Designing A Better Tomorrow

Schematic Design Report For

Oak Bay United Church
Neighbourhood Housing

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PROJECT NO. 1-18-056
July 27, 2018

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1. INTRODUCTION

This report presents the proposed electrical system design intent for the Oak Bay United Church expansion. The residential building expansion referenced in this report is located in the municipality of Oak Bay, British Columbia.

The electrical systems for this project will be designed to accommodate a variety of uses and as such they are intended to be flexible and adaptable. Safety will be the primary consideration in the design of the systems.

1.1 DESIGN CRITERIA

The electrical systems will be designed in accordance, and in keeping with, the intent of all applicable codes, ordinances, standards, and regulations. The following is a list of the applicable codes and regulations that apply to this facility.

1.2 APPLICABLE CODES & REGULATIONS

- British Columbia Building Code 2012 (BCBC)
- Local Municipal Codes and Standards
- ASHRAE 90.1 or MNECB including all adopted amendments
- BC Energy Step Code
- Provincial Fire Marshall Regulations
- Workers' Compensation Board (WCB) Regulations
- Fire Marshall Act
- Applicable NFPA Regulations
- Canadian Electrical Code 2015 (CEC)
- CSA Standards
- ULC Standards
- IES (Illuminating Engineering Society) Standards

1.3 DESIGN PARAMETERS

The design parameters shall be as follows:

- The power system shall be designed to address all current future power needs of the facility, with minimum 25% spare capacity.
- IES standards will be utilized in the design of lighting, however, lighting power densities will conform to ASHRAE 90.1 or MNECB where applicable in the common areas such as lobbies, corridors, and the parking garage.

2. MAIN SERVICES

2.1 Existing Building

.1 The existing church site has a 600A 120/208V 3PH 4W BC Hydro utility service which is fed from BC Hydro owned pole mounted transformers located on Mitchell Street.

.2 The pole mounted transformers provide power to the existing church via overhead conductors that travel from the pole to the main electrical room in the lower level of the church.

.3 The existing main switch (600A) within the church building provides the site with 173kW of power, should it be required.

.4 In the last 24-month period, the church has demonstrated a peak demand of 71kW, leaving approximately 102kW of available capacity for added loads.

2.2 New Building

.1 Based on preliminary calculations made with limited data available at the time this report was generated, the anticipated new load of the expansion area is 647kW. This figure is in excess of the 102kW available, as described above.

.2 Adding the existing church load, the resulting connected load is 718kW.

.3 Based on the figures presented above, the new site will require an 800A 347/600V 3PH 4W service. This service size is dependent on the availability of 25kV BC Hydro primary conductors in the vicinity of the development. Should BC Hydro primary be 12.5kV a customer owned unit sub-station transformer will be required to meet the demand of the new facility.

.4 The new service will be fed from a new BC Hydro pad mounted transformer (or unit sub-station transformer) located strategically on the site.

.5 The transformer will be located close to the property line in the area of the new expansion and will be kept a minimum of 3.0m away from adjacent structures and conductive elements, in accordance with BC Hydro standards.

.6 The new transformer will be fed with primary voltage conductors in three (3) 103mm conduits from the property line.

.7 The new transformer will feed the new main-switch with secondary voltage (347/600V) conductors in two (2) 103mm conduits.

.8 The existing BC Hydro service will be disconnected and removed.

.9 The communications service for the new building will be fed via three (3) 103mm PVC ducts from

the property line to the main electrical room. Two (2) 103mm conduits will be dedicated for Telus and one (1) 103mm conduit will be dedicated for Shaw services.

2.3 POWER SERVICE

.1 The main electrical room should be located in the parking garage of the new expansion. The electrical room will house BC Hydro service entrance wireway, site main switch, step down transformers, distribution CDP panels, and house panels. Meter stacks for the residential units will be contained on the upper floors of the building (see below).

.2 The existing main electrical room will be back-fed from the new main electrical room to ensure the church loads are adequately served by the new development.

.3 Secondary electrical closets will be stacked where possible, approximately 2.4m wide by 0.6m deep with double doors opening onto the corridors.

.4 In the residential floor areas, communication closets and power meter closets will be alternated on a floor by floor basis. Closets will be stacked on top of one another.

.5 The main electrical room will be dedicated to electrical services and not act as the communications demarcation point and distribution for the units. A separate communications room is required for the Telus and Shaw entrance conduits and demarcation points.

2.4 TELEPHONE/CATV

.1 The main telecommunications service will run from the new main communications service point in the parking garage of the new building to the property line for Telus and Shaw Cable services to the building.

.2 All underground conduits to be concrete encased where installed in traffic areas.

.3 Secondary communication rooms will be minimum 2.75m x 2.5m in dimension. Secondary communication closets will be stacked where possible and approximately 2m wide by 1m deep with double doors opening onto the corridors.

.4 In the residential floor areas, communication closets and power meter closets will be alternated on a floor by floor basis. Closets will be stacked on top of one another.

3. ELECTRICAL SYSTEMS

3.1 GENERAL

The electrical systems shall be designed to fulfil the requirements of the facility at a reasonable cost, keeping safety, functionality, flexibility, aesthetics, sustainability, and economical operation in mind. The systems shall be tailored to serve the occupancies planned for the development.

3.2 POWER DISTRIBUTION SYSTEM

.1 A BC Hydro pad mounted transformer will provide 347/600 volts secondary voltage to the main electrical room in the parking garage of the new building. The main secondary power distribution system will consist of a main circuit breaker type (CDP), 800A – 3Phase - 4W – 347/600 volt main distribution panel complete with main breaker section, and sub-distribution section and protective devices.

.2 The main secondary distribution will sub-feed the electrical closet meter stacks via suitably sized step-down transformers and overcurrent protective devices. The distribution system will be designed to provide metering for house loads and to each individual residential suite.

.3 All residential suite feeders will be provided with BC Hydro meters.

.4 Heating in residential buildings is anticipated to be provided by electric baseboard, which has been accounted for in our load calculations.

.5 The loads shall be fed at the following voltages:

.1	Mechanical	208 Volts and 600 Volts
.2	Small Mechanical	120 Volts and 347 Volts
.3	Lighting	120 Volts
.4	Receptacles	120 Volts
.5	Elevators	600V
.6	Large Loads	208 Volts and 600 Volts

.6 Residential suites will be provided with receptacle power outlets as required by code and where practical additional outlets will be provided for night tables or other appliances, televisions, and smart boxes.

.7 Power connections will be provided for mechanical systems equipment including electric heating, fans, pumps, etc., as required to facilitate mechanical systems installation. Grouped motor control centers will be used in areas of high density of mechanical equipment.

.8 Power connections for heat trace for both domestic cold water and fire sprinklers will be provided. Fire sprinkler heat trace controllers will be tied to the fire alarm system.

.9 Power connections for CO system monitoring and control panels will be provided as necessary.

.10 Power connections for dry sprinkler system compressors will be provided as necessary. Fire alarm ties to sprinkler equipment will be provided.

.11 Refer to the mechanical package for more information.

.12 Dedicated ground and circuit power outlets will be installed for telecommunications equipment.

.13 Power connections will be provided for elevator distribution equipment, and other similar loads as required.

.14 All wiring for power system connections will be run in electrical metallic tubing (EMT) to junction boxes located in accessible ceiling spaces with flexible armored cable drops to individual lighting fixtures and power outlets where construction materials are concrete. In residential wood-stud construction, NMD90 wiring will be used for power outlets and appliance wiring within suites.

.15 All outlet boxes shall be air tight.

.16 Digital Power Metering will also be provided for monitoring house loads (HVAC, lighting, etc.) to provide the building owner with demand information for the building electrical systems.

.17 All breakers 400A and greater will be long-term, short-term, instantaneous, ground-fault (LSIG) trip electric style to achieve protection and coordination.

.18 For the irrigation system, sleeves will be provided as necessary/required by the landscape consultant and power/data will be provided for controllers. Refer to the landscape package for more information.

3.3 ELECTRIC VEHICLE CHARGING SYSTEM

.1 EV charging station will be provided as required by the owner.

.2 Should the number of EV charging stations exceed the available capacity of the site, load management systems will be provided to limit the connected EV charging load and mitigate the size of the BC Hydro site service.

.3 The load management strategy will be implemented as follows:

.1 If multiple chargers are plugged in at any given time, and their connected demand exceeds the available site capacity, the delivery of power will be throttled within the available capacity.

4. LIGHTING SYSTEM

4.1 INDOOR LIGHTING

.1 Residential suites will be fitted with residential grade luminaires using LED's. Residential luminaires will be coordinated with the requirements of the interior designer. Refer to their package for more information.

.2 The following guidelines will be utilized in the design of lighting:

.1 Functionality: The lighting system for a particular use area shall be suitable for the space and shall enable users to perform their tasks without any hindrance from the lighting system and allow flexibility of use through lighting control.
.2 Energy Efficiency: Energy efficient technologically proven light sources will be utilized to conserve energy.
.3 Aesthetics: The lighting shall enhance the aesthetics of the space by creating a pleasant environment.
.4 Suitability to Environment: The luminaires selected shall suit the environment, as well as resist the environmental pressures put on the system.

.3 Lighting system for the interior common space part of the building is to consist mainly of energy efficient LED luminaires with good colour temperature (K) and colour rendering index (CRI), and long lamp life. Lighting power densities will meet and exceed the requirements of ASHRAE 90.1- or the MNECB and its latest adopted amendments. Lighting controls will also comply with ASHRAE or MNECB requirements and will be automated in all common areas.

4.2 OUTDOOR LIGHTING

.1 The outdoor lighting shall fulfil all exterior illumination requirements at night, while creating a safe environment for pedestrian night traffic. Elimination of light pollution shall be an important aspect of the lighting design.

.2 All site lighting will be of an architectural design and full cut-off (no up-light) to minimize negative effects on the night sky.

.3 IES Standards shall be utilized in selection of the type of lighting as well as lighting levels recommended.

.4 The following guidelines shall be utilized in the design of lighting:

.1 Functionality: The lighting system designed shall suit the task and shall create a safe environment.

.2 Energy Efficiency: Energy efficient technologically proven light sources will be utilized to conserve energy.
.3 Aesthetics: The lighting shall enhance the aesthetics of the building and area without compromising the safety.
.4 Suitability to Environment: The luminaires selected shall suit the environment, as well as resist the environmental pressures put on the system.
.5 Light Pollution: The outdoor lighting system shall be designed to minimize light spillage to neighboring areas, avoiding light pollution, and helping local nocturnal life to flourish.

.5 Exterior building lighting is to consist mainly of recessed or surface mounted LED luminaires, to provide good illumination at entry and exit locations, as well as building perimeter lighting.

.6 All exterior lighting will be 3000-degree Kelvin in colour temperature in accordance with the International Dark Sky Association (IDA) recommendations.

.7 Exterior lighting for the development will consist primarily of building mounted lighting with area-lights and step-lights strategically located to provide required levels along pedestrian pathways.

.8 Site lighting will be deployed and coordinated with landscape architects to ensure consistency across the development. Refer to their package for more information.

.9 Select luminaires along pedestrian pathways will be provided with micro-inverters and battery-backup in order to provide safe exiting levels in the event of a utility failure.

.10 Residential suite patios shall have exterior lighting which will match the colour temperature of other exterior fixtures – 3000-degrees Kelvin. Suite patio fixtures will be individually controlled from within the suite.

.11 Residential suite patios at grade with access from the buildings' exterior will be provided with recessed step-lighting and entrance door luminaires as required.

4.3 LIGHTING CONTROLS

.1 All lighting shall be controlled manually and/or automatically to ensure energy savings and conform to energy code mandates.

.2 The indoor lighting control system shall consist of a line-voltage lighting control system.

.3 In the residential corridors, lighting circuits will be connected to occupancy sensors and will automatically dim fixtures when no users are present.

.4 All outdoor lighting shall be controlled by photoelectric cells and timers.

5. LIFE SAFETY SYSTEMS

5.1 GENERAL

.1 The life safety systems for the facility shall be in accordance with all applicable codes, and standards as a minimum, and shall ensure quick detection, and proper notification and safe evacuation of all occupants from the facility expediently at all times. The electrical life safety shall consist of the following:

.1 Fire alarm System: Ensuring quick detection, and occupant notification of a fire condition.
.2 Exit Lighting: Ensuring all egress routes are properly indicated at all times.
.3 Emergency Lighting System: Ensuring that all egress routes are sufficiently illuminated in the event of an emergency condition, even when utility power supply is interrupted.

5.2 FIRE ALARM SYSTEM

.1 The existing fire alarm system in the church building is a Mircom system.

.2 The existing fire alarm system does not contain adequate space for the expanded floor areas and usage, therefore a new fire alarm control panel will have to be installed.

.3 Existing devices in the church will be reused with the head end unit replaced to facilitate additional zones.

.4 The fire alarm system will be a single-stage addressable, fully supervised microprocessor-based system, utilizing digital techniques for data control, and digital/multiplexing techniques for data transmission. The systems will be complete with remote monitoring by the Owner's designated monitoring agent.

.5 The main central control unit (CCU) panel will be located in the main electrical room, which will be conveniently located within the building.

.6 Remote annunciators will be installed at the main (firefighters) entry locations on the main floor of each of building and will be provided complete with an active graphic.

.7 Manual stations, automatic activating fire detectors, sprinkler system flow alarm switches, and supervisory devices shall be located and installed in accordance with Current Building Code Regulations.

.8 Where door hold-open devices are provided, these will be automatically released upon activation of the fire alarm system within each building.

.9 Audible devices are to be installed in corridors and common areas to provide full audible coverage for the building. Horns or son alert devices will be used in all buildings such that the audible signal type is consistent for the entire project.

.10 Visual strobe devices to be installed where required in noisy spaces or in designated hearing-impaired suites.

.11 Complete fire alarm system installation shall be in accordance with CAN/ULC-S524-01 Standard for the installation of fire alarm systems. The system shall be verified as per ULC standards.

5.3 EXIT LIGHTING

.1 Exit lighting system is to consist of 120V LED green pictogram type exit signs. Exit signs will be installed in accordance with current Building Code requirements.

5.4 EMERGENCY POWER SYSTEM

.1 The emergency power system will be provided by several centralized batteries and inverters.

.2 Emergency lighting will be provided by the normal lighting fixtures fed from the battery inverters to provide egress lighting levels along all exit routes in accordance with the code.

.3 The fire alarm system will be provided with backup batteries providing 24-hours of supervisory power.

.4 All exit signage will be provided with battery backup.

.5 All emergency devices will be available for 30 minutes of full load in accordance with the code.

6. COMMUNICATIONS SYSTEM

.1 The structured wiring system in residential buildings will include Category 5e modular RJ45 wall jacks, each with Category 6 UTP four pair cable runs to Category 6 horizontal field modular RJ45 patch panels located in suite smart panels. From each suite smart panel, a fiber optic cable will run to the main communication rooms or closets and will be supplied and installed by Telus. The contractor will provide end-to-end connectivity for all Cat6 UTP wiring, however, Telus will terminate all fiber optic cabling. Cross-connects between main incoming telephone service cable termination point and riser cabling patch panels, including electronic switching equipment, will be by Telus forces.

.2 Each suite demarcation point will be provided with a power receptacle, 120 Volts 15 Amps, to allow for installation of either Telus or Shaw digital telephone systems. Within suites, COAX cabling will run from the demarcation point smart box to each point-of-use outlet. Termination will be by Shaw Cable.

.3 Telus fiber riser cables will be fed from the main communications room to each levels communications closet.

7. CATV SYSTEM

.1 COAXIAL cabling will be provided from the main communication rooms to each floor closet and then to each suite in accordance to Shaw Cable Standards.

.2 COAXIAL riser cables will be fed from the main communications room to each level's communications closet.

8. SECURITY SYSTEM

8.1 CCTV / ENTER-PHONE / ACCESS CONTROL SYSTEM

.1 Residential building enter-phone systems will be provided with audible communication to each suite and video capabilities such that suite occupants can view a guest requesting entrance into the building. Each enter-phone panel will be provided with 120 volt power, a CAT6 communications run, and a COAX cable run to the main communication room of each respective building.

.2 CCTV camera rough-ins will be provided at select locations.

.3 Access controlled doors, rough-in, wiring, and devices will be provided at select locations.

9. CONNECTION TO MECHANICAL EQUIPMENT

.1 Power shall be supplied to mechanical equipment from Motor Control Centers (MCC) located in mechanical rooms. The starters shall be magnetic starters, with terminal strips in each starter cubicle.

10. RENEWABLE ENERGY PROVISIONS

The facility will be made ready to accept a future photovoltaic (PV) system by way of a conduit pathway between select locations on the roof and the main electrical room. Space provisions will be made within the main electrical room to accommodate future PV system components.

11. SEISMIC RESTRAINT

.1 All electrical systems will be provided with seismic restraints designed in accordance with the applicable codes and regulations for the Victoria area earthquake zone requirements.

END OF REPORT