Number 23

MAINTENANCE MATTERS

BC HOUSING RESEARCH CENTRE

Electrical Planning for Multi-Unit Residential Buildings

In British Columbia, strata corporations are regularly receiving requests from owners to approve upgrades, such as air conditioning, heat pumps, in-suite laundry and electric vehicle (EV) charging. New amendments to the Strata Property Act and Regulations are making it easier for people to request EV charging stations where they live. Additional, upcoming regulations will prioritize the use of high efficiency electrical equipment in an effort to phase out the use of fossil fuels in buildings.

Each of these upgrades will add electrical loads to the building. Since buildings, townhouses and bare land strata communities have limited electrical capacity, strata corporations need to take steps to understand the electrical capacity they have available and plan for their future electrical capacity needs. New amendments to the Strata Property Regulation have introduced mandatory Electrical Planning Reports for strata corporations to plan for costs and operations associated with electrical demand. This handbook is designed to help strata corporations understand their building's electrical system, and plan for building and electrical capacity upgrades.

Understanding electrical load and capacity to maintain safe, efficient, and reliable electrical systems in strata communities.

Images for this bulletin provided by FRESCo (2023)

Maintenance Matters

This series of bulletins and companion videos is designed to provide practical information on maintaining residential buildings. Produced by BC Housing, this bulletin was prepared by FRESCo and CHOA.

Electrical systems, loads and capacity

A building's **electrical system** is a network of conductors and equipment, such as electrical panels, designed to safely distribute electrical power from the point of delivery to the different loads around the building that consume electricity. Strata buildings usually have a main electrical utility service that branches out to:

- Common area electrical distribution meters and panels, such as hallways, elevators and stairways, amenities, and parkades, where consumption is usually paid for by the strata corporation.
- Suite electrical meters and panels, where consumption is usually paid by each strata lot owner or tenant.
- Commercial space meters and panels in mixed-use buildings, where consumption is usually paid by the commercial lot owner or tenant.

Electrical load refers to the electrical power consumed or drawn by an electrical device, appliance or equipment connected to the building's electrical system. The electrical load can vary throughout the day and across different seasons based on the activities of the occupants. When the amount of energy drawn from the grid in a set time is at its highest, this is referred to as the **peak load**.

Electrical capacity is the maximum electrical power a building's electrical system can handle, ensuring a safe limit for total electrical loads without overloading the system.

How do building upgrades and additional loads impact electrical capacity?

Building upgrades that will add to the electrical load of the building include:

- Installation of EV charging.
- Upgrading gas systems (space heating, hot water systems and ventilation systems) to electric heat pump systems.
- Occupants adding portable air conditioning systems.
- Addition of household appliances such as dishwashers, clothes washers and dryers, electric ranges, and other appliances or equipment.
- Addition of recreational appliances such as hot tubs, saunas, etc.

When new electrical loads are added to a suite or building, it is necessary to evaluate if there is enough electrical capacity at the specific electrical panel to which the new load is being connected, as well as sufficient capacity at the neighbourhood level. Suites, buildings, and neighbourhoods have limited electrical capacity, and each new electrical load consumes a portion of that available capacity. Once this limit is reached, adding future electrical loads will not be possible without reducing existing loads or increasing the electrical capacity of the building or neighbourhood, which can make electrical upgrades costly.

The electrical capacity of a strata community is a common and shared resource. It is imperative for all strata communities to proactively plan how to utilize and cost-effectively upgrade the buildings' electrical capacity considering the current and future needs of occupants.

For example, building occupants may independently purchase and use portable air conditioners in their suites that do not overload their suite panel. However, if all owners purchased one or more portable air conditioners and use them at the same time as other electrical loads in the building, it may overload the building's electrical capacity.

Different types of strata corporations?

Different types of strata corporations, including multi-unit residential buildings (MURBs), townhomes, condominiums, and bare land stratas, have different physical characteristics and electrical configurations.

The most important factors to consider are:

- Whether they share central building mechanical and electrical systems and physical parking spaces.
- How the electrical panels and meters for the building's central systems and in-suite systems are arranged.

These factors have implications regarding the approach for where and how to add new electrical loads, and who is responsible for paying for the upgrades and energy use.

In a typical apartment building, additional electrical loads, or upgrades to shared building systems, such as central heating, central domestic hot water, common area ventilation and EV charging, are generally added to the common electrical distribution panel. Energy consumption from these new loads is typically charged to the strata's electric meter(s). On the other hand, additional loads or upgrades to in-suite systems, such as in-suite heat pumps, in-suite hot water tanks, in-suite heat recovery ventilators (HRV), and in-suite laundry, are typically added to each suite's electrical panel and consumption from these new loads is charged to the individual suite meter.

For townhomes or bare land stratas, it is typical for many of the mechanical systems and EV chargers to be connected directly to the home's individual electrical panel. This may make the upgrades simpler, but caution must be taken in considering the electrical conductors feeding the homes. Sometimes conductors are connected directly to the utility, while sometimes they are all connected to a main service to the site, which will also have limited capacity.

Just as in-suite electrical usage affects building capacity, shared electrical service among multiple buildings impacts the entire neighborhood due to the combined building-level consumption. It is important that this scope is included in the electrical capacity study, particularly when undertaking substantial electrical and mechanical building upgrades.

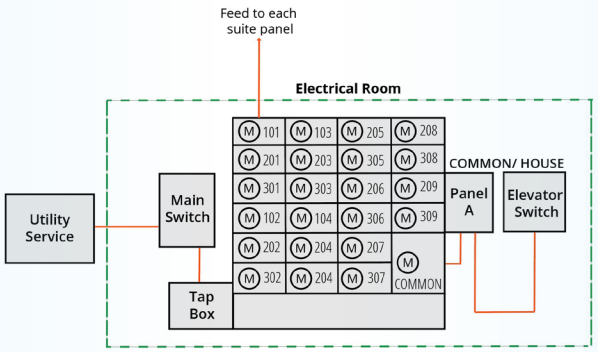
How to plan for building upgrades?

New amendments to the Strata Property Regulation (B.C. Reg. 43/2000) introduced in December 2023 establish that existing strata corporations with five or more strata lots are now required to commission an **Electrical Planning Report (EPR)** to inform decision-making on electrical capacity. EPRs help strata corporations plan for future electrification upgrades and other demands on their electrical systems and support resident requests for EV charging. The report shall include elements such as the current building electrical capacity, a list of existing demands on the electrical system (including EV charging stations), an estimate of peak demand, spare capacity and future anticipated electricity demand, and recommendations for demand management and upgrades (see full list in Checklist section at the end). Strata corporations required to obtain an EPR will need to do so by 2026 or 2028 depending on location (refer to the Order in Council 671/2023 for full details).

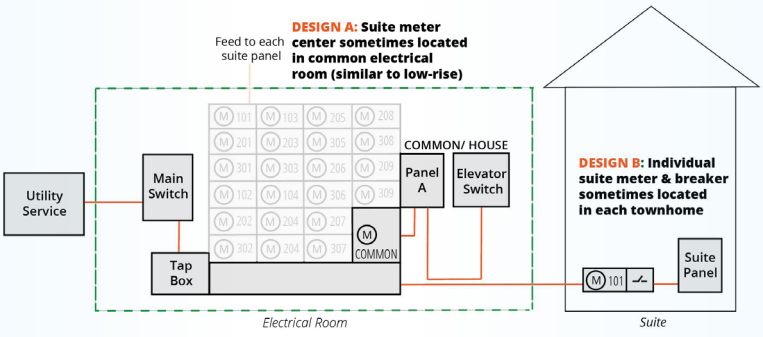
There are other studies that strata corporations can commission when planning for building upgrades, such as:

- **Electrification Ready Plan***, also known as a Decarbonization Plan or Electrification Retrofit Plan, outlines a strategy for building electrification, which can include converting space heating, cooling, domestic hot water heating, ventilation, and appliances from fossil fuels to electric power using highly efficient equipment. This type of plan can also outline a long-term strategy for adding EV charging equipment, improving the building envelope to reduce electrical

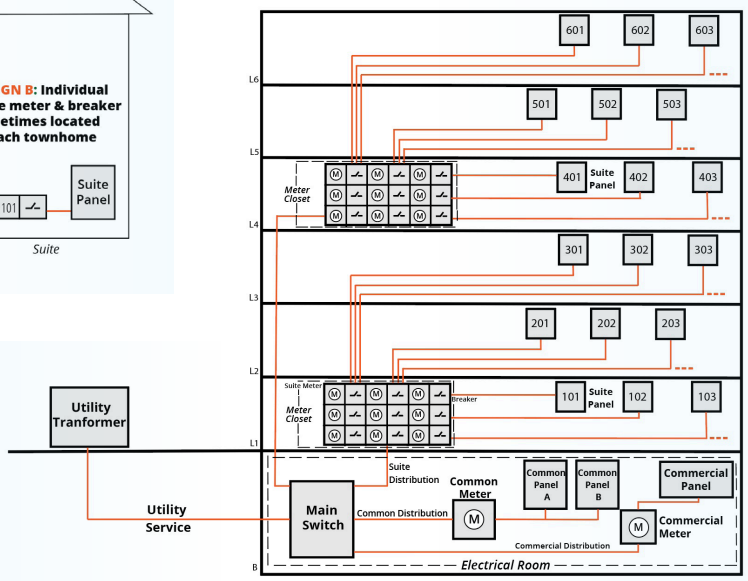
Low-rise



Townhome/Rowhome



Mid-High Rise



Examples of Electrical System Configuration in Different Types of Stratas.

Source: FRESCo (2023)

loads, and exploring other opportunities such as load management, to maximize the efficiency of the building and reduce the costs of electrical capacity upgrades. The scope of an Electrification Ready Plan should be determined by the needs of the strata community (refer to the checklist at the end for more details).

- **EV Ready Plan** outlines a strategy for implementing EV-ready parking spaces in multi-unit residential buildings. While the plan incorporates an electrical capacity assessment, it focuses exclusively on capacity and upgrades related to the installation of EV charging only and does not consider capacity upgrades for mechanical systems and other appliances. Therefore, is important to ensure that the EV Ready Plan is aligned with the recommendations in the Electrical Planning Report to avoid multiple electrical capacity upgrades for different end uses.
- **Energy study**, also known as an energy audit or energy assessment, provides an analysis of a building's energy (typically electricity and gas) consumption and efficiency and identifies opportunities for conservation, cost savings, and upgrades. These studies may include energy consumption analysis, building envelope assessment, lighting analysis, mechanical system assessment, equipment efficiency analysis and recommendations for upgrades to the building and mechanical systems, and passive cooling strategies. Energy studies may not include an assessment of the electrical capacity of the building and typically will not provide sufficient information to guide a full building electrification.

* To date it has not been common practice for comprehensive Electrification Ready Plans to be conducted. Most commonly, strata corporations have hired consultants to provide individual services like energy studies, electrical capacity studies, or EV Ready Plans for specific building upgrades, like adding heat pumps or installing EV charging. Moving forward, it is recommended as a best practice that strata corporations utilize their Electrical Planning Reports and consider planning for both building electrification and EV charging needs together. This approach will help ensure the most efficient and cost-effective plan for building and electrical capacity upgrades.

What are some of the solutions to address building electrical capacity limitations?

Qualified professionals can provide guidance and phased short- and long-term solutions to meet building electrical capacity needs through load reduction, load management and increasing electrical capacity. Some of the strategies are outlined below.

In some buildings, available spare electrical capacity can be increased through **load reduction**. Electrical load reduction is any change that will reduce electrical consumption in the building. Options for reducing loads include:

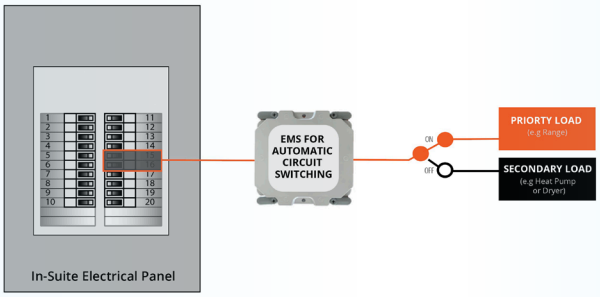
- **Upgrading electric baseboards with in-suite heat pumps** provides air conditioning and high-efficiency electric heating that can increase available electrical capacity, both at the suite panel and the main building service.
- **Upgrading the building lighting** with LED lights in common areas and parkades and installing lighting controls (to turn lights off when not in use).
- **At the time of replacement, upgrading less efficient appliances** with low-power high-efficiency models in common areas and individual suites (e.g., ventless laundry machines, dishwashers, ranges, etc.).
- **Improving the building envelope** by upgrading windows, adding insulation, or improving the air tightness can make the building more energy efficient and reduce the amount of electricity needed for space heating and cooling.

In some instances, building electrical capacity limitations can be addressed by using **load management technologies** in common areas, such as load switching and load sharing devices and smart panels. These technologies can optimize electrical capacity and reduce peak loads by powering non-essential appliances and systems only when essential appliances and systems are not in use. Load management technologies are used to 'share' the available electrical capacity in the building –

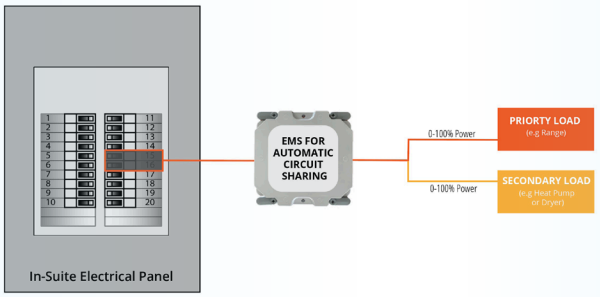
allowing for new electrical loads (like EV charging) to be added without needing to upgrade a buildings electrical capacity. Load management systems for EV charging are widely used and can control how much power each charging station can use when multiple EV chargers are connected to the same circuit.

Strata corporations can also consider **increasing the building's electrical capacity** by upgrading the building's electrical infrastructure. This upgrade can range from a small panel replacement limited to one common use or one suite, all the way to a whole building infrastructure upgrade involving planning with the utility. The most expensive option is the one that requires asking the utility to provide a bigger electrical service to the building. Planning upgrades properly can ensure that the new service provides enough electrical capacity to fulfill all electrification and EV charging goals in the short and long term.

Branch Circuit Switching



Dynamic Branch Circuit Sharing



Examples of load management technology, such as load switching devices and load sharing devices.

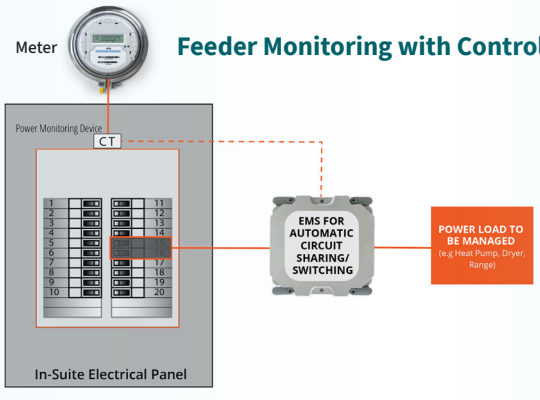
Source: FRESCo (2023)

Who pays for electrical capacity upgrades?

It is common for strata communities to have questions regarding who is responsible for covering the costs of electrical capacity upgrades, whether they are related to individual suites or the building. Electrical upgrades can be triggered by various factors, and whoever triggers the upgrade does not necessarily bear the financial cost for the upgrade. The cost of electrical upgrades is a common strata corporation expense unless they are a condition of an alteration request of an individual strata lot. For this reason, strata communities should plan for future electrical capacity needs and develop bylaws to determine how the costs of electrical upgrades will be paid for. Effective communication, transparency, and mutual understanding among strata members is vital when preparing and budgeting for electrical upgrades. To make informed decisions on the best way to proceed, strata corporations should seek professional advice, conducting cost-benefit analysis on the options available to meet electrical capacity needs, and explore available financial incentive programs to help cover costs for building electrification and EV charging upgrades.

Installation of EV charging stations, heat pumps, and other upgrades may be a significant change in use or appearance of common property. Strata corporations are recommended to develop bylaws and consult legal council when considering applications.

Feeder Monitoring with Controls



Checklist to plan for building and electrical capacity upgrades

This checklist outlines steps that strata corporations can take to plan for building upgrades that involve the building's electrical and mechanical systems.

1. Identify short- and long-term building upgrades and electrification needs.

- ❑ Survey residents to determine the number of required EV charging stations.
- ❑ Survey residents to identify homes/suites that want to add heat pumps, air conditioning or other significant loads.
- ❑ Determine when mechanical systems, such as space heating, domestic hot water heating and ventilation, need replacement and explore electrification options, if applicable. Refer to your strata depreciation report to identify the end-of-life of existing equipment.
- ❑ Identify upcoming regulations that may influence equipment upgrade requirements at the time of replacement.

2. Commission an Electrical Planning Report.

- ❑ Existing strata corporations are required to complete an Electrical Planning Report by 2026-2028 depending on location (refer to the Order in Council 671/2023 for full details).
- ❑ Qualified professionals that can conduct Electrical Planning Reports include registered professional electrical engineers, registered applied science technologists, and certified construction or industrial electricians (refer to the Order in Council 671/2023 for full details).
- ❑ Electrical Planning Reports must include (refer to the Order in Council 671/2023 for full details):
  - Information on when and by whom the report was conducted, including their qualifications.
  - The current capacity of the strata corporation's electrical system.
  - A list of existing demands on the electrical system including demands from EV charging infrastructure, heating, cooling, ventilation, and lighting systems.
  - The current peak demand and spare capacity of the electrical system.
  - An estimate of the electrical capacity that would be needed to power systems, including heating, cooling and ventilation systems, that are currently powered by an energy source other than electricity.
  - An estimate of the electrical capacity needed for any other anticipated future demands on the electrical system, including heating, cooling, ventilation and other systems that the strata corporation anticipates may be modified or installed in the future, as well as EV charging infrastructure that the strata corporation anticipates may be installed in the future.
  - Practical steps to reduce the demands on the capacity of the electrical system, as well as upgrades or modifications to the electrical system to increase the capacity of the electrical system.
  - An estimate of the new electrical capacity after demand reduction and system upgrades.

3. Commission other plans and studies as necessary.

- ❑ Building electrification ready plans and energy studies can be delivered by experienced and qualified registered professional engineers and certified energy professionals in energy audits and building energy performance professionals.
- ❑ Work with qualified professionals to define the scope of the plan or study based on the required or desired building upgrades.

4. Investigate options for rebates and incentives.

- ❑ Identify available financial aid programs and initiatives (e.g., rebates, incentives, loans, etc.) to offset upgrade costs. For more information, visit:
  - Building Upgrade Incentives: www.betterbuildingsbc.ca
  - EV Charging Incentives: https://pluginbc.ca/incentives/

5. Before the strata corporation proceeds with energy upgrades or authorizes alterations, review:

- ❑ All details of construction, product, and energy demands.
- ❑ Your governing structure, bylaws, the Strata Property Act, Regulations, and all regulatory requirements.
- ❑ Permit requirements for building, electrical, structural, mechanical and life safety components.
- ❑ Any dangerous or toxic material removal and management requirements (e.g., asbestos).
- ❑ Your authority to enter into contracts and the project funding.
- ❑ The written application of an owner requesting permission to install upgrades to their strata lot, and the common property.
- ❑ The responsibility for installation, maintenance, operation and all related costs and user fees.
- ❑ Whether a significant change in use or appearance of the alteration may require the approval of the owners at a general meeting.
- ❑ Strata corporations must respond to alteration requests for EV charging within 3 months.

6. Implement recommended actions.

- ❑ Once all necessary approvals and specific details have been confirmed, work with qualified professionals to establish a timeline and budget to implement the recommended actions to reduce electrical demand and upgrades to increase electrical capacity.
- ❑ Once the necessary electrical upgrades have been made, plan for the phased construction and installation of new equipment (i.e., heating, cooling, ventilation, appliances and EV charging infrastructure).

Source: Adobe Stock

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