O'M Engineering
Electrical & Electronic Consulting Engineers
www.omengineering.ca

City of Coquitlam - Poirier Facilities Electrical Load Study Report

Prepared for:

Krystal Law, Building Technician | Facilities, City of Coquitlam

640 Poirier Street, Coquitlam, BC

Project No.	Date	Authored by	Reviewed by
23-571	June 10, 2024	Stephen Cyr, B.ENG.	Jinwoo Park, P.ENG., Associate & Technical Operations Manager

Permit to Practice No: 1001261

PERMIT TO PRACTICE: #1001261

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
J. PARK
46943

2024-06-10

PROFESSIONAL SEAL & SIGNATURE

TABLE OF CONTENTS

1.0 INTRODUCTION

O'M Engineering was retained by The City of Coquitlam to carry out a load study for the main electrical power service for Poirier Facilities located at 618 Poirier St, Coquitlam, BC V3J 6A9. The purpose of this electrical load study is to determine the current available power capacity on the existing electrical power service and if the existing electrical power service has sufficient capacity to feed 3 new dual-head EV charging stations and future planned HVAC upgrades/electrifications.

The City informed O'M Engineering that the preferred EV charging station model is ChargePoint CPF50 (dual-head).

The City's future planned HVAC electrifications of the existing equipment are as follows,

- Centennial Pavilion:
  - Year 2026:
    - AHU 2: Serial # NOE4845574 / Model #Z0086N0828AAA1C
    - AHU 3: Serial # NOE984557S / Model # ZJ036N08P2AAAK
    - AHU 4: Serial #NOE9845573 / Model # ZJ036N08
  - Year 2030;
    - AHU 1: Serial # NOE9840127 / Model # ZH120N15S2AAA4B
- Dogwood Pavilion:
  - Year 2032:
    - RTU 1: Serial # S42807 / Model # DJE20/0 / Manufacturer: Engineered Air
    - RTU 6: Serial # S42807 / Model # HE 40/0 / Manufacturer: Engineered Air

2.0 CODES AND STANDARDS

Although all existing installations would have been completed to applicable codes and standards at the time of installation, the electrical system was reviewed in accordance with the intent of all current applicable codes, ordinances, bylaws, standards, and regulations.

The following list of applicable codes and regulations apply to this report:

- 2021 Canadian Electrical Code (CEC)
- 2024 British Columbia Building Code (BCBC)
- Applicable NFPA Regulations
- Canadian Standards Association (CSA)
- Underwriters' Laboratories of Canada (ULC)

3.0 ASSESSMENT APPROACH

3.1. Site Visit Approach

O'M Engineering conducted the electrical assessment by visiting the site, completing a walkthrough, and making observations of the existing electrical systems and equipment deployed. We attended our site visit on December 21st, 2023 to develop an understanding of the existing electrical power distribution system and equipment serving the City of Coquitlam facilities, and to anticipate what potential upgrades may be required for the upcoming electrification projects and EV charging station installations.

During the site visit, short, informal interviews and discussions were held with John Baird, M.A.C City Assets from the City of Coquitlam. The results of these discussions are considered in this report.

Our site visit consisted of the following:

- Identification of the existing BC Hydro pad-mounted transformer (PMT),
- Identification of the existing main distribution board (MDC) equipment size and condition,

Figure #1: Site Plan Showing the Existing Main Electrical Room

3.2. Site Overview

During the site visit, O'M Engineering completed a review of the following areas:

- Location of the existing BC Hydro pad-mounted transformer (PMT),
- Existing Electrical Service Room,

3.3. Available Documents

The following documents and existing drawings were made available for the preparation of this report:

- BC Hydro peak demand data since December 2006
- City's future planned HVAC upgrades/electrification existing equipment details
- City's future EV charging station implementation plan
- EV charging station model number
- Photographs taken during site visits.

4.0 ELECTRICAL SERVICE AND EXISTING POWER DISTRIBUTION SYSTEM

4.1 Site Visit Approach

O'M Engineering conducted the electrical assessment by visiting the site, completing a visual walkthrough, and making observations of the existing infrastructure within the Electrical Service Room. We attended the site visit on December 21, 2023, to develop an understanding of all existing electrical systems and verify if the existing electrical distribution has available spare capacity for the proposed EV chargers and how much spare capacity may remain for future mechanical upgrades.

4.2 Available Documentation

The following documents were made available for the preparation of this report:

- EV Charging Data Sheets
- BC Hydro historical billing data from the last 17 years.

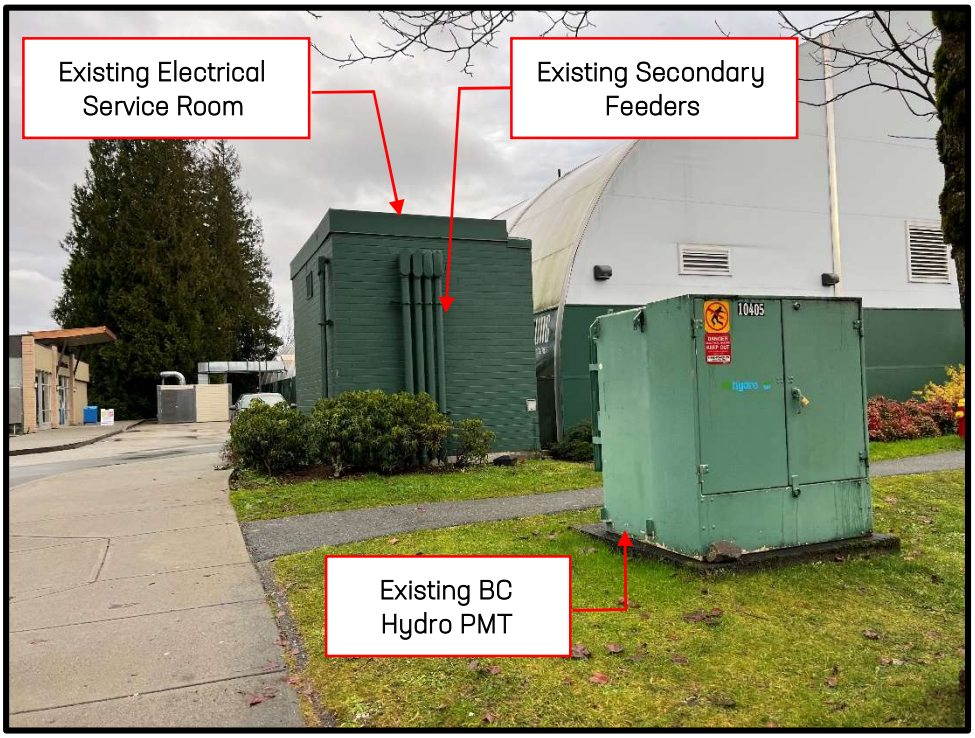
5.0 EXISTING ELECTRICAL POWER SYSTEM AND LOAD STUDY

5.1. Existing Electrical Power System

The Electrical Service Room (ESR) is fed from a BC Hydro Pad-Mounted Transformer (PMT). Feeders run underground from the PMT to the ESR where they travel up the exterior of the ESR, enter the room, and connect to the Main Distribution Centre (MDC).

The main breaker on the MDC is 800A, 120/208V, 3 phase. The MDC then supplies electricity to the buildings at the Poirier Complex. The PMT, MDC, and other electrical equipment in the ESR were installed in the 1970s and are past their designed life expectancy.

O'M engineering developed an electrical single line diagram of the ESR's main distribution and attached it in *Appendix A*.



Picture 1 - Existing BC Hydro Pad-Mounted Transformer and Electrical Service Room

Picture 2 - Existing Electrical Service Room

5.2. Existing Spare Capacity Load Calculation

To verify the historical peak demand load and available spare power capacity for the main electrical service, we utilized BC Hydro utility data recorded since December 2006 in accordance with Canadian Electrical Code 8-106(9).

As per the BC Hydro historical utility demand data recorded from December 2006 to January 2024, a peak demand of 225 kW was recorded in January 2017. O'M Engineering used the peak demand from 7 years ago since it is our understanding that the major loads are relatively unchanged, and it would be possible for the facility to draw the same amount of power again. Based on all available data, such as the existing service size, main circuit breaker and BC Hydro Utility data, etc., we have compiled the following table to summarize the existing and available power capacity for the school's electrical system:

Description	Value	Units
Main Breaker (800A, 120/208V, 3Ph, 80% Rated)	230	kVA
BC Hydro Meter Peak Demand*	230	kVA
Available Spare Power Capacity	**0**	**kVA**
Available Spare Power Capacity in %	**0**	**%**
Considerations and Assumptions: *Calculated from 225kW peak demand recorded in January 2017, with a power factor of 0.98.		

Table 1 - Load Calculation for Poirier Electrical Service Station - Existing

Based on the BC Hydro peak demand and the above load calculation, the existing electrical power distribution is fully loaded and does not have capacity for any future load additions.

6.0 PROPOSED FUTURE LOADS

6.1. Power Requirement of the Planned HVAC Upgrades/Electrification

The City informed O'M Engineering that the City is planning to upgrade and electrify the existing gas-fired mechanical units with new units over the next 8 years. A detailed breakdown of the planned upgrades can be found in *Section 1.0 Introduction* above.

O'M Engineering was only provided with the existing equipment's manufacturer and model number details. The precise power requirements of the future electrified mechanical units were not available at the time this report was prepared. O'M Engineering used existing gas-fired units' MBh values and converted them into kW to estimate the power requirements of the new mechanical units.

Please note that the below table is only prepared to estimate the power requirements of the new mechanical units in kW. The numbers are just estimated and subject to change based on the selected mechanical equipment in the future.

Existing Equipment Description	Catalogue MBh	Conversion to kW*
AHU 2: Serial # NOE4845574 / Model #ZO086NO828AAA1C	86,000	25.2
AHU 3: Serial # NOE984557S / Model # ZJO36NO8P2AAAK	36,000	10.5
AHU 4: Serial #NOE9845573 / Model # ZJO36NO8	36,000	10.5
AHU 1: Serial # NOE9840127 / Model # ZH120N15S2AAA4B	125,000	36.6
RTU 1: Serial # S42807 / Model # DJE20/0 / Manufacturer: Engineered Air	1,400	0.4
RTU 6: Serial # S42807 / Model # HE 40/0 / Manufacturer: Engineered Air	1,4000	4.1
Total	**298,400**	**87.4**
Considerations and Assumptions: * The kW numbers are direct unit conversion. Required future electrical loads will be subject to new equipment selections by mechanical consultant.		

Table 2 - Power Requirement of the Planned HVAC Upgrades/Electrification

6.2. Power Requirement of the New EV Charging Stations

The City informed O'M Engineering that the City is planning to install 3 new EV charging stations and the preferred EV charging station model is ChargePoint CPF50 (dual-head). The below power requirement of the 3 new EV charging stations are prepared based on the ChargePoint CPF50 cutsheet.

Description	Value	Units
ChargePoint CPF50 (dual-head) (Two 40A, 2-pole breaker)	13.3	kVA
Total of 3 EV Charging Stations:	**39.9**	**kVA**

Table 3 - Power Requirement of the New EV Charging Stations

6.3. Total Power Requirement of the Planned HVAC Electrifications and the New EV Charging Stations

Description	Value	Units
Power Requirement of the Planned HVAC Electrifications	87.4	kW
Power Requirement of the Planned HVAC Upgrades/Electrification @0.95pf	92	kVA
Power Requirement of the New EV Charging Stations	39.9	kVA
Total	**131.9**	**kVA**

Table 4 – Total Power Requirement of the Planned HVAC Upgrades/Electrification and the New EV Charging Stations

Based on the above *Table 4*, a minimum 131.9 kVA of additional spare power capacity will be required to accommodate the future planned HVAC electrifications and 3 new EV charging stations. However, as per the load calculation in the above *Table 1* in section *5.2. Existing Spare Capacity Load Calculation*, the existing electrical power distribution is fully loaded and does not have capacity for any load additions.

7.0 PROPOSED ELECTRICAL SERVICE UPGRADE

To accommodate the future planned HVAC electrifications, 3 new EV charging stations, and allow sufficient spare capacity for future electrical upgrades, it is recommended that the main incoming service be upgraded to a 1600A, 120/208V, 3 phase service. This will provide sufficient capacity for the EV chargers and future electrical upgrades as shown in the table below.

Description	Value	Units
Main Breaker (1600A, 120/208V, 3Ph, 80% Rated)	461	kVA
BC Hydro Meter Peak Demand*	230	kVA
Power Requirement of the Planned HVAC Upgrades/Electrification @0.95pf	92	kVA
Power Requirement of the New EV Charging Stations	39.9	kVA
Available Spare Power Capacity	**99.1**	**kVA**
Available Spare Power Capacity in %	**21**	**%**
Considerations and Assumptions: *Calculated from 225kW peak demand recorded in January 2017, with a power factor of 0.98.		

Table 5 – Capacity after proposed electrical service upgrades.

Based on the above load study, after completion of the main service upgrade, installation of the future planned HVAC electrifications, and installation of 3 new EV charging stations, the Poirier Complex's main electrical service is anticipated to have 99.1 kVA (21%) available spare power capacity.

8.0 OPINION OF PROBABLE COSTS

The opinion of the probable costs for the electrical works described in Section 7.0 are summarized in the table below.

The opinion of the probable costs in this report is based on our experience with similar projects and only provides a Class D estimate. All probable cost numbers are approximate and are subject to change based on the contractor's pricing and project challenges. A class D estimate provides a rough order of magnitude cost, as such the accuracy of this estimate is generally +40% to -20%. This cost is for the electrical subtrade labour and materials.

The table describes the cost of upgrading the existing equipment in the service stations and excludes the planned future EV units and mechanical upgrades.

Item	Description of Component	Opinion of Probable Cost
New Service Equipment	1600A, 120/208V, 3Ph Main Distribution Centre	$125,000 - $150,000
Panel and Breakers	Replacement 42cct panel and breakers for outdated Panel D in the service room	$10,000 - $15,000
Conduit and Cabling	To Panel D and the existing transformer in the service room	$5,000 - $10,000
BC Hydro Design Fee	BC Hydro will require a design fee for the service upgrade	To be determined by BC Hydro
Civil Work	Required civil work for the new BC Hydro PMT	$100,000 - $120,000
Electrical Contractor		$50,000 - $60,000
OM Engineering Design Fee	Fee is an estimate and may change depending on the scope of project	$22,000
Structural Engineering Service for BC Hydro coordination	BC Hydro coordination and signed drawings for duct building entrance	$3,000
	Estimated Total Probable Cost:	**$315,000 - $360,000**

9.0 CONCLUSION

The Electrical distribution in the Poirier Electrical Service Room has reached the end of it's designed life expectancy. Once Electrical equipment reaches the end of it's designed life expectancy, although it may not fail, maintenance will become more expensive, and it will be more difficult to source spare parts.

Due to the age of the equipment and the future electrical needs of the city, we recommend upgrading the existing 800A, 120/208V, 3Ph service to 1600A, 120/208V, 3Ph and the electrical distribution boards within the Electrical Service Room be replaced with similar rated new devices.

The service upgrade includes the replacement of the existing BC Hydro PMT, the Main Distribution Centre (MDC), and the incoming feeder and duct.

These upgrades should help ensure that the main electrical service at Poirier Complex can safely supply power and spare capacity for future electrical needs.

END OF REPORT

APPENDIX A – EXISTING SINGLE LINE DIAGRAM