel) trouble. The emergency generator will serve just the building life safety systems: elevator, emergency lighting, exit signs, fire alarm system, and required life safety mechanical loads. Automatic Transfer Switch for the emergency power distribution shall complete with maintenance bypass.
4. Emergency lighting will be located along the building interior and exterior egress paths.
5. Exit signs will be the new running man exit sign, located where required by code. Signs will be thermoplastic on the basement level, and edge-lit on the rest of the floor levels.
    1. Thermoplastic Exit Sign shall be Thomas & Betts EP series or equivalent
    2. Edge-lit Exit Sign shall be Thomas & Betts EDE series or equivalent
6. The building fire alarm system will be a single stage addressable fire alarm system c/w EVAC capabilities. The system will comprise of the following:

1. Fire Alarm Control Panel – located in the Main Electrical Room, c/w 24-hr battery backup.
2. Fire Alarm Annunciator – located in the interior of the main entry lobby.
3. Active Graphic – colored graphic, ladder style c/w floor plan located by the annunicator panel.
4. Pull stations, Fireman Handset, EVAC speakers, Isolators, Sprinkler Tamper/Supervisory Modules, Smoke Detectors, Strobes, Modules for connection to the elevator controller – located where required by code.
5. System will require ULC listed offsite monitoring.
6. Wiring will be in Class A loop installed in electrical conduits.
7. Fire Alarm riser wiring shall be MI cables rated for 2-hours or installed in 2-hour rated shaft.
8. If required, connections to the security system, building management system shall be capable of monitor trouble and alarm signals of the fire alarm system and send appropriate message to maintenance staff.
9. Fire Alarm System shall be Simplex 4010ES or equivalent.

6.4 Technology Systems

1. The main incoming communication services will enter from the lane similar to the main incoming service. It is intended to run 2 x 4” ducts into the Main Electrical Room where the main building demarcation will be located. From there it is intended to allow for 3 x 3” conduits to run to the building riser noted in the above sections with 3 x 3” sleeves on the each floor level above for future tenant use.
2. A telephone line will be provided to the Elevator controller and to the ULC Listed monitoring equipment. All other telephone/data connections will be completed by the tenant.
3. Security rough in will be provided as required to suit the final building program.

7. CLOSURE

We trust that the foregoing provides the information required at this time. Should you have any questions or require additional information, please do not hesitate to contact the undersigned.

INTEGRAL GROUP

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APPENDIX A – Schematic Drawings

APPENIX B – Lighting Cutsheets