BC HOUSING
DESIGN GUIDELINES AND CONSTRUCTION STANDARDS 2014
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Introduction

This *Design Guidelines and Construction Standards* provide standards and technical guidelines for the design and construction of new building, conversions, and renovation projects considering the building functional quality, long-term operational efficiency and sustainability in the social housing sector. The objective of the design guidelines and construction standards is to ensure that all projects incorporate features that will:

1. provide safe and secure housing that responds to needs of the residents and fosters a sense of community
2. design projects that are cost effective, spatially efficient, easy to maintain
3. pursue sustainable design and construction practices that balance environmental responsibility, the well-being of the users and efficient use of resources while considering economics of building construction and life cycle costs
4. construct buildings which are durable and meet BC Housing’s minimum life expectancy of 60 – 75 years for the building structure and considers the service life of all building components from the perspective on life cycle costs
5. optimize project outcomes relating to user satisfaction, timelines, and cost through a design approach which considers the needs of all stakeholders in an integrated manner throughout the project development cycle

The *BC Housing Design Guidelines and Construction Standards* are currently organized into six sections:

1. **General Design Requirements** – provides the site planning and building design requirements, primarily applicable to the Schematic design and Design Development stages.
2. **Integrated Design Process** – provides an understanding of Integrated Design Process as a project delivery approach.
3. **Energy and Environment Design** – provides design guidelines to ensure projects are designed to meet BC Housing sustainability goals, greenhouse gas neutral strategies and LEED requirements.
4. **Crime Prevention through Environment Design** – summarizes the strategies used to influence environmental design decisions that will be incorporated to deter criminal behavior and nuisance activities
5. **Construction Standards** – outlines the minimum requirements or referenced standards that must be incorporated in the construction documents. This section is primarily applicable to the project specifications.
6. **Drawing and Document Requirements** – identifies the level of detail required for drawings and specifications for each stage of the BC Housing project review process.
ALTERNATIVES TO THE BC HOUSING DESIGN GUIDELINES AND CONSTRUCTION STANDARDS

The BC Housing Design Guidelines and Construction Standards are intended to be a reference and baseline from which full project specific specifications are compiled by the Design Team. This document identifies general design guidelines and construction standards that are expected within the constraints of the approved construction budget.

The purpose of this document is to establish an acceptable level of quality for construction materials and assemblies that optimizes occupant satisfaction and minimizes annual operating costs for the building.

In this context, BC Housing recognizes the responsibility and authority of the Prime Consultant with respect to the preparation of the construction contract documents and the expertise that the non-profit societies, and other operators, will bring to the projects being developed or renovated. For these reasons, BC Housing will support proposals for alternatives to these standards from non-profit societies, or others, and their development teams.
Glossary of Terms

**Assisted Living**: Assisted living units are self-contained apartments for seniors or people with disabilities who need some support services to continue living independently, but do not need 24-hour facility care. Services provided include daily meals, social and recreational opportunities, assistance with medications, mobility and other care needs, a 24-hour response system and light housekeeping.

**Family Housing**: Independent housing for low to moderate income households with a minimum of two people including at least one dependent child.

**Group Home**: A small, community-based development, usually under 10 beds/units, that provides affordable housing with supports to those with special needs including individuals with severe mental and physical disabilities, youth, and women with their children fleeing abuse. BC Housing provides administration and property management support for group homes on behalf of other provincial ministries and health authorities.

**Independent Seniors**: Housing for seniors where minimal or no additional services are provided. Seniors are usually defined as individuals who are 65 years of age and older.

**PRHC**: The Provincial Rental Housing Corporation is BC Housing's land-holding company. It holds provincially owned social housing properties, and leases residential properties to non-profit societies and co-operatives.

**Second Stage Housing**: Housing for women and children at risk of violence who have completed a stay in a transition house or safe home. Stays can be up to 18 months.

**Single Room Occupancy (SRO)**: These provide long-term accommodation in single rooms, typically without private bathrooms or kitchens.

**Social Housing**: Includes both public housing and housing that is owned and managed by non-profit and co-operative housing providers.

**Supportive Housing**: Housing that provides ongoing supports and services to residents who cannot live independently and are not expected to become fully self-sufficient.

**Transitional Housing**: Housing that is provided for a minimum of 30 days and up to two or three years, which includes the provision of on- or off-site support services to help people move towards independence and self-sufficiency.
General Design Guidelines

Section 1

- General
- Location and Site Planning
- Building Design
- Building Common Areas
- Dwelling Unit Design
- Kitchens and Bathrooms
- Finishes and Materials
- Building Systems
- Site and Landscape Design
- Wheelchair Accessible and Adaptable Dwelling Units
# General

## 1.1 Objectives

.1 The BC Housing Design Guidelines provide basic guidance on design and performance which will influence the form, layout and specifications of buildings delivered under the various programs of BC Housing.

.2 The BC Housing Design Guidelines are a combination of performance guidelines and prescriptive standards. Project teams should use these guidelines and standards to prepare a design program that reflects their specific requirements, the characteristics and opportunities presented by the building site, and the framework of the funding program under which the project is being delivered.

.3 In all cases, project design is expected to comply with the requirements of federal, provincial, city and municipal governments, and all authorities having jurisdiction over the project.

## 1.2 Project Types

Projects delivered under the various housing programs of BC Housing are generally classified as new construction, renovation or conversion projects.

.1 **New Construction Projects**

   New construction projects are designed primarily as residential in occupancy but may also include secondary uses associated with support services provided to the residents. Some developments may also include commercial or leased spaces.

   The scope, size and target clients for a project should be based on a need and demand analysis for a particular location or region and should be designed to meet the needs of the clients within the cost and funding framework established for the project.

.2 **Renovation Projects**

   Renovation projects involve major or minor improvements or changes in the design, layout, materials or systems of an existing building which do not typically involve a change of use or building occupancy.

   BC Housing has developed a provincially-based capital planning process that includes assessments of buildings to determine the required capital renewal needs. All renovations that are initiated have been identified as high priority on the provincial priority list and are undertaken based on a full analysis of Facility Condition Index (FCI), service life and impact to residents.

.3 **Conversion Projects**

   Conversion projects involve a change in building use and occupancy. A rezoning process may be required to meet new occupancy requirements. A zoning bylaw and building code review as part of an overall project feasibility study should be undertaken to determine the extent of any changes or retrofits to the building arising from the change in use.
1.3 HOUSING CLIENT GROUPS

The following are the client groups for which these design guidelines are intended:

- Homeless or Persons at Risk
- Low Income Families
- Youth
- Seniors (independent seniors and assisted living)
- Persons with Disabilities

1.4 APPLICABILITY OF THE GUIDELINES

.1 Unless otherwise specified in this document, the recommendations included in these guidelines are intended to apply to housing developments whose capital and operating budgets are funded by BC Housing regardless of project type.

.2 For renovation or conversion projects, it is recognized that existing conditions or user considerations may override the recommendations contained in these Guidelines. If such is the case, approval from BC Housing should be obtained at the schematic or preliminary design stage.

2 Location and Site Planning

2.1 LOCATION CONSIDERATIONS

.1 Access to existing community services and infrastructure

Sites for new housing developments shall be located in areas which have access to existing infrastructure and community services. Public transportation should be within reasonable walking distance.

.2 Soils and subsurface conditions

Due diligence must be undertaken in assessing existing soil and geotechnical conditions to ensure these are suitable for the proposed development and that there are no conditions which could significantly impact the viability of the project.

.3 Environmental site assessment and hazardous materials conditions

.1 Potentially hazardous conditions affecting the site must be reviewed to assess the risks and the mitigating measures necessary to manage these risks. These include contaminated soils, hazardous materials, flooding, steep slopes and other potential physical and environmental hazards.

.2 A comprehensive review of the hazardous materials at the site must be completed. Any repairs undertaken that disturb the materials must be completed in a way that reduces the disruption and should be done within the appropriate safety requirements.

.4 Acoustic considerations

Where existing or potential road, rail or other sources of noise indicate a need for review, an acoustic consultant should be engaged to recommend mitigation measures and confirm municipal bylaw requirements.
Refer to the recommendations in the following reference documents:


.5 **District heating and cooling systems**

Sites that have access to available or planned district heating and cooling systems should consider the feasibility of connecting to these systems.

.6 **Heritage Designation**

For areas or buildings with a heritage designation or classification, the requirements of the municipality or local heritage authority should be reviewed and evaluated at the feasibility stage of the project.

### 2.2 SITE PLANNING

.1 **General**

.1 All exterior areas intended for tenant use including landscaped open space and outdoor recreation areas use should be universally accessible to persons of all ages and abilities.

.2 Optimize building orientation and massing as part of a passive design strategy to reduce life-cycle costs and maximize indoor environmental quality.

.3 Site planning and landscape design should consider basic defensible space principles to promote tenant security. Project design shall take into consideration Crime Prevention Through Environmental Design (CPTED) strategies, e.g., territoriality, natural surveillance, activity support and access control as well as other recognised CPTED principles. Refer to Section 4 – Crime Prevention Through Environmental Design (CPTED).

.2 **Pedestrian Approach to the Building**

.1 Provide a paved accessible walkway from the municipal road system and parking areas to the main building main entrance, clearly separated from vehicle traffic and clear of any obstacles such as posts, planters or bollards. A minimum 1524 mm (5’-0”) wide walkway is recommended.

.2 Walking surfaces shall be permanent, firm, stable, and slip-resistant.

.3 Provide a maximum slope of 5% for exterior walkways. Provide minimum slope for surface drainage to prevent slips from ice or water accumulation. Cross slopes for drainage may be provided but must be kept to a maximum of 2%.

.4 Stairs and ramps must be easily usable by people with reduced mobility and impaired vision and must comply with the requirements of the BC Building code.

.3 **Outdoor Recreation Areas**

.1 Projects should incorporate a conveniently located sunny outdoor open area that is universally accessible from the main building and promotes positive social interaction.

.2 The exterior recreation area should permit tenants to relax and sit in the sun or shade, out
of the wind, in quiet spots or with a large group. To facilitate these activities consider the following:

- A hard surface patio
- Weather protected areas at the common patio through the use of an awning, canopy, building overhang or gazebo.
- Seating which is universally designed.

.3 Community Garden

Where required by the Owner and Operator, provide an outdoor area for community garden. Consider the location and size of the area depending on the access to sunlight and water, proximity to other structures, lighting and security for tenants, types of plants and tools, as well as accessibility. Adjust the height and depth of raised beds to facilitate access for tenants with wheelchair or restricted movement. Work with local officials and community garden group, if necessary.

.4 Outdoor Smoking Area

An outdoor smoking area may be designated, if required, to meet user, LEED or Licensing requirements.

.5 Families

Provide adequate and secure play space for children. Locate play spaces so they are overlooked by common facilities such as the amenity building, laundry rooms and individual dwelling units. Rules for play areas are to be provided and posted.

.6 Seniors

Provide an exterior recreation area that is conveniently accessible from the common amenity area.

The exterior recreation area should permit tenants to participate in both active and passive activities such as:

- watching outside street life
- sitting in the sun or shade, out of the wind, in both quiet spots and with a large group
- walking conveniently without encountering stairs or children’s play areas

.4 Parking

.1 General

- Provide on-site parking as required by the municipality. Where possible and based on client type and need, a request for parking relaxation from the municipality should be investigated.
- Adequate staff parking must be provided.
- Consider providing designated parking for carpools, vanpools or car co-ops.

.2 Seniors Projects
• Where outdoor parking is provided, do not exceed 25 m (82’-0”) as the exposed walking distance from the parking lot to the building entrance.

• Provide a vehicular drop-off point that is designed with a height clearance for Handy Dart or overheight vans. Provide a weather-protected route to the building entry.

.3 Parking Space Identification
All parking areas shall meet municipal delineation regulations.

.4 Accessible Parking Spaces
Provide accessible parking, all with required pavement markings and signs, as required by municipal regulations and BC Building Code.

.5 Plug-in Heaters
Parking lots in colder climates should be provided with plug-in heater outlets. Install the outlets in impact resistant metal or concrete bollards adjacent to the parking stall and not across walkways to prevent cords running across the walkways.

.5 Site Drainage
.1 Ensure that site grading is designed to slope away from the building areas.

.2 Ensure that appropriate drainage systems are put in place to deal with run-off from adjacent sites.

.3 Ensure that area drainage is provided to avoid water and ice accumulation particularly in areas used by the residents.

.4 Consider using sustainable on site water management strategies. Where feasible, retain the maximum amount of existing planting materials and top soil.

.6 Snow Removal
.1 In areas with substantial snowfalls, the site plan must incorporate designated snow storage areas. These areas should be finished with “grass crete”, asphalt, or a similar material. Soft landscaping, including sod, should not be used in these areas.

.2 Avoid curbs, planters or other snow plough obstructions in parking areas.

.3 Location and type of fencing should be co-ordinated with the snow removal plan and CPTED guidelines.

.4 Ensure that areas intended for tenant access to the building are protected from ice and snow accumulation or shedding from the roof.

3 Building Design

3.1 Building Form
.1 Housing provided under BC Housing programs may take the following building forms:

• Emergency shelters or transition/second stage housing
• Medium-density housing such as townhouses, motel-type accommodations or low-rise apartment buildings
• High-density housing such as medium to high-rise apartment buildings
• Licensed group homes or licensed residential care facilities

.2 Subject to BC Housing approval, other housing forms may be considered depending on the specific needs of the client group and location of the project.

3.2 CONSTRUCTION METHODS
.1 For new construction, conventional wood frame construction is the standard form of construction. Where required by Code or determined to be more cost effective, concrete or structural steel framing can be considered.

.2 Alternative forms of construction, such as modular or pre-manufactured homes, which could improve the cost-efficiency of a project may be considered. A proposal for an alternative construction method shall be submitted at the schematic stage of the project and must take into consideration the life cycle cost of the system as well as the local skills available for the maintenance and future upgrades to the building.

Refer to Section 5 - Construction Standards, Division 01 23 00 Alternatives.

3.3 BUILDING DESIGN CONSIDERATIONS
.1 The building configuration should be simple, efficient and easy to build, without sacrificing a level of articulation and architectural expression that is consistent with the context of the site and the existing neighborhood.

Standardize unit types, kitchen and bathroom layouts within a project as much as possible. Avoid numerous small projections or recesses. Keep the foundation plan simple. Maintain continuity of load bearing walls between floors.

.2 Design projects to create an environment that is universally accessible and barrier-free. Common areas intended for tenant use should be universally accessible to all persons regardless of age and degrees of ability.

.3 Provide a building that is spatially efficient and designed to maximize the ratio of residential areas to required programme, support, circulation and service areas.

Co-ordinate and plan for amenity and support service spaces to maximize efficiency of circulation for both tenants and staff. The amenity spaces should be located centrally and grouped for efficiency and to encourage social interaction.

.4 Consider the principles of Crime Prevention through Environmental Design (CPTED) in the design of the building to ensure the security of the residents and staff, e.g., natural surveillance, activity support and access control as well as other recognized CPTED principles.

Refer to Section 4 - Crime Prevention Through Environmental Design.

.5 Design the building envelope to current code and industry best practices to prevent water penetration and envelope failure.

.6 Provide building forms and design that integrate the use of passive energy and sustainable design principles. Consider optimized envelope design, building massing and orientation, low-demand fixtures and use of renewable sources of energy to reduce demand on fossil-fuel based energy and reduce greenhouse gas emissions.

Refer to Section 3 – Energy and Environmental Design.

.7 Provide building materials and finishes that are durable and require low maintenance. Consider the requirements of the users, availability of maintenance products, and overall life cycle costs.

### 3.4 BUILDING SIZE (NEW CONSTRUCTION PROJECTS)

#### .1 Functional Program

.1 A Functional Program shall be prepared by the project team to confirm the space requirements of the user group and to confirm the efficiency of the building design. The Functional Program is to be submitted at Schematic Design Stage.

.2 The overall building efficiency is calculated as the Total Residential Area divided by the Gross Livable Area (GLA).

Gross Livable Area is defined as the sum of habitable areas above grade and excludes underground parkades, rooftop and underground service areas. For purposes of BC Housing's evaluation of building efficiency, commercial retail units and leased spaces will not be included in the Gross Livable Area calculation.

.3 The following approximate are the overall building efficiency targets:

- Projects with basic amenity and office space only 82%
- Projects with additional amenities and program space 77%
- Projects with common dining and meal preparation 70%

The Functional Program must be submitted to BC Housing in the format suggested below.

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**GENERIC FUNCTIONAL PROGRAM**

<table>
<thead>
<tr>
<th>Project Name:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Address:</td>
<td></td>
</tr>
<tr>
<td>Building Type (Wood-frame, Concrete)</td>
<td></td>
</tr>
<tr>
<td>Parking Type (Surface, Underground)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Function</th>
<th>Description of units/spaces</th>
<th>ft²/unit or room</th>
<th># of units</th>
<th>Total ft²</th>
<th>Total m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>a - Residential Units</td>
<td>Studios</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>One-bedroom</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Two-bedroom</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total # of units</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b - Resident's Amenity</td>
<td>Lounge</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Multipurpose rooms</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Resident laundry</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## General Functional Program

<table>
<thead>
<tr>
<th>Function</th>
<th>Spaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>c - Administration / Program Support</td>
<td>Offices, Staff washrooms, Staff Laundry</td>
</tr>
<tr>
<td>d - Circulation</td>
<td>Corridors and lobby, Stairs, Elevators</td>
</tr>
<tr>
<td>e - Service Rooms (if finished and located above grade)</td>
<td>Janitor’s Room, General Storage, Heat Treatment Room, Electrical/mechanical</td>
</tr>
</tbody>
</table>

### SUMMARY

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>a - Total Residential Area</td>
<td></td>
</tr>
<tr>
<td>b - Total Residents’ Amenity</td>
<td></td>
</tr>
<tr>
<td>c - Total Admin/Support</td>
<td></td>
</tr>
<tr>
<td>d - Circulation</td>
<td></td>
</tr>
<tr>
<td>e - Service Rooms (located above grade)</td>
<td></td>
</tr>
<tr>
<td>f - GROSS LIVABLE AREA (a + b + c + d + e)</td>
<td></td>
</tr>
</tbody>
</table>

Overall Building Efficiency (Total Residential area / Gross Livable Area) a / f: %

The project team is to use this as a guide in developing a functional programme to suit their specific requirements. The areas described above are provided only to suggest the type of spaces that can be categorized in each function.

### Cost Target Framework

1. For new construction projects, the BC Housing Cost Target Framework provides the project team with a basis for determining the building size and approximate development cost for the project. The Cost Target Framework shall be used by BC Housing as part of their review of the schematic and design development plans and the corresponding capital budget of the proposed project.

4 Building Common Areas

4.1 GENERAL

.1 Common areas within a building consist of

- amenity spaces used by the residents,
- the offices and spaces used by administrative and support staff,
- circulation space and
- service areas for maintenance and building services and storage.

.2 Provision for these spaces will depend on program objectives, the level of support services to be provided for the residents, project size, location and budget parameters. These guidelines may not apply to renovation projects.

4.2 INDOOR AMENITY SPACES

.1 General

Amenity spaces are an important part of developments funded by BC Housing. These spaces provide for meetings and social gatherings and should be designed to offer residents the option for social interaction and to encourage a sense of community within the project.

.2 Location

.1 The space should be centrally located and adjacent to the outdoor common space. It should be at grade and fully wheelchair accessible. Below grade amenity spaces are not acceptable. It is normally desirable to cluster the amenity space with other common facilities such as the laundry and project office.

.2 For family projects, the amenity space should be located adjacent to the children’s play area.

.3 There are 3 general levels of amenity spaces provided in BC Housing funded projects:

- Basic Amenities for Family and Independent Housing
- Additional Amenities for Supportive Housing and Assisted Living
- Amenities for Common Dining and Meal Preparation for Supportive Housing and Assisted Living

.4 Basic Amenities for Family and Independent Housing

.1 For projects which will provide housing accommodations only, the amenity space shall consist of a multi-purpose room, a kitchenette, an accessible public washroom, and storage room.

.2 The multi-purpose room shall be calculated as a minimum of 1.4 m² (15 ft²) per unit. For projects with less than 25 units, the multi-purpose room shall not be less than 35 m² (375 ft²). The accessible washroom and amenity kitchenette should be adjacent to the multi-purpose room.

.3 The amenity kitchenette is not intended to be used for commercial cooking purposes. It shall provide:
• a minimum of 2.4 m (8'-0") of cabinet frontage
• a double bowl stainless steel sink
• a 0.34 m³ (12.0 ft³) refrigerator
• a 76 cm (30") self-cleaning range
• microwave outlet and shelf

.5 Additional Amenities for Supportive Housing and Assisted Living

For projects which will provide housing and direct support services to the residents, additional space for socialization, group learning activities, recreational activities such as watching TV, reading and accessing the internet may be provided. The following spaces and requirements are proposed to meet these needs.

.1 Lounge / Activity Rooms

Lounges and activity rooms if provided should allow for socialization and recreation, and be designed to incorporate the following features:

• centrally located, near other tenant amenity rooms
• separate, sound rated rooms for active and passive functions
• adjacent to the outdoor recreation area
• storage room for tables, chairs and equipment

Within the lounge consider including a small amenity kitchenette with:

• cabinets with a minimum of 1219 mm (4'-0") of work surface
• full upper cabinet and base cabinet
• a double bowl stainless steel sink
• a 0.41 m³ (14.4 ft³) refrigerator
• microwave outlet and shelf

.2 TV Room

Provide the following features:

• outlets and space for a large screen TV
• sound rated walls STC 55 minimum
• design for residential furniture and finishes - easy chairs, sofa, etc

.3 Internet / Library

Provide for the following features:

• high speed internet connection
• space for individual work stations
• bookshelves
Locate internet or computer stations in common areas that be easily monitored by support staff.

.6 Amenities for Common Dining and Meal Preparation for Supportive Housing and Assisted Living

.1 For projects which will be funded to operate a commercial kitchen and meal service for the residents, it is recommended that a commercial kitchen designer be engaged early in the design process to advise on space and other system requirements for a commercial kitchen suited to the scale of the project.

.2 Requirements for ventilation, exhaust, fire suppression and other building code requirements as well food service operations must meet the requirements of the Authorities Having Jurisdiction including the local health authority.

.3 Locate the commercial kitchen with direct access to a separate service entrance or loading bay.

.4 Common dining rooms may be designed for single or multiple seating service depending on the scale of the project, building size limitations or type of meal service to be provided.

.7 Common Washrooms

A universally accessible common washroom(s) shall be provided adjacent to the common amenity space. This shall be designed to the requirements of the BC Building Code.

.8 Common Laundry

.1 Provide a wheelchair accessible common laundry room, located adjacent to the common amenity space. Doorways, millwork heights, location of outlets and type of laundry equipment must be suitable for use by persons with mobility or visual impairment.

.2 The recommended number of laundry equipment is as follows:
  • Family projects: One washer/dryer pair for every 15 units
  • Seniors/single residents projects: One washer/dryer pair for every 20 units

.3 Washers and dryers shall be commercial grade, Energy Star rated and shall be front loading on raised platforms. Owner or Operator to decide what type of operation is required for the laundry equipment (e.g. coin operated, card access).

.4 Provide a single bowl, stainless steel laundry sink and a table or countertop for folding dry laundry. The counter shall be installed at accessible height and shall be designed with an open knee space under the sink.

.5 The laundry room should be well ventilated to avoid moisture problems. Locate laundry rooms close to the exterior of the building to minimize the length of dryer duct runs and to avoid lint and moisture build-up within the ducts.

.6 Laundry rooms shall be provided with a floor drain complete with trap primer.

.7 Laundry rooms shall be finished in non-slip flooring with integral flash coved base.

.8 Provide glazed (safety or tempered glass) doors to improve security and access to the laundry room, to the maximum permitted by the BC Building Code.
.9 Lighting in laundry rooms should be triggered by motion detector or occupancy sensor.

.9 Smoking Area
.1 Designate an outdoor smoking area for tenants and staff.
.2 For non-smoking buildings considering LEED certification, review requirements for the minimum distance of outdoor smoking areas from adjacent doors and operable windows.

4.3 ADMINISTRATION AND PROGRAM SUPPORT SERVICES

.1 General
.1 Ensure that office areas have direct visual connection to the main entry door, elevator lobby and resident amenity areas.
.2 In each of the office spaces consider the following requirements:
  • security provisions
  • acoustic privacy – STC rating for walls
  • spatial requirements – adequate space for desk, seating area for meetings, files, office equipment

.2 Office Spaces
.1 For family and independent living projects: provide an office(s) for project administration and building maintenance. The office must have a lockable window, steel door with mail slot, and a dead-bolt. Provide for telephone, cable and data outlets. The common washroom should be convenient to the office.
.2 For supportive and assisted living projects: provide offices for administration, program support and building maintenance required by the Owner reflecting the functional and operational requirements of the project.

.3 Staff Washroom
Provide a washroom adjacent to the staff room with a toilet, sink, vanity and common washroom accessories such as toilet paper holder, soap dispenser and towel dispenser. The staff washroom shall be designed as a universal toilet room as defined by the BC Building Code.

4.4 SERVICE AREAS

.1 Underground/Enclosed Parking
Design underground parking areas to maximize building and occupant security. Consider safety provisions for stair and elevator lobby vestibules, including:
  • Maximize glazing with wired glass in steel frames in stair and elevator vestibules within the requirements of the applicable codes.
  • Light levels and lighting design for the parkade ramp, traffic aisles, vestibules, stairwells and elevator lobbies shall be designed as recommended in Section 4 – Crime Prevention Through Environmental Design (CPTED).
.2 Bicycle Parking
Provide secure bicycle parking for building occupants and staff; direct access to the exterior is preferred. Bicycle parking could also be provided through sheltered exterior bike racks, for example under canopy or overhangs.

.3 Garbage / Recycling Rooms
.1 Provide a conveniently located area for collection and storage of garbage and recyclable materials.
.2 In urban areas provide an enclosed garbage room with adequate room for garbage and recycling containers and tractor, if required for pick up. Include mechanical ventilation for odour control. Do not heat room or only provide minimal heat.
.3 Walls and floors of the room should be protected and designed to accommodate heavy equipment. Provide wash downs to drains. Consideration should be given to provide a hose bib close to garbage room.
.4 Where garbage bins are located outdoors or adjacent to parking areas, install the bins on a concrete pad. Do not install directly on the asphalt pavement.

.4 Receiving
Where the project requires a commercial kitchen, provide for a separate receiving or service entrance.

.5 Equipment Storage and Maintenance
.1 Provide an insulated, finished space for maintenance and storage, appropriate to the requirements of the project, with direct access to the exterior for garden and lawn maintenance equipment.
.2 The storage space must be heated, well lit, and have a minimum of four separate duplex outlets located at bench height.

.6 General Storage
.1 Provide a finished, heated room for storage of maintenance building materials.
.2 If required, provide unheated additional storage room (such as tenant's locker) to supplement the tenants' in-suite storage.

.7 Janitor Closets
Provide a janitor closet on the ground floor, minimum 2.8 m² (30 ft²) in area with a mop sink, shelves, mop brackets, sprinkler and floor drain. In projects with more than 50 units provide additional janitor closets on upper floors, such as at every third floor, as required for efficient access. Locate close to elevators.

.8 Postal Services
Where mail is not delivered to each unit, provide secure mailboxes located in the lobby area. Where there is no secure lobby area, ensure that the mailboxes are located in a secure common area which is protected from the weather. Review proposed mailbox location with Canada Post and the Owner.
.9 Utility Lock Boxes

.1 All lock boxes for utility service providers and fire department access must be clearly marked to identify ownership.

.2 Lock boxes installed on the exterior of the building shall be located at the main entrance, or in the case of multi-building sites such as townhouses, outside of a secure location on the site such as the site office, common room, or a selected service room.

.3 All external lock boxes must be flush-mounted only and should be anchored into the exterior structural wall system. Surface mounted lock boxes are not acceptable.

.4 All indoor lock boxes should be located in an area of high visibility under constant or frequent observation, such as the main lobby.

.10 Scooter Storage

For Seniors projects, provide a scooter storage room with:

• direct access to the exterior, located near the entrance to the building
• automatic door opener with access control
• outlets for recharging
• ventilation
• storage for spare batteries

.11 Mechanical and Electrical Rooms

.1 The Owner shall review the location, space and technical requirements with the mechanical and electrical consultants as part of the integrated design process to ensure the most effective design. Ensure that the mechanical and electrical rooms are located as close as possible to the entry point for utilities. Locate for efficient distribution, including space and access for servicing.

.2 Where service rooms are located adjacent to tenant suites, additional noise and vibration measures must be incorporated to ensure that the noise and vibration from the systems do not disrupt the residents living in those particular units.

.3 Mechanical and electrical rooms are to be painted and cleaned prior to turnover.

.4 If an exterior entrance is provided to mechanical or electrical rooms, ensure that a concrete walkway is provided.

.12 Heat Treatment Room (optional)

Provide for a heat treatment (or bed bug treatment) room, if appropriate to the project. Provide insulation to walls, floors and ceilings to allow the room to reach the required operating temperature throughout the room. Provide a heat source and provisions for exhausting heat after treatment or use. Instructions to staff for the use of the heat treatment room should be posted.

Refer to Section 5 - Construction Standards, Division 13 20 00 - Heat Treatment Room.
4.5 CIRCULATION AND ACCESS

.1 Entrance Lobby
   .1 Provide a level area minimum of 1500 x 1500mm (5'-0" x 5'-0") at the main entrance door, both outside and inside.
   
   .2 A building enterphone system shall be installed with easy to use controls, and installed functions below 1200mm (4') from the finished floor level and compatible with the security system.
   
   .3 Provide an accessible path from the main entrance to all parts of the building.
   
   .4 Provide mailboxes and shelf with adequate lighting levels and adequate font / label sizes located at an accessible location and height.
   
   .5 In cold climates such as the Interior and North regions provide a vestibule to prevent heat loss and drafts to the lobby area.
   
   .6 Provide a sitting area in the main lobby.

.2 Corridors
   .1 Common corridors serving more than four units shall be at least 1524 mm (5'-0") wide.
   
   .2 Provide visual interest to common corridors using features such as colour, provision of outside views and well designed lighting.
   
   .3 Provide colour contrast between floor and wall finishes.
   
   .4 Avoid long stretches of corridors; provide rest/ sitting areas if unavoidable.
   
   .5 Maximize glazing in public corridors including doors at fire separations, exit stairs and common areas as permitted by code to enhance personal security of residents.
   
   .6 Provide wall protection or corner guards in high traffic areas.
   
   .7 For seniors projects – in addition to the above, provide for the following:
      • provide handrails on each side of the corridor
      • travel distance shall not exceed 30 m (98'-5") from any suite entry door to the nearest exit
      • integrate hand rail design with parcel shelf at suite entry
      • dead end corridors shall be limited to 2 m (6'-7") in length

.3 Exit Stairs
   .1 Lighting at exit stairs and primary egress routes shall be 100 lx average illumination at floor and tread levels. Emergency lighting shall provide minimum 50 lx at stair treads and 20 lx in level paths of travel. These light levels are double the minimum building code requirements to accommodate the high percentage of tenants with visual impairment.
   
   .2 Incorporate day lighting from exterior windows whenever possible.

.4 Elevators
   .1 Buildings of two or more storeys above grade without direct grade access must have at
least one elevator conveniently located near the main entrance. All underground parking levels must be served by at least one elevator. Refer to 8.1 - Elevators of this section for the number of elevators for senior project.

.2 For seniors projects, provide a sitting area in the elevator lobby area.

.3 Ensure that floors are identified through colour coding and/or graphics.

.5 **Interior Stairs**

For 2 storey residential units, interior stairways should allow for the passage of queen-size beds and furniture without damage to walls. Provide a minimum width of 900 mm (3'-0").

.6 **Attic Access**

For security reasons, attic access shall be lockable and located in common areas such as corridors and lobbies.

.7 **Universal Access**

.1 All areas of the site and all parts of the building used by the residents shall be accessible and shall be designed to consider the safety of people of all ages and degrees of abilities.

.2 Floor and ground surfaces shall be stable, firm, slip-resistant, producing minimal glare and not be heavily textured.

.3 Changes in level, except elevating devices and curb ramps, shall be a maximum of 13 mm in height and shall be bevelled with 1:2 slope if more than 7 mm. Any change in level greater than 13 mm shall be sloped at a maximum 1:12.

.4 **Operating Controls**

- Operating controls such as door and window openers and locks, faucets, electrical outlets, switches, thermostats, fire alarm pull station and activation devices shall be installed with the centreline between 455 to 1067 mm (1'-6" to 3'-6") to center from the floor.

- Provide a clear level floor area of at least 750 mm (2'-6") wide x 1200 mm (4'-0") in front of miscellaneous services such as laundry facilities, mailboxes, garbage disposal, hose bibs including controls and operating mechanisms.

- Controls shall be operable with one hand, without tight grasping or pinching and with force not exceeding 22N; visual displays shall be colour contrasted and on a glare-free surface.

- Operating controls shall be illuminated to a level of 100 lx, and where reading is necessary to a level of at least 200 lx.

.5 Doorways in the accessible path of travel with a clear opening width not less than 863 mm (2'-10") throughout the building.

.6 For renovation or conversion projects, provide accessibility to areas where persons with disabilities could be reasonable employed or are expected to use and where providing such access would be practical.
5 Dwelling Unit Design

5.1 GENERAL

.1 The following design guidelines are intended for self-contained dwellings in multi-unit residential buildings, regardless of building form.

.2 Where units are intended for seniors or to be adapted for future modification for persons with disabilities, reference should be made to BC Building Code, Section 3.8.5 Adaptable Dwelling Units.

.3 Wherever applicable, adopt the 19-point universal design standards published in the SAFERhome Standards Manual. These standards provide a safer home environment for the residences and keep them active and independent in their homes.

5.2 STUDIOS

The general approach to the design of studios is to maximize the functionality and livability of limited floor space to allow for basic residential occupancy functions such as cooking, dining, sleeping, socializing, personal hygiene and storage. Flexibility in the application of the following unit design guidelines can be expected in view of the size of these compact units.

5.3 DWELLING UNIT FLOOR AREAS

Dwelling units shall be designed within the following Net Unit Areas. Net Unit Area is the dwelling area calculated from the centre line of party walls, corridor walls and the outside face of exterior walls, and includes in-suite storage.

<table>
<thead>
<tr>
<th>Unit Type</th>
<th>Bedroom</th>
<th>Sq. Metres</th>
<th>Sq. Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Townhouse</td>
<td>1</td>
<td>56 m²</td>
<td>600 ft²</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>90 m²</td>
<td>969 ft²</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>111 m²</td>
<td>1195 ft²</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>125 m²</td>
<td>1345 ft²</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>145 m²</td>
<td>1560 ft²</td>
</tr>
</tbody>
</table>

| Apartment/Single Storey          | Studio  | 33 m²      | 350 ft²  |
| Apartment (Motel Type)           |         |            |          |
|                                  | 1       | 54 m²      | 585 ft²  |
|                                  | 2       | 74 m²      | 795 ft²  |
|                                  | 3       | 93 m²      | 1000 ft² |
|                                  | 4       | 117 m²     | 1260 ft² |

.1 Net Unit Areas may be increased by a maximum of 12% to provide wheelchair accessibility.

.2 It is recommended that all interior hallways inside the suites are a minimum of 1015 mm (3’-4”). For accessible, seniors and adaptable units, it is recommended to have the minimum width of 1067 mm (3’-6”).
5.4 LIVING-DINING AREAS

.1 Suite Entrance

.1 Provide a defined, primary entrance area to the suite. Provide a coat closet with the following minimum dimensions:

<table>
<thead>
<tr>
<th>UNIT TYPE</th>
<th>COAT CLOSET</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Number of Bedrooms)</td>
<td>Minimum Width (mm)</td>
</tr>
<tr>
<td>1</td>
<td>900</td>
</tr>
<tr>
<td>2</td>
<td>1200</td>
</tr>
<tr>
<td>3</td>
<td>1500</td>
</tr>
<tr>
<td>4</td>
<td>1900</td>
</tr>
<tr>
<td>5</td>
<td>2250</td>
</tr>
</tbody>
</table>

.2 The entry coat closet must have a minimum effective depth of 600 mm (2'-0") and be equipped with a coat rod and a 300 mm (1'-0") deep shelf.

.2 Living Area

.1 Living areas shall be designed to provide for seating capacities in accordance with the requirements noted below. Seating capacity may be provided by any reasonable combination of sofas, love seats and armchairs.

<table>
<thead>
<tr>
<th>UNIT TYPE</th>
<th>LIVING AREA SEATING CAPACITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>One Bedroom Units</td>
<td>4</td>
</tr>
<tr>
<td>Two Bedroom Units</td>
<td>5</td>
</tr>
<tr>
<td>Three Bedroom Units</td>
<td>6</td>
</tr>
<tr>
<td>Four Bedroom Units</td>
<td>7</td>
</tr>
<tr>
<td>Five Bedroom Units</td>
<td>8</td>
</tr>
</tbody>
</table>

.2 Through circulation spaces should be a minimum of 850 mm (2'-10") wide.

.3 Suggested furniture layouts should be coordinated with baseboard heater and forced air vent locations as appropriate.

.3 Dining Area

.1 Dining areas shall be designed to provide for seating capacities in accordance with the requirements noted below.

<table>
<thead>
<tr>
<th>UNIT TYPE</th>
<th>DINING SEATING CAPACITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>One Bedroom Units</td>
<td>4</td>
</tr>
<tr>
<td>Two Bedroom Units</td>
<td>4</td>
</tr>
<tr>
<td>Three Bedroom Units</td>
<td>6</td>
</tr>
<tr>
<td>Four Bedroom Units</td>
<td>8</td>
</tr>
</tbody>
</table>
### 5.5 Bedrooms

#### 1. General

1. Locate bedrooms and sleeping areas so that they are visually isolated from the unit entrance.
2. Avoid designs that locate beds under windows.
3. Locate doors so that they are able to open a full 90 degrees.
4. Allow access to both sides and the foot of all beds.
5. Avoid possible conflict between the placement of beds and access to the clothes closet.

#### 2. Bedroom Types

The bedrooms are classified into three types as per the table below:

<table>
<thead>
<tr>
<th><strong>Bedroom Type</strong></th>
<th><strong>Bed</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>2 Single</td>
</tr>
<tr>
<td>B</td>
<td>1 Double</td>
</tr>
<tr>
<td>C</td>
<td>1 Single</td>
</tr>
</tbody>
</table>

Provide a combination of bedroom types as noted. The bedroom types are defined by minimum dimensions, areas and furniture requirements.

<table>
<thead>
<tr>
<th><strong>Unit Type</strong></th>
<th><strong>Bedroom Type</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>One Bedroom Units</td>
<td>B</td>
</tr>
<tr>
<td>Two Bedroom Units</td>
<td>A, B</td>
</tr>
<tr>
<td>Three Bedroom Units</td>
<td>A, B, C</td>
</tr>
<tr>
<td>Four Bedroom Units</td>
<td>A, B, C, C</td>
</tr>
<tr>
<td>Five Bedroom Units</td>
<td>A, B, C, C, C</td>
</tr>
</tbody>
</table>

#### 3. Bedroom Sizes

1. It is recommended that bedrooms are designed to the following minimum areas and dimensions.

<table>
<thead>
<tr>
<th><strong>Bedroom Type</strong></th>
<th><strong>Minimum Floor Area</strong></th>
<th><strong>Minimum Dimension</strong></th>
<th><strong>Minimum Closet Width</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>13.4 m² (144 ft²)</td>
<td>2.8 m (9’ - 2&quot;)</td>
<td>1.8 m (6’ - 0&quot;)</td>
</tr>
<tr>
<td>B</td>
<td>10.0 m² (108 ft²)</td>
<td>2.8 m (9’ - 2&quot;)</td>
<td>1.8 m (6’ - 0&quot;)</td>
</tr>
<tr>
<td>C</td>
<td>8.5 m² (92 ft²)</td>
<td>2.6 m (8’ - 6&quot;)</td>
<td>1.0 m (3’ - 4&quot;)</td>
</tr>
</tbody>
</table>

2. The required areas and dimensions shall be measured between finished wall surfaces.
.3 The required areas do not include closet areas.

5.6 IN-SUITE STORAGE

.1 General Storage
.1 Provide a total of 2.3 m² (25 ft²) of general storage for each dwelling unit. This can be provided in-suite or in combination with storage lockers elsewhere in the building.

.2 Provide three, 400 mm (1'-4") deep shelves along one wall of all in-suite storage areas.

.2 Linen Closet
Provide a linen closet with four shelves in a location readily accessible to the main bathroom and bedrooms.

.3 Bedroom Closets
Equip all clothes closets with one shelf and integral coat rods with an unsupported span of less than 1000 mm (3'-3"). Install to barrier free design heights in all wheelchair accessible units.

6 Kitchens and Bathrooms

6.1 KITCHENS

.1 General
The kitchen should be located adjacent to or connect directly with the dining area (e.g., a kitchen pass-through). Provide L-shaped kitchen configurations whenever possible. Avoid galley kitchen configurations.

.2 Fixtures and Appliances
.1 Provide for a stainless steel, double bowl sink with low-flow, single-lever faucet. Do not install a garburator.

.2 Provide for a frost-free refrigerator, easy-clean range and 2 speed 180 cfm range hood. Appliances shall be EnergyStar rated.

.3 For studios: A cooktop may be installed in lieu of a range, if specifically preferred by the user group. Provision of a single sink is acceptable if the product specified incorporates an overflow feature.

.4 For family projects: Provide plumbing and electrical rough-in to allow future installation of a dishwasher.

.5 For senior and adaptable unit projects: If required by the Owner, provide plumbing and electrical rough-in to allow future installation of a dishwasher.

.6 Waste pipes in bathroom and kitchen sinks shall be roughed into the wall no higher than 14" from floor level to the centre of the pipe. This will facilitate future lowering of the countertops when converting to a wheelchair accessible unit.
.3 **Counter Frontage**

Counter frontage or lengths shall be as recommended below. Counter frontage must be calculated from the front edge of the counter. Calculations exclude range and refrigerator spaces.

<table>
<thead>
<tr>
<th>Units</th>
<th>Length (mm)</th>
<th>Length (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>One and Two Bedroom</td>
<td>2440</td>
<td>8’ - 0”</td>
</tr>
<tr>
<td>Three Bedroom Units</td>
<td>2890</td>
<td>9’ - 6”</td>
</tr>
<tr>
<td>Four Bedroom Units</td>
<td>3340</td>
<td>11’ - 0”</td>
</tr>
<tr>
<td>Five Bedroom Units</td>
<td>3790</td>
<td>12’ - 6”</td>
</tr>
</tbody>
</table>

.4 **Kitchen Cabinet Design**

.1 Provide a minimum of four sliding drawers in each kitchen.

.2 Each base cabinet shall have one intermediate, fully adjustable shelf.

.3 Provide one standard base cabinet that includes one bottom roll-out shelf with a four-sided surround.

.4 All base corner cabinets shall have full height doors equipped with wire swing out swivel baskets or lazy Susan. Provide doors with a minimum leaf width of 230 mm (9”). Inaccessible corners are not acceptable.

.5 Provide D- pull handles which are easily graspable.

.6 Provide for a microwave shelf and outlet or allow for counter space for a microwave oven.

.7 Family projects: Provide a 600 mm (2’-0") base cabinet on one side of the sink cabinet that can be removed for future installation of a dishwasher.

Refer to Section 5 – Construction Standards, Division 12 32 00 – Manufactured Wood Casework, Division 11 30 00 – Residential Equipment, and Division 22 00 00 – Plumbing for detailed requirements.

.8 Wherever possible, cabinets under kitchen and bathroom sinks can be easily removed to allow future adaptability for wheelchair users.

6.2 **BATHROOMS**

.1 **General**

.1 The location of bathrooms should address the need for visual and acoustical privacy.

.2 Bathrooms and powder rooms should be accessible from a common hallway.

.3 Provide privacy locks on bathroom doors.

.4 Provide non-slip, resilient sheet flooring. The provision of floor drains in the bathroom should be considered, based on the anticipated need of the users.

.5 Ensure that accessories such as toilet paper holders, robe hooks and towel bars are conveniently located and easily reachable by the residents.

.2 **Fixtures and accessories**

Provide the following for all units:

.1 Provide low water consumption fixtures such as low flush water closets and low flow, single
.2 Vanities or lavatory countertops for three-piece bathrooms should have a minimum length of 900 mm (3'-0") and be equipped with a lockable drawer. Provide a plate glass mirror the same width as the vanity.

.3 Provide 600mm (2'-0") towel bars on solid backing, stainless steel shower rods with flange and nylon curtain hooks, chrome toilet paper holder and robe hook.

.4 Provide 600mm (2'-0") vertical grab bars with solid backing at both ends of the shower or bathtub.

.5 Provide 2" x 12" horizontal blocking installed at 900 mm (3'-0") from the top of finish floor around the shower, bathtub and beside the water closet for future installation of grab bars. Refer to Section 5 - Construction Standards, Division 22 00 00 Plumbing, for details on plumbing fixtures and accessories.

.6 Refer to Article 6.1 Kitchens for waste pipe height under bathroom sinks.

.7 For all new and renovation of existing buildings, install pressure/temperature control valves on all shower faucets.

.3 Studios and One Bedroom Units

.1 Provide one three-piece bathroom consisting of a 914 x 1524 mm (3' x 5') prefabricated fibreglass shower with curb, water closet, and lavatory basin with vanity.

.2 For renovation of existing buildings, the choice of showers or bathtubs shall be based on specific project requirements.

.4 Two Bedroom Units

Provide one three-piece bathroom consisting of standard size bathtub or 914 x 1524 mm (3' x 5') prefabricated fibreglass shower with curb, water closet, and lavatory basin with vanity.

.5 Three or More Bedroom Units

As above, plus provide one powder room consisting of a water closet and lavatory basin with vanity.

.6 Seniors Units

.1 Provide one three-piece bathroom including a 914 x 1524 mm (3' x 5') prefabricated fibreglass shower with seat and curb, adjustable telephone-type showerhead, water closet, and lavatory basin with vanity.

.2 The use of roll-in showers may be considered where necessary to meet the needs of target users.

.3 Provide ADA compliant low flush water closets with the seat at 430 mm - 480 mm (17" - 20") from the floor, with bolted lids.

.4 Provide solidly backed grab bars beside the water closet and in the shower installed in accordance with the 2012 BC Building Code Article 3.7.2.10.

.5 Grab bars shall be designed and installed to withstand a load of 1.3 kN.

.6 Refer to Section 7 Finishes and Materials for door width and swing requirements.
.7 Provide removable cabinets under kitchen and bathroom sinks if necessary to create an open knee space for wheelchair users in future. Refer to Section 6 Kitchens and Bathrooms for lowering waste pipe under sinks.

.8 Position bath and shower controls halfway between the outer edge and the centreline of the tub or shower enclosure to avoid having to lean in and reduce the potential slip and fall accidents. Refer to SAFERhome Standards Manual.

7 Finishes and Materials

7.1 GENERAL

.1 Provide a minimum of 2 colour schemes and sample board of finishes for unit interiors, building exterior and common areas for review by the Owner.

.2 Colour, patterns and cladding should be designed to provide emphasis to the main building entrance to assist people with visual impairments.

.3 Refer to Section 5 - Construction Standards for detailed requirements for interior and exterior finishes.

7.2 INTERIOR FINISHES

.1 General

.1 Design and construct wall, floor and ceiling assemblies to achieve a minimum Sound Transmission Class (STC) of 55 when tested in accordance with ASTM E90, “Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.

.2 Paint finishes shall be low odor and low VOC. Provide MPI specified products and systems.

.2 Interior Walls

.1 Walls within dwelling units and common areas shall be finished with painted gypsum board.

.2 For painting work in renovation or repair jobs, provide prime and finish coats from corner to corner and from floor to ceiling of affected walls.

.3 Interior Ceilings

.1 Ceilings in living and dining areas within tenant units shall be finished with gypsum board with a spray texture finish. Where an open living dining area is continuous with the kitchen area, provide a painted gypsum board finish.

.2 Kitchen and bathroom ceilings within tenant units shall be finished with painted gypsum board.

.3 Common Area ceilings shall be finished with painted gypsum board. Avoid the use of t-bar or acoustic tile ceilings. Areas where t-bar or acoustic tile ceilings are not avoidable, in particular for access to building services, should be limited to common areas which are easily supervised by building staff.
.4 Floor Finishes

.1 Dwelling Units

- Provide resilient sheet flooring throughout. Low maintenance, no wax and non-glare finishes are required.
- For family projects: direct glue-down carpets may be considered within the living and bedroom areas as an alternative to resilient sheet flooring.
- Bathrooms: slip-resistant sheet flooring.

.2 Tenant Common Areas

- Common areas (such as corridors and lounges) used by residents shall be finished in low maintenance, no wax and non-glare resilient sheet flooring.
- High traffic areas such as entrance lobbies may be finished with slip resistant ceramic tile.
- Administrative and Staff Areas
  Office and other spaces used by staff shall be finished in resilient sheet flooring or level loop direct glue down carpets.

.3 Common Laundry, Assisted Bathing Rooms, Commercial Kitchens

Provide non-slip safety flooring sloped to a clampable floor drain.

.4 Utility Rooms

Storage rooms and service rooms within the finished floor area shall be finished in resilient sheet vinyl.

.5 Baseboards

- For tenant suites: 4" painted wood baseboard
- For common areas: 6" painted wood baseboard
- For common laundry, assisted bathing rooms, commercial kitchen: flash coved base
- For service or utility rooms: standard vinyl base
- To prevent insects and bed bugs from getting behind the baseboard and wall, provide a continuous bead of sealant along:
  - the joint between floor finish and bottom of the wall sheathing
  - the top edge and underside of the baseboard

.6 Stair Treads, Risers and Nosings

Where resilient stair treads, risers and nosings are considered for common areas of the project, incorporate detectable warning strips at the top of stairs and visually contrasting nosings on each tread as required by applicable codes.

Refer to Section 5 - Division 09 68 00 - Carpet and Division 09 65 00 - Resilient Flooring for more detailed requirements.
7.3 DOORS

.1 General

.1 Rough in wiring at building entry and parkade lobby for future automatic door opener. Note future automatic door button locations on as-built drawings.

.2 For projects housing seniors and persons with disabilities, at least one power assisted door should be provided at the main entrance to the building.

.3 For renovations and conversion projects, the configuration of existing doors, opener sizes and sill heights should be reviewed to ensure that these meet current code requirements.

.4 Provide level or roll-over thresholds (flush or bevelled) at all doors, including balcony doors. Thresholds shall be no more than 13 mm high, with bevelled edges with a slope no more 1:2. Refer to SAFERhome Standards Manual for the details on exterior flush threshold to ensure water tightness.

.5 Commercial grade lever door handles are to be installed throughout.

.6 Doors must not open into a step.

Refer to Section 5 – Division 08 70 00 – Finish Hardware for more detailed requirements.

.2 Exterior and Suite Entry Doors

.1 All exterior and suite entry door leaf with a clear opening must be 900 mm (3'-0") minimum for all type of projects.

.2 Provide all exterior doors with weather protection consisting of a roof overhang or canopy extending past both door jambs.

.3 For exterior doors, provide a detail for the framing or forming at the sill to achieve a roll-over threshold while providing for good waterproofing at the door sill.

.3 Seniors, Wheelchair Accessible Units and Adaptable Units

.1 In wheelchair accessible units, all suite interior doors shall have a minimum leaf width of 914 mm (3'-0").

.2 In seniors and adaptable units, at least one bathroom and one bedroom doors shall have a minimum leaf width of 914 mm (3'-0"). The minimum width of all other interior door leaf and access to common living areas inside the suites must be 863 mm (2'-10").

.3 Suite entry door closers – provide low resistance, delayed action closers. Consider swing-free electronic closers in seniors units where the clients may have difficulty with standard door closers.

.4 Provide lever handles on all doors.

.5 Bathroom doors are required to swing out. Sliding pocket doors with D-pulls are acceptable.

.6 Avoid sliding exterior doors.

.7 Latch side clearance of minimum 600 mm (2'-0") on the pull side and 300 mm (1'-0") on the push side of the door shall be designed in the following locations:

- suite entry and all suite interior doors in wheelchair accessible units
- suite entry and at least one bedroom and one bathroom doors in seniors and adaptable units

.4 Other Interior Doors

.1 Except as noted above, the minimum width of all other interior door leaf width must be 863 mm (2'-10”).

.2 Provide bypass doors for all closets 1200 mm (4'-0") or wider. Provide bi-fold or swing doors (preferred) for all closets less than 1200 mm (4'-0") wide.

.5 Common Area Doors

.1 Maximize glazing in doors in public corridors including doors at laundry rooms, fire separations, exit stairs and common areas as permitted by code, to enhance building security.

.2 All doors in residential amenities, administration/program support, service and common areas should have a minimum leaf width of 914 mm (3'-0”). Latch side clearance should be met as specified above.

7.4 WINDOWS, SIDE HINGED AND SLIDING GLASS DOORS

.1 General


.2 Windows must be easily operable by persons with limited strength and dexterity.

.3 For new construction projects, provide casement or awning windows.

.4 For renovation and conversion projects:

• Review the configuration of existing windows, opener sizes and sill heights to ensure these meet current codes.

• Provide casement and awning windows. Where the operable unit creates a potential hazard in walking areas, sliding windows can be used.

.5 When design permits, provide windows in stairways and corridors to introduce natural lighting.

.6 Review the design and location of operable windows to address code requirements, security issues and the risk of falls.

.7 Provide window restrictors where requested by the Owner/Operators or as required by Code.

.8 Do not locate windows in bathtub or shower enclosures.

.9 The design of the windows should consider the daily light exposure and views of the
outdoor to achieve a healthy lit environment.

.10 Avoid the use of skylights in projects.

.2 Acoustic Considerations
For projects where an acoustic study has been prepared to address road, rail or other sources of noise, review the study to confirm any recommendations for window specifications and other mitigation measures.

.3 Window Cleaning
Windows shall be easily accessible for exterior cleaning. Where windows cannot be cleaned from inside, designers are to ensure that provision is made for windows that cannot be cleaned from grade level. Safety features such as roof top window washing anchors may be necessary for higher buildings.

.4 Window Coverings
.1 Provide drapes or blinds for all exterior windows. The choice of window treatment shall be made by the Owner.

.2 For renovation or conversion projects, review the dimensions of existing window coverings to determine if these are compatible with the new completed work. Installation of new window coverings may be necessary.

7.5 EXTERIOR FINISHES

.1 General
.1 The choice of exterior finishes should consider minimizing capital, maintenance and replacement costs without compromising the performance of the building envelope, comfort of the residents and a modest architectural expression that is consistent with the existing neighborhood.

.2 Refer to Section 5 - Construction Standards for detailed requirements for roof and exterior wall finishes.

.2 Roofing
.1 Roofing design and installation shall meet the requirements of the 10-year Guarantee Certificate of the Roofing Contractors Association of BC. Refer to Division 07 31 13 – Asphalt Shingles or Division 07 50 00 – Membrane Roofing for warranty requirements.

.2 Wherever possible, roof design should consider “high heel trusses” to allow increased insulation and better ventilation.

.3 Acceptable roof finishes include:
  • Asphalt Shingles
  • 2 ply SBS roof membrane

.4 Provide simple roof designs that address the high levels of precipitation in coastal regions and snowfall in interior and northern regions.

.5 Ensure that roof drainage is designed to avoid ice damming and to prevent rainwater runoff.
or snow shedding onto pedestrian pathways.

.6 Ensure easy access to all roof levels from within the building for roof maintenance. Provide a lockable, rated roof access hatch. Access to small roof areas by an exterior ladder is acceptable if access from the interior is not convenient and not more than 2 storeys from grade. Providing roof access from within suites is not acceptable.

.3 Exterior Wall Cladding

.1 It is recommended that all exterior wall cladding be designed with a rainscreen or a drained cavity system, except in geographical locations, exposure conditions and building form where this may not be necessary.


.2 Acceptable wall finishes include:

For wood frame buildings:
- Vinyl siding
- Fiber cement siding
- Stucco
- Masonry units

For non-combustible and high rise buildings:
- Metal panels
- Masonry units
- Pre-cast concrete panels
- Curtain wall systems – subject to capital budget consideration

BUILDING SYSTEMS

8.1 ELEVATORS

.1 Elevator Design Considerations

.1 Type of Elevator

The type(s) of elevator(s) for any given building should be selected from the following table:

<table>
<thead>
<tr>
<th>Number of Floors Above Ground</th>
<th>Type of Elevator Equipment</th>
<th>Minimum Rated Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 or less</td>
<td>Machine Room-Less Traction</td>
<td>150 fpm</td>
</tr>
<tr>
<td>5 - 10 Floors</td>
<td>Conventional or Machine Room-Less Traction</td>
<td>200 fpm</td>
</tr>
</tbody>
</table>
### Elevator Selection Criteria

<table>
<thead>
<tr>
<th>Floors Range</th>
<th>Type of Elevator</th>
<th>Speed (fpm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>11 - 24 Floors</td>
<td>Conventional or Machine Room-Less Traction</td>
<td>250</td>
</tr>
<tr>
<td>25-30 Floors</td>
<td>Conventional Traction</td>
<td>500</td>
</tr>
<tr>
<td>30 + Floors</td>
<td>Conventional Gearless Traction</td>
<td>700</td>
</tr>
</tbody>
</table>

Other types of elevating devices such as Lifts for Persons with Disabilities, Wheelchair Platform Lifts and Limited Use Limited Application (LULA) elevators shall not be used in place of a true elevator. The building shall be designed such that additional lifts of this nature would not be required.

#### 2 Number and Speed of Elevators

.1 The following criteria shall be reviewed to confirm the number of elevators required for the project.

The number of elevators required shall be determined based on the anticipated traffic patterns and demand in the building, using generally accepted elevatoring principles. The buildings covered by this section will be predominantly residential in use and typically exhibit traffic patterns that are more intense than typical residential buildings. Analysis shall be performed by an experienced Elevator Engineer or Consultant.

If secondary entrances from parking areas, walkways, tunnels or other areas are located at levels other than the main lobby level, the impact of such entrances on the elevator traffic patterns must be taken into consideration when calculating the elevator requirements.

Population density varies depending on the anticipated tenancy and the following table shall be used as a guide when selecting the figures for calculating the elevator requirements. The peak traffic patterns are generally two-way and all analysis shall be based on this type of traffic peak as well a traditional up peak analysis. Due to the nature of the buildings and tenancy, the inefficiency in the use of the elevators may be somewhat greater than in typical buildings and the following inefficiency values shall be used in the calculations.

The elevator analysis should determine the appropriate speed of the elevators to provide good elevator service and the minimum rated speed shown in the preceding section above shall be used as a guide only.

The number, size and speed of elevators and the type of doors shall be determined using elevatoring analysis calculations and simulation techniques. Analysis should be performed for both up peak traffic periods and for two way traffic periods to determine the anticipated elevator performance level that would result to provide the anticipated demand on the elevators. As a minimum the following criteria should be utilized for the applicable building type and the following guidelines for elevator performance (interval and waiting time) should be targeted as maximums.

#### Building Population and Use Criteria

<table>
<thead>
<tr>
<th>Type of Tenancy</th>
<th>Population Density (persons per bedrooms)</th>
<th>Inefficiency Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Studio</td>
<td>1.0</td>
<td>10%</td>
</tr>
<tr>
<td>Seniors</td>
<td>1.2</td>
<td>25%</td>
</tr>
</tbody>
</table>
**SECTION 1**

**General Design Guidelines**

| Families | 1.8 | 20% |

**ELEVATOR SYSTEM PERFORMANCE CRITERIA**

<table>
<thead>
<tr>
<th>Type of Tenancy</th>
<th>Minimum 5 Minute Handling Capacity as a Percentage of Total Building Population</th>
<th>Maximum Lobby Interval (for Up Peak traffic periods)</th>
<th>Maximum Average Waiting Time (for Two Way traffic period)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Studio</td>
<td>10%</td>
<td>50 seconds</td>
<td>30 seconds</td>
</tr>
<tr>
<td>Seniors</td>
<td>7%</td>
<td>50 seconds</td>
<td>40 seconds</td>
</tr>
<tr>
<td>Families</td>
<td>7%</td>
<td>50 seconds</td>
<td>30 seconds</td>
</tr>
</tbody>
</table>

.2 Seniors Projects:

A minimum of two elevators are required in projects intended for Seniors to ensure that elevator service is available at all times for the safety and convenience of tenants. Elevators shall be conveniently located near the main entrance.

The location of high traffic areas of the building such as lounges, laundry facilities, gardens, mail rooms and other amenity rooms must be taken into consideration when calculating the elevator requirements. If these areas are located at levels other than the main lobby level, their impact on the elevator traffic patterns should be taken into consideration when calculating the elevator requirements. Meal time may place the highest demand on the use of the elevators and where centralized dining facilities are used that rely on transporting tenants to and from the dining areas the peak traffic created by such movement should be utilized in determining the elevator requirements.

.3 Supportive Housing (additional supports and program space provided)

Passenger demand in buildings of this nature may be more constant and prolonged than in typical residential buildings and this should be taken into consideration when determining the elevator requirements.

.4 All Others

Where the building is 6 or more storeys in height, or where accessible / adaptable units are provided, there should be at least two (2) elevators.

.3 Elevator Location

.1 Elevators should be located in a location that compliments the function and traffic flow of the building. Ideally, elevators should be located within the main entrance lobby of the building and visible from the main entrance.

.2 Elevators should be located in close proximity to the geometric centre of the building to allow balanced access to all parts of the building. For most projects it is recommended that the distance from the farthest suite or room to the elevator(s) should not exceed 45 m (150ft). For seniors projects, it is recommended that the distance from the farthest suite or room to the elevator(s) and nearest exit does not exceed 30 m (98’-5”).

.3 The elevator hoistway and machinery areas shall be isolated from residential rooms in the building with mechanical shafts, stairwells or corridors where possible. If the hoistway or machinery areas must be adjacent to residential rooms, then the wall shall have an effective
minimum sound transmission rating of STC 55. This will require a wall assembly rated at STC 60.

.4 Elevator Group Arrangement

.1 Elevators should be grouped, avoid single elevators in various parts of the building. Where two or more cores of elevators are provided in separate parts of the building, then each group must have additional capacity to account for the possible imbalance in the traffic between the groups.

.2 Where a group of elevators is provided, the group must be arranged to minimize walking distance among or between the elevators.

.3 Where two elevators are provided in a group the cars should be arranged side by side with no separation between the hoistways.

.4 Where three or four elevators are provided in a group the cars should be arranged side by side in a row or two side by side opposite the other(s).

.5 Larger groups of elevator should have a maximum of 4 cars in a row side by side.

.5 Lobby Size

.1 The size of the main lobby area must allow for the loading, unloading and queuing of passengers and other goods or materials that will be transported by the elevators. The lobby width should not be less than 3 m (10') in width.

.2 Where a single elevator is provided, the lobby width at typical floors shall not be less than 1.5 m (5').

.3 Where a group of elevators is provided, the lobby width at typical floors shall not be less than 1.8 m (6') where the elevators are side by side and not less than 2.7 m (9') where the elevators are opposite.

.6 Floors Served

.1 All elevators in a group shall serve the same floor levels including parking levels if applicable.

.7 Machine and/or Control Room Location

.1 Control rooms for Machine-Room-Less traction elevators should be located adjacent to the elevator hoistway at or near the top landing of the elevator(s). Control spaces that do not permit full body entry into the space containing the control equipment shall not be provided. Remote control rooms should only be provided when suitable space is not readily available adjacent to the top elevator landing or hoistway overhead area.

.2 Conventional traction elevator machine rooms shall be located directly overhead of the hoistway unless Municipal zoning height restrictions apply.

.8 Capacity and Size of Elevator

.1 Elevators shall be of minimum dimensions to provide access for persons with disabilities and to accommodate a mobile stretcher in the prone position or as otherwise required by the governing codes and regulations. A standard 1134 kg (2500 lb) passenger elevator with a 1067 mm (42") single panel side opening door is the minimum size of elevator acceptable.
The elevator shall have internal cab dimensions no less than 2032 mm (80") wide by 1295 mm (51") deep.

.2 Where other door dimensions or configurations are contemplated, the platform and cab inside dimensions shall be adjusted to meet the stretcher requirements.

.3 For buildings intended for seniors or other persons with impaired mobility the minimum size elevator should be increased to a standard 1600 kg (3500 lb) passenger elevator with internal dimensions no less than 2032 mm (80") wide by 1650 mm (65") deep.

.4 Service elevators provided for the movement of goods and materials, beds or for longer term care purposes should be hospital / service shaped elevators with minimum 2045 kg (4500 lb) capacity rating, 1220 mm (48") wide doors and 2410 mm (7'-11") cab depth

.5 All elevator cabs shall have a clear height inside of not less than 2590 mm (8'-6") below the cab ceiling or suspended light fixture.

.9 Elevator Fire and Life Safety Features

.1 Elevators shall be equipped with Firefighter’s Emergency Operation Phase I & II as defined by the B44 Elevator Safety Code and as a minimum regardless of whether these features are required by the building code or not. Provide automatic recall, alternate floor recall, machine room smoke sensor recall and recall by hoistway or pit fire detectors (if applicable) all in accordance with the B44 Elevator Safety Code.

.2 Elevator emergency power operation need only be provided for “high” buildings as defined by the applicable building code and for any elevators that are designated for use by Firefighters.

Refer to 8.3 Fire and Life Safety Measures and Section 5 – Division 14 20 00 – Elevators for technical requirements.

.10 Elevators in Renovation or Building Conversion Projects

.1 Existing elevators in buildings that are renovated or converted for other uses shall be upgraded or replaced to meet current standards for operation, reliability, performance, safety, accessibility and to reasonable standards of cleanliness and appearance. Alterations or replacements to existing elevators should include the necessary scope to meet the technical requirements of Section 5 – Division 14 20 00 – Elevators. The size, location and speed of existing elevators can remain unchanged in most instances unless these are deemed inappropriate for the on-going use and operation in the building.

.2 Consideration should be given to replacing hydraulic elevators that use in-ground buried hydraulic cylinders with traction elevators of the Machine-Room-Less (MRL) type as an alternative to merely upgrading the hydraulic elevator and its components.

8.2 MECHANICAL AND ELECTRICAL

.1 Heating, Ventilation and Cooling Systems

.1 Heating, ventilation and cooling systems in multi-unit residential buildings shall be designed to use 26% less energy than required by ASHRAE 90.1-2007.

.2 Projects are to be designed to achieve:
• Minimum eight points with the LEED® NC 1.0 2009 rating system (for new construction projects)

• Projects are encouraged to exceed the above noted energy requirement and to optimize reduction of greenhouse gas emissions and total life cycle cost of the building.

.3 Refer to Section 3 - Energy and Environmental Design.

.2 Plumbing Systems

.1 Provide water efficient plumbing fixtures including low flow shower heads and faucets and low-flush water closets.

.2 Water supply piping in exterior walls is not permitted unless it is installed in a furred-out chase on the warm side of the wall. Do not embed piping in the wall insulation.

.3 Avoid plumbing within party walls. Provide chases as required to avoid this condition. If plumbing within party walls is unavoidable, engage the services of an acoustical consultant to provide design, site inspection and testing services to ensure STC55 is achieved in party walls.

.4 Avoid sump pumps for storm and sanitary wherever possible.

.5 Permanent structures must not be located over any underground site services.

.6 Provide non-freeze hose bibs at roof level for the maintenance of solar panels or green roofs where provided on a project.

.3 Electrical

.1 Mount light switches, thermostats and other controls at 1067 mm (3'-6") from the finished floor to the center of the outlet or control box. Locate convenience outlets no lower than 455 mm (1'-6") above finished floor to the centerline of the outlet.

.2 Provide an electrical outlet near all bedroom windows (for future curtain controls), top or bottom of the stairs (for future stair gliders) and above suite entry doors (inside – for future door opener).

.3 Consideration should be given to installing a 4-plex convenience outlet on each side of the bed of master bedroom to avoid the use of extension cords and potential fire hazards.

.4 If possible, place an electrical outlet on a side wall beside a counter to make it easier for those people who cannot reach the back.

.4 Metering

.1 Design metering to meet the operational requirements of the project and in compliance with the metering requirements of the utility provider. These requirements should be clearly stated at the start of the design phase.

.2 Typically, independent metering is to be provided for each of the following areas:

• Gas: Separate meters for residential areas, common areas and lease spaces

• Electricity: Separate BC Hydro meters for residential areas, common areas, lease spaces and common lease space. Each residential unit shall be provided with a meter base for
future individual metering.

The intent is for the project to have a single BC Hydro master meter on the entire service with separate BC Hydro meters for residential, residential common, lease spaces and common lease space, with the ability to change to individual residential metering in the future should the project parameters change.

Refer to BC Hydro metering requirements on their website.

.5 **Security Systems**

.1 The Consultant shall review security issues at the design development stage and incorporate cost effective security systems, subject to review by the Sponsor and BC Housing. The technical requirements for these systems shall be identified during the design stage to allow for coordination and inclusion in the contract documents.

.2 Security measures may include access control systems, surveillance systems and security alarms, based on a threat and risk assessment, in accordance with CPTED principles. Related costs must be identified prior to project commitment.

Refer to [Section 5 - Division 26 00 00 - Electrical](#).

.6 **Personal Call Systems**

For assisted living projects, equipment and wiring for a personal call system shall be installed in the common areas. Electrical outlets and telephone jacks shall be provided in the residential suites to allow the installation of a personal call system.

### 8.3 FIRE AND LIFE SAFETY MEASURES

.1 **Suppression and Fire Containment**

.1 Provide sprinkler protection for all projects. Comply with the BC Building Code, BC Fire Code, NFPA, and Authority Having Jurisdiction.

.2 Provide listed “residential” sprinklers in all suites, adjoining corridors and common areas, except where prohibited by NFPA or the sprinkler listing. NFPA allows quick response sprinklers; residential types are considered to provide a greater level of safety. Where applicable, use wall mounted sprinklers at top floors to minimize attic space air leakage and freezing of pipes in unheated spaces.

.3 Firestopping of penetrations in fire separations shall use firestopping and smoke seal systems listed by Underwriter’s Laboratory of Canada (ULC) or an approved independent testing agency. Refer to [Section 5 - Division 07 80 00 - Firestopping and Smoke Seals](#) for detailed requirements.

.4 For renovation and conversion projects, installation of a sprinkler system can result in impacts to other fire detection and alarm systems. Review of the entire Fire and Life Safety systems must be completed prior to undertaking a sprinkler installation.

.5 For renovation and conversion projects consideration must be given to Section 5.6 of Division B of the British Columbia Fire Code and Part 8 of the BCBC (Safety Measures at Construction and Demolition Sites). Prior to commencement of construction or demolition, a fire safety plan must be prepared (and maintained for the duration of the construction
project) that addresses issues involving fire separations in occupied buildings. If the required fire separation or life safety system cannot be maintained any time during the project, the contractor must ensure that alternate fire safety provisions are added during that period (i.e. a manual fire watch).

.2 Fire Detection and Alarm

.1 Provide a fire detection and alarm system as required by the BC Building Code and local authorities having jurisdiction.

.2 For projects where smoke alarms are at risk of being severely tampered or obstructed by the suite occupants and where 24/7 operations staff are available, the Society may consider using combination photo-electric smoke detector/rate-of-rise heat detector which shall be electrically supervised by the fire alarm system. Note that except for the City of Vancouver, this initiative may require a Building Code or municipal building bylaw relaxation.

.3 The combination photo-electric smoke detector/rate-of-rise heat detector shall be tamper-resistant to prevent removal.

.4 Note that the “high sensitivity level” setting cannot be used in the suites as it is unlikely that the residential suites can be considered smoke-free controlled environments.

.5 Where a fire alarm system is not required, install smoke alarm(s) with an integral silence switch.

.3 Fire Safety Plan

The contractor shall prepare a fire safety plan and documentations in accordance with the current BC Fire Code and the Vancouver Fire Bylaw, unless otherwise specified by the Owner/Operator. Refer to Division 01 78 00 Closeout Submittals.

9 Site and Landscape Design

9.1 Landscaping

.1 General

.1 Provide exterior landscape designs which are simple in nature with low maintenance and durability as the highest priorities.

.2 Provide a reasonable balance of hard and soft landscaped areas. Incorporate interest in landscaped areas by providing a variety of colour, texture, height and massing.

.3 Preference in plant selection should be given to the utilization of native plant species and those which require minimal ongoing maintenance. For sloped areas, review appropriate planting material suitable for that area.

.4 The landscaping of interior courtyards and suspended concrete slabs over parkades requires particular consideration in order to avoid ongoing maintenance problems. Built-in planters and large trees with aggressive root systems in these locations are not acceptable.

.5 To facilitate the maintenance of waterproofed suspended slabs, provide removable landscape finishes such as concrete pavers or movable planters in lieu of large landscape
overburden or poured concrete finishes. Review RCABC Guarantee requirements to avoid the need for moisture detection systems in these areas.

.6 Avoid large heavy planters that could damage concrete pavers and the waterproofing membrane.

.7 Grass areas should be eliminated or minimized. Avoid grass areas in sloping areas or small areas of sod in locations not readily accessible to a lawn mower, e.g. narrow fingers of sod between parking spaces and small areas on elevated concrete slabs or interior courtyards.

.8 Locate trees to avoid maintenance and foundation problems. Trees are to be placed a minimum 4.5 m (15') away from the building. Avoid close proximity to gutters, catch basins and building perimeter to avoid problems from build-up of leaves.

.9 Locate trees so as not to obscure natural surveillance into an area or block or screen lights.

.10 Provide benches that are designed and constructed with backs and arms. Outdoor furniture and seating are to be durable, low maintenance and universally designed.

.11 All landscaping, including movable planters, should be separated from the building by a minimum 6" wide gravel strip and have a minimum clearance of 8" from the underside of the cladding. Window boxes are not acceptable.

.2 Landscape Irrigation

.1 To promote water conservation, provide native or drought resistant landscaping in order to avoid the need for a permanent landscape irrigation system. Providing temporary irrigation from hose bibs on the exterior of the building to help establish initial planting may be considered.

.2 It is acknowledged that provision of permanent landscape irrigation may be necessary in certain regions of the province or under certain operating conditions. Review of the Owner’s operating requirements should be undertaken at the initial design stages of the project.

.3 Consider the use of captured or harvested rainwater for site or landscape irrigation.

9.2 WALKWAYS, SIDEWALKS AND CURBS

.1 Provide concrete curbs to all interior roadways. Provide broom finished concrete sidewalks to all interior roadways, building entrances and common areas with exterior access such as the amenity rooms. Connect project sidewalks to the municipal road system.

.2 Sidewalks should meet accessible requirements defined by Code including maximum grades, slopes and cross slopes, location and sizes of obstacles, guard and handrail requirements and curb cuts.

.3 Curb cuts for wheelchair or stroller access should be as gradual as possible and should not project into the roadway. Where a curb cut is in the path of travel, the sides should be sloped to avoid the problem of pedestrians, especially the visually impaired, from unexpectedly stepping down into the cut.

.4 On the downhill side of sloped sidewalks, provide guards and tapping rails for the safety of persons with mobility or visual impairments.
.5 Where frequent snow removal is required, provide low profile curb and gutter section.

.6 Walkways shall be constructed using concrete, unit pavers or other materials which have an even slip-resistant surface. Where precast or unit pavers are used, ensure that joints are flush as possible to a maximum tolerance of 6 mm (1/4").

.7 In order to improve visibility of walkways without additional lighting, use products that create contrast in colour and/or texture. For example, use a different boundary colour and/or texture on the perimeter of walkways.

.8 Review the site layout and provide handrails in walkways which have a significant slope.

.9 Walkways should be located to avoid conflict with open casement or awning windows and door swings.

9.3 BUILDING SIGNAGE

.1 Provide easy to read building signage. Minimum letter size should be 100 mm (4") or as required by the municipality. Provide a 70% contrasting colour background. Position signs to avoid shadow areas and glare.

.2 Provide directional signage for sites with more than one building.

9.4 EXTERIOR LIGHTING

.1 Provide lighting to circulation routes, stairs, ramps and outdoor amenity areas to at least 100 lx at ground level.

.2 Provide lighting with minimal contrast and smooth transition between lit and unlit areas for parking areas, all walkways, entrances, patios and open balconies to maximize the security of tenants.

.3 Provide motion sensors to activate lighting on secondary walkways and photo sensors for exterior building and primary walkway lighting to reduce electrical power consumption.

.4 Exterior light fixtures should be energy efficient and low maintenance and should not create shadows, excessive glare, light pollution, upwards aiming light or direct lighting into residents’ units. Refer to Section 4 – Crime Prevention Through Environmental Design and LEED® Canada.

9.5 FENCING

.1 Provide fencing with a degree of transparency at the perimeter of the site.

.2 Provide fencing or screening to protect tenants and children from access to potentially dangerous areas such as gas meters, electrical transformers, roads and steep slopes.

9.6 RETAINING WALLS

.1 All abrupt vertical changes in grade greater than 610 mm (2'-0") shall be retained by a modular or poured in place concrete retaining wall engineered to resist the lateral pressure of the retained material.
.2 Vertical grade changes greater than 610 mm (2'-0") are required to have a 1070 mm (3'-6") high guardrail. Where guardrails are located along walkways, provide graspable handrails installed at a maximum height between 865-965 mm (2'10"-3'2") from the ground.

.3 Provide drainage behind all retaining walls.

## 10 Wheelchair Accessible and Adaptable Dwelling Units

### 10.1 GENERAL

Projects may be designed to include units modified for wheelchair accessibility. For new construction, it is required to develop at least 5% of the total units as wheelchair accessible. Depending on the municipalities and need and demand study in the community, this number may increase to accommodate more wheelchair accessible units in a project. Unit areas may be increased by up to 12% to accommodate wheelchair accessibility.

### 10.2 WHEELCHAIR ACCESSIBLE UNITS

#### .1 General

Wheelchair accessible units shall be designed in accordance with the BC Building Code. Reference shall also be made to CSA B651-04 Accessible Design for the Built Environment for design guidelines not covered by Code.

#### .2 Circulation

.1 Provide a clear 1500 mm (5'-0") turning radius:
  - inside and outside of suite entrance doors
  - inside the bedroom
  - inside the bathroom, (radius to be clear of all cabinets and fixtures)
  - inside the kitchen (radius to be clear of all cabinets and fixtures)

.2 Provide a 900 mm (3'-0") minimum clearance for circulation in the living area.

#### .3 Unit Entrance Weather Protection

Provide weather protection at the primary unit entrance.

#### .4 Doors

.1 Refer to Section 7 Finishes and Materials for door width, latch side clearance and threshold. Provide hinged balcony or patio door.

.2 Install low resistance, delayed action closers for all doors on accessible routes, including suite entrance doors.

.3 In projects with wheelchair accessible units, consider the use of kick plates at least 250 mm (10") high on the push side of doors in high traffic areas to prevent doors from damage.

#### .5 Windows

.1 Windows should be designed so that the sill is no more than 750 mm (2'-6") above the floor.
.2 Ensure that hardware for operable portions of windows are not more than 1200 mm (4'-0") above the floor. Provide window restrictors where required by Code.

.6 Kitchen

Provide L-shaped configurations wherever possible. Galley kitchen configurations are considered a hazard and therefore are not recommended.

.1 Cabinets

.1 Provide a counter height at a maximum height of 812 mm (32").

.2 Provide at least one work surface that is 760 mm (2'-6") wide x 600 mm (2') deep, with a centred knee clearance at least 760 mm (2'-6") wide x 500 mm (1'-8") deep x 685 mm (27") high .

.3 Provide a knee clearance centered on the cook top at least 760 mm (2'-6") wide x 250 mm (10") deep x 685 mm (27") high with an additional toe space at least 760 mm (2'-6") wide x 250 mm (10") deep x 250 mm (10") high.

.4 Provide a pull-out work surface with hardwood or plastic laminate top below the counter and an additional pull-out shelf below the wall oven.

.5 Provide full-extension pull-out shelves with minimum 40 mm (1.6") raised edges or drawers on free-rolling mechanical slides rather than fixed shelving in base cabinets.

.6 Provide a base cabinet toe space of 150 mm (6") deep x 250 mm (10") high.

.7 Cabinet doors shall be provided with easily graspable D pulls.

.2 Kitchen Sink

.1 Provide a double bowl stainless steel sink, complete with insulated hot water supply, insulated off-set drain, and pressure balanced single lever faucet.

.2 Provide a knee clearance centered on the sink at least 760 mm (2'-6") wide x 250 mm (10") deep x 685 mm (27") high with an additional toe space at least 760 mm (2'-6") wide x 250 mm (10") deep x 250 mm (10") high.

.3 Appliances

.1 Appliances in wheelchair accessible units should include the features as noted below:

.1 Dishwasher: front loading, porcelain liner.

.2 Refrigerators: frost free; ADA compliant top freezer refrigerators with all controls not more than 1200 mm (4') above finished floor and allow one-hand operation.

.3 Cooktop: four elements, front controls.

.4 Range hood: two speed ducted range hood with light and fan controls mounted on the front of the counter.

.5 Wall Oven: side opening swing door, self cleaning, installed at 700 mm - 840 mm (2'-4" to 2'-9") from floor to bottom edge, with pull-out shelf below.

.6 Provide outlets for microwave ovens to be installed at the countertop.
.2 Provide convenience outlets, light, and fan controls at locations accessible from seated positions.

.7 Bathroom

.1 Provide a vanity counter with a maximum height not more than 812 mm (32").

.2 Provide a knee clearance centred on the sink at least 760 mm (2' - 6") wide x 250 mm (10") deep x 685 mm (27") high with an additional toe space at least 760 mm (2' - 6") wide x 250 mm (10") deep x 250 mm (10") high. Provide a lavatory with pressure balanced single lever faucet, insulated hot water supply, and off-set drain.

.3 Provide a 914 x 1524 mm (3' x 5') prefabricated fibreglass roll-in shower. Provide wall-mounted folding seats that will allow lateral transfer from a wheelchair. Provide low flow, pressure balanced shower valves with telephone type shower head on adjustable slide bars. Provide anti-scall protection for showers.

.4 Provide ADA compliant low flush water closets with the seat at 430 mm - 480 mm (1' - 4" to 1' - 7") from the floor, with bolted lids.

.5 Provide a 900 mm (3'-0") transfer space beside the water closet.

.6 Provide solidly backed grab bars beside the water closet and in the shower installed in accordance with the 2012 BC Building Code Article 3.7.2.10. Grab bars shall be designed and installed to withstand a load of 1.3 kN.

.7 Provide a mirror with bottom edge no more than 1000 mm (3' - 4") from the floor.

.8 Bathroom doors should open out to ensure that the bathroom door can be opened in case of emergency. Sliding pocket doors with heavy duty “D” pulls are also acceptable.

.9 Bath and shower control positioning: all controls are offset from centre, roughly 1/2 way between center location and the outside edge of the shower or tub enclosure.

.10 Provision of a trench drain could be considered in the shower enclosure design. Refer to SAFERhome Standards Manual.

.8 Operable Fixtures

All operable fixtures, including cabinet and window hardware, must be accessible and easily operable by persons with limited strength and dexterity.

.9 Storage

Provide for storage closets rather than storage rooms for easy access. Closet widths less than 1200 mm (4' - 0") are not recommended.

.10 Clothes Closets

All clothes closet rods must be adjustable from 1200 to 1400 mm (4' - 4' - 8") above finished floor.

.11 Electrical Items

.1 Refer to Article 8.2.3 Electrical in this section for mounting height and outlet placement.

.2 In bedrooms, in addition to the switched ceiling mounted fixture, provide a three way switched wall outlet adjacent to the bed; one switch at the door to the room, and one
adjacent to the bed.

.3 Light fixtures must contain two or more bulbs.

.4 Provide a ground fault current interrupter (GFCI) electrical outlet at the bathroom vanity, in a location accessible from a seated position.

10.3 ADAPTABLE UNITS

Adaptable units are designed and constructed to facilitate future modification to provide access for persons with disabilities. The requirements for the design of adaptable units are set out in Section 3.8.5 Adaptable Dwelling Units of the BC Building Code.

Designing for adaptable units will allow residents to age in place if they desire or allow adaptations in their units to meet possible changes in their physical abilities. The number of adaptable units in projects will be based on the Owner's requirement supported by a need and demand in that geographical location. This will allow flexibility for future access for persons with disabilities at minimal additional cost.

It is required that all suites in multi-unit residential buildings for seniors be designed as adaptable units. Adaptable units shall consider all other design requirements contained in the BC Housing Design Guidelines including the following features below. Where there is a conflict, the more stringent shall prevail.

.1 Access requirements

.1 Refer to Section 2 Location and Site Planning for exterior and interior access route and other requirements.

.2 Refer to BC Building code section 3.8.5 for corridors and passageways providing access to adaptable dwelling units entrances and common facilities.

.3 Refer to Article 4.5.7 Universal Access for minimum width of doorways in the accessible path of travel throughout the building.

.4 The construction of adaptable units and the building in which they are located shall comply with all the other access requirements called for in the BC Building Code.

.2 Doorways to adaptable dwelling units

.1 Refer to Section 7 Finishes and Materials for door width, latch clearance and other requirements for adaptable units.

.2 Floor space in at least one bedroom and one bathroom shall have a level front clearance of 1500 mm (5'-0") on the pull side of the door and 1200 mm (4'-0") on the push side of the door.

.3 Adaptable Dwelling Unit Bathrooms and Kitchens

.1 Bathrooms in adaptable units shall be designed to allow manoeuvrability and access to the shower, lavatory and water closet by persons using mobility aids such as walkers. Some requirements are:

- a 914 x 1524 mm (3' x 5') prefabricated fibreglass shower with curb. Location of the shower fixtures should be easily reached by the people with wheelchairs.
• A dimension from the front edge of the toilet to the facing wall of not less than 850 mm (2'-10").
• A dimension from the front face of the shower to the centreline of the toilet not less than 510 mm (1'-8").
• Units with bathtub should be designed to allow easy conversion to shower units.
• A clear floor area in front of the lavatory not less than 760mm (2'-6") wide x 1220 mm (4'-0").
• Provide 2 x 12 solid wood backing for future installation of grab bars beside the water closet and around the shower as called for in the 2012 BC Building Code 3.7.2.10 which will resist a vertical and horizontal load of not less than 1.3 kN.
• For seniors projects, install the grab bars as required in the 2012 BC Building Code Article 3.7.2.10.
• Position bath and shower controls halfway between the outer edge and the centreline of the tub or shower enclosure to avoid having to lean in and reduce the potential slip and fall accidents.

.2 Design the kitchen to provide kitchen counter lengths to the requirements called for under Section 6 Kitchens and Bathrooms. Additional requirements are:
• the range and sink are adjacent or can have a continuous counter between them.
• 900 mm (3'-0") base cabinet for the kitchen and bathroom sinks which can be removed in the future if necessary to create an open knee space for wheelchair users. Refer to Section 6 Kitchens and Bathrooms for lowering waste pipe under sinks.

.4 Electrical
.1 Refer to Article 8.2.3 Electrical for mounting height and outlet placement.
.2 Provide for strobe lights as called for in the 2012 BC Building Code Article 3.2.4.19.

.5 Window Hardware
Locate hardware for operable windows not more than 1067 mm (3'-6") above the floor.

End of Section
Integrated Design Process (IDP)

- General
- Principles of an IDP
- Summary of the Phases of an IDP

Tables
  - Summary of IDP
  - Roles of Team Members by Design Phase
General

The integrated design process (IDP) is a holistic approach to building design that seeks to attain high performance on a wide variety of specific environmental and social goals while staying within budgetary and scheduling limitations. The specific phases associated with the process are directly related to the project’s design intent.

The integrated design process is a BC Housing requirement for all projects undergoing LEED certification and should be considered on other projects such as conversions, renovations, or small scale projects. IDP is the fundamental component in realizing sustainable goals while avoiding or minimizing incremental costs. Cost savings are realized because IDP is based on the principle that changes or improvements in the design process are fairly easy to make at the beginning of the design process, but become gradually more difficult, costly, and disruptive as the process advances. IDP allows project teams to take best advantage of various opportunities to influence sustainability and minimize costs at the project onset.

In addition to extensive collaboration, integrated design involves a “whole building design” approach. A building is viewed as an interdependent system, as opposed to an accumulation of separate components (site, structure, systems, and use). The goal of looking at all systems together is to make sure that they all work in harmony with each other.

An effective IDP can ensure that the Design Team incorporates the needs of the Owner and Operators based on their concerns, function, and operational requirements. Also this kind of process can ensure information is shared on daily operations such as who will be performing regular maintenance and what their level of expertise is and what training will be required.

Principles of an IDP

.1 Goal Driven – with the primary goal being sustainability, but with explicit subsidiary goals, objectives and target set as a means to get there.

.2 Facilitated – by someone whose primary role is not to produce the building design or parts of it, but to be accountable for the process of design.

.3 Clear Decision Making – for a clearly understood methodology for making decisions and resolving conflicts.

.4 Inclusive – everyone from the owner to the operator has something critical to contribute to the design and everyone must be heard.

.5 Collaborative – so that the Architect is not simply the form-giver, but more the leader of a broad team collaboration with additional active roles earlier in the process.

.6 Holistic or Systematic Thinking – with the intent of producing something where the whole is greater than the sum of the parts, and which may even be more economic.

.7 Whole-Building Budget Setting – allows financial trade-offs so money is spent where it is most beneficial when a holistic solution is found.

.8 Iterative – to allow for new information to inform or refine previous decisions.

.9 Non-Traditional Expertise – on the team as needed or brought in at non-traditional times to
Excerpts from the CMHC “Integrated Design Process Guide” by Alex Zimmerman, P. Eng. It is recommended that this document and the “Metro Vancouver Roadmap to the Integrated Design Process (IDP)” be referenced in whole for a comprehensive approach to the integrated design process.

Summary of the Phases of an IDP

PRE-DESIGN
The earliest stages of design represent an opportunity to set goals, objectives and the overall direction for a project. It is also when a building’s owner/operator can outline their concerns and hopes for a building, ensuring that the design team understands their needs and wishes for the project.

SCHEMATIC DESIGN
The Schematic Design phase is the ideal time for project teams to investigate options, including new ideas, innovative solutions and other options that will help the project to optimize the design for the site, location and operational needs. Evaluation of options should be as holistic and life-cycle based as possible, taking into account the particulars of the opportunities and constraints unique to the project. For renovation projects, the schematic design phase typically is included in the design development phase.

DESIGN DEVELOPMENT
Design development should be used to select and finalize the design choices. Final analysis of options should be conducted with input from the whole project team and presented to the owner/operator for approval.

CONSTRUCTION DOCUMENTATION
Integrated design during the construction documentation phase means paying attention to ensure that the concerns raised during earlier phases are addressed in detail. The building’s owner/operator especially should confirm that the integration achieved earlier is maintained, within budget and schedule constraints.

BIDDING, CONSTRUCTION AND COMMISSIONING
The bidding, construction and commissioning phase of the process is crucial from the perspective that knowledge and information about both the goals of the project team and the operating requirements of the building must be passed from design team to the construction team to the operating team. The more attention that can be paid to effective communication, translating the integration achieved earlier into an actual built, operational project, the greater the chances of success.
POST CONSTRUCTION
The transition from construction to operation is another phase where the success for a project can be optimized through effective integration and communication. Ensuring that effective documentation of the commissioning activities and rigorous adherence to building handover tasks are part of this optimization. All project team members bear some responsibility for these activities.

POST OCCUPANCY
Once the building is occupied and complete, integration and the IDP are still continued through the maintenance and operation activities. IDP can be used to ensure greater and more effective feedback both to the owner/operator and to the design and construction teams. Project teams should consider if and to what degree performance verification will be incorporated into the project's operations.
# Integrated Design Process

This listing does not encompass all the responsibilities of the participants but focuses on their roles in ensuring goals of the Integrated Design Process are achieved.

<table>
<thead>
<tr>
<th>IDP Summary Table</th>
<th>Phase 1 Pre-Design</th>
<th>Phase 2 Schematic Design</th>
<th>Phase 3 Design Development</th>
<th>Phase 4 Construction Documentation</th>
<th>Phase 5 Bidding, Construction, Commissioning</th>
<th>Phase 6 Post Construction</th>
<th>Phase 7 Post-Occupancy</th>
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</thead>
<tbody>
<tr>
<td>Plan Key Process Activities</td>
<td>Activities:</td>
<td>Activities:</td>
<td>Activities:</td>
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<tr>
<td></td>
<td>• Bring together a diverse and knowledgeable team to establish project goals and visions.</td>
<td>• Brainstorm ideas, develop concepts, evaluate sustainable strategies and refine options</td>
<td>• Engage new specialists (i.e. commissioning agent, outside experts)</td>
<td>• Coordinate CDs between disciplines</td>
<td>• Review and issue tender addenda / clarification to sub trades, if necessary</td>
<td>• Ensure proper transfer of knowledge between the design team, commissioning agent, building operator and occupants</td>
<td>• Host post-occupancy evaluation sessions within 3 months and share lessons learned</td>
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<tr>
<td></td>
<td>• Select an IDP Facilitator and/or Champion</td>
<td>• Evaluate energy impact of technologies and strategies</td>
<td>• Promote collaboration amongst team members</td>
<td>• Integrate green building strategies into CDs</td>
<td>• Transition from design to construction team</td>
<td>• Provide owner with complete building documentation including commissioning report</td>
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<td></td>
<td>• Establish communication pathways</td>
<td>• Keep project’s visions and goals at hand</td>
<td>• Maximize synergies between design disciplines</td>
<td>• Ensure that design intent is incorporated into CDs</td>
<td>• Review shop drawings to ensure these meet design intent</td>
<td>• Orient and train maintenance, operations staff and building occupants.</td>
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<tr>
<td></td>
<td>• Set design fees</td>
<td>• Ensure functional requirements are considered in planning</td>
<td>• Assess feasibility and viability of green building strategies/technologies</td>
<td>• Use tools to simulate (i.e. energy model) proposed technologies and strategies</td>
<td>• Include specific performance criteria in CDs</td>
<td>• Host post-occupancy evaluation sessions within 3 months and share lessons learned</td>
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<td></td>
<td>• Examine site constraints, challenges, opportunities</td>
<td>• Select design scheme which best reflects project visions and goals at hand</td>
<td>• Ensure systems and equipment are durable, long-lasting and low maintenance</td>
<td>• Finalize design decisions prior to proceeding to construction documents</td>
<td>• Develop commissioning plan</td>
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<td></td>
<td>• Enhance/confirm team cohesiveness and values</td>
<td>• Use tools to simulate (i.e. energy model) proposed technologies and strategies</td>
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<td>• Obtain Owner and BCH approval of construction documents and project budget</td>
<td>• Obtain Owner and BCH approval of construction documents and project budget</td>
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<tr>
<td></td>
<td>• Encourage a team mindset supporting creativity and systems-thinking</td>
<td>• Obtain Owner and BCH approval of schematic design and project budget</td>
<td>• Finalize design decisions prior to proceeding to construction documents</td>
<td>• Finalize design decisions prior to proceeding to construction documents</td>
<td>• Finalize design decisions prior to proceeding to construction documents</td>
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<td>• Visioning charrette or workshop</td>
<td>• Design charrettes and workshops</td>
<td>• Design charrettes and workshops</td>
<td>• Design charrettes and workshops</td>
<td>• Design charrettes and workshops</td>
<td>• Design charrettes and workshops</td>
<td>• Post completion session to share lessons learned</td>
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<td>• Programming Meeting</td>
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<td></td>
<td>• Facilities Management Meeting</td>
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<td></td>
<td>• Partnership Meetings</td>
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</table>
## IDP Summary Table

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<tbody>
<tr>
<td><strong>Output</strong></td>
<td>• Vision statement, goals and targets matrix&lt;br&gt;• Pre-design report including charrette synopsis&lt;br&gt;• Preliminary functional programme and space requirements&lt;br&gt;• Feasibility study and preliminary budget&lt;br&gt;• Roles and responsibilities matrix and communication protocol</td>
<td>• Updated goals and targets matrix&lt;br&gt;• SD report including approved schematic design&lt;br&gt;• Approved functional programme&lt;br&gt;• Construction cost estimate and capital budget review&lt;br&gt;• Preliminary energy analysis and LEED scorecard</td>
<td>• DD report including approved design development drawings&lt;br&gt;• Energy modeling simulation results and life cycle costing&lt;br&gt;• Updated LEED scorecard&lt;br&gt;• Construction cost estimate and capital budget review&lt;br&gt;• Outline specifications with embedded performance criteria&lt;br&gt;• Preliminary commissioning report&lt;br&gt;• Updated roles and responsibilities matrix&lt;br&gt;• Updated goals matrix</td>
<td>• Project specifications with embedded performance criteria&lt;br&gt;• Material substitution policy&lt;br&gt;• Tender documents with clear explanation of innovative aspects, contractor responsibilities for green building documentation, operator training &amp; commissioning requirements&lt;br&gt;• Construction cost estimate and capital budget review&lt;br&gt;• Outline specifications with embedded performance criteria&lt;br&gt;• Preliminary commissioning report&lt;br&gt;• Updated roles and responsibilities matrix&lt;br&gt;• Updated goals matrix</td>
<td>• Record drawings of completed project&lt;br&gt;• Commissioning reports&lt;br&gt;• Operation and maintenance manuals including on-going commissioning activities</td>
<td>• Training and education materials&lt;br&gt;• Measurement and verification data (if applicable)&lt;br&gt;• Completed commissioning documentation&lt;br&gt;• Environmental management program</td>
<td>• Updated building documentation&lt;br&gt;• Continuous monitoring (if applicable)&lt;br&gt;• Re-commissioning plan&lt;br&gt;• Post-occupancy evaluation of project</td>
</tr>
</tbody>
</table>
# Roles of Team Members by Design Phases

This listing does not encompass all the responsibilities of the participants but focuses on their roles in ensuring goals of the Integrated Design Process are achieved.

| Roles of Team Members by Design Phase | Phase 1  
Pre-Design | Phase 2  
Schematic Design | Phase 3  
Design Development | Phase 4  
Construction Documentation | Phase 5  
Bidding, Construction, Commissioning | Phase 6  
Post Construction | Phase 7  
Post-Occupancy |
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</thead>
<tbody>
<tr>
<td><strong>Owner’s representative</strong></td>
<td>• Hire motivated &amp; experienced team</td>
<td>• Work with team in decision making processes</td>
<td>• Help team make decisions that confirm goals &amp; reflect life-cycle thinking</td>
<td>• Help the team ensuring decisions made in previous stages are not lost with value engineering process</td>
<td>• Ensure the staff &amp; users are involved &amp; updated about the progress of the project; update new team members</td>
<td>• Coordination staff and user training</td>
<td>• Participate in training of other facilities personnel to ensure that they understand how their issues were represented during design</td>
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<tr>
<td></td>
<td>• Communicate project vision &amp; goals</td>
<td>• Participate fully in design workshops. Use opportunities to express opinions on lessons learned</td>
<td>• Continue to participate in design workshops.</td>
<td>• Continue to provide reviews as needed</td>
<td>• Visit site to observe building taking shape</td>
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<tr>
<td></td>
<td>• Work with design team to incorporate all building and functional requirements as early as possible</td>
<td>• Review design documents as needed</td>
<td>• Review design documents</td>
<td>• Ensure new team members have necessary information</td>
<td>• Evaluate changes proposed during construction against original goals</td>
<td>• Ensure a seamless handover to the owner</td>
<td></td>
</tr>
<tr>
<td><strong>Development Consultant</strong></td>
<td>• Work with owner representative to kick-start the project and coordinate team activities</td>
<td>• Review capital budget; help team stay on schedule and budget</td>
<td>• Review capital budget; help the team stay on schedule and on budget</td>
<td>• Review capital budget; help the team stay on schedule and on budget</td>
<td>• Help the team stay on schedule and on budget</td>
<td>• Ensure a seamless handover to the owner</td>
<td></td>
</tr>
<tr>
<td>(New Construction Only)</td>
<td>• Ensure effective communication among team members</td>
<td>• Help the team to work within BCH guidelines/ construction standards and project goals</td>
<td>• Help the team to work within BCH guidelines/ construction standards and project goals</td>
<td>• Help the team to work within BCH guidelines/ construction standards and project goals</td>
<td>• Help the team evaluate changes proposed during construction</td>
<td>• Ensure Owner’s maintenance manuals are prepared</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td>• Organize post occupancy evaluation of project</td>
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</tr>
</tbody>
</table>

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*BC Housing Design Guidelines and Construction Standards*
## Roles of Team Members by Design Phases

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<tbody>
<tr>
<td>BC Housing Representative (Renovations; BC Housing may assume the role of Development Consultant and the Owner’s representative)</td>
<td>• Work with team to kick-start the project</td>
<td>• Provide comment re: compliance with BCH design guidelines and cost targets</td>
<td>• Provide comment re: compliance with BCH design guidelines and cost targets</td>
<td>• Provide comment re: compliance with BCH design guidelines and cost targets</td>
<td>• Review progress draws and change orders, monitor construction status, schedule and project budget</td>
<td>• Ensure Owner’s maintenance manuals are reviewed</td>
<td>• Participate in post occupancy evaluation of project</td>
</tr>
<tr>
<td>Architect</td>
<td>• Ensure that other consultants are part of early consultations, especially on building form &amp; programming</td>
<td>• Schedule charrettes early to gain maximum benefit</td>
<td>• Coordinate strategies and help to present cohesive information on pros and cons of design solutions</td>
<td>• Ensure all project goals are well documented in specs &amp; drawings so contractors can easily follow requirements</td>
<td>• Work with the contractor to ensure compliance with contract requirements</td>
<td>• Participate in user and operations staff training to ensure proper handover.</td>
<td>• Work to spread information on results within industry</td>
</tr>
<tr>
<td>IDP Facilitator and/or Champion (Green Design Specialist, Development Consultant, Owner’s representative or BC Housing Representative may assume to take this role)</td>
<td>• Work with owner representative to set up initial goal setting workshops</td>
<td>• Facilitate workshops</td>
<td>• Continue to facilitate workshops - evolve the format to reflect the progress of the design process</td>
<td>• Continue to facilitate workshops - evolve the format to reflect the progress of design</td>
<td></td>
<td>• Review building warranty/deficiencies and coordinate with appropriate team member</td>
<td>• Participate in post occupancy evaluation of project</td>
</tr>
</tbody>
</table>
### Roles of Team Members by Design Phases

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</thead>
<tbody>
<tr>
<td><strong>Building Envelope Consultant</strong></td>
<td>• Consider impact of Architectural, Structural, and Mechanical choices on building envelope performance, durability, and future maintenance</td>
<td>• Provide input into the discussions on practices that would impact building envelope systems</td>
<td>• Provide input into the life-cycle, energy performance, and durability discussions</td>
<td>• Ensure durability requirements, materials selection, and construction methods reflect sustainable goals</td>
<td>• Work with the contractor to ensure compliance with new strategies / technologies included in the project</td>
<td>• Participate in user and operations staff training to ensure complete and informative handover</td>
<td>• Work to gather information on lessons learned</td>
</tr>
<tr>
<td><strong>Structural Engineer</strong></td>
<td>• Consider impact of structural choices on form &amp; massing.</td>
<td>• Consider impact of structural choices on daylighting potential, materials (i.e. fly ash content), etc.</td>
<td>• Provide input into life-cycle and durability discussions</td>
<td>• Ensure durability requirements, materials selections, and construction methods reflect sustainable goals</td>
<td>• Work with the contractor to ensure compliance with new strategies/technologies</td>
<td>• Participate in user and operations staff training to ensure proper handover</td>
<td>• Work to gather information on lessons learned</td>
</tr>
<tr>
<td><strong>Mechanical Engineer</strong></td>
<td>• Provide feedback on impact of massing &amp; orientation on mechanical systems and energy performance</td>
<td>• Input into discussions on envelope performance, energy targets and other building components that will impact mechanical systems</td>
<td>• Help team consider new options</td>
<td>• Work with design team to refine systems choices within preset energy targets</td>
<td>• Work with contractor to ensure compliance with new strategies/technologies</td>
<td>• Participate in commissioning &amp; user and operations staff training to understand energy optimization options.</td>
<td>• Work with the team to understand difference between Modeled &amp; actual data</td>
</tr>
</tbody>
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<tr>
<td><strong>Electrical Engineer</strong></td>
<td>• Provide feedback on impact of massing &amp; orientation on electrical systems &amp; lighting/daylighting options</td>
<td>• Provide input into the discussions on glazing performance, energy targets and other building components that will impact electrical systems</td>
<td>• Provide input on implications of different control strategies.</td>
<td>• Ensure that equipment selections, materials selections and construction methods reflect sustainable goals</td>
<td>• Work with the contractor to ensure compliance with new strategies/technologies</td>
<td>• Participate in commissioning &amp; training of users and operations staff to ensure proper handover</td>
<td>• Work to spread information on results within industry</td>
</tr>
<tr>
<td><strong>Green Design Specialist/LEED AP</strong></td>
<td>• Bring broad knowledge of green design strategies to the table</td>
<td>• Help the team identify potential green design strategies</td>
<td>• Direct team to green design resources</td>
<td>• Review plans and specifications to ensure green strategies are incorporated</td>
<td>• Deliver or participate in contractor and sub-training on green design and certification</td>
<td>• Submit application for LEED certification</td>
<td>• Work to spread information on results within industry</td>
</tr>
<tr>
<td><strong>Civil Engineer (with expertise in water and wastewater systems)</strong></td>
<td>• Provide input into site-specific opportunities regarding water conservation, reuse and treatment</td>
<td>• Work with the team to integrate water treatment options &amp; landscape choices into building design</td>
<td>• Help the team to ensure that the building design complements the water management plan and vice versa</td>
<td>• Ensure that sustainable design features are well documented in specs &amp; drawings so contractors can easily follow requirements</td>
<td>• Work with the contractor to ensure compliance with new strategies/technologies</td>
<td>• Participate in user and operation staff training for any unusual features to ensure proper care</td>
<td>• Work to spread information on results within industry</td>
</tr>
<tr>
<td><strong>Cost Consultant/Quantity Surveyor (with green design expertise)</strong></td>
<td>• Assist team to set realistic budget, bearing in mind current market conditions</td>
<td>• Provide input into site specific requirements</td>
<td>• Help the team to understand what choices may help keep costs under control</td>
<td>• Assist team with life-cycle cost and value analysis</td>
<td>• Assist team with life-cycle cost and value analysis</td>
<td>• Review final bid documents with the design team</td>
<td></td>
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<tr>
<td><strong>Landscape Architect</strong></td>
<td>• Provide input into site-specific opportunities relating to habit preservation or restoration, indigenous plantings, etc.</td>
<td>• Work with the team to integrate landscape choices into building design</td>
<td>• Help the team to ensure that the building design complements landscape features and vice versa</td>
<td>• Ensure all sustainable design features are well documented in specs &amp; drawings so contractors can follow requirements</td>
<td>• Work with the contractor to ensure compliance with new strategies/technologies</td>
<td>• Participate in user and operations staff training for any unusual features to ensure proper care</td>
<td>• Work to spread information on results within industry</td>
</tr>
<tr>
<td><strong>Construction Manager/ General Contractor (Phase 5 and 6)</strong></td>
<td>• If applicable, CM to advise team with constructability issues associated with site &amp; specific program reqts and how goals can be met most efficiently with construction technologies available</td>
<td>• If applicable, CM to work with the design team to accurately cost differences in construction methods, materials, etc, based on current market conditions</td>
<td>• If applicable, CM to help the team ensure that construction documents are complete and coordinated</td>
<td>• Help the team ensure that the project is on budget</td>
<td>• Take charge to ensure green strategies are executed &amp; documented by all sub-trades</td>
<td>• Provide maintenance info to help with education of users and facilities staff</td>
<td>• Participate in post occupancy evaluation</td>
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<tbody>
<tr>
<td>Regulatory Approval Representatives</td>
<td>• Work with the design team with the intent of project's impact on local infrastructure</td>
<td>• Keep working with the team to meet the project &amp; municipal goals</td>
<td>• Keep working with the team to meet the project &amp; municipal goals</td>
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</tr>
<tr>
<td>Interior Designer</td>
<td>• Consider the impact of the program &amp; project goals on material &amp; finish choices</td>
<td>• Work with rest of team to meet goals around daylighting &amp; material selection as well as goals for durability and user needs</td>
<td>• Help with life-cycle cost analysis to determine impact of durability choices, material sources, etc</td>
<td>• Ensure sustainable design features are well documented in the specs &amp; drawings so contractors can easily follow requirements</td>
<td>• Work with the contractor to ensure compliance with new strategies/materials</td>
<td>• Participate in commissioning &amp; user and operations staff training to ensure proper handover</td>
<td>• Work to spread information on results within industry</td>
</tr>
<tr>
<td>Soils or Geotechnical Engineer</td>
<td>• Provide input into site-specific opportunities or concerns with systems and technologies that the design team may consider</td>
<td>• Work with team regarding the impacts of the site's conditions on the building</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commissioning Authority</td>
<td>• Review the Owner’s design intent and basis of design</td>
<td>• Work with the design team &amp; owner to ensure that the project goals are being incorporated into the design documentation</td>
<td>• Provide review functions as required to ensure proper integration of needs &amp; requirements. (Typically at 50%, 100% of CD’s)</td>
<td>• Draft commissioning plan.</td>
<td>• Continue to provide review functions as required to ensure proper integration of needs &amp; requirements</td>
<td>• Review select contractor submittals</td>
<td>• Work to spread information on results within industry</td>
</tr>
<tr>
<td></td>
<td>• Verify installation, performance, operation &amp; maintenance documents</td>
<td></td>
<td>• Keep communication lines open between owner, BCH, contractor and design team</td>
<td>• Provide commissioning reports</td>
<td>• Ensure that sufficient time is allowed for hand-over training &amp; commissioning activities</td>
<td></td>
<td>• Participate in post occupancy evaluation</td>
</tr>
</tbody>
</table>

### Additional Team Members

- **Regulatory Approval Representatives**
  - Work with the design team with the intent of codes decreasing project's impact on local infrastructure
  - Keep working with the team to meet the project & municipal goals
  - Keep working with the team to meet the project & municipal goals
  - Keep working with the team to meet the project & municipal goals
  - Keep working with the team to meet the project & municipal goals

- **Interior Designer**
  - Consider the impact of the program & project goals on material & finish choices
  - Work with rest of team to meet goals around daylighting & material selection as well as goals for durability and user needs
  - Help with life-cycle cost analysis to determine impact of durability choices, material sources, etc
  - Ensure sustainable design features are well documented in the specs & drawings so contractors can easily follow requirements
  - Work with the contractor to ensure compliance with new strategies/materials
  - Participate in commissioning & user and operations staff training to ensure proper handover
  - Work to spread information on results within industry

- **Soils or Geotechnical Engineer**
  - Provide input into site-specific opportunities or concerns with systems and technologies that the design team may consider
  - Work with team regarding the impacts of the site’s conditions on the building

- **Commissioning Authority**
  - Review the Owner’s design intent and basis of design
  - Work with the design team & owner to ensure that the project goals are being incorporated into the design documentation
  - Provide review functions as required to ensure proper integration of needs & requirements. (Typically at 50%, 100% of CD’s)
  - Draft commissioning plan.
  - Continue to provide review functions as required to ensure proper integration of needs & requirements
  - Incorporate commissioning plan.
  - Review select contractor submittals
  - Keep communication lines open between owner, BCH, contractor and design team
  - Provide commissioning reports
  - Verify installation, performance, operation & maintenance documents
  - Ensure that sufficient time is allowed for hand-over training & commissioning activities
  - Work to spread information on results within industry
  - Participate in post occupancy evaluation
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</thead>
<tbody>
<tr>
<td>Community Partners</td>
<td>• Work with the design team to ensure that concerns &amp; opportunities are heard</td>
<td>• Participate in planning workshops &amp; public hearings to voice opinions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Become occupants of the building and community spaces</td>
</tr>
</tbody>
</table>

**Note:** on small scale projects or renovations the roles described in the table above may be combined (for example, on some projects the BC Housing representative may assume the role of the Owner’s representative and/or any other roles that may be applicable).

For projects undergoing LEED certification, the Green Design Specialist/ LEED AP takes the role of IDP Facilitator and/or Champion in most cases. For other projects, Development Consultant, Owner’s representative or BC Housing Representative may assume to take this role.

**End of Section**
section

3

Energy and Environmental Design

- Sustainability Goals
- LEED®
- High Performance Greenhouse Gas Neutral Strategy
- Waste Management Reduction Goals
- Utility Incentives and Rebate Documentation
1 Sustainability Goals

1.1 BC Housing is committed to actively support the provincial government’s actions leading to creation of a low-carbon economy and sustainable future.

1.2 BC Housing’s sustainability plan focuses on three strategic areas:
   .1 Development of cutting-edge expertise in demonstrated delivery of sustainable social housing.
   .2 Gaining recognition within the social housing sector and construction industry as leaders in sustainable social housing.
   .3 Establishing a best practice approach to integrating sustainability into all levels of decision making.

1.3 The plan is supported by the following objectives related to buildings:
   .1 Reduction in energy consumption and GHG emissions
      .1 BC Housing became Carbon Neutral in 2010.
      .2 BC Housing will reduce its greenhouse gas emissions from PRHC owned or leased buildings relative to 2005 baseline by 50% in 2020/2021.
      .3 BC Housing monitors and reports to the BC Government energy and electricity consumption, and related greenhouse gas emissions, for all of PRHC owned and leased buildings under the legal requirement of Bill 44 – 2007: Greenhouse Gas Reduction Targets Act. The emissions data, as well as GHG reduction actions and plans, and statement of relevant carbon offsets applied, are submitted by BC Housing as a Carbon Neutral Action report to the BC Government. The reports are made publicly available every year by the end of June.
      .4 BC Housing has independently adopted a GHG policy for new construction projects that it funds (irrespective of the building ownership) with the goal of reducing GHG emissions to the greatest extent possible while being cost effective. It also endeavours to include GHG reduction strategies in renovation projects where feasible.
   .2 Improved indoor environmental quality for tenants
      BC Housing will ensure high quality, healthy living conditions for its occupants by integrating daylighting and outdoor views into rooms, selecting materials that either reduce or eliminate indoor pollutants and providing high levels of air exchange.
.3 Reduced operating and maintenance costs

BC Housing projects will preferentially select materials and designs that emphasize durability and ease of maintenance to minimize the long term operating costs for the non-profit owner-operators.

.4 Achieve LEED® Gold certification at the best value

BC Housing established LEED® Gold as the baseline for environmental performance for eligible new construction projects, which is verified through a process of third party certification. The measures required to meet LEED® Gold will be achieved within capital cost parameters established by BC Housing.

1.4 BC Housing maintains a sustainable procurement policy, meaning that the purchase of new products, equipment and appliances must follow specific guidelines. They shall be limited to green labeled and/or meet a minimum set of criteria for commonly purchased equipment (i.e. heat pumps, hot water tanks, furnaces, boilers, and other type of equipment) approved by BC Housing. These items shall be selected from a pre-qualified list of products provided through either Natural Resources Canada¹ (NRCan) or FortisBC²³ (depending on the product).

2 LEED®

2.1 REQUIREMENTS

.1 LEED® is a third-party certification program and an internationally accepted benchmark for the design, construction and operation of high performance green buildings. In Canada LEED® is administered by the Canada Green Building Council (www.cagbc.org).

.2 BC Housing has committed to achieving Gold certification under the relevant version of LEED® Canada. A summary of LEED® credits and prerequisites, their relevance to BC Housing projects and an ease of implementation rating can be found on the BC Housing website.

.3 Deliverable: The copy of the final LEED scorecards, signed LEED letter templates and final energy model made to CAGBC shall be submitted to BC Housing by the consultant.

3 High Performance, Greenhouse Gas Neutral Strategy

3.1 REQUIREMENTS

.1 New construction projects shall achieve:

.1 Minimum eight points for Optimized Energy Performance with the LEED® NC 1.0 2009 rating system. Project teams pursuing certification under other versions of LEED (e.g.

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3.2 EXCEPTIONS
  .1 Smaller buildings, which are constructed in accordance with Part 9 of the BC Building Code, shall meet an Energuide 80⁴ rating. Compliance shall be demonstrated by providing the Energuide evaluation report. Consideration should be given to mid construction air leakage testing.

3.3 OPTIMIZATION OF ENERGY PERFORMANCE
  .1 The building enclosure and building systems shall be designed to minimize energy demand and total cost of ownership of the building. GHG emissions shall be further optimized by considering fuel switching from fossil fuel to low GHG emission energy sources, including low GHG emission electricity and on-site renewable energy or considering future district energy potential for the site, when it is cost-effective.

3.4 COST-EFFECTIVENESS
  .1 Lifecycle cost analysis, considering total cost of ownership of the building, will be used to identify cost effective GHG emission and energy reduction strategies.

3.5 DETERMINATION OF ANNUAL ENERGY CONSUMPTION
  .1 Energy consumption for new projects may be estimated from energy simulations. Acceptable energy simulation programs include those which are accepted for use by the Canada Green Building Council for the LEED® rating system that is appropriate for the relevant building type (i.e. LEED® NC or LEED® for Homes).
  .2 Design teams shall follow the following procedure for simulations:
    .1 A preliminary modeling exercise should be undertaken during the schematic design stage of the project.
    .1 Where a project can meet the requirements of the BC Hydro New Construction Whole Building program⁵, or similar comprehensive incentive program, the project team should evaluate enrolling in and following the program modeling requirements.
    .2 If the project does not pursue this program, the project team should follow a similar procedure by evaluating a series of potentially feasible Energy Conservation Measures (ECMs) identified and a cost-benefit analysis completed on each to identify those measures which make the most sense for the project based on energy and GHG savings, financial impact and strategic value. After selecting which measures will be

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⁴ The Energuide for New Houses program is a Federal initiative to encourage enhanced performance in new Part 9 housing. The program provides modeling tools to encourage enhanced building performance. An Energuide 80 (EGH80) rating corresponds to an R2000 house.

implemented, a final cumulative model run including all selected ECMs will be compared against the baseline case. The baseline case and report format shall be as per the requirements of the BC Hydro New Construction program. In addition, an estimate of the number of LEED® EA credit 1 points shall be included in the summary report. Regardless of the path followed, every effort shall be made to follow the principles of integrated design.

.3 Deliverables: Preliminary energy modeling report with ECM analysis and estimate of LEED® EA credit 1 points shall be submitted to BC Housing.

.2 A final energy simulation should be undertaken when the project’s design has been approved for construction and final selections for all equipment have been made. The final simulation will be a comparative model done for LEED® EA credit 1 compliance and include an estimate of the GHG savings associated with this final design.

.1 Deliverables: Copy of the final energy submission made to the CaGBC shall be submitted to BC Housing.

3.6 COST EFFECTIVENESS OF ACHIEVING GHG — REDUCTIONS ON PROJECTS.

In general, reducing GHG emissions also reduces life cycle building costs due to operational savings and may therefore be justified on a purely financial basis. Consultants should target cost effective GHG emission reduction strategies.

4 Waste Management Reduction Goals

BC Housing is committed to reducing resource consumption and waste, as expressed in the Livegreen plan. Waste reduction and diversion from landfills will be targeted for all new construction, renovation, and conversion projects across the Province. Currently, BC Housing has set an average total waste diversion target from landfills of 80% in the lower mainland and on Vancouver island, and 60% elsewhere in the province, on projects with a budget greater than $100,000 (hazardous and excavated materials, such as asbestos, lead, and earthwork, is to be excluded from the targets).

The Contractor will be responsible for tracking waste diversion rates throughout the construction project. A waste tracking form (outlined in Appendix C) will be provided upon project kickoff, and is required as a closeout submittal upon completion of the project. A holdback will be retained for incomplete or non-submitted waste tracking forms.

5 Utility Incentive and Rebate Documentation

BC Housing is committed to achieving optimal energy performance on equipment and materials that are specified for our existing buildings and in new developments. As such, BC Housing is committed to selecting energy efficient materials and securing all rebates and incentives associated with these energy efficient choices.

.1 The contractor will provide all documentation necessary to apply for all applicable incentives,
including, but not limited to, appliance invoices, lighting invoices, exhaust fan invoices, boiler invoices, and any related mechanical equipment invoices. Invoices must state the manufacturer, model, unit price and quantity. For the appliances, lighting, and exhaust fans, a suite or unit breakdown should be provided outlining corresponding lighting and appliances, including make, model type and confirmation of EnergyStar rating. All documentation must be submitted to the BC Housing staff responsible for managing the project within 30 days of equipment purchase.

End of Section
section 4

Crime Prevention Through Environmental Design (CPTED)

- Description
- CPTED Principles
- CPTED Performance Objectives
- CPTED Performance Standard Checklist
1 Description

Crime Prevention Through Environmental Design (CPTED) is defined as a multi-disciplinary approach to deterring criminal behaviour and nuisance activity through environmental design. CPTED strategies rely upon the ability to influence decisions that precede criminal acts and nuisance activity through proper design, effective use and maintenance of the built, social and administrative environment. Realizing that there is a direct relationship between the physical environment, behaviour of people, productive use of space and crime/loss prevention, BC Housing has the following CPTED principles:

.1 Territoriality
.2 Natural Surveillance
.3 Access Control
.4 Activity Support
.5 Maintenance

CPTED based strategies emphasize enhancing the perceived risk of detection and apprehension. Research into criminal behaviour indicates that the decision to offend or not to offend is more influenced by cues to the perceived risk of being caught than by cues to reward or ease of entry. Behaviour effects can be accomplished by reducing the propensity of the physical environment to support criminal behaviours.
2 CPTED Principles

Crime Prevention through Environmental Design (CPTED) is supported by the following five overlapping principles that are applied to specific sites and situations.

2.1 TERRITORIALITY

Territoriality is a design concept that clearly delineates private space from semi-public and public spaces and also creates a sense of ownership. Ownership thereby creates an environment where appearances of such strangers and intruders stand out and are more easily identified through:

.1 The enhanced feeling of legitimate ownership by reinforcing existing natural surveillance and natural access control strategies with additional symbolic or social ones

.2 The design of space to allow for its continued use and intended purpose

.3 The use of pavement treatments, signage, landscaping, art, signage, screening and fences to define and outline ownership of space

2.2 NATURAL SURVEILLANCE

Natural surveillance is a design concept directed primarily at observing intruders. Provision of natural surveillance helps to create environments where there is sufficient opportunity for people engaged in their normal activities to observe the space around them. Areas can be designed so they are more easily observed through:

.1 Design and placement of physical features to maximize visibility. This may include: building orientation, windows, entrances and exits, parking lots, refuse and recycling containers, walkways, guard gates, landscaping, trees and shrubs, use of wrought iron fences or walls, signage and other physical obstructions.

.2 Placement of persons or activities to maximize surveillance possibilities

.3 Provision of minimum maintained lighting standards for nighttime illumination of parking lots, walkways, entrances, exits, and related areas to promote a safe environment

2.3 ACCESS CONTROL

Access control is a design concept directed primarily at decreasing criminal accessibility. Provision of natural access control limits the number of entry points to the property and building. Intruders are discouraged or denied entry through:

.1 The use of sidewalks, pavement, gates, lighting, way-finding signage, and landscaping to clearly guide the public to and from entrances and exits

.2 The use of gates, fences, walls, landscaping and lighting to prevent or discourage public access to or from dark or unmonitored areas

.3 The use of locks, non-removable pin hinges and other target hardening measures
2.4 ACTIVITY SUPPORT

Activity support is the presence of activity planned for the space, and involves placing activity where the individuals engaged in an activity will become part of the natural surveillance system.

.1 Place safe activities in areas that will discourage would be offenders, to increase the natural surveillance of these activities and the perception of safety for normal users, and the perception of risk for offenders. Examples include a seating area facing out the window from the inside of the lobby.

.2 Place high-risk activities in safer locations to overcome the vulnerability of these activities by using natural surveillance and access control of the safe area. Examples include a playground located inside the fenced/enclosed courtyard of a building, or a recreation room with many windows along the main lobby of the building.

.3 Locate gathering areas to provide for natural surveillance and access control or in locations away from the view of would-be offenders

2.5 MAINTENANCE

Provide a standard of maintenance document that describes proper maintenance of the property, fixtures, buildings, and other features required to support the principles of CPTED. Functions include:

.1 Locating lighting in such a way that bulbs can be easily replaced and shrubs and vegetation do not obstruct light from intended target areas

.2 Landscaping which is maintained at prescribed standards so that the placement and growth of shrubs and vegetation does not interfere with sight lines or light sources
3 CPTED Performance Objectives

3.1 ACCESS CONTROL

.1 The security of the property is enhanced by discouraging casual intrusion by non-residents, and public access should be restricted. Access control systems should be designed around a combination of systems which may include a concierge, digital access control (DAC) and door intercom system.

.2 There should be no paths which could be used to gain unobserved access.

.3 Easily found address and directional signage should be provided to deter unauthorized access and to assist emergency services, trades persons, etc.

3.2 BALCONIES

Enclosures to balconies at all levels should be designed to exclude handholds and to eliminate the opportunity for climbing up, down or across between balconies.

3.3 CAR PARKING

.1 Individual car parking arrangements are preferred but where communal car parking areas are necessary, they should be in small groups, close and adjacent to the suites which they serve, and open to view of the residents from frequently occupied rooms.

.2 Garages should be located to maximize opportunities for natural surveillance.

.3 Underground parking should include well lit walls, posts, ceilings, and way-finding signage which can be achieved through lighting, paint, white concrete stain, window placement, or a combination thereof. Entrances to garages should be designed to be within the boundaries of the secured area. In certain conditions additional security features such as cameras may be required for parking.

.4 Pavement treatment and maintenance in parking areas, such as painted curbs, parking symbols and lines, help to define the transition from public to semi-private space and create a sense of ownership and territoriality.

3.4 COMMUNAL FACILITIES

Communal facilities on the ground floor, such as residents' communal lounges and common laundry rooms are best located to give natural surveillance of entrances, entrance lobbies and external areas. Bin storage and chutes, service ducts and panels, pipes and door entrance canopies should be designed to eliminate the opportunity for unauthorized access and climbing. Secure bicycle storage for residents and visitors should be considered.

3.5 CONCIERGE/BUILDING MANAGER OFFICES

Where a concierge service is provided, entrances and fire exits should be audibly alarmed to the concierge control centre. Where provided, building managers offices should be located adjacent to main entrances, and directly accessible to the concierge control centre, if applicable. Building manager offices should include two room areas, one within view of the outside area adjacent to the office and one that is not within view.
3.6 **CRIME GENERATORS**

A crime generator is a location whose most likely frequented participants create a higher than average probability of illegal or inappropriate activity. Consideration should be given to locating potential crime generators within areas that have been secured from public access and where they are not likely to allow the escalation of problematic activities.

3.7 **DIGITAL ACCESS CONTROL (DAC) AND CLOSED CIRCUIT TELEVISION (CCTV)**

Main entrances to multi-tenanted buildings should be fitted with a digital access control system. This may be DAC entry system, a door entry phone system and electrical lock release or a combination of these. Where a DAC entrance system, concierge and CCTV system are provided, consideration should be given to extending these systems to cover the internal circulation areas, for example DAC entry/door entry systems may be provided on landings and accessing elevator floors.

3.8 **DISPLACEMENT ISSUES**

CPTED solutions should be designed to eliminate the problem versus relocating or displacing problems to other areas of the neighborhood or property.

3.9 **EDGE EFFECTS**

Buildings and structures should be constructed in a fashion that avoids the actual or perceived “unused” areas that become partially or fully hidden from view. Windows or spandrel glass (appearing like real windows) should be installed in areas where an end wall may have little or no natural surveillance over a space where socialization may occur. The property layout should provide each block with a clearly defined defendable space, and fencing where appropriate.

3.10 **ENTRAPMENT SPOTS AND MOVEMENT PREDICTORS**

Entrapment spots and movement predictors should be eliminated where possible. When options to eliminate entrapment areas or movement predictors do not exist, they should be located in areas of high visibility, including formal surveillance, and/or should include means of emergency communication.

3.11 **EXTERIOR ENTRANCES**

The entrances to a building should be preceded by elements such as fences, shrubs, and/or pathway treatments that identify a transition from public to semi-private space. Often they form the first physical barrier to access for outsiders. Where possible, a single point of entry should be provided, and all other access points required for fire egress safety should be restricted to exit only. Resident access should be limited to no more than two locations where possible. Doors should all be well lit, easily visible and not recessed behind site-line obstructions.

3.12 **FORMAL SURVEILLANCE**

A monitored (active and passive) close circuit television (CCTV) system covering the site area, with particular focus on key access points may be required. Consideration should be given to providing residents with the ability to view CCTV images from entrances and other areas that
may be considered of risk. All systems must be designed to adhere to the standards of the Privacy Commissioner of BC.

### 3.13 GARAGES

All doors leading to parking garages should be secured, and minimizing the number of entry doors is recommended. Windows should be provided in garage doors. On carports and single car garages, roofs should be pitched (flat roofs should be avoided), and rainwater leaders etc, should be located so as to avoid providing climbing opportunities.

### 3.14 INTERNAL SECURITY

Communal internal circulation areas, staircases, entrances and elevator lobbies should be brightly decorated and well lit, and a hierarchy of defendable space established. Access staircases should be linked to the minimum number of dwellings. External walkways should be eliminated wherever possible, or the number of dwellings accessed from them limited to the minimum compatible with the physical form of the building and the need for fire safety.

### 3.15 LANDSCAPING

1. Landscaping is an important feature of CPTED. Landscaping should not impede natural surveillance and must not create blind spots or potential hiding places for intruders, especially adjacent to footpaths or close to buildings where it may obscure doors and windows.

2. Ornamental walls and hedges should not exceed one metre in height. Grass or low ground cover planting only should be used within 2 metres of either side of a footpath. The location and species of trees should not allow them to obscure lighting or CCTV, or become climbing aids. Take into account the maintenance needs to ensure continued compliance as plants grow. The correct use of certain species of plants can help prevent graffiti and loitering, and in addition to fencing may be used to define/reinforce boundaries. Landscaping such as berberis, low-height fencing, bio-swales, or similar products should be utilized to achieve this purpose. Private and semi-private yard spaces should have clearly defined boundaries.

### 3.16 LIGHTING, ILLUMINATION AND COLOUR/IMAGE RENDERING

1. Appropriate lighting should be carefully designed to cover potential high risk areas.

2. Uniform and consistent levels of lighting should support all areas of natural and CCTV surveillance in order to deter intruders and reduce the fear of crime. Light sources should provide for accurate colour rendering, and light levels should place greater emphasis on the consistency of light versus the brightness level. The following areas must be lit: main site access, garages, car parking areas, all footpaths and associated doorways and accesses to the main building, refuse storage, secluded areas and similar locations around the site that are intended for use at night.

3. All exterior lighting for:

1. Primary areas (building exterior, primary entrances, primary walkways, etc) should be automatically controlled by photo-electric cell activator.

2. Secondary areas (alternate egress routes, landscaped walkways, areas of risk, etc) should be
automatically controlled by motion sensor. Light fixtures, fittings and service wiring should be vandal resistant and located to minimize vulnerability to vandalism.

3.17 **LINE OF SIGHT**

All public and semi-private areas should maintain an unobstructed view from areas that are frequently and regularly occupied.

3.18 **MOVEMENT PREDICTORS**

Any design feature that funnels or channels people along a route that contains few or no exits prior to the destination is a movement predictor. These should be avoided. (See entrapment spots)

3.19 **NATURAL SURVEILLANCE**

Optimum natural surveillance should be incorporated, whereby residents can see and be seen. Recesses, blind corners and hiding places should be eliminated wherever possible. The use of mirrors can assist in this measure. Additional measures should include:

1. An unobstructed view from dwellings of the site, its external spaces and neighbouring homes to include external paths, roadways, common areas, yards, landscaping, garages, entrance/exit doors and parking areas

2. The avoidance/elimination of recesses, blind corners, and hiding places

3. Windows placed in doors to stairways, laundry rooms, common hallways, recreation rooms, and other areas requiring visibility to improve safety

3.20 **PATHWAY/WALKWAY PRINCIPLES**

1. Superfluous and unduly secluded access points and routes should be avoided. Access points to the rear of buildings should be controlled, for example by means of lockable gates. Roads to groups of buildings should be designed to create a sense of identity, privacy and shared ownership amongst occupants. Foot and bicycle paths should be of generous width and have a suitable landscape setting to avoid creating narrow corridors which could be perceived as threatening. In terms of security, the design of the footpath is of equal importance to the design of the building. Where possible, the footpath route should be at least 3-4 metres wide, which includes a verge on either side of the 2 metre wide walkway.

2. Any shrub/planting should start at the back of the verges. The position of planting and choice of species should be such that hiding places are not created. Thorny species of shrub can help to deter intruders. Good visibility should be maintained from either end, and along the route of foot and bicycle paths. Sharp changes in direction should be avoided.

3. Foot and bicycle paths should not generally be routed to the rear of buildings, but if this is unavoidable a substantial buffer should be planted between a secure boundary fence and the footpath’s margins, with planting designed so as to discourage intruders.

4. Where developments adjoin waterways, rivers with foot/bicycle path access, parks or similar public spaces, the buildings should ‘face both ways’, i.e. overlook the watercourse as well as the street. Foot/bicycle paths should be lit in built-up areas, except where the route is passing
through woodland or an ecologically sensitive area, in which case an alternative lit route should be made available, such as a footway alongside a road.

### 3.21 PAVEMENT TREATMENTS

Pavement treatments can provide a means of territoriality and help to define/demark transitions between public, semi-private and private space. Changes in pavement treatments, such as moving from concrete to stone walkways, help to define boundaries.

### 3.22 PHYSICAL SECURITY AND FIRE/EGRESS REGULATIONS

In multi-tenant buildings, particular care needs to be taken to ensure that the security measures do not conflict with fire regulations with respect to means of escape in case of fire. In all cases, locks must be able to be opened from the inside without the aid of a key, to comply with fire regulations.

### 3.23 SIGNAGE AND WAY FINDING

Address and way finding signage should be located at intersecting pathways, in parkades, and along driveways where the destination building signage cannot easily be seen. Address signage should be large enough to be clearly legible from the street and must have a source of light for viewing in darkness. Signage should be located where it can easily be seen for way finding, but should not be placed where it would interfere with the line of sight for vehicles or pedestrians, or where it would be easily vandalized. Exterior signage located at ground level or where it could be easily vandalized can be protected by planting berberis or similar products in a 1 metre or larger circumference around the base. Intercom displays should not include both the suite number and name of occupants, rather, the name and an entry code number, unrelated to the suite number, should be used.

### 3.24 STREET LIGHTING

Consideration should be given to ensure that lighting meets with these same standards on the building walkways along the street.

### 3.25 STREET PRESENCE

This is the perception of the property that is created at the boundary of the property where it borders the municipal street in terms of the CPTED principles.

### 3.26 TARGET HARDENING

Entrance and exit doors, including their frames, hinges and locks should be of robust, vandal-resistant material. Vandal resistant viewing panels should be fitted into doors. Entrances should be well lit internally and externally. External opening swing doors should be fitted with non-removal hinge pins, full length astragals and vandal-resistant locking devices. Doors, frames, equipment and finishes in circulation areas, including elevators, should be designed to be vandal resistant. Lock boxes should be securely flush mounted rather than a protruding surface mount.

### 3.27 TERRITORIALITY

This relates directly to the concept of ownership and the building design should lend itself to
allowing the building owner and its occupants to portray/express a sense of ownership by defining the transitions from public to semi-private and then private space.

### 3.28 TRAFFIC CALMING

These devices and measures are used to control the volume and/or speed of traffic at the posted/required area. Examples can include speed bumps, traffic circles/roundabouts, bollards, and narrow lanes.

### 3.29 VULNERABILITIES

Identification of one or more weaknesses in the design and/or operation of the property as it relates to the prevention of crime or nuisance behaviours.

### 3.30 WINDOWS

.1 Ground floor windows and those easily accessible above the ground floor must have a multipoint locking system to lock the window from being opened from the outside. Windows should be located on all sides of the building to provide full visibility of the property.

.2 Where necessary, opening restrictors or similar built-in mechanisms should be utilized. Where windows are required under the building code to act as an egress, the opening window must not have key operated lock. These egress windows must not be restricted in any way to prevent emergency exit from building. Instead of bars, consider all other alternatives such as laminated glass.
## CPTED Performance Standard Checklist

<table>
<thead>
<tr>
<th>Principle/ Objectives</th>
<th>Design Intent</th>
<th>Evaluation Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Building Identification</strong></td>
<td>Ensure buildings are clearly identified by street number to prevent unintended access and to assist persons trying to find the building.</td>
<td>Street numbers should be plainly visible and legible from the street or road fronting the property.</td>
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<td>In residential uses, each individual unit should be clearly numbered. In multiple building complexes, each building entry should clearly state the unit numbers accessed from that entry. In addition, directional signage to unit numbers should be provided on each level or floor.</td>
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<td>Street numbers should be made of durable materials, preferably reflective or luminous, and unobstructed (e.g. by foliage).</td>
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<td>For larger projects, provide location maps (fixed plaque format) and directional signage at public entry points and along internal public routes of travel.</td>
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<tr>
<td><strong>Common/ Open Space Areas and Public On-Site Open Space</strong></td>
<td>Provide natural surveillance for common/open space areas</td>
<td>Position active occupancies or occupied rooms with windows adjacent to main common/open space areas, e.g. playgrounds, swimming pools, etc., and public on-site open space.</td>
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<td>Design and locate dumpster enclosures in a manner which screens refuse containers, minimizes opportunities to hide, and provides direct vehicle access for the removal and replacement of the bin.</td>
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<td>Locate waiting areas and external entries to elevators/stairwells close to areas of active occupancies to make them visible from the building entry.</td>
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<td>Foot and bicycle paths should be of generous width and have a suitable landscape setting to avoid creating narrow corridors which could be perceived as threatening.</td>
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<td>Locate seating in areas of active uses.</td>
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<tr>
<td><strong>Exterior Entrances</strong></td>
<td>Provide entries that are clearly visible</td>
<td>Design entrances to allow users to see into them before entering.</td>
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<td>Avoid confusion in locating building entrances</td>
<td>Entrances should be clearly identified</td>
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<td>Entrances should be easily recognizable through design features and directional signage.</td>
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<td>Minimize the number of entry points.</td>
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<tr>
<td><strong>Fencing</strong></td>
<td>Fence design should maximize natural surveillance from the street to the building and from the building to the street, and minimize opportunities for intruders to hide</td>
<td>Front fences should be predominantly open in design, e.g. pickets or wrought iron, or solid fencing no higher than 1.2 meters.</td>
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<td>Design other high solid fences in a manner that incorporates open elements such as lattice to allow visibility above the height of 1.5 meters.</td>
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<td>If noise insulation is required, install other devices at the front of the building rather than solid fences higher than 1.5 meters.</td>
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<td>Other landscape features such as elevation changes or berberis landscaping should be used in conjunction with fences in locations where climbing the fence is likely.</td>
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</table>
### Crime Prevention Through Environmental Design

#### CPTED PERFORMANCE STANDARD CHECKLIST

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<tr>
<td><strong>Landscaping</strong></td>
<td>Avoid landscaping which obstructs natural surveillance and allows intruders to hide</td>
<td>Trees with dense low growth foliage should be spaced or their crown should be raised to avoid a continuous barrier. Use low groundcover, shrubs a maximum of .6 meters in height, or high-canopied trees (clean trimmed to a height of 2.4 meters) around children’s play areas, parking areas, and along pedestrian pathways. Avoid vegetation that conceals the building entrance from the street.</td>
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<tr>
<td><strong>Use vegetation as barriers to deter unauthorized access</strong></td>
<td>Consider using berberis plants as an effective barrier in place of or in addition to fencing, and to obstruct access to walls, fences and other structures prone to graffiti.</td>
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<tr>
<td><strong>Avoid placement of vegetation or structures that would enable access to a building or to adjacent buildings</strong></td>
<td>Avoid placement of large trees, garages, utility structures, fences, and gutters next to second story windows or balconies that could provide a means of access.</td>
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<tr>
<td><strong>Lighting – Exterior</strong></td>
<td>Provide exterior lighting that enhances natural surveillance</td>
<td>Prepare a lighting plan in accordance with BC Housing Standards, which addresses project lighting in a comprehensive manner. Select a lighting approach that is consistent with local conditions and eliminates crime. Locate elevated light fixtures (poles, light standards, etc.) in a coordinated manner that provides the desired coverage. The useful ground coverage of an elevated light fixture is roughly twice its height. For areas intended to be used at night, ensure that lighting provides visibility. Where lighting is placed at a lower height, ensure that it is vandal resistant. Ensure inset or modulated spaces on a building facade, access/egress routes, and signage is well lit. In areas used by pedestrians, ensure that light shines on pedestrian pathways and possible entrapment spaces. Place lighting to take into account vegetation, in its current and mature form, as well as any other element that may have the potential for blocking light. Avoid lighting of areas not intended for nighttime use to avoid giving a false impression of use or safety, or alternatively, use motion activated spot lights in these areas. Provide uniform areas of light versus over-lighting areas which creates significant contrast to areas of darkness. Select and light “safe routes” so that these become the focus of legitimate pedestrian activity after dark. Avoid climbing opportunities by locating light standards and electrical equipment away from walls or low buildings. Use photoelectric rather than time switches for exterior lighting. Placement of lighting and cameras needs to be coordinated in order that areas to be covered by camera are sufficiently lit and that lighting is not blinding the camera shot.</td>
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<td><strong>Mix of Uses</strong></td>
<td>In mixed use buildings, increase opportunities for natural surveillance while protecting privacy</td>
<td>Where allowed by code, locate shops and businesses on lower floors and residences on upper floors. In this way, residents can observe the businesses after hours while the residences can be observed by the businesses during business hours.</td>
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<td>Include food kiosks, restaurants, etc. within parks and parking structures.</td>
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<td>Access to dwellings or other uses above commercial/retail developments should not be located in secluded areas.</td>
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<tr>
<td><strong>Natural Surveillance</strong></td>
<td>Avoid blind corners in pathways and parking lots.</td>
<td>All public and semi-private areas should maintain an unobstructed view from areas that are frequently and regularly occupied. Pathways should be direct.</td>
<td>Consider the installation of mirrors to allow users to see ahead of them and around corners. Any barriers along pathways should be transparent (see through) including landscaping, fencing etc.</td>
</tr>
<tr>
<td><strong>Ownership and Maintenance</strong></td>
<td>Create a “cared for” image</td>
<td>Ensure that landscaping is well maintained to give an impression of ownership, care, and security. The building design should allow the building owner and its occupants to portray/express a sense of ownership by defining the transitions from public to semi-private and then to private space. Use materials which reduce the opportunity for vandalism. Consider using strong, wear resistant laminate, impervious glazed ceramics, treated masonry products, stainless steel materials, anti-graffiti paints, and clear over sprays to reduce opportunities for vandalism. Avoid flat or porous finishes in areas where graffiti is likely. Where large walls are unavoidable, utilize vegetative screens to prevent vandalism and graffiti. Where exits are closed after hours, ensure this information is indicated at the parking area entrance.</td>
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<tr>
<td><strong>Security</strong></td>
<td>Reduce opportunities for unauthorized access</td>
<td>Utilize security hardware and/or human measures at each entry point to reduce opportunities for unauthorized access.</td>
<td>Security doors should include laminated glass panels to enhance visibility. Security bars should be avoided in favour of alternatives such as security film, laminates, wired glass, alarmed spaces, and barriers to the glassed area such as landscaping, fences, bollards and planters.</td>
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## CPTED Performance Standard Checklist

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<tr>
<td><strong>Signage</strong></td>
<td>Ensure that signage is clearly visible, easy to read and simple to understand</td>
<td>Use strong colours, standard symbols, and simple graphics for informational signs.</td>
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<td>Address and way finding signage should be located at intersecting pathways, in parkades, and along driveways where the destination building signage cannot easily be seen.</td>
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<td>Upon entering the parking area, provide both pedestrians and drivers with a clear understanding of the direction to stairs, elevators, and exits.</td>
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<td>In multi-level parking areas, use creative signage/colours to distinguish between floors to enable users to easily locate their cars.</td>
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<td>Signage should advise users that security measures that are in place, and identify locations such as security phone, panic alarm or intercom system.</td>
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<td>Where exits are closed after hours, ensure this information is indicated at the parking area entrance.</td>
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<tr>
<td><strong>Site and Building Layout</strong></td>
<td>Allow natural observation from the street to the occupancy, from the occupancy to the street, and between occupancies</td>
<td>Orient the main entrance towards the street, or on corners, to both streets.</td>
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<td>Position occupied rooms with windows at the front of the dwelling.</td>
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<td>Offset windows, doorways and balconies to allow for natural observation while protecting privacy.</td>
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<td>Minimize the number of entry points, and locate the main entrances/exits at the front of the property and in view of the street.</td>
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<td>If employee entrances must be separated from the main entrance, they should maximize opportunities for natural surveillance from the street.</td>
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<td>Avoid large expanses of parking. Where large expanses of parking are proposed, provide surveillance such as security cameras.</td>
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<td>In parkades, access to elevators, stairwells and pedestrian pathways should be clearly visible.</td>
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<td>Avoid hidden recesses.</td>
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<td>Locate parking areas in locations that can be observed by adjoining occupancies.</td>
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<td>Open spaces such as parks, plazas, common areas, and playgrounds must be clearly designated and situated at locations that are easily observable by people.</td>
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<td>Where possible, design multi-unit residential occupancies such that no more than six to eight units share a common building entrance.</td>
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<td>Common area and/or street furniture shall be made of durable, vandal resistant materials and secured by sturdy anchor points.</td>
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<td>Communal facilities on the ground floor, such as residents’ communal lounges and common laundry rooms, should be located to provide natural surveillance of entrances, entrance lobbies and external areas.</td>
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End of Section
Introduction to Construction Standards

1 Purpose

The purpose of the Construction Standards is to establish a good quality level for construction materials and assemblies that optimizes occupant satisfaction and minimizes overall lifecycle costs for the building. Overall lifecycle ownership cost is defined as the sum of:

1. Fixed financial criteria: nominal discount rate, length of study
2. Investment cost: initial capital cost
3. Annual costs: taxes, insurance, maintenance, operation, energy and municipal costs
4. User costs: change as a result of staffing requirements
5. Periodic costs: replacement, repair, alteration and re-decoration
6. Salvage value: at the end of material or equipment’s useful life

The Construction Standards identify the level of standards that are expected within the constraints of the approved construction budget. Compliance with these standards is mandatory unless specifically waived by BC Housing in consultation with the Design Team.

2 Scope

These Construction Standards apply to buildings projects, including new construction, conversions, and renovations. The design consultant, in consultation with BC Housing, must apply these construction standards where applicable.

3 Construction Standards and Specifications

The Construction Standards are intended to be a reference on all projects (new construction, conversions, and renovations), from which full project-specific specifications are compiled by the design consultant. The design consultant is not to reproduce these standards for project specifications, but to refer to them for information. A qualified construction specification writer should be engaged to prepare the project specifications.

The Design Consultant is responsible for reviewing the Construction Standards, all applicable design and regulatory requirements, and incorporating these into the project specifications.

All other clauses identify General, Product, and Execution requirements to be incorporated in the project specifications.
4 Alternatives

Acceptable products/materials for a given application, the design consultant has the option of using any of the listed materials or specifying alternative materials that meet or exceed the specified requirements. BC Housing/the Owner must be notified, and approve of alternatives, prior to commencement of construction, refer to Section 5 – Division 01 23 00 – Alternatives.

5 Hazardous Materials

Also included in this document is a section on hazardous materials which provides information to ensure safe working conditions and compliance with WorkSafeBC when dealing with any hazardous materials and where additional information can be accessed. Reference Appendix D for this information.

6 Organization

These Construction Standards are organized according to the 2014 edition of MasterFormat, published jointly by Construction Specifications Canada and the Construction Specifications Institute. MasterFormat is a master list of numbers and titles for organizing information about construction requirements, products, and activities widely accepted as standard practice in Canada. BC Housing requires that project specifications follow MasterFormat numbering and titles.

7 Revisions

While the published Construction Standards will govern the evaluation of submissions, where emerging technology, code changes and experience indicate revisions are required, BC Housing may require these revisions be incorporated in a particular project.

8 Review by BC Housing

Missing or deficient project specifications will be noted in the construction document review. It is recommended that the design consultant undertake an internal review process to ensure their conformity with the Construction Standards. Refer to Appendix A for BC Housing review process.

9 Tendering and Construction Requirements

.1 Consultants are responsible for the preparation of bidding requirements in accordance with the BC Housing procurement requirements and the Public Tendering Guidelines for Non Profit Housing.

.2 Consultants are responsible for including the applicable BC Housing Supplementary General Conditions in the contract documents.

.3 According to BC Housing Supplementary General Conditions, the Contractor and Subcontractors are responsible for the provision of opportunities for work experience and training in the construction industry for entry level workers to trade apprentices, if Owner supports.
The Contractor’s work force is required, where such programs exist, to include individuals placed through agencies such as Bladerunners, Tradeworks and Embers that provide ongoing training and support to persons with barriers to employment. Individual placed through these programs will be considered employees of the Contractor Subcontractor. The level of involvement in the program will be developed in consultation with the program’s local Project Coordinator.

End of Section
01 23 00 – Alternatives

.1 All substitutions and or alternatives must be pre-approved by the Consultant, BC Housing, and the Owner.

.2 BC Housing will consider alternative construction materials and assemblies that adjust capital cost provided that:
   .1 substitute(s) shall be the same type, be capable of performing the same functions, and meet or exceed the standards of quality of the specified product(s),
   .2 building performance and comfort criteria as described in the BC Housing Design Guidelines and Construction Standards are not compromised, and
   .3 the estimated overall “life cycle cost” remains consistent or is decreased.

The minimum criteria and information has been developed to assist in preparing a “life cycle cost” study for evaluation of alternatives. Life cycle cost is defined in Introduction to Construction Standards under Section 5 – Construction Standards.

.3 Design consultants must submit the cost and performance data for review by BC Housing. Include the estimated increase or decrease to capital cost, “annual ownership costs”, estimated service life and quality and performance benefits as compared to the Construction Standard.

.4 Acceptance of any alternative will be based on the value of the estimated cost savings and relevance of the performance benefits to the project.

.5 The Consultant and the Contractor must coordinate the changes of the work in conjunction with other parts of the work that may be affected. Upon agreement of the changes, the Contractor shall be responsible for cost of changes resulting from the Contractor’s proposed substitutions that affect other parts of the work.

End of Section
01 31 00 - Project Meetings

The Consultant shall use the following criteria as a guide in preparing this section.

.1 Representatives of the Contractor, subcontractors and suppliers attending meetings must be qualified and authorized to act on behalf of the party each represents.

.2 Schedule a pre-construction meeting within fifteen (15) days of issuance of “Notice to Proceed” letter (design-tender) or within fifteen (15) days of commencement of construction (design-build).

.3 Schedule and hold regular construction progress meetings, as required to expedite Work, not less than once monthly.

.4 Attendance for pre-construction and construction progress meetings (but not limited to):
   .1 Owner’s representative(s) where applicable
   .2 BC Housing representative(s)
   .3 Design Consultant and engineering consultants
   .4 Contractor’s project manager
   .5 Contractor’s superintendent
   .6 Sustainability Consultant where applicable
   .7 Contractor’s and Subcontractor’s Sustainability Coordinator where applicable
   .8 Subcontractors as appropriate to the agenda
   .9 Suppliers as appropriate to the agenda
   .10 Commissioning authority where applicable

.5 Agenda for pre-construction meeting – the following agenda items (but not limited to) should be reviewed:
   .1 Project description – civic address, site information, project statistics
   .2 Project team – roles/responsibilities and flow of communication – sponsor, consultants, contractor, BC Housing team and support funding partner
   .3 Construction schedule and milestones
   .4 Pre-construction documents – see construction contract requirements, e.g., schedule of values, construction schedule, insurance, bonds, WCB status and all other project specific requirements
   .5 Contract documents – construction contract, construction drawings, as-built drawings
   .6 Contract administration procedures – progress claims, changes, alternates, submittals, shop drawing reviews, reports, meetings, as built drawings
.7 Building envelope – field review, mock ups, window testing
.8 Project close out/substantial performance documents and procedures, building handover guide
.9 Lien holdback – early release documents
.10 Signage – BC Housing, Sponsor
.11 Use of the premises, utilities, site mobilization and review of Owner and Contractor responsibilities and administrative procedures, and recording and distribution of minutes.
.12 Sponsor site access and display suite
.13 Site security
.14 Health, safety and emergency response procedures
.15 Municipal requirements – building inspectors, permits and offsite services
.16 Fire safety plan
.17 LEED® Requirements and Documentation Submittals
.18 The requirements of the “Construction Waste Management Tracking Sheet”
.19 Site photographic documentation
.20 Erosion and Sediment Control Plan
.21 Third party inspection or testing for quality assurance – e.g. energy auditor, RCABC, MPI.
.22 BCH Owner’s controlled insurance requirements – e.g. fence, video surveillance
.23 The requirements for utilities incentive and rebate documentations
.24 Complete demonstration and training of all mechanical and electrical systems and equipment
.25 Hazardous Materials Management Tracking Form or inventory spreadsheet – for renovation project

.6 Agenda for construction progress meeting should follow (but not limited to) the items mentioned:
.1 Approval of minutes of previous meeting
.2 Review of items of significance that could affect progress and/or Project costs
.3 Topics as appropriate to current status of the work and schedule
.4 Status of proposed changes
.5 Status of submittals
.6 Update of Construction Schedule
.7 LEED® progress and Environmental Goals
.8 Tenant communications for renovation and conversion projects
.9 Hand over, training and commissioning activities
.7 Post Occupancy Meetings: the following meetings should be held to discuss the procedures and requirements for overall completion of the project:

.1 Building Handover Meeting: to be undertaken prior to actual building occupancy. Refer to Guide to Building Handover.

.2 Post Completion Review Meeting: to be undertaken within 3 months of project occupancy. The meeting will include analysis of the budget, schedule, scope, change order variances, communication among the stakeholders, risk management and operational issues, along with identifying the successes of the project and the areas for improvement.

.3 Six Month Review Meeting: to be undertaken within 6 months after substantial completion, if required for the project. The purpose is to review Owner’s training requirements after initial handover. Refer to Guide to Building Handover.

.4 Warranty Review Meeting: within 2 months prior to expiry of warranty. Refer to Guide to Building Handover.

End of Section
01 45 00 – Quality Control

1 Inspections and Testing of Materials

.1 Unless alternate arrangements are made on a project specific basis, the Contractor must engage and pay for independent testing and inspections, by agencies approved by the Owner, including but not limited to the following:

.1 Exterior wall mock-up inspection including air barrier membrane.
.2 Window and door pre-delivery lab test (if required)
.3 Window and door mock-up inspection
.4 Window and door field tests – water penetration
.5 Erosion and sediment control
.6 Compaction testing of backfill, road base and sub-courses, underslab fill and service trenches
.7 Asphalt mix and testing
.8 Concrete mix design
.9 Concrete testing
.10 Masonry veneer wall mock-up inspection
.11 Roofing inspection (RCABC)
.12 Painting inspection (MPI)
.13 Flooring inspection by an independent agency (if required)

.2 If any defects are revealed during inspection and testing, the appointed agency will request additional inspection and/or testing to ascertain full degree of defect. The Contractor must correct defects and irregularities as advised by the design consultant at no additional cost to the Owner. The Contractor must pay all costs for re-testing and re-inspection.

.3 Within fifteen (15) days of award of the Contract, the Contractor must submit to the design consultant a list of the proposed independent inspection agencies for review and approval by the owner, the design consultant, and BC Housing if not the Owner.

.4 Notify the Design Consultant, Owner and Testing Agency two (2) days prior to expected time for operations requiring inspection and testing. When tests or inspections cannot be performed, through the fault of the Contractor, the Contractor is responsible for reimbursing the Owner for additional costs incurred.

.5 Submit PDF electronic copy of inspections and test reports to each: the Owner, Design Consultant and BC Housing.

.6 Provide a hardcopy of inspections and test reports on site for all time.
2 Mockups

.1 Construct full-size mock-ups on site of the following conditions in locations directed by the design consultant. Make changes to the mock-ups as directed by the design consultant and building envelope consultant. Mock-ups, once accepted, may be used in the finished work and will serve as a standard against which other work will be judged.

.1 Typical exterior wall construction: include exterior wall finish, backup walls, wall cavities, flashings, air seal membranes, insulation, sealants, sheathing and sheathing membranes as applicable.

.2 Windows: include installed window frame, window anchors, glazing, flashing, air seal membrane connection and sealants as applicable and finished trim. Refer to Division 08 50 00 – Windows, Side Hinged & Sliding Glass Doors.

.3 Masonry mock-ups.

.4 Complete suite mock-up for modular units (if project is larger than 200 units).

.5 Exterior cladding mock-ups (Stucco, vinyl, etc.).

.6 Painting, see Division 09 91 00 – Painting.

.7 Flooring, see Division 09 65 00 – Resilient Flooring.

.2 Indicate mock-up inspections on the construction schedule. Coordinate with regular site meetings if possible. Inform the BC Housing Inspector and the Consultant at least two (2) days in advance of mockup inspections.

.3 Provide photographic documentation for mock-ups as specified in Division 01 78 00 – Closeout Submittals. Notify the service provider 24 hours before commencing mock-up area and do not cover area until after photographs have been taken.

End of Section
01 74 19 - Construction Waste Management and Disposal

1 General

.1 CONSTRUCTION DEBRIS AND WASTE MANAGEMENT GOALS FOR ALL PROJECTS.

Ensure a waste management plan for all Projects. A process shall be employed by the Contractor to ensure the generation of as little construction waste as possible. Refer to LEED® Canada and BC Housing Livegreen Plan (located on the BC Housing website).

.2 CODE OF PRACTICE

The waste management plan shall comply with Metro Vancouver’s “The Greater Vancouver Regional District 3Rs Code of Practice for the Building Industry” and Job Site Recycling guide.

.3 REGULATORY REQUIREMENTS

Conform to applicable codes and regulations for disposal and removal of common and hazardous waste. Handle and dispose of all hazardous and banned materials in accordance with the BC Waste Management Act and Special Regulation, and regional and municipal regulations. The hazardous and banned materials include but are not limited to asbestos, drywall (banned from disposal), underground storage tanks, polychlorinated biphenyls (PCBs), abandoned chemicals (gasoline, pesticides, flammable and combustible substances), freon from cooling equipment, lead-based paints, smoke detectors, and mercury containing switches.

.4 WASTE MANAGEMENT PLAN

.1 For all projects, a waste management plan should be developed and implemented; quantifying material diversion goals and highlighting recycling salvage requirements. Currently, BC Housing has set an average total target of 80% waste diversion from landfills in the lower mainland and on Vancouver island, and 60% elsewhere in the province, on projects with a budget greater than $100,000 (hazardous and excavated materials, such as asbestos, lead, and earthwork, is to be excluded from the targets). The Contractor will be responsible for tracking waste diversion rates throughout the construction, demolition and land clearing waste. Refer to LEED® Canada.

.2 Refer to the BC Housing Livegreen Plan (located on the BC Housing website).

.3 The following list, though not exclusive, itemizes the materials that are to be recycled.

.1 Clean dimensional wood, palette wood
.2 Concrete/Brick/Concrete Block/Asphalt
.3 Drywall
.4 Fluorescent tubes
.5 Land clearing debris
.6 Old corrugated cardboard
.7 Paint (return to Paint Depot)
.8 Scrap metal
.9 Window glass/frames

.4 All Contractors shall prevent contamination of materials to be recycled and salvaged and handled materials consistent with requirements for acceptance by designated facilities. Where space permits, source separation shall be provided. Where materials must be co-mingled the Contractor shall arrange appropriate bins and also arrange for bins to be taken to a processing facility for separation offsite.

.5 The “Construction Waste Management Tracking Sheet” is to be filled out, signed, and submitted, by the Contractor, at the end of the project. Refer to Appendix C for the form.

2 Products
Not Applicable

3 Execution
Not Applicable

End of Section
01 78 00 – Closeout Submittals

1 General

.1 Typically, BC Housing utilizes CCDC 2 contracts, which covers closeout requirements for Contractors. However, if any forms of contracts are used, the following requirements, in addition to what is stated in those particular contracts, will apply.

.2 The closeout documents shall be prepared by the Contractor and submitted to the Consultant, Owner, and BC Housing for review. An appropriate deficiency holdback should be stated in the contract documents for items not submitted on time and deficiencies in the as-built drawings and operating and maintenance manuals.

.3 The contractor shall prepare a fire safety plan and documentations in accordance with the current BC Fire Code and the Local Fire Bylaw, unless otherwise specified by the Owner/Operator.

.4 Consideration should be given to the size and complexity of the project as well as location and costs to determine if comprehensive third party photo documentation of construction progress and as-built conditions by the contractor is required or applicable.

.5 If the photographic documentation is required for the project, the following requirements must be incorporated:

.1 All documentation services shall track at regular intervals (typically monthly) throughout the construction in chronological order, in addition, special dates like milestones, mockups, testing, inspection, commencement, completion and miscellaneous events such as materials arriving on site, waste handling/recycling as determined by Owner/Consultant. The documentation shall include date, electronic indexing, navigation through architectural plans, storage and online access.

.2 Exterior progress documentations: include all elevations and major site features like underground utilities, soil and sediment control, adjacent buildings, blindside property line excavation, reinforcing drainage, concrete wall construction, outside progression of building envelope and more.

.3 Interior progress documentations: include interior improvements by areas like interior wall framing and finishes, flooring installation, interior finishes, millwork and more.

.4 Overlapping images of all in-slab utilities within the building and all finished systems located in the walls and ceilings for mechanical, electrical, plumbing and all other systems.

.5 Upon completion of the Project, final copies of the documentation all “as-built” conditions (the “Permanent Record”) with the indexing and navigation system embedded (and active) to be provided in an electronic media format, such flash hard-drive or equivalent. Submit a total of 4 copies- 1 each to the Consultant, Owner, BC Housing and the Contractor. Make sure “as-built” condition shows actual physical conditions, completely and accurately including all change orders.
.6 Provide online site access available for any standard internet connection for multiple users – simultaneous use and access to clear, focused, high resolution photographs (organized by date, time and location) that can be enlarged and individually printed as required. Technical support related to using the system should be provided during the construction and 2 years after the substantial completion.

2 Closeout Requirements

.1 AS BUILT DRAWINGS AND SPECIFICATIONS

.1 The design consultant will provide one (1) set of white prints of all contract drawings for the sole purpose of recording all “as-built” conditions. The Contractor must clearly identify them as “as built drawings” and have them available at all times and at each regular project progress site meeting for inspection by the Design Consultant, Consultant Inspector (if applicable), and BC Housing.

.2 As work progresses, the Contractor must record clearly and indelibly in red pencil all “as-built” deviations from the contract documents as a result of changed site conditions, various directives by addenda, correspondence, site clarifications, site instructions, change orders, shop drawings and changes required by authorities having jurisdiction. All documentation that is referenced must be included and cross referenced in the as built drawings. Present as-built prints for scrutiny at each project meeting and as may be required by the Consultant.

.3 Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross reference on the Contract Drawings.

.4 Upon completion of the Work, the Contractor shall employ the design consultants to produce one (1) copy of signed and certified white print and two (2) sets in high quality indexed electronic format (e.g. CD, USB) for both PDF and CAD drawings that include all as built conditions noted on the Contractor’s as built drawings.

.5 The recorded deviations include, in general but are not necessarily limited to, items that are hidden from view, items of major importance to future operations, maintenance, alterations and additions.

.6 The title sheet shall include a complete list of all drawings. Each drawing shall include a graphic symbol that identifies all as built revisions, cross referenced to a date in the drawing issue portion of the title block.

.7 The Contractor must sign each drawing and provide one (1) Certificate of Record for the drawing set as illustrated in the following paragraphs, signed by persons authorized to sign on behalf of the Contractor.

.8 Acceptance of the as-built drawings shall be subject to the review and approval of the Consultant and BC Housing.

.9 Include two (2) copies of specifications with contract modifications, addenda, change orders and site instructions in PDF on high quality indexed electronic format.
.2 CERTIFICATE OF RECORD – AS-BUILT DRAWINGS

I/We (name of Contractor) hereby certify that the set of as-built drawings attached hereto, comprised of (-) sheets, is a complete and total record of the building(s) as constructed. I/

We further certify that the drawings show accurately all structural details, all mechanical and electrical services, exposed or hidden and that the Owner may fully rely on their accuracy in any future contemplated repairs, modifications or additions to this work.

Signed by
Contractor: ______________________________________

Name of Contractor __________________________________

Per: ______________________________________________

Date: _____________________________________________

Witnessed by: _____________________________________

Date: _____________________________________________

.3 CONSTRUCTION WASTE MANAGEMENT TRACKING SHEET

The Contractor must complete the “Construction Waste Management Tracking Sheet” as part of the closeout requirements. The form is to be completed by the Contractor, signed, and submitted to BC Housing at the end of each project. Refer to Appendix C for sample waste management tracking sheet and Section 3- Energy and Environmental Design for additional information.

.4 UTILITY INCENTIVE AND REBATE DOCUMENTATION

The contractor will provide all documentation necessary to apply for all applicable incentives within 30 days of equipment purchase to the BC Housing staff responsible for managing the project. The related documents are, but not limited to, appliance invoices, lighting invoices, exhaust fan invoices, boiler invoices, and any related mechanical equipment invoices. Refer to Section 3- Energy and Environmental Design for additional information.

.5 HAZARDOUS MATERIAL INVENTORY SPREADSHEET

For renovation projects, the contractor will update the existing hazardous material inventory spreadsheet and submit to the BC Housing staff responsible for managing the project.
3 Contractor: Operating and Maintenance Manuals

Provide a detailed index and a summary checklist of items to be maintained, including required preventative maintenance time scale. Also highlight the methodology and scope which can be readily cut and pasted onto work orders or separate scopes of work for bid purposes and/or instruction to in-house maintenance staff.

.1 Manuals are to contain pertinent care, maintenance, operational and installation information for all building materials, finishes, components, equipment and systems. Instructions in the manuals to be in plain language so as to guide the Owner in the proper operation and maintenance of the building.

.2 Manuals shall be prepared by experienced and qualified staff or consultants. Acceptance of the maintenance manuals shall be subject to the review and approval of the Consultant and BC Housing.

.3 Provide information for future operating staff to understand and optimally operate the commissioned systems and how to effectively recommission the systems to prolong the service life, decrease energy consumption, and reduce operational, maintenance and replacement cost.

.1 Requirements

.1 Submit a draft copy of the tables of contents for the manuals 30 days prior to the date of Substantial Performance of the Work, for review by the Consultant.

.2 Submit completed maintenance manuals with application for Substantial Performance, for review by the Consultant. Include an indexed demonstration video of all mechanical and electrical systems and electrically-operated devices to the Owner’s operating and maintenance staff and any training required by the specifications, to the Owner’s satisfaction.

.3 Submit one (1) set of final hardcopy maintenance, operating and instruction manuals and two (2) sets in high quality indexed electronic format (e.g. CD, USB) PDF to the Owner no later than thirty (30) business days after the certificate of completion is issued.

.4 Complete reports including a balancing report for all mechanical systems and certification by all testing, cleaning or inspection authorities as specified in the contract documents.

.5 Include the LEED® Durability Tables, if targeted for project.

.6 Include summary of items covered by Change Orders

.7 Include any equipment supplied by the Owner, separate to the contract.

.8 Include development permit, building permit, occupancy permit and letters of assurance.

.9 Include all warranty information, contact information for inquiries, warranty period start dates, expiry dates, and a brief description of any commentary related to warranty coverage or limitations. Warranty information is to be compiled into one document that can be easily referenced by the Owner.

.10 Include performance bond and/or maintenance bonds (If applicable).
.11 Include Letter of Credit (if applicable) issued to cover the performance and completion of site services.

.12 Format: Bind manual contents into hard plastic coated three-ring binders, complete with coloured plastic tabs organizing contents into applicable categories of Work, based on the specifications for the project. Label the cover and spine of the manuals with the name of the project and manual contents. Descriptions and lists are to be neatly typed or printed on 216 mm x 280 mm (8" x 11") heavy bond paper.

.2 Organization of Manuals

.1 Section 1.0 – Directory

.1 Provide a directory listing the names, addresses, telephone and facsimile numbers of Consultant, Engineering Consultants, Contractor, Subcontractors, major equipment, product and equipment suppliers and service contract providers (e.g., alarm system, elevator). Include emergency contact names. Also outline duration of warranties, including start and expiry dates.

.2 Section 2.0 – List of Drawings and Specifications

.1 Provide a complete list of drawings and specifications. Provide list of shop drawings and test reports for the project in their own sections.

.3 Section 3.0 – Architectural (Including Landscaping, Building Envelope, Finishes)

.1 Provide care, cleaning and recommended maintenance instructions for finishes and materials as specified.

.2 Provide operation and maintenance instructions for equipment such as (but not limited to) overhead doors, landscape irrigation systems and elevators. Provide descriptive and technical data, maintenance and operating procedures, wiring diagrams, spare parts lists, name of service representative, suppliers for replacement parts, trouble shooting data and preventive maintenance program complete with maintenance and renewal checklists.

.3 Submit a backup copy of the elevator control system software.

.4 Provide copy of finish hardware schedule, paint schedules (interior and exterior), and caulking and sealant schedules, complete with the manufacturer, supplier and identification names and numbers.

.5 Provide inspection and approval certificates from authorities having jurisdiction.

.6 Provide RCABC and MPI Guarantee and documentation.

.7 Provide a copy of all warranty and guarantee certificates as specified.

.8 Provide a copy of the Homeowner Protection Office (HPO) Building Envelope Renovation Schedule, where applicable.

.9 Submit a list of chattels, if any, including make, model and serial number provided by the Contractor for the project.

.4 Section 4.0 – Mechanical
Provide an index with the following headings:

.1 Mechanical Drawing List
.2 Description of Systems
.3 Mechanical System Troubleshooting
.4 Required preventative maintenance schedule, belt schedule, filter schedule, and lubrication schedule for all equipment and systems
.5 Subtrade and supplier list equipment repair manuals
.6 Chemical treatment certificates, hydrostatic and air test certificates
.7 Balancing report
.8 Valve tag schedule, piping colour code
.9 Equipment start up reports
.10 Guarantee certificate, final inspection certificates, warrantee certificates
.11 Sprinkler Shop Drawings
.12 Vibrations Isolation Shop Drawings
.13 Air Handling Unit & A/C Unit Shop Drawings
.14 Fan Shop Drawings
.15 Grille Shop Drawings
.16 Radiant Heating Shop Drawings
.17 Sump Pump Shop Drawings
.18 Plumbing Fixtures and Drains Shop Drawings
.19 Controls “As Built” Drawings
.20 WHMIS Information
.21 DDC system with training manuals

.22 Under each of the above headings, provide the following information, arranged under separate tabs, for each system and major piece of equipment:

.1 Descriptive and Technical Data

Include detailed description of the system and components, an explanation of how each component interfaces with others and the location of each thermostat and all controls

.2 Operating Procedures

.1 Provide complete and detailed operation of each major component
.2 Include starting procedure, exact switch and control location
.3 Describe operation of component controls, changes required for summer or
winter operation and method of making changes

.4 Describe trouble shooting sequence when settings cannot be maintained

.5 Describe safe guards to check if equipment goes off line

.6 Describe fire protection and smoke control

.3 Maintenance and Lubrication

.1 Provide detailed preventive maintenance schedule for each of the major components including daily, weekly, monthly, semi-annual and yearly checks and tasks

.2 Describe lubrication and maintenance procedures for equipment components such as bearings, drives, motors and filters. Include recommended lubricants

.3 Compile this information for each typical piece of equipment

.4 Provide a belt schedule

.4 List of Equipment Supplier, Subcontractors and Servicing Companies

.1 Provide a complete list of local equipment Supplier of parts, Subcontractors and reputable and qualified Service Companies, including address and telephone numbers

.2 Outline procedures for purchasing parts and equipment

.3 Provide a detailed description including drawings, dimensions, parts list and repair manual for each piece of equipment specified

.5 Certification and Test Results

Include copies of the following:

.1 Pre-operational cleaning reports and chemical treatment

.2 Hydrostatic and air tests performed on piping systems

.3 Equipment alignment certificates

.4 Balancing reports for air and water systems

.5 Valve tag identification schedule including location, service and normal position

.6 Pipe colour code

.7 Inspection and approval certificates for plumbing and gas systems and heating and ventilation systems

.8 Equipment startup reports

.9 Warranty certificates

.6 Shop Drawings

Include copy of all reviewed shop drawings.
.5 Section 5.0 – Electrical

Provide an index with the following headings:

.1 Switch Gear and Distribution
.2 Lighting Fixtures and Lamps
.3 Fire Alarm System
.4 Emergency Generator System
.5 Mechanical Motor Control Equipment
.6 Communication Systems
.7 Security System
.8 Personal Call system (if any)
.9 Fire Safety plan

.10 Under each of the above headings, provide the following information, arranged under separate tabs, for each system and major piece of equipment:

.1 Descriptive and Technical Data
.2 Maintenance and Operating Procedures
.3 Wiring Diagrams
.4 Spare Parts List
.5 Service Representatives
.6 Suppliers for Replacement Parts
.7 Test Results
.8 Certifications and warranties
.9 Trouble Shooting Data
.10 Preventive Maintenance Program Complete With Checklists

.3 Schedule of Maintenance Manuals Submittals

.1 The Contractor shall ensure that all manufacturer product information required by the Owner to maintain the building is included in the Maintenance Manuals.

.2 Include a copy of all reviewed shop drawings as noted in the Schedule of Maintenance Manual Submittals, or as requested by the Consultant.

.3 The following table is a checklist of typical Maintenance Manual contents:
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<tr>
<th>TRADE (1)</th>
<th>SECTION NO. (2)</th>
<th>CONTACTS (3)</th>
<th>SHOP DRAWINGS &amp; PRODUCT DATA (4)</th>
<th>INSTALLATION INSTRUCTIONS (5)</th>
<th>WARRANTIES &amp; GUARANTEES (6)</th>
<th>SUGGESTED MAINTENANCE INTERVALS (7)</th>
<th>CARE &amp; CLEANING (8)</th>
<th>HARDWARE SCHEDULE (9)</th>
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<td>MAINTENANCE &amp; OPERATING INSTRUCTIONS</td>
<td>INSPECTION &amp; TEST CERTIFICATES</td>
<td>WIRING DIAGRAMS</td>
<td>LIST OF SUPPLIERS AND MODEL NUMBERS</td>
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<th>SECTION NO.</th>
<th>CONTACTS</th>
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<th>INSTALLATION INSTRUCTIONS</th>
<th>WARRANTIES &amp; GUARANTEES</th>
<th>SUGGESTED MAINTENANCE INTERVALS</th>
<th>CARE &amp; CLEANING</th>
<th>HARDWARE SCHEDULE</th>
<th>COLOUR/PATTERN</th>
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</table>

Notes:
(1) Trade listing.
(2) Section listing in BC Housing Construction Standards.
(3) Submit Subcontractor or Supplier's name, address, telephone number and emergency contact.
(4) Submit copy of reviewed shop drawings or Product data as specified. Submit engineered shop drawings where specified.
(5) Submit installation instructions for products which BCH may be removing and reinstalling.
(6) Submit warranties and guarantees as called for in the specifications. Warranties and guarantees to be signed by an authorized signing authority.
(7) Submit list of required maintenance intervals for materials covered under warranties and guarantees.
(8) Submit manufacturer's instructions covering the care, cleaning and maintenance of specified finishes.
(9) Submit a complete copy of the hardware schedule in accordance with the specifications.
(10) Submit a complete listing of colour/pattern products and locations.
(11) Submit descriptions and operation of major components and systems, including seasonal variations, interface with other components, and operation of controls.
(12) Submit a detailed preventative maintenance schedule, operating instructions and complete trouble shooting checklists. Include schedules of tasks, frequency, tools required and task time.
(13) Submit testing, adjusting and balancing reports as specified.
(14) Submit inspection and test certificates issued by authorities having jurisdiction and equipment manufacturers. Submit performance data sheets after commissioning is complete.
(15) Submit wiring diagrams and schematics as specified.
(16) Submit a complete list of equipment and fixtures installed as part of the Work complete with make and model numbers.
(17) Submit a complete list of spare parts for equipment, sources and approximate replacement costs.
4 Fire Safety Plan

.1 Unless otherwise specified by the Owner/Operator, the Contractor shall engage a qualified person or company to prepare a fire safety plan and documents in accordance with the current requirements of the Local Fire Authority, the BC Fire Code, and any other applicable legislation at least 45 days before the target substantial completion.

.2 The fire safety plan shall be kept in a location designated by the BC Code and local authorities having jurisdiction. The design team shall review this requirement at the design development stage with the fire department to confirm if a secure location in the lobby will be required. Refer to Division 21 00 00 – Fire Protection.

.3 The fire safety plan and related documents required by the local authorities shall be submitted to the Prime Consultant, Owner, and local Fire Department or other authorities having jurisdiction for review and approval, and if needed, make all necessary modifications to the documents to satisfy the requirements of the local authority. It is expected that this plan will go beyond the basic requirements of the Fire Code to include additional sections on Earthquake Preparedness/Response and Major Incident Response.

.4 Upon completion, the Contractor shall submit two (2) hard copies in 3 ring binders with printed and laminated tabs for each section, and one (1) copy in electronic format using .doc or .docx (Microsoft Word) for text and .dwg or .vsd for site/building plans.

.5 The Contractor is responsible for completing (including costs) all application and registration process, including permits in all jurisdictions where required.

5 Operator: Maintenance and Renewal Plan

.1 The Contractor shall provide the Operating and Maintenance (O&M) manuals and project documents to allow the Owner/Operator to prepare a Maintenance and Renewals (M&R) Plan for the project.

.2 The Owner/Operator shall engage qualified personnel to prepare the M&R Plan. The M&R Plan shall be based on the maintenance manual and information supplied by the Contractor. The Plan shall include all necessary information to allow the Owner to conduct routine maintenance and meet the Owner’s obligations under any warranties provided for the Work.

.3 The Owner shall submit the following:

.1 Draft M&R Plan to BC Housing within 30 business days after receiving the Contractor’s Maintenance Manual of the building for review by BC Housing and the Consultant.

.2 One (1) hard copy (three ring binder format) along with two (2) copies in indexed electronic format (CD, USB) within 15 business days of written approval of the draft M&R Plan.
.3 The M&R Plan shall include the following:

.1 contact list providing telephone numbers, fax numbers and addresses, for the Consultants, and Sub-Consultants, Contractor and all Sub-contractors and major suppliers.

.2 overview of necessity and use of the M&R Plan

.3 warranties for all materials, systems and equipment in the building, related maintenance requirements and, if applicable, Maintenance Bonds or Letters of Credit issued to cover the performance of particular building components

.4 overview of building envelope principles utilized in the design of the building's exterior walls, building envelope assemblies and components and associated maintenance requirements

.5 glossary of terms utilized in the documentation

.6 information needed for building maintenance, operation/recommissioning of building systems and cost of future replacement of building components

.4 Maintenance and renewal/replacement planning schedule including the following elements:

.1 11" x17" format table with building element to be maintained or replaced along with a description of the task to be carried out including architectural, elevator, mechanical and electrical elements over a 30 year planning period

.2 note frequency of maintenance listing the specific year of maintenance renewal and replacement over a minimum 30 year span along with the associated cost of maintenance and replacement

.3 note key dates from the Home Warranty or warranties for manufactured items and the level of expertise required for each inspection

.5 Include an annual inspection checklist (routine, annual, or cyclical) outlining items to be inspected, based on the Maintenance Schedule. Refer to Housing Provider Kit, Building Handover Guide, Maintenance Guide, Sample Maintenance Checklist.

.6 The following completed project documents shall be included:

.1 Substantial Completion Certificate

.2 Document Six – Canadian Standard Form of Agreement for Architectural Services

.3 CCDC 2 - Contract between Owner and Contractor

.4 Municipal Building Permit and Letters of Assurance

.5 Copy of Performance Bond

.6 As-built drawings and specifications

.7 Building commissioning information

End of Section
02 30 00 - Subsurface Investigation

General

.1 SITE INVESTIGATION REPORT: FOR DESIGN BID BUILD (DESIGN TENDER)

.1 The Owner will appoint and pay for a geotechnical investigation report for the project site.

.2 The investigation report is to identify subsurface (i.e. soil and groundwater) conditions and provide recommendations for site preparation including anticipated stripping depths, temporary excavation slopes, active soil level, foundation design, excavation, dewatering, pavement design, backfill material specifications, compaction requirements including the suitability of the site soils for re-use as structural fill, seismic, seepage and drainage considerations. The report should consider the seasonal variations of the soil, particularly in the interior and northern region where freezing depth can have additional effects on construction. Recommendations for pavement design shall consider loading from fire trucks, garbage trucks, and other heavy vehicular traffic.

.3 The report shall contain the recommendations for lateral earth pressures on below-grade foundation walls, for construction of interior slabs-on-grade, perimeter foundation, underslab drainage and estimates of potential total and differential post-construction foundation settlement.

.4 The report will be obtained for the Owner’s use in design. The report and borehole and/or test pit logs or other subsurface data will be made available for the contractor’s information as an appendix to the bid documents.

.5 The report by its nature cannot reveal all conditions that exist or can occur on the site and the contractor is assumed to be knowledgeable of the limitations of such reports. The report is provided for information only and no guarantee is made of the subsurface conditions other than at the exact borehole locations and to the depth of investigation at those locations.

.6 The Contractor is required to visit the site and acquaint themselves with all existing conditions as well as the geotechnical report, included in the contract documents.

.2 SITE INVESTIGATION REPORT: FOR DESIGN BUILD

.1 The Developer must appoint and pay for a geotechnical investigation report on the project site to identify subsurface conditions. Provision should be made by the Developer/Builder for site reviews, inspections and testing including reporting during site preparation, foundation, excavation and pavement construction.

.2 The investigation report shall provide the recommendations as specified in the clauses 1.2 and 1.3 above.

.3 Submit one (1) hardcopy and one (1) electronic copy of the geotechnical investigation report(s) to BC Housing.

.4 Submit progress and final reports from the Geotechnical Consultant for all field reviews,
inspection and testing carried out during construction including excavation/backfill placement/ 
backfill compaction and pavement construction, including base, sub-base and asphalt compaction.

End of Section
03 30 00 - Cast in Place Concrete

1 General

.1 Architectural and/or structural concrete specifications shall be prepared by the architect and/or structural engineer.

.2 All concrete construction must conform to CAN/CSA A23.1/A23.2 Concrete Materials and Methods of Construction/Methods of Test for Concrete.

.3 The Contractor must appoint and pay for a CSA certified inspection agency to review concrete mix designs and perform concrete testing in accordance with CAN/CSA A23.1. Submit copies of mix designs and test reports to the Consultant and the BC Housing Inspector.

.4 The use of supplementary cementing materials (SCMs) conforming to CSA A3000 can be considered to increase the recycled content of concrete.

.5 The use of regionally available concrete materials is recommended.

.6 Consideration should be given to the reduction in the amount of heat-absorptive, impervious paved surfaces that may contribute to the heat island effect.

2 Products

.1 CONCRETE Topping

Provide a 38 mm (1 1/2") concrete floor topping over all wood sub-floors separating residential units.

.1 Design concrete mix to produce 25 MPa minimum compressive strength at 28 days.

.2 Course aggregate and slump to CSA A23.1 Chemical admixture to confirm ASTM C494 – water additive will not be accepted.

.3 Reinforcement: consider use of Polypropylene fibres or micro fibres to reduce cracking. Use fibre additive only with approval of BC Housing. It is generally recommended to reduce shrinkage and hold thin set concrete together as it will crack at a microscopic level if not used.

.4 Bond Breaker: 6 mil polyethylene or water based chemical bond breaker as recommended by topping manufacturer must meet ULC requirements for inclusion in a rated assembly and subject to approval of structural engineer.

.5 Provide a double bottom plate in wood frame construction for wood baseboard backing.

.2 GYPSUM CONCRETE

.1 Installation, minimum requirements and gypsum concrete properties to follow ASTM F2419 and the Tests in accordance with modified ASTM C 472. Flame, fuel contributed and smoke
developed – all ‘O’ and floor assembly must meet ULC and STC rating.

.2 Provide manufacturer’s 5-year warranty on material.

.3 Applicator to be authorized by the manufacturer and using manufacturer approved mixing and pumping equipment.

.4 With in-floor radiant heating:

.1 Apply in two lifts. A single pour is acceptable if recommended by the manufacturer and providing there is sufficient flow over and under the piping.

.2 Minimum 19mm (3/4”) coverage over piping

.3 No potable water piping allowed in topping to prevent heating of potable water and cross over of piping

.5 Provide a double bottom plate in wood frame construction for wood baseboard backing.

.6 Gypsum underlayment may be poured over expanded or extruded polystyrene (EPS) board which meets or exceeds the physical properties of ASTM C-578 for Type IV or Type IX or acoustic sound control mats.

.7 EPS board must be securely fastened to the sub-floor by an adhesive compatible to the EPS board, gypsum slurry or mechanical fastening. Follow manufacturer’s recommendations for installing acoustic sound control mats (by licensed applicators).

.8 Do not use a bond breaker with lightweight concrete. Apply manufacturer’s recommended floor primer to the sub-floor or on EPS board or acoustic mat prior to installing gypsum underlayment and applying manufacturer recommended sealer over the underlayment.

The architect shall review compatibility with floor finish materials including specification of moisture content requirements. Refer to Division 09 65 00 – Resilient Flooring.

.3 CONCRETE FORMWORK

.1 Conform to CAN/CSA – S269.3 Standard Concrete Formwork.

.2 Formwork for concrete exposed to view: GIS Douglas Fir, Spruce plywood, medium density overlaid plywood or Insulated Concrete Forms (ICF).

.3 Insulated Concrete Forms (ICF) units manufactured of polystyrene foam plastic insulation conforms to CAN/ULC – S701 for type 2, 3 or 4 polystyrene with minimum insulation R-24.

.4 ICF installer must be certified/approved by the manufacturer. The use of ICF to be approved by architect/structural engineer at design development stage.
Execution

.1 MISCELLANEOUS

.1 Repair defective concrete as directed by the Consultant. Defective concrete includes honeycombing, rock pockets, chips, spalls and rust stains in exposed concrete surfaces. Establish the materials and methods for repair of defective concrete with the Consultant prior to executing the work. The repair must proceed as soon as possible after removal of forms. As a minimum, defective concrete must be repaired with a sack rub finish or sandblasting as applicable.

.2 Steel trowel concrete slabs to be left exposed or to receive carpeting, resilient flooring, and sheet membrane waterproofing. Finish floors flat, free from defects which would telegraph through finish material. Conform to CAN/CSA A23.1 for floor finish, flatness ratio, curing and tolerances.

.3 Provide concrete topping control joints in logical areas based on room sizes. Control joints to also be placed at entry to each suite and at other such areas as necessary to control shrinkage cracking.

.4 When using gypsum concrete topping, installation may take place before or after drywall installation has taken place. Spread and screed gypsum concrete to a smooth surface. Place topping in continuous operation. Provide continuous ventilation and adequate heat during drying. Perform dryness testing after 5 – 7 days. The architect shall review the test result and recommend approval or any further retesting /actions if warranted.

.2 CONCRETE SIDEWALKS

.1 Concrete sidewalks and paving to be constructed, reinforced and finished to suit municipal bylaws and engineering standards.

.2 Standard grey sand and cement concrete paving to the exterior areas conforming to applicable exposure class C2 of the CAN/CSA A23.1.

.3 Slope paving to drain minimum 2%. Provide expansion and contraction joints to suit and at junction of paving and building. Expansion joints are to be at maximum 4.57 m (15’) on center. Apply consistent broom finish to sidewalks and paving areas; all paving with broom finish to have tooled joints.

.4 Concrete paving or sidewalks installed directly on top of base structure, shall be 75 mm (3”) thick minimum, reinforced with 152 mm x 152 mm (6” x 6”) – 4/4 welded wire mesh or 10M at 457 mm (18”) o/c each way, adequately chaired to mid depth.

.5 Concrete paving or sidewalks installed on 150 mm (6”) minimum gravel or sand base, shall be 100 mm (4”) thick minimum, reinforced with 152 mm x 152 mm (6” x 6”) – 2/2 welded wire mesh or 10M at 457 mm (18”) o/c each way, adequately chaired to mid depth.

End of Section
04 20 00 - Masonry

1 General

.1 Conduct a pre-construction meeting with masonry contractor and consultant to review specifications, submittals and construction issues.

.2 Prepare a site mock-up showing the use of units, jointing and coursing, flashing and connectors. Mortar and caulking colour for review by design consultant, owner and BC Housing Representative.

.3 Masonry work shall not proceed until mock-up and submittals have been approved by the design consultants.

.4 Submit shop drawings for masonry connector design prepared by a structural engineer retained by the Contractor. Sample for metal flashing to be approved by Consultant.

.5 Installers shall be members in good standing of Masonry Institute of BC, and be qualified under the current Technical Masonry Certification (TMC) program.


2 Products

.1 **Brick Veneer**: To CSA A82, Grade EG, Type S.

.2 **Concrete Block**: To CSA A165.1, Classification: H/15/A/M.

.3 **Connectors**: Stainless steel brick ties to CSA A370 and CSA S304.1.

.4 **Thru-wall Membrane Flashing**: EPDM or SBS modified bitumen peel and stick, minimum 1 mm (0.040”). Primers and mastics as recommended by the membrane manufacturer.

.5 **Metal Flashing**: Minimum 26 gauge, galvanized to ASTM A653/A 653M, Z275 coating prefinished with Stelcolour 8000 series.

.6 **Mortar and Grout Mixes**: To CSA A179, Type S mortar and Block-fill grout.

3 Execution

.1 Install membrane flashing at base of cavity walls and where cavity is interrupted by horizontal members or supports. Turn flashing up the backup wall a minimum of 203 mm (8”). Form flashing
“end dams” where flashing is terminated. Install vertical flashing where outer veneer returns at window or door jambs, to prevent contact of veneer with inner wall. Install metal flashing with a hemmed drip edge in horizontal joints and shelf angles to extend sufficiently beyond the outer face of the wall to prevent staining from drainage. Membrane over the metal flashing must lap within mortar joint.

.2 Omit mortar from head joints above horizontal flashings to provide weep holes spaced at 610 mm (24") on centre. Provide top vents in masonry as specified, or detailed. Do not block weep holes with sealant or mortar droppings.

End of Section
05 50 00 - Metal Fabrications

1 General

.1 Retain a structural engineer registered in the Province of British Columbia to prepare signed and sealed shop drawings for guardrails and handrails and other miscellaneous metal fabrication.

.2 The use of recycled metal is encouraged where deemed appropriate by the project consultants.

.3 Design handrails and guardrails and connections to withstand lateral forces in accordance with BCBC, municipal bylaws and ASTM E985.

.4 All connections and attachments to building surfaces must conform to building envelope detailing requirements in order to prevent water ingress.

.5 Coordinate with work of Division 09 91 00 - Painting to ensure compatibility of finish systems.

2 Products


.2 Interior Guardrails/Handrails: Aluminum or steel, powder coat finish. Powder coating to AAMA 2603/2604/2605.

.3 Metal Flashings: Minimum 26 gauge, galvanized to ASTM A653/A 653M-09, Z275 coating prefinished with Stelcolour 8000 series.

.4 Roof Ladder: to ANSI A14.3 galvanized steel ladder, mounting brackets and connections.

.5 Anchor bolts/Nuts/Washers: Anchor bolts shall be in accordance with ASTM A36/A36M or A307. Nuts, bolts and washers to be hot dip galvanized in conformance with ASTM A153.

.6 Bike Rack (if required): hot-dip galvanized or stainless steel to ASTM A53/A500, powder coat finish with baked enamel top coat for durability.

3 Execution

.1 Anchoring system to be vertically mounted aluminum base plates, with stainless steel anchor bolts and neoprene gaskets.

.2 All bolt holes and penetrations through fascia and/or walls shall be injected with sealant to prevent water penetration.

End of Section
06 10 00 - Rough Carpentry

1 General

.1 As shown on structural drawings, lumber grades shall be according to NLGA Standard Grading Rules for Canadian Lumber, maximum moisture content 19%.

.2 Where possible all composite and agrifibre products used within weatherproofing layer of the building must not contain urea-formaldehyde.

.3 Where possible, wood products are recommended to be certified according to the requirements of one of the four internationally recognized third-party audited certification systems: Forest Stewardship Council (FSC), CAN/CSA Z809, Sustainable Forestry Initiative (SFI) (SFI 2010-2014), Program for Endorsement of Forest Certification Systems (PEFC) or other product programs mutually recognized by PEFC.

2 Products

.1 LUMBER: Softwood lumber should confirm to CSA O141

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<th>MATERIAL/GRADE</th>
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<tr>
<td>Exterior Fascia and Trim</td>
<td>SPF # 2</td>
<td>Textured combed finish, pre-primed for solid colour stain, not less than 51 mm (2&quot;) nominal thickness</td>
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<tr>
<td>Fencing</td>
<td>Cedar or Hem Fir treated posts</td>
<td>Stained, galvanized steel, open bottom fence post brackets with 203mm-305mm (8&quot;-12&quot;) interface with wood posts to minimize deterioration due to moisture.</td>
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<tr>
<td>Grab bar and Railing blocking</td>
<td>Hem Fir</td>
<td>38 mm x 235 mm (2&quot; X 10&quot;)</td>
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<tr>
<td>Landscaping Timbers</td>
<td>SPF # 2</td>
<td>Pressure treated, rough</td>
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<tr>
<td>Interior/Exterior Wall Backing/Blocking</td>
<td>Hem Fir, SPF # 2</td>
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</tr>
<tr>
<td>Cavity Furring/Strapping</td>
<td>Pressure treated Hem-Fir</td>
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.2 **PLYWOOD:** Plywood shall confirm to CSA 0121 Douglas Fir Plywood (DFP), CSA O151 Canadian Softwood Plywood (CSP). Panels shall be of an exterior type.

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<th>ITEM</th>
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<tbody>
<tr>
<td>Exterior Deck Sheathing</td>
<td>Select Tight Face Grade DFP/ CSP</td>
<td>T &amp; G, plywood under PVC deck waterproofing</td>
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<tr>
<td>Exterior Wall Sheathing</td>
<td>DFP/CSP, sheathing grade or wide end</td>
<td>Confirmation regarding nailing pattern required prior to covering sheathing (see Execution 3.0)</td>
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<tr>
<td>Interior Floor Sheathing</td>
<td>DFS/CSP, sheathing grade</td>
<td>T &amp; G panels, glue and screw fastening.</td>
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<tr>
<td>Interior Floor Underlayment</td>
<td>GIS or Custom Grade DFP/CSP intended for underlayment; 3 ply 9.5 mm (3/8&quot;) thick.</td>
<td>Panel type shall comply with requirements for warranty by resilient flooring manufacturer.</td>
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<tr>
<td>Roof Sheathing</td>
<td>DFP/CSP, sheathing grade</td>
<td>Edge support, when required using T &amp; G panels or H clip</td>
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<tr>
<td>Stair</td>
<td>DFS/CSP, sheathing grade</td>
<td>Minimum 25 mm (1&quot;) thick</td>
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<tr>
<td>Wall Backing/Blocking</td>
<td>DFP/CSP, sheathing grade</td>
<td>Provide backing for washroom accessories, fixtures and fittings not supplied by backing attachments, mounting and anchoring cabinets, grab bars, mechanical and electrical equipments, and hardware.</td>
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<tr>
<td>Cavity Furring /Strapping</td>
<td>Pressure treated plywood – conforming to CAN/CSA O80 Series</td>
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.3 **ACCESSORIES**

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<tr>
<td>Fasteners/Hardware</td>
<td>Confirm to CSA B111 and ASTM A153</td>
<td>Galvanized and/or stainless steel in exterior locations, high humid areas in treated lumber and elsewhere liable to exposed to corrosion</td>
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<tr>
<td>Insect screen</td>
<td>Black fibreglass</td>
<td>1/16&quot; mesh</td>
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<tr>
<td>Sill Gaskets</td>
<td>Polyethylene</td>
<td>closed cell</td>
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<tr>
<td>Wire Mesh to Storage Lockers</td>
<td>Galvanized</td>
<td>76 mm x 76 mm (3&quot; x 3&quot;) 10 gauge welded wire mesh</td>
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.4 **WOOD PRESERVATIVES**

.1 Exterior wood in contact with ground, concrete, masonry, or where continuous moisture may occur, (e.g. roof up stands in flat roofs, planters, heavy timber construction, fence posts) or above ground (e.g. decking): Pressure treatment according to CSA O80 Series, water borne Alkaline Copper Quaternary (ACQ) or Copper Azole (CA) preservative.

.2 Pressure preservative treatment with Borates may be used as an alternative for lumber & timbers used out of ground contact and continuously protected from liquid water, pressure treatment according to CSA O80 Series. Materials should mark the marking program according to Wood Preservation Canada. Bottom plate of frame walls with sill gaskets does not require pressure treating.

.3 Use incised lumber for treatment as required by CSA O80 Series.
.4 Treat cut surfaces with two brush coats of copper naphthenate preservative or liquid Borate as applicable.

.5 Use hot-dipped galvanized fasteners meeting ASTM A153 and connectors meeting ASTM A653 Class Gi85 for ACQ and CA pressure treated wood.

3 Execution

.1 All grab bars as per layout specified in Design Consultant’s detail drawings. Design Consultant to refer to CAN/CSA B651 - Accessible Design for the Built Environment and BC Building Code, amended section 3.8 for the requirements of grab bar installation. Washroom wall reinforcements should be reinforced with 50 mm x 305 mm (2” x 12”) solid lumber (as noted in the table above) in all washroom tub, shower, and toilet locations, between the studs and should be centered 915 mm (36”) from the top of the finished floor.

.2 Set exterior wall sill plates and bottom plates in contact with concrete or masonry on full width strip of polyethylene sill gasket.

.3 Prior to covering exterior sheathing or shear walls, request structural engineer to inspect nailing patterns. Provide confirmation report to BC Housing Inspector.

.4 Install fascias and trims in longest practical lengths, end joints to be cut at 45 degrees and lapped. Fasten with hot dipped galvanized casing nails and countersink.

.5 Where fibre-cement siding use prefabricated trims at inside/ outside corners and other trim locations. Provide blocking at trim such that trim overlaps siding.

.6 Provide insulation, vapor barrier and moisture barriers to walls, soffits and ceiling areas that will become inaccessible to other trades.

.7 The lower end of the post bracket shall be embedded into the concrete up to 50mm—64mm (2”–2.5”) to hold the posts in place.

.8 For Townhouses and 2 storey row houses, at the top of all stairs walls to be reinforced with 50 mm x 305 mm (2” x 12”) solid lumber at 900 mm (36”) on center. This will allow installing a solid gate at the top of the stairs in future to protect falling.

Coordinate with work of Division 09 91 00 - Painting to ensure compatibility of finish systems.

End of Section
06 20 00 - Finish Carpentry

1 General


.2 All composite and agrifibre products used within the building must not contain urea-formaldehyde.

.3 Where possible, wood products are recommended to be certified according to the requirements of one of the four internationally recognized third-party audited certification systems: Forest Stewardship Council (FSC), CAN/CSA Z809, Sustainable Forestry Initiative (SFI) (SFI 2010-2014), Program for Endorsement of Forest Certification Systems (PEFC) or other product programs mutually recognized by PEFC.

2 Products

<table>
<thead>
<tr>
<th>ITEM</th>
<th>MATERIAL/GRADE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseboards for Carpet/ Resilient Flooring</td>
<td>Hemlock or Pine</td>
<td>Primed, 11 mm (7/16&quot;) thick with profile to top edge. Provide the baseboard height 102 mm (4&quot;) for tenant suites, 152 mm (6&quot;) for lobby/corridor/ amenity space/office and 64 mm (2 1/2&quot;) for service areas.</td>
</tr>
<tr>
<td>Door Casings</td>
<td>Hemlock or Pine</td>
<td>Primed, 57 mm wide x 11 mm thick (2 1/2&quot; x 7/16&quot;) with profile to edge</td>
</tr>
<tr>
<td>Window Sills</td>
<td>Hemlock or Pine</td>
<td>Primed, 32 mm (1 1/4&quot;) thick</td>
</tr>
<tr>
<td>Shelving</td>
<td>Plastic coated wire shelving</td>
<td>Full width between walls and intermediate supports, one 305 mm (12&quot;) deep shelf in each closet, three 406 mm (16&quot;) deep shelves in storage areas, four 406 mm (16&quot;) shelves in linen closets. Kitchen pass-through surfaces should be protected with plastic laminate.</td>
</tr>
<tr>
<td>Cap to Pony Wall/Stairway</td>
<td>Hemlock or Pine</td>
<td>Primed, 19 mm (3/4&quot;) thick</td>
</tr>
<tr>
<td>Accessories/Hardware</td>
<td>Galvanized to CSA G164 or stainless steel</td>
<td>Compliance with hardware schedule</td>
</tr>
</tbody>
</table>

Coordinate with work of Division 09 91 00 - Painting to ensure compatibility of finish systems.

End of Section
07 10 00 - Dampproofing and Waterproofing

1 General

.1 Installers must be trained by the manufacturer for installation of their products.

.2 Inspection to be provided by the Building Envelope Consultant.

.3 Dampproof all concrete foundation walls below grade enclosing non-habitable basements and parkades as determined by the Building Envelope Consultant.

.4 Waterproof all foundation walls below grade enclosing habitable basements and parkades, storage areas, exterior balconies, service rooms, stairs and all below grade walls where deemed necessary by the Geotechnical Report and the Building Envelope Consultant.

.5 Waterproof suspended concrete slabs and decks over habitable space and balconies over uninhabited space. Extend membrane continuously under planters and upstands — use of a concrete “pre-curb” is recommended.

.6 Waterproof membrane assembly shall be designed to prevent penetration of the membrane by root systems at planter areas — a minimum 0.50 mm (20 mil) High Density Polyethylene (HDPE) sheet is recommended or a proprietary root barrier.

.7 Ensure compatibility of overlapping membranes or coatings.

2 Products

1 DAMPPROOFING MATERIALS: EXTERIOR DAMPPROOFING/WATERPROOFING

.1 Emulsified Asphalt Mineral – Colloid Type unfilled, for Dampproofing and Waterproofing and for Roof Coating conforming to CAN/CGSB 37.2-M.

.2 Filled, Cutback Asphalt for Dampproofing and waterproofing conforming to CAN/CGSB 37.16–M: for use at temperatures below 4º C (39º F).

2 WATERPROOFING MATERIALS FOR FOUNDATION WALLS (WHERE DEEMED NECESSARY BY THE CONSULTANT)

.1 Self-Adhesive Membrane: 1.5 mm (1/16" or 60mils) thick, self-adhering membrane of rubberized asphalt integrally bonded to a high density, cross-laminated, polyethylene sheeting with vapor permeance 2.8 ng/pa.s.m² (0.05 perms) to ASTM E96.

.2 1 Ply SBS Modified Membrane: 180 g/m² non-woven polyester reinforcing, minimum thickness of 4.0 mm (0.160" or 160mils) polyethylene bottom surface for torch application to substrate, granular top surface is required where membrane terminates above grade level, conforming to
CGSB 37–GP–56M.

.3 Cold Fluid-Applied: elastomeric asphalt emulsion waterproofing membrane in compliance with CAN/CGSB 37.2 M or ASTM C836. Apply a full and continuous coat at a rate of minimum 2.0 l/m² (5 gal/100ft²) to provide a minimum wet thickness of 2.3 mm (0.090" or 90mils) ensure no pinholes or blisters. Allow membrane to fully cure/dry prior to subsequent application coatings. Membrane complies with the VOC limits established by the South Coast Air Quality Management District.

.3 WATERPROOFING MATERIALS FOR SUSPENDED PARKADE SLABS AND DECKS

(The 5 year waterproofing guarantee is available for this section per Tab 2.1.5 of the RCABC Roofing Practices Manual). Leak detection is required for heavier overburdens.

.1 2 Ply SBS Modified Membrane:

.1 Base Sheet: minimum 95 g/m² base sheet for non habitable space and 180g/m² for habitable space; reinforced with non-woven fibreglass, polyethylene surface top and bottom with a thickness of minimum 2.2mm (0.088" or 88mils). Product shall conform to the requirements of CGSB 37–GP–56M.

.2 Cap Sheet: 180 g/m² cap sheet reinforced with non-woven polyester reinforcing, minimum thickness of 4.0 mm (0.160" or 160mils) confirming to CGSB 37–GP–56M. Granular surface is required where membrane terminated above grade level.

.1 10 year manufacturer's warranty shall be provided for the system.

.2 Hot Applied Rubberized Asphalt Waterproof Membrane

.1 Membrane should be accepted by BC Housing and consultant prior to the start of construction. Membrane and applicable components shall conform to CGSB 37.50M & CGSB 37.51M respectively, subject to the following conditions:

.1 2 ply fully spun-bonded polyester reinforced assembly

.2 10 year manufacturer’s warranty shall be provided for the system.

.4 WATERPROOFING MATERIALS FOR BALCONIES

.1 Polyvinyl Chloride (PVC) Waterproofing: polyester reinforced, for use over non-habitable spaces only, with minimum thickness of 1.5 mm (0.06" or 60mil), UV resistance, heat-welded seams and perimeter attachment conforming to CAN/CGSB 37.54 with an abrasion resistance of 12.6 at 5000.

.2 Liquid Urethane Waterproofing: low VOC content, UV resistant, reinforced, slip resistant pedestrian composite system for use over non-habitable spaces with a combined minimum thickness of 1.5 mm (0.06" or 60mil) confirming to ASTM C957.
.5 **CRYSTALLINE WATERPROOFING:** hydrophilic, crystalline waterproofing to the mix design approved by concrete ready-mix supplier for exterior underground and above grade applications in place of or in conjunction with externally applied surface membranes. When used as the only barrier to water penetration utilize crystalline water stop at static slab to wall, slab to slab and wall to wall cold joint locations; and manufactures crystalline grout for pipe penetrations, tie holes and general repair of bug holes and honeycombing.

.6 **COMPOSITE DRAINAGE MAT:** High impact, dimpled, polystyrene drainage core and a non-woven, needle punched filter fabric adhered to the outward face of the core, sheet draining 18 gpm/ft² to ASTM D4716, suitable for use under soil or pavement as applicable. Install over waterproof membrane to provide protection and drainage when the membrane is installed over suspended slabs and on foundation walls.

.7 **PROTECTION BOARD/SEPARATION SHEET**

.1 4 mm (3/16") asphalt glass laminate protection board should be used for torch application.

.2 SBS modified bitumen membrane having a minimum thickness of 4.0 mm (3/16" or 160mils), non-woven polyester reinforcement of 180 g/m² meeting CGSB—37—GP—56M. Sanded lower surface fully compatible with the primary membrane also can be used as an alternative.

3 **Execution**

.1 Ensure all substrates are prepared and primed in accordance with manufacturer’s printed instructions. Ensure that installation takes place only at required temperatures and weather conditions. Fabric reinforcement into liquid applied membrane must ensure no fish-mouthing or wrinkles.

.2 Membranes installed over parkades must extend a minimum of 203 mm (8") up vertical surfaces, from the finished horizontal surfaces, and extend down the face of foundation walls to cover the cold joint between the slab and foundation wall. Refer to [Division 07 50 00 – Membrane Roofing](#) where membranes are applied under landscaping and unit paving.

.3 Protect completed waterproof membrane installation with protection board.

.4 Protect surface applied crystalline waterproofing against rapid loss of moisture for minimum 3 days by the manufacturer’s approved methods. Cure crystalline admixture waterproofing as per proper concrete curing practices to ACI—308.

.5 For urethane membrane broadcast silica sand immediately into topcoat and back roll according to manufacturer’s specification.

.6 Install dampproofing/waterproofing to CAN/CGSB – 37.3M application of Emulsified Asphalt for Dampproofing & Waterproofing.
.7 PVC Membranes at balconies should consider the following:

.1 Install flashings at junctions of walls and deck and drip flashings at all exterior edges of the deck.

.2 All seams to be lapped a minimum of 51 mm (2") and heat welded in place.

.3 Lap membrane up adjoining walls a minimum of 152 mm (6") except where door entrances do not allow. At doors lap over door threshold rough opening and up jamb rough opening 152 mm (6"). Caulk all transitions, allow for a double row of caulking between door threshold and membrane (primary and secondary barrier).

.4 Membrane to be lapped on to and heat welded to drip edge flashing or provide a finished mechanical fastening bar on the vertical face.

.5 Finished decks and walkway traffic coating assemblies are to be sloped away from the building at a minimum 2% grade, smooth, fully adhered, neatly edged, and freely draining.

.6 No penetrations shall occur through horizontal surfaces.

End of Section
07 21 00 - Thermal Protection (Insulation)

1 General

1. Minimum thermal insulation in wall, roof, and floor assembly should comply with current BC Building Code, authority having jurisdiction and Model National Energy Code, whichever is greater.

2. Apply insulation, bonding adhesive and accessories in accordance with the manufacturer specifications.

3. Thermal resistance values must consider the requirements of BC Housing Design Guidelines and Construction Standards, Section 3 - Energy and Environmental Design.

2 Products

1. Rigid Insulation: Extruded closed cell Polystyrene, CAN/ULC – S701 Type 4 with maximum water absorption of 0.7% in accordance with ASTM D2842 for foundation, roofing or wall.

2. Thermal Batt Insulation: mineral/glass fibre friction fit, formaldehyde free, CAN/ULC – S702, Type 1 with high post consumer recycled content, to ASTM E84 (flame spread rating ≤25 and smoke developed rating ≤50) for exterior walls, floors and ceilings.

3. Acoustic Batt Insulation: CAN/ULC – S702, Type 1, to ASTM E90, airborne sounds transmission loss and to ASTM E413, sound transmission class for sound rated partitions and floors.

4. Blown-In Insulation: Attics, thickness as required to meet R value after settlement occurs.

5. Sprayed Thermal Insulation (Or Spray-On Thermal Insulation): Noncombustible to CAN/ULC S114, inorganic, elongated glass fibre type, blended with adhesive or mineral fibre, for use where parkade ceiling has heated space over.

   Applied and cured insulation to conform to the following minimum requirements:

   1. K Factor: Minimum 0.26 to ASTM CS18.

   2. Flame Spread: 0–5 to ASTM E84.

   3. Fuel Contributed and Smoke Developed: 0 to ASTM E84.

   4. Colour: White or off-white.
.6 **SPRAY POLYURETHANE FOAM INSULATION (OR SPRAYED-IN-PLACE POLYURETHANE FOAM INSULATION):** CAN/ULC – S705.1 and CAN/ULC – S705.2, noncombustible to meet CAN/ULC S124, for floor joist header, interior concealed wall and ceiling junctions, parapets and roof curbs for penetrations requiring insulation and air seal or as specified by Consultant.

.7 **INSULATION CLIPS:** Use to fastening rigid insulation to wall sheathing and soffits. Impale type, perforated 51 mm x 51 mm (2" x 2") steel, 0.7 mm (0.030") thick, adhesive back, spindle of 2.5 mm (0.098") diameter annealed steel, 25 mm (1") diameter self-locking washers, length to suit insulation thickness.

### 3 Execution

.1 **PERIMETER INSULATION**

.1 Extend boards a minimum of 600 mm (24") below grade.

.2 Install perimeter insulation using mechanical fasteners or adhesive. Butt joints tightly, offset horizontal and vertical joints. Use largest possible sheets to reduce number of joints. Do not use chipped or cracked insulation boards.

.3 Protect insulation from UV degradation and ensure the protection is capable of being exposed without UV and moisture degradation.

.2 **BATT INSULATION – THERMAL**

.1 Install insulation full width and length between studs and framing members to fit snugly without buckling, creasing or crushing.

.2 In walls, install lower batt first; upper batt installed to butt with the first and any extra length of insulation trimmed at the top.

.3 Fit insulation tight to electrical boxes, pipes, ducts, around exterior doors & windows and other protrusions. Split insulation around wiring, plumbing or any other mid-wall interruption. Do not stuff insulation into corners or gaps – use rigid, spray or semi-rigid insulation, as appropriate. Exterior and interior corners are to be designed to allow installation of insulation.

.3 **BATT INSULATION – SOUND**

.1 Install acoustic insulation for sound rated partitions. Tightly fit insulation between studs to full height of partitions. Fit insulation tight to penetrations through wallboard.

.2 Install a layer of RSI 2.45 (R14) batt insulation around and under bathtubs.
.4 SPRAYED THERMAL INSULATION

.1 Apply material with specially designed nozzle using pressures recommended by the manufacturer.

.2 Maintain thermal continuity of insulation on entire area to be insulated to ensure thermal performance is achieved.

.3 Spray material into all cracks, holes, seams; seal around electrical receptacles, telephone and television jacks, ducts and plumbing.

.4 Tamp insulation to a uniformly level and smooth surface without unsightly projections and voids.

.5 Apply a clear overspray sealer to the tamped sprayed insulation surface in accordance with manufacturer’s directions.

.6 Completed installation must produce a uniformly smooth white or off-white surface free of cracks, dusting, flaking, spalling, separation and blistering.

.5 SPRAY POLYURETHANE FOAM INSULATION: To be installed by trained and certified installers in accordance with CAN/ULC-S705.2 using CCMC certified spray foam with an accredited 3rd party Quality Assurance Program (example: CUFCA).

.6 ACCESS HATCHES: Insulate access hatches to the same R value as the assembly in which they occur.

End of Section
07 31 13 - Asphalt Shingles

1 General

.1 The use of products which are regionally extracted and manufactured and/or containing recycled materials are recommended.

.2 QUALITY ASSURANCE


.2 The roofing installation must be inspected by an independent roofing inspection agency paid for by the Contractor in accordance with the RCABC guarantee program. The Owner shall request RCABC to recommend an inspection agency from their list of approved agencies.

.3 The roofing manufacturer must warrant in writing to the Owner of the building that The Roof System will remain free of any manufacturing defects resulting in water leakage during the applicable warranty period. The warranty will include for removal and replacement of any defect in The Roof System to a water tight condition, including labour or refund the Owner an amount equal to the costs for labor and materials required to replace the defective materials. The warranty shall be non pro-rated for a period of ten (10) years from the date of substantial completion.

.3 SUBMITTALS

Provide to the Owner, the “RCABC Roofing System Record” upon completion of the work. Record to include guarantees, copies of inspection reports and roof maintenance guide.

.4 ROOF GUARANTEE

.1 Provide standard RCABC Ten (10) year guarantee upon completion of the Work.

.2 Provide a minimum Thirty (30) years guarantee for the asphalt shingle manufacturer's standard material.

.3 An alternative to the Ten (10) Year RCABC Guarantee may be accepted subject to BC Housing’s approval and the provision of the following documentation. This alternative shall be submitted prior to execution of the construction contract and will be paid for by the Contractor.

.1 Inspection by an independent roofing inspector during installation to ensure compliance with RCABC Standards.

.2 A two (2) year Maintenance Bond with an option to renew for an additional one (1) year at the expiry of the original two (2) year Surety at the discretion of the owner.

.3 Inspection by an independent inspector prior to the end of a two (2) year period along with maintenance inspections for year five (5) and eight (8). The inspector will be appointed by the Owner and the cost will be borne by the Contractor.
.4 Ten (10) year roofing installer’s guarantee.

.5 A minimum ten (10) year full system material non-pro-rated guarantee from the manufacturer or as specified in the Construction Standards.

.4 For smaller sized-projects with a contract value less than $20,000, standard RCABC 10 year warranty or 2 years maintenance bond is not required. A qualified roof inspector to be contracted to complete inspection during installation and at post construction, if required. The inspector will be appointed by the Owner.

2 Products

.1 ASPHALT SHINGLES
Acceptable materials as listed in the RCABC Roofing Practices Manual. Shingle materials manufactured to CSA A123.5 for fibre glass felt core product. Organic felt products are not acceptable as they are not covered under the Roofing Guaranty Corporation (RGC) program.

.2 METAL FLASHINGS
.1 Base and counter flashing metal to be sheet steel, minimum 26 gauge, galvanized to ASTM A653/A653M, Z275 coating, prefinished with Stelcolour 8000 series paint finish.

.2 Step flashings must be 26 gauge and shall extend a minimum of 125mm (5") up vertical services in accordance with RCABC requirements.

.3 ACCESSORIES
Install zinc strips to all ridge locations with minimum 51 mm (2") exposed to the weather.

.4 GUTTERS & DOWNSPOUTS
.1 Prefinished with 2-coat as per ASTM D-1729, seamless one piece aluminum gutters; 127 mm x 127 mm (5" x 5"), 7 mm (.027") thick. Downpipes are of size 51 mm x 75 mm (2" x 3") with minimum thickness of 0.43 mm (0.017"). All accessories should be provided by the manufacturers. Colour as selected by owner.

.2 Downspouts that terminate at sloped roofs shall have the downspouts continued down and over the roof to drain directly into the eaves trough/gutters; colour of RWL section to be compatible with the shingles.

.3 Downspouts shall be capped where they enter the storm drain, at grade level, with a metal cap finished to match downspouts. Secure the cap to the drain with sheet metal screws. Where storm drains do not exist, terminate downspouts on a dedicated splash pad.
3 Execution

.1 Provide slope to drains in all gutter applications. Waterproof linings for “hidden” or “inboard” or “built-in” type gutters must be fully adhered 2 ply modified bitumen sheets and must be carried up to the slope to a point that is 200 mm (8”) vertical above the outside height of the parapet or an emergency overflow outlet in the gutter. The cap sheet is to provide UV protection and must be installed in all areas exposed to UV. Use self adhering base sheet whenever possible with second UV protective ply fully torched to first ply. Ensure drains discharge into downspouts that are kept above freezing.

.2 Caulking compounds must not be used as the primary water seal for any roofing application or roofing detail.

End of Section
07 46 33 - Vinyl Siding

1 General

.1 Work in this section is to conform to the BC Building Code, or as directed by the Architect and/or Building Envelope Consultant.

.2 Exterior siding system to be designed to meet BC Building Code requirements for wind load and wind uplift.

.3 Contractor to supply 10% “attic stock” for future maintenance purposes.

.4 SUBMITTALS

.1 Submit shop drawings of siding installation, material and accessories. Shop drawings shall indicate thickness and dimension of parts; fastening and anchoring methods; detail and location of joints, including joints necessary to accommodate thermal movement.

.2 Shop drawings to be complete with seal of a BC Registered Professional Engineer; show all load calculations and conformity to codes and specifications herein.

.5 QUALITY ASSURANCE

.1 Vinyl siding products must conform to ASTM D3679 and with CAN/CGSB 41.33–M87. Colour retention should conform to ASTM D6864. Products should be selected from the Vinyl Siding Institute’s (VSI) list of certified products.

.2 Prepare siding mockups as directed by the Consultant. Mockups must incorporate starter strips, siding, soffits, all required finishing accessories and adjacent materials such as windows, doors, trim and strapping.

.6 COORDINATION WITH OTHER TRADES

All penetrations through the siding for the work of other trades must be fitted with a watertight sleeve.

2 Products

.1 VINYL SIDING: Integrially coloured rigid polyvinyl chloride (PVC), complying with ASTM D 3679 with minimum nominal thickness 1.1 mm (0.044”).

.2 VINYL SOFFIT: Integrially coloured rigid polyvinyl chloride (PVC), complying with ASTM D 4477 with minimum nominal thickness 1.1 mm (0.044”), 203 mm (8”) wide perforated/non-perforated.

.3 ACCESSORIES

.1 Starter strips, window under sill trim drip caps, “F” channel, base flashing, inside and outside
corner posts and “J” channel shall have the same compound materials with comparable siding properties for a complete and finished installation so that there are no exposed unfinished edges.

.2 Provide mounting blocks to ensure a watertight and finished installation for handrails, door bells, lights, gas and electrical connections, dryer vents, and other exterior fixtures.

.4 FASTENINGS
Corrosion resistant, concealed and sized as recommended by the siding manufacturer. Exposed fasteners, where required, must match the surface in which they occur. Provide appropriate corrosion resistance fasteners if they penetrate through pressure treated materials.

3 Execution

.1 Install siding and accessories in accordance with manufacturer’s printed instructions, reviewed shop drawings and the latest edition of the “Rigid Vinyl Siding Application Manual” published by the Vinyl Siding Institute.

.2 Provide starter strip at the base of all walls including stepped wall locations.

.3 Lay out siding lengths to achieve a regular staggered joint pattern. Use longest practical lengths and minimize joints where possible.

.4 Install siding true to line and level with clean cut edges and joints.

.5 Nails must penetrate the substrate by a minimum of 25 mm (1").

.6 Nail only in the centre of the nailing slot. Leave a space of 2 - 3 mm (1/16" - 1/8") between the nail head and the siding surface, do not nail tightly. Pre-punch vinyl surface before nailing.

.7 Overlap siding and accessories. Cut-outs for overlap should be 38 mm (1-1/2") long and overlap 1/2 of the cut-out width. Do not nail overlapping siding/accessories within 152 mm (6") of the joint.

.8 Where panels fit into accessories, leave 6 mm (1/4") clearance for expansion.

.9 Lift panels into the lock when nailing, but not pulled up tight. Panels must hang in the lock without strain.

.10 Provide watertight fitted PVC penetration fittings.

.11 Install accessories so that junctions of siding with dissimilar construction will be finished with trim members.

.12 Use inside and outside corner posts at the junction of internal and external corners and ensure that all siding and accessories are overlapped, except where noted otherwise.
.13 Trim soffit openings with “F” channel or 9.5 mm (3/8") aluminum “J” channel.

.14 Provide “J” channel around the sides of windows and door frames.

.15 Provide drip cap above all window and door openings and extend on each side with the exposed leg of the siding “J” channel. Bend tab down over “J” channel on the sides and seal watertight.

.16 Use undersill trim under windows and doors and at the top of walls adjoining soffits.

.17 Finished installation must be properly secured, free of rattles, distortions, waviness, protrusions, and damaged or chipped components.

.18 Provide downspouts connected to storm drains.

End of Section
07 46 46 - Fiber-Cement Siding

1 General

.1 Work in this section is to conform to the BC Building Code, or as directed by the Building Envelope Consultant.

.2 SUBMITTALS

.1 Submit shop drawings of siding installation, material and accessories. Shop drawings shall indicate thickness and dimension of parts; fastening and anchoring methods; detail and location of joints, including joints necessary to accommodate thermal movement.

.2 Shop drawings to be complete with seal of a BC Registered Professional Engineer; show all load calculations and conformity to codes and specifications herein.

.3 QUALITY ASSURANCE

.1 Fiber cement siding products must conform to ASTM C1185 and C1186 with a minimum manufacturer’s warranty of 30 years and a minimum manufacturer’s finish warranty of 15 years.

.2 Mock-Ups: Prepare siding mockups as directed by the Consultant. Mockups must incorporate all required finishing accessories, fasteners and adjacent materials such as windows, doors, trim and strapping.

2 Products

.1 Fiber Cement Board: Cement and cellulose fiber formed under high pressure into boards with integral surface texture complying with ASTM C 1186 Type A Grade II machined edges.

.2 Siding to have the minimum nominal thickness of 8 mm (5/16") with 200 mm (8") exposure, factory primed and pre-finished with minimum 15-year labour and material warranty on the factory applied coating system.

.3 Siding to be engineered for climate by the manufacturer for the climate zone in which it is to be installed. Provide written documentation from the manufacturer.

.4 Accessories:

.1 Fiber Cement Trim: Minimum thickness 25 mm (1") factory primed and painted; colour as selected by Owner or Consultant to match or contrast siding. Wood trim is also an approved alternate.

.2 Fastenings: Corrosion resistant, concealed and sized as recommended by the siding manufacturer. Exposed fasteners, where required, must match the painted surface in which they occur. For metal framing, provide self-drilling, corrosion resistant, S-12 ribbed bugle-head having the recommended length that meet applicable code and manufacture’s minimum requirements.
3 Execution

.1 Install fiber-cement siding and accessories in accordance with manufacturer’s written instructions. Type, size and spacing of fasteners to meet or exceed manufacturer’s minimum requirements.

.2 Ensure siding is adequately supported in accordance with siding manufacturer’s recommendations.

.3 Install trim and siding using longest practical lengths, straight, true and plumb.

.4 Use full pieces wherever possible to minimize appearance of seams. Arrange seams in random pattern as per the manufacture’s written instructions to minimize appearance and to be away from most prominent line of vision.

.5 Do not install siding less than 200 mm (8”) from any previous surface of ground or loose fill grade nor closer than 50 mm (2”) to roofs, patios, porches, decks and other solid surfaces where water may collect.

.6 Provide minimum 3 mm (1/8”) gap where lapped plank or shingle meets the vertical trim at openings and corners to allow for proper flexible sealant/caulking.

.7 Install sheet metal flashing above door and window casings and horizontal trim in field of siding.

.8 Seal around all penetrations and field-prime and paint exposed un-primed or un-painted trim surfaces and cut edges. Refer to Section 5 Division 09 91 00 – Painting.

End of Section
07 50 00 - Membrane Roofing

1 General

.1 The use of products which are regionally extracted and manufactured and/or containing recycled materials are recommended. If recommended by the Owner/Operator, the use of roofing materials meeting Energy Star requirements for high reflectance and low emissivity can be considered.

.2 QUALITY ASSURANCE


.2 The roofing installation must be inspected by an independent roofing inspection agency paid for by the Contractor in accordance with the RCABC guarantee program. The Owner shall request RCABC to recommend an inspection agency from their list of approved agencies.

.3 The membrane manufacturer must warrant in writing to the Owner that the roof membrane system will remain free of any manufacturing defects resulting in water leakage during the applicable warranty period. The warranty will include for removal and replacement of any defect in the roof membrane system to a water tight condition including labour, or refund the Owner an amount equal to the costs for labor and materials required to replace the defective materials. The warranty shall be non pro-rated for a period of ten (10) years from the date of substantial completion.

.3 SUBMITTALS

Provide to the Owner, the “RCABC Roofing System Record” upon completion of the work. Record to include guarantee, copies of inspection reports and roof maintenance guide.

.4 DELIVERY, STORAGE AND HANDLING

.1 2 ply SBS membrane roofing must comply with or exceed RCABC Safety Precautions – Torching for Modified Bituminous Systems as described in the RCABC Roofing Practices Manual (Tab 5.0.1). Failure to do so may result in the work being suspended by the Consultant or Inspection Agency for non compliance with this requirement.

.2 For all membranes, insure that materials are clearly labeled and seals intact.

.3 Store all materials in accordance with the manufacturer’s specifications.

.5 REGULATORY REQUIREMENTS

Roof Covering Materials: Tested in accordance with CAN/ULC S107M to achieve a Class A rating for exposed membrane systems and Class A, B or C for any other areas as required by local authorities having jurisdiction.
.6 ROOF GUARANTEE

.1 Provide standard RCABC ten (10) year guarantee upon completion of the Work.

.2 The following is an alternative to the Ten (10) Year RCABC Guarantee may be accepted subject to BC Housing’s approval and the provision of the following documentation. This alternative shall be submitted prior to execution of the construction contract and will be paid for by the Contractor.

.1 Inspection by an independent roofing inspector during installation to ensure compliance with RCABC Standards.

.2 A two (2) year Maintenance Bond with an option to renew for an additional one (1) year at the expiry of the original two (2) year Surety at the discretion of the owner.

.3 Inspection by an independent inspector prior to the end of a two (2) year period along with maintenance inspections for year five (5) and eight (8). The inspector will be appointed by the Owner and the cost will be borne by the Contractor.

.4 Ten (10) year roofing installer guarantee.

.5 A minimum ten (10) year full system material non-pro-rated guarantee from the manufacturer or as specified in the Construction Standards.

.3 Note RCABC guarantee will apply to roofing membrane under soft landscape area, unit paver areas and under paving slabs. RCABC will also guarantee the membrane under poured in place concrete provided that a leak detection grid is installed (refer to Tab 2.1.5 of the RCABC Roofing Practices Manual). RCABC guarantee only covers the membrane (roofing) repair/replacement and only when the correct protection sheets are used in conjunction with the membrane system. It also applies to removal and replacement of landscape or paver overburden if it is less than 203mm (8") deep and installed by the roofing contractor. The minimum membrane thickness of the modified bitumen cap sheet must be 3.7 mm (0.145") on the selvage edge in the above applications.

2 Products

.1 ROOF INSULATION SELECTION NOTES

.1 Batt insulation installed between roof joists or trusses: Refer to Division 07 21 00 – Thermal Protection.

.2 Air/Vapour Barrier: Self-adhered air/vapour barrier membranes composed of bitumen modified with thermoplastic polymers and high-density polyethylene film. The width of the self-adhered membrane shall be 1.14 metres (45 inches) to allow the membrane to fit on the top flute of most structural steel decks. The self-adhesive underface is covered with a silicone release sheet. Water vapour permeability: 0.92 ng/Pa.s.m² (0.016 Perm).

.3 Rigid Polystyrene Insulation

.1 Expanded Type 1 (low density) and Type 2 (medium density) are generally suitable for conventional roofing applications where the Insulation is under the membrane and over the roof deck.

.2 Extruded Type 4 (high density) is suitable for conventional applications and is the only
type acceptable for use in inverted or protected membrane applications. For inverted or protected membrane a filter mat under the metal flashing must extends 50 mm (2") over the insulation.

.4 Rigid Polyisocyanurate Insulation: Has the highest thermal resistance but consider that the published thermal resistance may degrade or drift within a relatively short period of time. Insulation panel composed of a closed cell polyisocyanurate foam core manufactured to a premium coated glass facer on both sides. Must conform to CAN/ULC – S704 Thermal Insulation, Polyurethane and Polyisocyanurate, Boards, Faces; using the Long-Term Thermal resistance (LTTR) in accordance with CAN/ULC – S 770. LTTR values are based on ASTM C1289, providing updated 15-year time weighted averages of R-5.6 per inch. Insulation must be multiple layers, non-organic facers, staggered at least 305 mm (12") between layers and mold resistant, scoring a 10 on ASTM D3273.

.5 Insulation Overlay Board: Multi-ply, semi-rigid asphaltic roofing substrate board at least 4.8 mm (3/16") minimum thickness composed of a mineral fortified asphaltic core formed between two asphaltic saturated fibreglass liners or in conformance with ASTM C1177/C1177M Standard water resistant silicone-treated core, embedded glass mat facing, 6.4, 13 or 15.8 mm (1/4", 1/2", or 5/8") thick UL rated gypsum board.

.6 Specify that all foamed plastic insulations be CFC & HCFC free and in compliance with the Environmental management Act Ozone Depleting Substances and Other Halocarbons Regulations.

.7 RCABC requires that all insulation installed over “nailable” decks be mechanically fastened, or use polyurethane foam adhesives per the roof system Manufacturing 90psf uplifting rating. Specify that the fasteners be manufactured with corrosion resistant coatings, are of suitable length for the application, and be approved in writing by the insulation manufacturer and the membrane manufacturer.


.9 Confirm insulation types with membrane manufacturer.

.2 ACCEPTABLE MEMBRANE SYSTEM

.1 2 Ply Flexible Membrane Roofing Systems (SBS – Styrene Butadiene Styrene)

2 ply SBS membranes, conforming to CGSB 37–GP–56M, must each have a minimum of 180 g/m² of non woven polyester reinforcement. Base sheets must have a minimum thickness of 2.2 mm (3/32") for mop applications and a minimum thickness of 3 mm (1/8") for torch applications. Cap sheets must have a minimum thickness of 3.0 mm (1/8") exclusive of granules.

.3 ROOF ACCESSORIES

For SBS use proprietary spun or top welded flange aluminum roof jacks and stacks. Lead roof jacks and stacks are not acceptable on flat or low slope roofing. Field fabricated details are not acceptable unless manufacture provides written confirmation or consultant approval. Where flanged vent is over 1265 cm² (196 in²) mount it on 203 mm (8") curbs according to manufacturer’s recommendations.
.4 **METAL FLASHINGS**

.1 Base and counter flashing metal to be sheet steel, minimum 26 gauge, galvanized to ASTM A653/A653M, Z275 coating, prefinished with Stelcolour 8000 series paint finish.

.2 Use standing seams only.

.3 All exposed edges of flashings must be hemmed a minimum of 12.7 mm (1/2") for rigidity.

### Execution

.1 Install membranes to the manufacturer’s written installation requirements and published details.

.2 Ensure that the roof is slope minimum 2% to drain with no pond water.

.3 Substrate shall be primed as per manufacturer’s requirements before applying self adhered moisture/vapor barrier.

.4 Caulking compounds must not be used as the primary water seal for any roofing application or roofing detail. Specify sealants which are UV resistant and exhibit good adhesion with low modulus. One part urethane sealants are often ideal for general roofing applications. Silicone sealants should not be used for general roofing applications.

.5 Apply two coats of bituminous paint on each contacting surface between dissimilar metals.

.6 All metal flashings must be installed to RCABC guarantee standards and standard RCABC flashing details. Form flashings square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance. Ensure that wide girth flashings are adequately sloped to the inside of the roof area and do not pond water.

.7 Metal flashings are to be securely anchored to continuous blocking or nailers using clips and fasteners suitable for the purpose. All anchoring must meet or exceed RCABC guarantee requirements.

.8 Use concealed fastening unless otherwise approved by the Consultant.

.9 Flash copings, roof edges, openings and all items projecting through roofing. Ensure that no flashings pond water and that all drain to the interior of the roof area.

.10 Protect finished roof from damage and ensure that only authorized traffic and persons can access the finished roof. Install protective walkways when service personnel must access the roof to service equipment.

.11 Comply with all safe work practices as required by WorkSafeBC, the RCABC Guarantee program and insurance providers.

End of Section
07 72 00 - Roof Accessories

1 General

1.1 As required by the BC Building Code, or as directed by the Consultant.

1.2 Submit shop drawings for approval.
   Consultant to ensure that specified fire resistance ratings meet regulatory requirements.

2 Products

2.1 Roof Hatch: complies with UL 790, 762 mm x 914 mm (30" x 36"), shop cleaned, degreased and prime-coated/mill finish: 14 gauge (2.9 mm) exterior with 22 gauge (4.6 mm) liner galvanized steel or 11 gauge (2.3 mm) aluminum roof hatch.

<table>
<thead>
<tr>
<th>SPECIFICATIONS</th>
<th>GALVANIZED STEEL/ALUMINUM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cover</td>
<td>Break-formed, hollow-metal design with 1&quot; (25 mm) concealed fiberglass insulation, cover 76 mm (3&quot;) beaded, overlapping flange, fully welded at corners, and internally reinforced for 195 kg/m² (40 psf) live load.</td>
</tr>
<tr>
<td>Curb</td>
<td>305 mm (12&quot;) in height with integral cap flashing, 25mm (1&quot;) fiberboard insulation, fully welded at corners, and 89 mm (3—1/2&quot;) mounting flange with 11 mm (7/16&quot;) holes provided for securing frame to the roof deck.</td>
</tr>
<tr>
<td>Operating Hardware</td>
<td>Heavy-duty pintle hinges with 9 mm (3/8&quot;) Type 316 stainless steel hinge pins. Slam latch with interior and exterior turn handles and padlock hasps. Compression spring operators enclosed in telescopic tubes. Automatic hold-open arm with grip handle release.</td>
</tr>
<tr>
<td>Accessories:</td>
<td>Extruded EPDM rubber gasket permanently adhered to cover.</td>
</tr>
</tbody>
</table>

2.2 Roof Ladder: Complies with ANSI A14.3, fabricate ladder from steel sections galvanized after fabrication. Provide brackets for permanent fastening to wall construction. Refer to Division 05 50 00 – Metal Fabrications.

3 Execution

Not applicable

End of Section
07 80 00 - Firestopping and Smoke Seals

1 General

.1 Furnish and install all required firestopping and smoke seals within fire resistive wall and floor assemblies.

.2 All firestopping and smoke seals shall be listed by Underwriters’ Laboratories of Canada (ULC) or Underwriters Laboratories UL that meet the requirements of ULC-S115-M are given a cUL listing and are published by UL in their “Products Certified for Canada (cUL) directory and shall form a draft tight barrier to retard the passage of smoke, flame and hose stream as noted in the appropriate cUL/ULC classification.

.3 Mechanical and electrical penetrations through fire resistance rated floor, roof and wall assemblies inclusive of cable trays, receptacles, conduits, pipes, sleeves, ducts and poke through devices are to be fully coordinated with Division 15 and 16 respectively.

.4 DESIGN REQUIREMENTS

.1 All installations and materials are to be to the satisfaction of the Consultant and Authorities Having Jurisdiction. The following criteria must be considered.

.2 Generally all firestopping for this project shall conform to ‘F’ rating as per the BC Building Code, except areas of firewalls and parking (parkade) slab to ground floor to conform to ‘FT’ rating, unless noted otherwise on the drawings.

.3 Fire protection ratings per CAN4-S115 in all seals.

.4 FTH fire protection ratings per CAN4-S115 in cable (in excess of 20 mm O.D.) and cable tray penetrations.

.5 Minimum 10% operational movement of all joints and annuals of mechanical piping and electrical bus duct penetrations.

.6 Flexible seals for fire damper perimeters and mechanical piping penetrations.

.7 Complete fire-tested (CAN4-S115) compatibility and operational compatibility without stress corrosion and/or any weakening effects within the following materials and/or combinations thereof in their respective applications:

.1 Aluminum (Cable Tray)

.2 ASJ Vapour Barriers (Insulation, Jacketing)

.3 Black Steel (Piping, Sleevings & Structural)

.4 Cast Iron (Piping)

.5 Communication Cables (minimum 40% tray fill area rating)

.6 Concrete
.7 Copper (Piping)
.8 Galvanized Steel
.9 Masonry
.10 Power Cables (Min. 40% tray fill area rating)

.8 Inspection of installations must be simplified by using identifiable material colours such as red or orange.

.9 25 mm (1") Head 0.25 kPa (0.035 psi) of water pressure resistance required for all fire stop seals.

.10 Non-slump ability in wall and overhead applications.

.11 Re-enterability in cable and cable tray penetrations without use of power tools.

.12 Minimum 17.6 kg/cm\(^2\) (250 psi) compression strength in cable and cable tray penetrations.

.13 Only cast-in and/or speed sleeve devices are permitted to penetrate horizontal fire separations.

.5 SUBMITTALS

.1 Submit complete shop drawings (using architectural floor plans); show all locations of all firestop seals including Division 15 and 16 seals. Indicate applicable listed cUL/ULC system and design number as applicable. Show all fire rated walls and floor penetrations. Show all penetrations and develop an indexing (identification) system. Shop drawings must include VOC limits, as required by LEED\(^\circ\) if applicable.

.2 Shop drawings to be submitted and reviewed prior to forming of concrete openings and placement of sleeves by Division 15 and 16.

.3 Submit firestop seal details and confirmation of cUL/ULC system listings. Show any variations, limitations or areas where listings are expected to be exceeded.

.4 Provide copies of reviewed shop drawings to Division 15 and 16 subtrades.

.5 Submit, upon completion, one (1) copy of maintenance manuals for the Owners’ future use. Include product names, applicator, installation instructions, cUL/ULC listings, manufacturer’s literature, etc.

.6 QUALITY ASSURANCE

.1 All work to be of the highest quality according to best trade practice and in strict accordance with manufacturer’s printed trade specifications, by an approved specialist firestopping caulking firm employing only skilled tradesmen.

.2 Submit upon completion, signed copies of letters of assurance confirming conformity to reviewed shop drawings and complete firestopping and smoke seal system including Division 15 and 16.

.3 For those firestop applications that exist for which no ULC or cUL tested system is available through a manufacturer, a manufacturer’s engineering judgement derived from similar ULC or cUL system designs or other tests will be submitted to local authorities having jurisdiction for
SECTION 5 Construction Standards > Division 7 – 07 80 00 – Firestopping and Smoke Seals

their review and approval prior to installation.

.4 A manufacturer’s direct representative (not agent or distributor) to be on site during initial inspection of firestop systems to train appropriate contractor personnel in proper selection and installation procedures.

.5 Manufacturer to have Fire Protection Specialist on staff.

2 Products

.1 Firestop Caulking Compound: Minimum requirements – National Standards System specifications as applicable and as listed above.

.2 Approved Firestop Caulking (Sealants) Compound: Only those products tested, approved and listed in the cUL/ULC – List of Equipment and Materials – Volume II – Building Construction may be used and only within specific firestop joint locations as listed.

.3 Obtain firestopping products from one manufacturer. Contractor to co-ordinate with all trades.

.4 Wall opening protective materials to conform with cUL/ULC.

.5 Identification:
Identify areas of re-enterability requiring through-penetration firestop systems with pressure-sensitive, self-adhesive, pre-printed vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system identification. Include the following information on the label:

.1 The words: “Warning – through penetration firestop system – do not disturb. Notify Building Management of any damage”.

.2 Installing contractor’s name, address, and phone number.

.3 Through-penetration firestop system designation of applicable testing and inspecting agency.

.4 Date of installation.

.5 Through-penetration firestop system manufacturer’s name.

.6 Installers name.

3 Execution

.1 SEQUENCING

.1 No installation is to proceed unless review and return of shop drawings has been completed.

.2 Schedule installation of CAST IN PLACE firestop devices after completion of floor formwork, metal form deck, or composite deck but before placement of concrete.
.3 Schedule installation of Drop-in firestop devices after placement of concrete but before installation of the pipe penetration. Diameter of sleeved or cored hole to match the listed system for the device.

.4 Firestopping to floor and roof slab penetrations must precede drywall track installation.

.5 Firestopping must precede fireproofing installation.

.6 Firestopping at slab edge detail to exterior wall panels and at window panels must be done with wall panel installations.

.7 Firestopping must precede mechanical pipe insulation (vapour barriers must be continued along with FPI – ASJ jacketing).

.8 A pre-review walk through conducted by manufacturer’s direct representative, with a representative from each associated contractor for the work. Manufacturer is to provide a written summary, in the form of a letter, of the visual observations. No inference of contractors adherence to correct installation practices in unobserved firestop applications is implied, or are to be drawn from, in this letter.

End of Section
07 92 00 - Joint Sealants

1 General

.1 As required by the current BC Building Code or as directed by the Building Envelope Consultant.

.2 VOC content limits shall comply with South Coast Air Quality Management District Rule # 1113.

.3 Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

.4 Sealants refer to CAN/CGSB 19 series or ASTM C920 for conditions with non-staining colours that match to adjacent surfaces. Colours to be approved by Owner from manufacturer’s full range.

.5 Install in accordance with ASTM C1193 and manufacturer’s instructions unless noted otherwise.

.6 Ensure compatibility of sealants to the substrate or adjacent materials.

2 Products

.1 POLYETHYLENE FOAM BACKUP ROD
Closed cell polyethylene, urethane, neoprene or vinyl foam backer rod conforming to ASTM D1056 compatible with primers and sealants as recommended by sealant manufacturer with Shore A hardness of 20, tensile strength from 140 to 200 kPa and diameter 30% greater than the width of the joint (where it will be installed).

.2 POLYURETHANE SEALANT (2 & 3 PART)
Conform to CAN/CGSB 19.24 Type M Class 25, for exterior locations at joints between dissimilar construction, around penetrations through exterior walls, roofs and floors, metal flashing, brick veneer control joints, around window frames and doors, vinyl/fibre cement siding and pressed steel door frames.

.3 POLYURETHANE SEALANT (1 PART)
Conform to CGSB CAN/CGSB 19.13 Type S Class 25 Grade NS for locations between interior pressed steel frames, concrete and masonry; stud wall plates to surrounding construction in exterior walls, penetrations through interior layer of gypsum wallboard, floors and ceilings where the “Airtight Drywall Approach” is used to control air leakage.

.4 SILICONE SEALANT
Conform to ASTM C920 Type S Grade NS Class 25 use NT, G & A for junction of washroom fixtures to floors, vanities to walls and countertops, behind plumbing escutcheons in tubs and showers,
joints between tub enclosures and tubs, between finished resilient flooring and door frames, resilient floor/wall junction prior to installation of the base boards, resilient flooring/baseboard junctions, walls/top of the baseboard and resilient floor/kitchen cabinet junctions.

Use white against white fixtures and clear in other locations. Conform to ASTM C 1248 for non-staining to porous substrates.

.5 **ACOUSTICAL SEALANT**
Non-hardening sealants conforming to CAN/CGSB 19.21 and effectively reduces airborne sound transmission through perimeter joints and openings as demonstrated by testing representative assemblies according to ASTM E90. Use sealants in sound-rated gypsum wallboard partitions, all end and lap joints in polyethylene vapour barriers, stud plates top and bottom, junction of vertical studs with dissimilar materials, around penetrations in walls and as required by rated assembly specifications.

.6 **BOND BREAKER TAPE**
Polyethylene tape/plastic tape recommended by sealant manufacturer, applied to sealant contact surfaces where bond to substrate or backer rod must be avoided for proper performance of sealant. Provide self-adhesive tape where applicable.

### Execution

.1 Examine joint sizes and conditions to establish correct depth to width relationship for installation of backup material and sealants. Prepare and prime surfaces in accordance with the manufacturer’s directions. Use joint backup material to control the depth of joint to the sealant manufacturer’s recommended thickness.

.2 Apply sealant in accordance with the manufacturer’s directions with sufficient pressure to properly fill all voids and seal the joint. Apply compounds in continuous beads, without open joints, voids, air pockets or embedded impurities.

.3 The surface of all caulking must be smooth, free from ridges, wrinkles, sags and air pockets. Tool exposed surfaces to give a slightly concave shape and ensure full contact with inner face of joint.

.4 Remove excess compound promptly as work progresses and upon completion using cleaners recommended by the manufacturer.

End of Section
08 11 00 – Metal Doors and Frames

1 General

.1 As required by the BC Building Code for exterior doors, and as directed by the Architect and/or Building Envelope Consultant.

.2 Doors and frames to exit stairs and service rooms and suite entrance frames from public corridors must conform to Canadian Steel Door and Frame Manufacturer's Association (CSDFMA), Manufacturing Specifications for Steel Doors and Frames.

.3 Fire-Rated Door Assemblies complying with NFPA 80 are listed/labeled by ULC/WH (Warnok Hersey) acceptable to authorities having jurisdiction for fire protection ratings indicated. Materials not less than the thickness specified herein, unless a greater thickness is specified in the rating requirements.

.4 Submittals: prior to fabrication clearly indicating manufacturer, door frame, elevations, dimensions, fastening, reinforcing, thickness, hardware, reinforcement details, opening requirements for glazing, quality of materials, shop finishes, fabrication details, installation requirements and wall condition/anchorage details. Include schedule identifying each unit, with door marks and numbers relating to numbering on drawings and door schedule of the Architect.

.5 Maximum glazing, area of wired glass, fire rating, requirements of the hold open device activated by the fire alarm and temperature rise rating as governed by BC Building Code and NFPA 80.

.6 Glazed door lites must meet the requirements of the Energy Efficiency Act.

2 Products

.1 Door and frame product shall be manufactured from Commercial Steel (CS) dry passivated, Type B to ASTM A924. Galvanized to ASTM A653, coating designation A40 (ZF 120), known commercially as painted galvanneal.

.2 Metal door frames in wood frame construction shall be “knock down” or welded frame type. Welded frames to be used for exterior doors.

.3 Attach fire rated label to hinge side of door.

.4 Exterior Service Room, Exit Doors

   .1 Thickness: 45 mm (1-3/4").

   .2 Door Construction: minimum 18 gauge galvanized steel.
.3 Style: Flush – hollow metal panel design. Flush doors are defined as those without visible seams on faces of doors.

.4 Core: Polyurethane insulation.

.5 Finish: Prime painted for site finishing.

.6 Sill: extruded aluminum.

.7 Weatherstripping: mechanically fastened, extruded aluminum with neoprene inserts and adjustable sweep at sill.

.8 Frame: hollow metal frame.

.9 Rain Drip: aluminum rain drip at head of door frame.

.5 SERVICE/MECHANICAL ROOMS, INTERIOR EXIT DOORS

.1 Door Construction: 18 gauge galvanized steel.

.2 Finish: Prime painted for site finishing.

.3 Frame: hollow metal frame.

.4 Door frames for concrete and concrete block walls: coating designation ZF075, wiped zinc coated.

.5 For corridor door weatherstripping: mechanically fastened, extruded aluminum with neoprene inserts and adjustable sweep at sill.

3 Execution

.1 SITE STORAGE AND PROTECTION OF MATERIALS

.1 Protect the door and door frames; keep them free from scratches, disfigurement and dents.

.2 Store the doors in a vertical position, and be spaced with blocking to permit air circulation between them. Doors and frames are to be stored in a manner to prevent any warping and twisting.

.2 INSTALLATION

.1 Doors are to be installed plumb, square and level. Ensure that doors can swing out fully without obstruction.

.2 Fire-rated door and frame product shall be installed in accordance with the terms of their listings, NFPA, and/or the local Authority Having Jurisdiction (AHJ).

.3 While setting the frame, check and correct as necessary for opening width, opening height, square, alignment, twist and plumb, in accordance with the CSDMA, “Recommended Dimensional Standards for Commercial Steel Doors and Frames”.

End of Section
08 14 00 - Wood Doors and Frames

1 General

.1 Wood doors must conform to the Quality Standards Illustrated (QSI) for Architectural Woodwork as published by the Architectural Woodwork Manufacturers Association of Canada (AWMAC), residential grade.

.2 Wood products are recommended to have certification according to the requirements of one of the four internationally recognized third-party audited certification systems: Forest Stewardship Council (FSC), CSA CAN/CSA Z809, Sustainable Forestry Initiative (SFI), Program for Endorsement of Forest Certification Systems (PEFC) or other product programs mutually recognized by PEFC.

.3 All composite and agrifibre products used within weatherproofing layer of the building must not contain urea-formaldehyde.

.4 Comply with requirements in NFPA and BCBC for fire-rated doors. Fabricate non-rated doors in accordance with QSI requirements.

.5 Glazed door lites must meet the requirements of the Energy Efficiency Act.

.6 All wood doors and frames shall be guaranteed by the manufacturer for a period of not less than three (3) years after the substantial completion against stile, rail, core show-through or deformation in the surfaces as determined under AWMAC.

2 Products

.1 INTERIOR UNIT ENTRANCE DOORS (SOLID CORE)

.1 Door Core: Particle board or solid wood stave; core fully glued and bonded. Rated for fire requirements.

.2 Door Faces: Flush tempered hardboard, primed for a paint finish. Refer to Division 09 91 00 - Painting.

.3 Frames: Fire rated finger joined SPF, primed for a paint finish.

.2 INTERIOR DOORS, PASSAGE/BIPASS AND BI FOLD (HOLLOW CORE)

.1 Door Core: Expanded honeycomb

.2 Door Faces: Flush tempered hardboard, primed for a paint finish. Refer to Division 09 91 00 - Painting.

.3 Frames: Finger joined SPF, primed for a paint finish.
.3 POCKET DOORS

.1 Door Core: Expanded honeycomb

.2 Door Faces: Flush tempered hardboard, primed for a paint finish. Refer to Division 09 91 00 - Painting.

.3 Hardware: Provide for tri-wheel track and hardware system, with accessories necessary to assure a smooth, warp-free and quiet operation. Provide robust D-pulls with the pulls made specifically for back to back mounting.

3 Execution

.1 SITE STORAGE AND PROTECTION OF MATERIALS

.1 Protect the door and door frames; keep them free from scratches, disfigurement and dents.

.2 Store the doors in a vertical position, and be spaced with blocking to permit air circulation between them. Doors and frames are to be stored in a manner to prevent any warping and twisting.

.2 INSTALLATION

.1 Doors are to be installed plumb, square and level. Ensure that doors can swing out fully without obstruction.

.2 While setting the frame, check and correct as necessary for opening width, opening height, square, alignment, twist and plumb, in accordance with the AWMAC.

.3 Consultant shall ensure that pocket doors walls do not support vertical or lateral loads (such as wall-hung fixtures, grab bars, etc) unless appropriate design measures are taken to support such loads.

End of Section
08 33 23 - Overhead Parkade Doors

1 General

Design and locate the overhead parkade door to reduce vandalism and theft, refer to Section 4 - Crime Prevention Through Environmental Design. Coordinate the gate operation with the Owner's Building security access system, if required.

2 Products

.1 GATE

.1 Type: Open grille, aluminum, sectional, upward acting.

.2 Construction: Two (2) horizontal sections comprising of 51 mm x 75 mm (2" x 3") tubular aluminum frame with 16 mm (5/8") square aluminum pickets spaced at 127 mm (5") o.c. vertically with closer spacing as required for security at attachment and activation points.

.3 Finish: Aluminum mill finish

.2 GATE HARDWARE

.1 Type: 75 mm (3") heavy duty, low headroom, double track hardware.

.2 Tracks: 75 mm (3") x 12 gauge commercially galvanized formed steel with double horizontal track and continuous angle for vertical stiffening.

.3 Rollers: 75 mm (3") in diameter with 178 mm (7") long axles. Rollers must be nylon long life precision bearing type.

.4 Roller brackets and hinges: Fabricated from 12 gauge commercially galvanized steel.

.5 Counterbalance mechanism: Torsion springs mounted on 25 mm (1") diameter solid steel shaft, grooved precision drums and flexible aircraft cables. Springs must be designed for 200,000 cycles.

.6 Rubber pads: Rubber pads to be mounted between ceiling slab, track supports and motor operator supports. Track supports must incorporate mylar strips to further reduce noise.

.3 OPERATION

.1 Motors: Supply and securely mount motor suitable to operate door of dimensions specified and weight supplied with additional reserve power (minimum 1/2 hp), heavy duty V-belt, #41 chain, an instant magnetic reversing starter, emergency disconnect and all necessary accessories.

.2 Power supply: Single phase, 60 Hz. Coordinate with Electrical Contractor for connection to power supply, and disconnect switches.

.3 Key: Provide 2 (two) remote control key fobs to parking garage entry for each parking stall and two (2) for maintenance.
.4 Treadle Car Detector: on interior side of door to operate door as vehicle approaches.

.5 Closing: Activated by an adjustable timer from 0 to 3 minutes.

.6 Door Bottom Safety Switch: electro-mechanical unit for full length of bottom rail of bottom section of door, to reverse door to open position when coming in contact with object on closing cycle.

.7 Safety Features: a pair of infra-red safety eyes shall be mounted on either side of the gate opening beyond the reach of unauthorized persons from exterior. In addition, a safety device/sensor to be added on the bottom rail of the door to sense an obstruction during closing/opening cycle and to contact motor to reverse to open.

.8 Control transformer: for 24V AC control voltage.

.9 Power Failure: In the event of a power failure, operator must be capable of being released from door by use of a quick release door arm for manual operation.

3 Execution

.1 Ensure that the clearance between the moving parts of a gate and adjacent surfaces shall prevent injury or entrapment of anyone attempting to intrude between the gate and the adjacent surface, but in no case shall the clearance be greater than 102 mm (4").

.2 Provide interconnecting wiring for a complete system to controller.

End of Section
08 41 00 - Aluminum Entrances and Storefronts

1 General

.1 Supply and install storefront framing and doors, including deflection channels, sill tracks, sill flashings, glass, glazing and hardware.

.2 DESIGN AND PERFORMANCE REQUIREMENTS:

.1 Structural design: design glass, framing members, and anchorage to the requirements of the 2012 BC Building Code for wind, seismic, guard, and human impact loads. Allow for deflection of building structure. Ensure no structural loads are imposed on storefront framing or doors. Engage Registered Professional Engineer to review structural design and attachment to building structure, seal shop drawings, carry out field reviews, and submit sealed letter of assurance stating that the window and door installation conforms to sealed shop drawings.

.2 Air leakage through the fixed lite areas of the storefront not to exceed 0.3 L/s·m² at 75 Pa when tested to ASTM E 283.

.3 Water penetration resistance: no uncontrolled water penetration when tested to ASTM E 331 at a test pressure of 290 Pa.

.4 Comply with BC Energy Efficiency Standards Regulation for manufactured fenestration products.

.3 WARRANTY:

Sealed units to have a minimum warranty period of ten (10) years against failure of glazing unit seals and deposits on interior glass faces detrimental to vision.

.4 QUALITY ASSURANCE:

.1 Submit shop drawings showing design loads, frame reinforcing, insulating glass makeup, installation clearances, expected building deformations, as well as shimming and anchorage requirements for the expected design loads for that location. Show all sealants, flashings and membranes required to ensure continuity of building envelope critical barriers to the fenestration system. Shop drawings shall bear the seal of a professional engineer registered in British Columbia.

.2 Submit certified copies of laboratory test reports from an approved independent testing agency to demonstrate storefront system compliance with air infiltration and water penetration resistance requirements.

.3 Submit written evidence of insulating glass certification to ASTM E 2190. The certification must apply to the insulating glass makeup used in the fenestration products.

.4 Submit Schedule S-B Assurance of Design and Schedule S-C Assurance of Field Review for fenestration product design and anchoring on completion of the installation.
2 Products

.1 STOREFRONT FRAMING AND DOORS

.1 Aluminum storefront framing, door framing, deflection channels, sill tracks, and operable vents in storefront framing to incorporate integral thermal breaks in all members.

.2 Sill flashings and frame anchorage to be designed and installed to minimize thermal bridging.

.2 SWING DOOR HARDWARE

.1 Closer: overhead, exposed, single acting, parallel arm, fully adjustable for barrier free opening, full metal cover, sized to suit door opening width, door weight and service application, finish to match door finish.

.2 Offset top and bottom ball bearing pivots, and 305 mm (12") high steel security latch protector plate.

.3 Provide top and bottom flush: hollow metal bolts on inactive leaf of double doors.

.4 Provide stainless steel push/pulls and wheelchair accessible threshold.

.5 Refer to Division 08 70 00 – Finish Hardware for detailed requirements.

.3 POWER-OPERATED SWING DOORS

.1 Power-operated swing door shall meet the requirements of ANSI A156.10, ANSI 156.19 and CSA/ULC.

.2 Equipment:

.1 Completely assembled and sealed unit which shall include helical gear-driven transmission, overriding clutch (to provide easy manual operation, spring-close), mechanical spring/bearings and filled with special lubricant for extreme temperature conditions. Attached to transmission system shall be a DC shunt-wound permanent magnet motor with sealed ball bearings.

.2 Housing - extruded aluminum fully enclosed housing with finished end caps, surface mounted to the door frame

.3 Operation:

.1 Exterior entry: provide exterior mounted operating switch with tamperproof key fob or card reader. Coordinate operation of automatic opener with entry phone for visitor access.

.2 Interior: provide stainless steel push plate switch, minimum 114 mm (4-1/2") diameter with wheelchair symbol.

.3 Manual operation – in the event of a power failure the door shall close as if equipped with a manual door closer and shall open with a force in accordance with ANSI 156.19.

.4 Features:

.1 The control shall include an adjustable (0 to 60 seconds) time delay module
.2 Weatherstripping at the interface between doors, frame and sidelight panels. Refer to Division 08 70 00 – Finish Hardware.

.3 Automatic locking system.

.4 Provide an electric strike connected to operating devices.

.5 Self-contained unit including necessary transformer, relays, rectifiers, and other electronic components for proper operation. Relays shall be plug-in type for individual replacement.

.6 Door operation shall not require any fluids or gases under pressure to be used in opening and closing of door.

.7 Manual door operation requires less than 12 lbs of force applied to door stile.

.4 GLASS AND GLAZING

.1 Glass thickness and heat strengthening: to be determined according to CAN/CGSB-12.20-M. Thickness and heat treatment of clear glass may be adjusted to suit structural requirements but shall not be less than 5 mm thick.

.2 Insulating glass units shall be of dual seal construction certified for durability and argon gas retention to ASTM E 2190.

.3 Insulating glass to be multiple glazed with at least one low-E coating between panes, a 90% argon gas fill level with a compatible edge sealant system and have spacer bars other than non-thermally broken aluminium box spacer bars.

.4 Sealants

Refer to Division 07 92 00 – Joint Sealants; use 2 part urethane to exterior and 1 part urethane to interior.

.5 Air Barrier

Maintain continuity of air barrier at junction with entrances and storefront.

.6 Finish

Factory applied thermo setting acrylic enamel coating in accordance with Architectural Aluminum Manufacturer’s Association Specification AAMA 2603 or clear anodized to AA – M12C22A31 as selected by Design Consultant.

3 Execution

Not Applicable

End of Section
General

.1 REFERENCES
   .3 CAN/CSA-A440.4 Window, Door, and Skylight Installation.
   .4 CAN/CGSB-12.20 Structural Design of Glass for Buildings.
   .6 ASTM E1105 Field Determination of Water Penetration of Installed Exterior Curtain Walls and Doors, by Uniform or Cyclic Static Air Pressure Difference.
   .8 Current versions of the BC Building Code, BC Energy Efficiency Standards Regulation, Vancouver Building By-Law (VBBL), and Local Government Act.
   .9 Building Enclosure Design Guide – Wood-Frame Multi-Unit Residential Buildings (Homeowner Protection Office – HPO, most recent edition) for guidance on window and door installation detailing.

.2 DESIGN AND PERFORMANCE REQUIREMENTS
   .1 Windows, side hinged doors and sliding glass doors (hereafter called the fenestration products) shall conform to AAMA/WDMA/CSA 101/I.S.2/A440 and CSA A440S1, and have the following minimum tested performance ratings:

   .1 Performance Class – to be selected according to the intended building usage:

   Class R   for modular residences
   Class LC  for group homes, medium-density residential such as townhomes, and low-rise apartments (up to 4-storey)
   Class CW  for high-density residential (more than 4 storeys), elementary and secondary schools
.2 Performance Grade – For Part 9 buildings, Performance Grades should be selected according to the Canadian Supplement CSA A440S1. For Part 3 buildings the architect may determine Performance Grades that will be used together with Performance Class to prequalify and select products. Performance Grade shall not be less than PG35.

.3 Water Penetration Resistance Test Pressure – to be determined in accordance with CSA A440S1, but in no case shall it be less than 290 Pa for buildings up to four storeys, or 510 Pa for buildings taller than four storeys.

AAMA/WDMA/CSA 101/I.S.2/A440 requires products supplied with screens to be laboratory tested for water penetration resistance both with screens and without screens.

.4 Air Infiltration/Exfiltration Level: A-3 for operable windows; “Fixed” for non-operable windows.

.2 Insulating glass units shall be of dual seal construction certified for durability and argon gas retention to ASTM E 2190.

.3 Schools, Multifamily and Part 3 Buildings

.1 Design and manufacture fenestration products and product anchoring to the building structure to meet all applicable building code loads for the building height and location, including wind loads, seismic loads, human impact loads, guard loads, seismic movements, and other expected movements and deformations of the building structure. Deflection of all glass supporting members to be limited to L/175.

.2 For the purposes of the fenestration product design and anchoring appropriate design wind pressures should be determined for building locations and terrain. The design pressure determined by the responsible engineer may differ from the Performance Grade used to prequalify products on the basis of NAFS tested performance ratings.

.4 The design of the windows should consider the daily light exposure and views of the outdoor to achieve a healthy lit environment.

.5 Fenestration products shall be Energy Star qualified on the basis of the U-factor qualification path for the Energy Star climate zone in which the building is situated, and shall be labeled to show compliance with the Energy Star program. When Energy Star qualification is not possible for some reason, products shall be labeled to show a maximum overall product U-value of 2.0 W/m²-K as required by the BC Energy Efficiency Standards Regulation. U-value labels shall bear the mark of a recognized certification agency.

The Energy Star program qualifies the energy performance of fenestration products in two different ways. The Energy Rating (ER) path is only suitable for single family homes. Fenestration products for town homes and multifamily buildings must be Energy Star qualified under the U-value path.

.6 Fenestration product installation details shall provide sub-sill drainage to provide a secondary or back-up drainage path to prevent water ingress into the wall framing below in case of leakage past the water shedding surfaces of the window frame and the adjoining wall.

.7 Fenestration products shall comply with the Canadian Operating Force Requirements in AAMA/WDMA/CSA 101/I.S.2/A440.

.8 Ensure replacement windows meet all current building code requirements (example; sill heights for operable windows and restrictor requirements).
.9 Avoid the use of skylights in the project.

.3 PRE-INSTALLATION LABORATORY TESTING

.1 Pre-installation laboratory tests are required under certain conditions, as determined by the Design Consultant in consultation with the Owner:

.1 When fenestration product(s) are of a size and/or a configuration not previously tested to AAMA/WDMA/CSA 101/ I.S.2/A440 by the fenestration supplier.

.2 When the fenestration product supplier is relying on the test reports of a third party for the AAMA/WDMA/CSA 101/I.S.2/A440 performance ratings of their products, a practice permitted in some certification programs.

.3 When using suppliers whose products have never previously been field tested for water penetration resistance.

.4 When a greater level of quality assurance is required, such as buildings subjected to very high driving rain wind pressures (coastal open terrain).

.2 Pre-installation laboratory tests, when required, shall be conducted on at least one full-size sample taken from each batch of windows or doors manufactured for the project. The test data shall be submitted to the Consultant for review and approval prior to installation. Include cost of testing in the contract price.

.1 Products shall be tested to the requirements of AAMA/WDMA/CSA 101/I.S.2/A440 and CSA A440S1 to determine they comply with the specified Performance Class and Grade, Water Penetration Resistance Test Pressure, and Canadian Air Infiltration/Exfiltration Level.

.2 Products shall be installed into the test buck in the same way as shown on the architectural drawings for the building. No additional shimming or anchoring of the test specimen shall be permitted. Consultant to approve test specimen installation prior to product testing.

.4 SUBMITTALS

.1 Submit written evidence of insulating glass certification to ASTM E 2190. The certification must apply to the insulating glass makeup used in the fenestration products.

.2 Submit certified copies of test results from an approved independent testing agency to confirm compliance with the minimum specified AAMA/WDMA/CSA 101/I.S.2/A440 Performance Class and Grade.

.3 Shop drawings: submit shop drawings of fenestration products showing design loads, frame reinforcing, insulating glass makeup, installation clearances, expected building deformations, as well as shimming and anchorage requirements for the expected design loads for that location. Shop drawings shall bear the seal of a professional engineer registered in British Columbia.

Shop drawings may be used to report the AAMA/WDMA/CSA 101/I.S.2/A440 Performance Class, Performance Grade, Water Penetration Resistance Test Pressure, and Air Infiltration/Exfiltration Level of the fenestration products in place of individual labels applied to the products. It is understood that the engineer’s seal on the shop drawings does not constitute an endorsement or certification of the AAMA/WDMA/CSA 101/I.S.2/A440 performance information.
.4 Submit Schedule S-B Assurance of Design and Schedule S-C Assurance of Field Review for fenestration product design and anchoring on completion of the installation.

.5 **MOCK-UP**

.1 Install a window and/or sliding glass door mock-up, complete with tie-ins to adjacent materials and assemblies to demonstrate the required sequence of installation, for the Consultant’s approval.

.2 Field test the mockup to verify that installed product and interface with surrounding construction complies with specified water penetration resistance test pressure.

.6 **FIELD TESTING**

.1 Selected installed fenestration products shall be tested for water penetration resistance in accordance with ASTM E 1105. The test Procedure shall correspond to the method of test used to qualify the product for water penetration resistance under AAMA/WDMA/CSA 101/I.S.2/A440. The Water Penetration Resistance Test Pressure shall be as indicated in this specification. The test chamber shall be installed so as to test both the product and the interface joint to the adjacent wall. The pass/fail criteria for the test shall be as defined in CSA A440SIClause 5.4.

.2 The minimum number of products selected for field testing are shown below.

<table>
<thead>
<tr>
<th>TOTAL NUMBER OF PRODUCTS*</th>
<th>PRIOR TO 5% INSTALLED</th>
<th>AT 50% INSTALLED</th>
<th>AT 100% INSTALLED</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 25</td>
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</tr>
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</tr>
<tr>
<td>&gt; 200</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

* Windows, sliding doors, and side hinged doors shall be field tested as shown in this table according to the quantity of each on the project.

.3 Where modifications are necessary to the window assembly or wall interfaces to achieve the required performance, the contractor shall undertake required modifications to the manufacturing or installation process to the satisfaction of the Building Envelope Consultant. This Consultant is to ensure that the required modifications in this process do not void or compromise the manufacturer’s warranty.

.4 Include cost of field testing in the contract price. The Contractor will pay for any re-testing required as a result of failures. For renovation projects, the Owner may choose to engage the testing firm independently.

.7 **WARRANTY**

.1 Sealed units to have a minimum warranty period of ten (10) years against failure of glazing unit seals and deposits on interior glass faces detrimental to vision.
.2 Fenestration product frames to have a minimum warranty period of 25 years against failure of frame, sash and mullions. Failure modes include: warping, cracking, shrunken glazing beads, failure of gaskets, dislocation or disappearance of weatherstrips, detectable water penetration through joints in the product, and operational difficulties such as inability or increased difficulty to operate products, including an increase in operating force beyond the values in AAMA/WDMA/CSA 101/I.S.2/A440 Table 6.

.3 Hardware to have a minimum warranty period for 10 years against breakage; premature wear and/or operational difficulties such as inability or increased difficulty to operate products, including an increase in operating force beyond the values in AAMA/WDMA/CSA 101/I.S.2/A440 Table 6.

.4 Unpainted frames shall be free of uneven or noticeable colour change for a period of 10 years. Painted finishes shall be free of noticeable uneven or noticeable colour change for a period of 10 years.

2 Products

.1 ALL FENESTRATION ASSEMBLIES: All fenestration products shall conform to all applicable provisions of AAMA/WDMA/CSA 101/I.S.2/A440 and CSA A440S1, including material and component quality requirements and specifications.

.1 Window Operation – awning or casement sashes are preferred. Sliding windows will be considered in certain applications (for example, on existing buildings in areas where awning or casement windows will result in a hazardous obstruction on exterior walkways or where large overhangs protect the slider).

.2 Forced entry resistance to comply with AAMA/WDMA/CSA 101/I.S.2/A440.

.3 The operating hardware type, operating force and handle location shall be determined by the Design Consultant so as to be appropriate for the needs and abilities of the building occupants. Accessible door hardware type and handle location shall be determined by the Design Consultant.

.4 Accessible side hinged and sliding doors exposed to driving rain should conform to the specified Performance Grade and Water Penetration Resistance Test Pressure. Design Consultant to detail the door installation in a way that accommodates accessibility without compromising specified performance requirements, by recessing the door into the floor if necessary. When this is not possible accessible doors shall be provided with sufficient roof overhang protection to protect the door sills from driving rain. The overhang depth must be sufficient to ensure a Low Exposure condition at the door sill using Rain Exposure Nomographs based on those in CSA A440.4, such as those published in the guide, “Best Practices for Replacing Windows and Doors in Wood Frame Buildings”, published by HPO.

.5 Provide screens on operable fenestration products. Screens shall be glass-fibre mesh in an aluminum frame, finished to match frame colour. Screens must be tested to comply with Clause 5.1 of CSA A440S1. Screens must not interfere with operation of window hardware.

.6 Machine all joints, corners, miters accurately to ensure flush hairline joints. Vinyl framed products to have welded frame corners.
.2 GLASS AND GLAZING

.1 Design glass strength to CAN/CGSB 12.20. Heat strengthened and tempered glass to conform to CAN/CGSB 12.1.

.2 Insulating glass units shall be of dual seal construction certified for durability and argon gas retention to ASTM E 2190.

.3 Low-E coating, edge spacer, and gas fill to be in accordance with labeled fenestration product labeled energy performance.

.4 Install insulating glass units in accordance with IGMA TM-3000.

.3 SEALANTS

Refer to Division 07 92 00 – Joint Sealants; use two-part urethane to exterior and one-part urethane to interior.

.4 CRITICAL BARRIERS

Ensure continuity of critical barriers (water shedding surface, water resistive barrier, air barrier, vapour retarder) at interface between fenestration products and walls.

.5 FINISHES

Factory applied coatings shall conform to the following specifications referenced in AAMA/WDMA/CSA 101/I.S.2/A440:

.1 AAMA 611 Voluntary Specification for Anodized Architectural Aluminum

.2 AAMA 612 Voluntary Specification, Performance Requirements, and Test Procedures for Combined Coatings of Anodic Oxide and Transparent Organic Coatings on Architectural Aluminum

.3 AAMA 613 Voluntary Performance Requirements and Test Procedures for Organic Coatings on Plastic Profiles

.4 AAMA 623 Voluntary Specification, Performance Requirements and Test Procedures for Organic Coatings on Fiber Reinforced Thermoset Profiles

.5 AAMA 2603 Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels
3 Execution

.1 Install fenestration products in accordance with CAN/CSA-A440.4.

.2 Installation must comply with contract documents, reviewed shop drawings and approved window mock-up.

.3 For renovations the Contractor is to verify window sizes by on-site measurement, allowing for installation clearances and tolerance for thermal movement. Refer to HPO publication, Best Practices for Window and Door Replacement in Wood Frame Buildings.

.4 Seal anchor penetrations through framing members with sealant.

.5 Correctly locate and install flashings, deflectors and weep holes to ensure proper drainage of moisture to exterior. Provide flashing with end dams over window heads and sill flashing with end dams at window sills. Slope sills and sill flashing to the outside.

.6 Do not block or seal fenestration product weep holes.

.7 Ensure that sealants are appropriate for the particular application; ensure proper surface preparation. Avoid any discontinuity in sealant application.

.8 Ensure proper fit, sizing and continuity of gaskets and glazing tapes.

.9 Adjust all hardware for proper functioning and ease of operation.

End of Section
08 70 00 - Finish Hardware

1 General

.1 Submit a detailed finish hardware schedule prepared by an Architectural Hardware Consultant (AHC) showing each separate type of item including make, model, material, function, size, finish, and other pertinent information.

.2 Provide two (2) copies of maintenance data, manufacturer’s parts list, manufacturer’s instructions for door closers, lock and latch sets, door holders, panic hardware, and three (3) sets of wrenches for door closers, lock and latch sets.

.3 Deliver tagged and indexed keys and key cylinders directly to Owner and obtain a signed receipt from Owner’s authorized receiver.

.4 Provide a one (1) year guarantee for all finish hardware except for exit devices which must have a five (5) year guarantee, closers with twenty five (25) years, locksets with five (5) years.

.5 Alternatives to the recommended products can be accepted if it is demonstrated that the alternatives meet the minimum requirements, and are accepted by BC Housing.

.6 The design team must consult with the Owner and building maintenance before considering the products in the building.

2 Products

.1 Deadbolts/Locks/Latchsets: Minimum requirements – ANSI A156.2 Series 4000 Grade 1 c/w mortised faceplate bolt/latch and 6 pin cylinders. Approved deadbolts, locks, latch set series, and designs are as follows. Any alternatives should be approved by BC Housing prior installation.

.1 Exterior Doors

.1 Schlage D Series Rhodes levers or Dorex GIL (required for Directly Managed buildings)

.2 Sargent 10 Line L levers

.3 Corbin CL 3500 NZD levers

.2 Unit Entry Doors

.1 Schlage B660 Deadbolts x D Series Rhodes lever/L series 06 Lever or Dorex GIL (required for Directly Managed buildings)

.2 Sargent 485 Deadbolt x 10 Series L lever/8200 series

.3 Corbin DL 3100 Series x CL 3500 NZD lever/ ML2000 series
.3 Interior/Public Corridors/Common Utility/Service Doors

.1 Schlage D Series Rhodes levers or Dorex G1L (required for Directly Managed buildings)

.2 Sargent 10 Series L lever

.3 Corbin CL 3500 NZD levers

.4 Interior Doors Within Units

.1 Schlage F Series Elan levers

.2 Sargent 3 Series L lever

.3 Corbin CL3720 NZD

.5 Lever handles are required on all lock and latch sets accessible to tenants.

.6 Exterior Doors or Gate Hardware

.1 Hardware for exterior doors or gates shall have stainless steel finish and corrosion resistant parts when exposed to weather.

.2 EXIT DEVICES

All Exit Devices must be ULC listed for Accident Hazard and Fire Exit, and must be tested in accordance to ANSI A156.3, Grade 1.

.1 Von Duprin 99 Series x 992L-06 trim (required for Directly Managed buildings)

.2 Sargent 8000 Series x ETL trim

.3 Corbin ED 5000 Series x Newport trim

.3 CLOSERS

Minimum requirements: All closers must be ULC listed and certified under ANSI Standards A156.4, Grade 1. All closers to meet barrier free requirements (ADA compliant) and to provide maximum degree of opening required.

.1 Fire Door Closers

.1 LCN 1461 (recommended for Directly Managed buildings)

.2 Sargent 1431 Series

.3 Norton 8501 Series

.2 Exterior Door Closer

.1 LCN 4040 (recommended for Directly Managed buildings)

.2 Sargent 351 Series

.3 Norton 7500 Series

.3 Swing free electronic closers (with ceiling mounted smoke detector):

If recommended by the Owner in assisted living projects for all suite entry doors and common
area doors frequently used by tenants:

.1 LCN Sentronic 4310 ME
.2 Rixson Smoke Chek VI

.4 BALL BEARING HINGES
For all fire protection rated doors, provide ball bearing hinges with five knuckles and two sets of bearings. Approved manufacturers and part numbers include:

.1 Hager BB1279 (Ferrous Steel); Hager BB 1191 (Non-Ferrous)
.2 Stanley BB179 (Ferrous Steel); Stanley BB 191 (Non-Ferrous)
.3 McKinney #TA 2714 (Ferrous Steel); McKinney #TA 2314 (Non-Ferrous)
Non-Ferrous hinges shall be used on all exterior doors. Non removable pins (NRP) to be installed on doors that have hinge barrel exposed on exterior side.

.5 HINGES – SUITE INTERIOR DOORS
.1 89 x 89 mm (3-1/2" x 3-1/2"), 2 GD finish, 3 pair.

.6 SLIDING POCKET DOORS
.1 Crowderframe Type ‘C’ – 400 track assembly (use privacy or passage set as applicable)
.2 Pemko PF Series or approved equivalent.
.3 Pocket doors should be equipped with heavy gauge “D” handles with back to back mounting for ease of operation and durability. Add stopper to prevent crashing.

.7 LABELED DOORS
Hardware used in fire rated openings must bear ULC label.

.8 ACCESSORIES:
.1 Door Stops
.1 Wall mounted convex/concave dome stop with concealed mounting. Gallery Hardware Wall #231 Convex; Wall #233 Concave or approved equal.
.2 Floor mounted half dome rubber stop with concealed mounting. Gallery Hardware Floor #200 Lo Rise; Floor #218 High Rise or approved equal.
.3 Provide solid backing for door stops.

.2 Door Viewer (peep holes)
Viewing hole to be provided at standard height 1626 mm (5’-4”) and at accessible height 1219 mm (4’-0”). View hole to have 180 degree viewing area and ULC rated.
.3 Kick Plates (For wheelchair accessible units only)

Minimum 254 mm (10") high, full width of door, 1.6 mm (1/16") thick, aluminum C-28 finish or stainless steel C-32D finish, secured with corrosion resistant screws. Considerations should be given to install kick plates for senior units.

.4 Push Plates

102 mm x 580 mm, 1.6 mm thick (4" x 20" x 1/16"), aluminum C-28 finish or stainless steel C-32D finish.

.5 Pull Plates

Same as push plates, with 305 mm (12") “D” handles.

.6 Door Pulls for Pocket Doors, Cabinets, and Closets

Should be easily graspable by people with limited dexterity; minimum 102 mm (4") D pulls. No pulls on inactive cabinet doors or drawers.

.7 Thresholds

Extruded aluminum, mill finish, bevelled, with no more than 13 mm (1/2") floor offset, barrier- free. Set on two continuous beads of sealant and secure with at least three corrosion resistant fasteners.

.8 Weatherstripping

Heavy duty bulb type extruded closed cell sponge neoprene clear anodized finish weatherstrips (not foam type). Weatherstripping must restrict air infiltration to not more than 0.05 m³ (1.76 ft³) per minute per 1.0 m (3'-4") of joint.

For residential doors, insert rabbit style door weatherstripping. It should have a nylon cover to prevent sticking to the slab in frosty conditions.

For out-swinging doors, insert door top and use overhead rain drip cap where door will be subjected to severe weather conditions. For interior doors use self adhesive for smoke/sound seal.

.9 All exterior doors should be equipped with heavy gauge steel 2-piece interlocking astragals for additional security.

.10 All sliding patio doors are required to have toe locks.

.9 KEYING

.1 All locks to be supplied with a 6 pin factory generated masterkey system. Keying to be determined in consultation with architect and Owner.

.2 All locks to operate on two common masterkeys, one master that opens all suite doors and a separate master that opens all common area and service room doors.

.3 Allow for factory construction keying of all locks. Provide future codes for all keys.

.4 Allow for five keys per lock (unless specified otherwise)

.5 Except suite entry keys, all keys to be stamped “Do Not Duplicate”
.10 FINISH

Generally BHMA 626 Satin Chromium, unless otherwise noted.

Door Closers: sprayed aluminum (BHMA 689 finish), unless otherwise noted.

All finishes, on hardware of like kind, shall match throughout the project. Finishes shall be #626 Satin Chromium, #630 Satin Stainless Steel, #628 Anodized Satin Aluminum, or powder coated #689 Aluminum.

.11 SCHEDULE

Provide finish hardware schedule as follows:

<table>
<thead>
<tr>
<th>SCHEDULE OF FINISH HARDWARE</th>
<th>DIVISION: 08710</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finish Hardware</td>
<td>Threshold</td>
</tr>
<tr>
<td>Exterior Out—swing Doors</td>
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</tr>
<tr>
<td>Building Entrance (Power Operated Door Opener)</td>
<td>●</td>
</tr>
<tr>
<td>Suite Entry Doors</td>
<td>●</td>
</tr>
<tr>
<td>Patio Doors</td>
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</tr>
<tr>
<td>Unit Interior Doors</td>
<td>●</td>
</tr>
<tr>
<td>Service Room Doors</td>
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</tr>
<tr>
<td>Public Rooms and Corridors</td>
<td>●</td>
</tr>
<tr>
<td>Stairwells</td>
<td>●</td>
</tr>
</tbody>
</table>

NOTES:
(1) Building Entrance and accessible unit entry door: wheelchair accessible threshold
(2) Building Entrance: closer with 90 degree hold-open arm with cards readers & electric strikes where required, no hold open
(3) Suite entry Doors: cards readers, electric strikes and suitable locksets where required
(5) Deadbolt and latch go together or panic hardware and no deadbolt
(6) Astragals required on exterior doors

3 Execution

.1 Install hardware to standard hardware location dimensions in accordance with the Door & Hardware Institute Guide.

.2 Coordinate with Electrical Sub-Contractor to provide disconnect switch located near door opening, conduit and connection of wiring to motor and connecting wiring into operator.
09 24 23 – Stucco

1 General


.2 Construct an on-site mockup. Mockup to show vertical control joint, cavity furring, cross cavity flashing, membrane flashing, metal flashing, building paper, stucco mesh, base and finish coats. The approved mockup may remain as a finished part of the work and will serve as a standard upon which other work will be judged.

.3 Stucco should be designed using the drained cavity wall approach. Face-sealed stucco is only acceptable in certain geographical locations in the province as noted in the building code. The form of the building must be considered when deciding on the face-seal approach.

2 Products

.1 STUCCO MATERIALS

.1 Base Coat Materials shall be in accordance with AWCC *Specification Standards Manual*.

.2 Finish Coat Materials: 100% acrylic based, factory premixed proprietary product compound with enhancements to reduce dirt pickup and staining. Owner to select the colour from manufacturer’s standard ranges. Texture: Medium sandfloat finish.

.2 BACKING MATERIALS

.1 Metal Flashing: refer to Division 05 50 00 – Metal Fabrications.

.2 Sheathing Membrane: water repellent breather type to CGSB CAN2-51.32.

.3 Membrane Flashing: minimum 1.0 mm (40 mil) thick sheet of self-adhering, self-healing, composite rubberized asphalt having a minimum membrane tensile strength of 177 N/25 mm (40 lb/in) to ASTM D903, and maximum permeance of 2.25 ng/Pa s m² (0.001 perms) to ASTM E96.

.3 FURRING AND LATHING MATERIALS

.1 Provide furring and lathing materials, including channels, furring channels, hanger and tie wire, in accordance with AWCC Specification Standards Manual.

.2 Use paperback lath, standard type welded wire lath, expanded metal or rib lath to ASTM C841 and C847.
.4 STUCCO ACCESSORIES

.1 Provide all stucco accessories and/or trim such as stops (casing beads), internal corner reinforcement, weep and drip screeds, reveals, etc., as detailed on drawings and/or as required to AWCC Specification Standards Manual.

.2 Provide accessories fabricated from hot dipped galvanized steel, zinc alloy, extruded exterior grade PVC or aluminum of types and of materials pre-approved by the design authority, and to Reference Standard.

.3 Fasteners to CSA B111 (nails and staples) and ASTM C1002 (screws), of suitable corrosion resistant material, compatible with material, sheathing, framing or other substrate.

.4 Fastener specifications will consider cladding weight, imposed lateral loads (wind and earthquake), strapping size and spacing, sheathing type and thickness, in addition to the various types of fasteners available.

3 Execution

.1 Unless otherwise specified stucco work should not be performed when the ambient air and substrate temperatures are below 4°C (39°F) or above 38°C (100°F) for 24 hours before, during and after stucco application. Do not install materials during inclement weather unless means to protect installation are taken. Refer to the manufacturer’s recommendations. Acrylic coat must be protected from moisture for a minimum of 24 hours following application.

.2 Ensure proper cure times are achieved between base, brown and finish coat.

.3 Ensure that stucco will fully cure by keeping it moist throughout the curing period. Additional methods of moist curing may be required to prevent cracking.

.4 Install a horizontal cross-cavity flashing at every floor level.

.5 All materials and ingredients should be clean and free of contamination during mixing and application. No surfactants are to be added to the stucco mix.

.6 Provide vertical control joints at maximum 3048 mm (10'-0") intervals and in areas where there is potential for differential settlement. Control joints should extend through the lath and other accessories to eliminate restraint at the panel edges.

.7 Vertical control joints must be sealed with non-hardening exterior type sealants as recommended by stucco manufacturer and in accordance with Division 07 92 00 – Joint Sealants.

.8 Ensure fasteners for the stucco lath are installed in an alternating pattern, on the wire, both vertically and horizontally.

End of Section
09 28 00 - Gypsum Wallboard

1 General

.1 Materials and workmanship must conform to The Specification Standards Manual as published by the Association of Wall and Ceiling Contractors of BC (AWCC).

.2 Finish walls within habitable areas with gypsum wallboard to receive a paint finish.

.3 Finish ceilings with gypsum wallboard to receive a spray texture. Kitchens and bathroom ceilings must have a painted drywall finish.

.4 Specify wall, floor and ceiling assemblies with a minimum rating of STC 50 when tested in accordance with ASTM E90, “Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements”. Specify assemblies with a minimum rating of STC 55 adjacent to an elevator shaft or refuse chute. Refer to BC Building Code, 9.11.1.1(1) and Appendix.

.5 Where fire and sound rated gypsum wallboard assemblies are required, construct to applicable BC Building Code, NBC, ULC, WHI or other pre-approved testing agency construction details pertaining to the assembly.

The Consultant should note, in the assembly schedule, the number of the rated assembly and the authority or agency responsible for the rating.

2 Products

1 Gypsum Boards

.1 Standard Gypsum Board: to ASTM C1396/C1396M, 12.7 mm (1/2") and 15.9 mm (5/8") thick.

.2 Fire-resistant Gypsum Board: Fire-resistant Type X and/or Type C to ASTM C1396/C1396M, 12.7 mm (1/2") and 15.9 mm (5/8") thick.

.3 Mould and Moisture Resistant Gypsum Board: to ASTM C1658, 12.7 mm (1/2") and 15.9 mm (5/8") thick Type X, coated inorganic fiberglass mat facer front and back with enhanced moisture and mould resistance core. Score 10 for mould resistance as per ASTM D3273.

.4 Water-resistant Gypsum Tile Backer Board: to ASTM C1178, 12.7 mm (1/2") thick standard and/or 15.9 mm (5/8") thick, Type X, water resistant board with enhanced moisture and mould resistant gypsum core and faces bonded to an inorganic fibreglass mat wrapping treated with one face coated with a heat cured copolymer water and vapour retardant coating.

.5 Cementitious Tile Backer Board: to ASTM C1325, asbestos and formaldehyde free, non-combustible composite board of Portland cement, ground sand, cellulose fibre, selected additives and water, thickness and length to suit for ceramic tile shower/tub surround.

.6 Glass-Mat Gypsum Sheathing Board: to ASTM C1177, 12.7 mm (1/2") thick standard and/or
15.9 mm (5/8”) thick, Type X, water resistant board with enhanced moisture and mould resistant gypsum core and coated inorganic fiberglass mat facers front and back for exterior sheathing. Score 10 for mould resistance as per ASTM D3273.

.2 **ABUSE-RESISTANT WALLBOARD**

.1 Abuse Resistant Gypsum Board: to ASTM C1629, Type X for use in lieu of standard drywall to protect from damage in high-traffic corridors and hallways and in buildings with hard to house tenants. Where additional protection required use vinyl wall protection systems, corner guards; refer to [Division 10 00 00 – Specialities](#).

.2 Moisture, Mould and Abuse Resistant Board: to ASTM C1658, 15.9 mm (5/8”) thick Type X, heavy duty coated inorganic fiberglass mat facer front and back with enhanced moisture and mould resistant gypsum core. Score 10 for mould resistance as per ASTM D3273, level 3 for surface abrasion, level 1 for indentation resistance and level 1 for soft body impact, and level 1 for hard body impact as per ASTM C1629.

.3 **ACCESSORIES**

.1 Fasteners: use drywall screws for fastening gypsum wallboard in accordance with AWCC Manual. Use corrosion resistant screws for fastening cementitious/water-resistant gypsum tile backer board.

.2 Corner Bead: use tape-on corners with an abrasion resistant finish.

.3 Acoustical Sealant: in accordance with [Division 07 92 00 – Joint Sealants](#).

.4 Thermal and Acoustic Insulation: in accordance with [Division 07 21 00 – Thermal Protection](#).

### Execution

.1 Make sure the area temperature is acceptable for execution; specially due to seasonal variations in interior/northern region. Do not close in ceiling and soffit spaces or walls until all services have been completed, tested and approved.

.2 Seal underside of wood stud plates with acoustical sealant in accordance with [Division 07 92 00 – Joint Sealants](#), and as required by the Specifications for the rated assembly. Seal around penetrations in sound-rated walls including joints between dissimilar constructions.

.3 Seal the bottom edge of the gypsum board with spray polyurethane foam sealant, refer to [Division 07 21 00 – Thermal Protection](#), to achieve suite compartmentalization.

.4 Provide a prefinished PVC “J” bead at window/gypsum board junctions.

.5 Provide fire extinguishers in recessed enclosures in corridor walls. User functions of fire extinguisher cabinets shall be installed at accessible height, e.g., not more than 1220 mm (4’-0”) above the floor. Do not compromise required fire separation or rating.
.6 Behind one-piece plastic laminate surround use moisture resistant gypsum wallboard.

.7 Carefully install insulation into track.

.8 For ceiling use spray texture fine to medium, polystyrene free, paintable finish.

.9 Finish gypsum wallboard surfaces in accordance with the Levels of Finish as prescribed in Section 9.5 of the AWCC Manual and as follows:

.1 Level 1 Finish: use this finish in areas where the assembly will be completely concealed from view such as in ceiling spaces and behind solid wall and ceiling finishes.

.2 Level 3 Finish: use this finish in areas that will receive a spray texture finish.

.3 Level 4 Finish: use this finish in areas that will receive a GL1, GL3 and GL5 paint finish.

.10 Refer to Appendix B-Reducing Air Leakage between Suites to minimize air leakage and bed bug migration between units.

End of Section
09 30 00 - Ceramic Tile

1 General

Furnish labour, materials, and equipment for the complete supply and installation of all ceramic wall and floor tile, to areas and surfaces as shown.

VOC limit for adhesives to meet the requirements of LEED® Canada. Consider using materials with recycled content.

.1 QUALITY ASSURANCE

All tile work in accordance with recommendations as set out in the latest edition of the Tile Specification Guide 09300 Tile Installation Manual as prepared by the Terrazzo, Tile and Marble Association of Canada (TTMAC) and to ANSI 108.1 & 108.5.

.2 SUBMITTALS

.1 Provide Owner with cleaning and maintenance instructions for tile and grouts used upon completion of the work.

.2 Provide the Owner with a minimum of 2% of each type and colour of tile used in the work for Owner’s later use or maintenance.

2 Products

.1 MATERIALS

.1 Cement: Type 10 Portland Cement conforming to CAN/CSA-A3000, A5 colour grey.

.2 Sand: Conforming to ASTM C144 passing 16 mesh.

.3 Water: Fresh, clean, potable, free from deleterious matter, acids or alkalis.

.4 Latex Additive: Enriched latex emulsion additive conforming to ANSI A118.4 for use in thin set mortar.

.5 Shower Base Waterproof Membrane:

Provide pre-manufactured sheet, liquid applied or trowelled membrane as required by applicable codes and authority having jurisdiction.

The Plumbing Officials Association of BC (POABC) allows above, below or on grade installations. Liquid & trowelled membrane applications must meet ANSI 118.10 for waterproofing and confirm manufacturer’s instructions and TTMAC requirements.

.6 Backer Board: Minimum 13 mm Cementitious backed board (ANSI A118.9), nominal 11mm Fibre-Cement baker board (ASTM C1288) or 13mm Coated glass mat baker board (ASTM C1178) according to TTMAC requirements.

.7 Reinforcing Mesh: All flooring incorporating a mortar bed and waterproof membrane. Reinforcing mesh, as per TTMAC detail 309F, to be 51 mm x 51 mm (2" x 2") 16 gauge galvanized welded wire mesh.
.8 Wall Tile Edge Trim: Extruded aluminum trim for use at exposed washroom wall tile edges.

.9 Floor Tile Edge/Transition Trim: Extruded aluminum trim at all exposed floor tile edges.

.2 TILE

.1 Conform to CAN/CGSB-75.1 – M complete with cushioned and bull nosed edges and necessary shapes as required. Provide floor tile with coved base and internal and external corners.

.2 All ceramic used at floor areas to meet dynamic co-efficient of friction of 0.42 in accordance with ANSI A137.1 standards.

The following tiles are suggested according to TTMAC ceramic tile type, finish and water absorption percentage by mass:

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>TYPE/DIMENSIONS/STYLE</th>
<th>MR RATING</th>
<th>FINISH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ceramic Tile WC Wall</td>
<td>Type 5 / Ceramic wall tile</td>
<td>MR 4</td>
<td>Matt or glazed finish</td>
</tr>
<tr>
<td>Ceramic Tile Shower Walls</td>
<td>Type 5 / Ceramic wall tile</td>
<td>MR 4</td>
<td>Glazed-finish</td>
</tr>
<tr>
<td>Ceramic Tile Shower Floor/ Cove Base</td>
<td>Type 2 / Porcelain mosaic tile</td>
<td>MR 1</td>
<td>Matt finish</td>
</tr>
<tr>
<td>Ceramic Tile Lobby Floors and High Traffic Areas</td>
<td>Type 4 / Porcelain tile with matching RE &amp; RX fittings</td>
<td>MR 2</td>
<td>Matt or unglazed For Matt finish PEI rating should be 5 or above</td>
</tr>
</tbody>
</table>

.3 MIXES

.1 Thin Set Mortar: requirement must meet ANSI 118.4 and ANSI 118.11 which can be single component (polymer modified) or two component (liquid latex modified).

.2 Mortar Bed: a mixture of 1 part Portland cement, 4 parts sand and latex additive where required by TTMAC detail. Premixed mortar may be used per manufacturer’s instructions and may need to adjust water volume depending on moisture content of sand.

.3 Polymer Modified Grout: requirement must meet ANSI 118.7

## Execution

.1 INSTALLATION

.1 Thin Set Method:

.1 Shower Walls: TTMAC detail 305W A & B; allow for a levelling coat to plumb water resistant cementitious backing board, concrete block and surfaces to receive tile; tape joints of backer board with fiberglass mesh set into acrylic modified motor bed. Apply mortar; minimum 5 mm (3/16") thick.
.2 Floor Areas & Base: Dry areas; TTMAC detail 311F - A; use thin set mortar bed on concrete floor surfaces; all tile to be fully back buttered with latex modified mortar for a full mortar bed without hollows or non-bonded ceramic tile areas. Level tile joints for even surface. Provide divider strips and edge trim at termination of tile floor to other surface. Divider strips and edge trim to have top width of 3 mm (1/8").

.2 Mortar Bed (Shower floor areas)

.1 Install ceramic tile according to the TTMAC details similar to 309F using a cleavage membrane/reinforced mortar bed and bond coat.

.2 Provide mortar bed over cleavage membrane and install galvanized reinforcing mesh. Set mortar bed thickness as required so that floor finish elevation to top of ceramic tile will match adjacent finish floor elevations.

.3 Install the ceramic tile to mortar bed using an acrylic modified bond coat.

.4 In shower areas, install waterproof membrane below tile mortar bed in accordance with manufacturer’s directions and slope to drain as indicated. Install floor tile in accordance with TTMAC Detail No. 319SR - A & B using reinforced mortar bed and bond coat.

End of Section
09 65 00 - Resilient Flooring

1 General

.1 Workmanship and materials must conform to the Specification Manual as published by the National Floor Covering Association (NFCA), Canadian General Standards Board (CGSB), and the BC Floor Covering Association (BCFCA), latest edition.

.2 Flooring products must contribute to LEED® Canada and FloorScore® indoor air emissions criteria where applicable.

.3 If a program exists on the recyclability of the products after the useful service life, preference should be given to that Manufacturer’s products.

.4 The long term maintenance of the products must be considered. It is required to have a very low maintenance floor product, with a long life expectancy and no wax finishes required while maintaining an even luster for the life of the product.

.5 Provide resilient flooring based on the following general areas:

.1 Tenant Suites
   .1 Bathrooms/Wheel in bathroom/shower - Slip resistant sheet vinyl for bathrooms with painted 102 mm (4") wood base.
   .2 Dining/Living Room/Bedroom - Homogeneous or heterogeneous sheet vinyl with painted 102 mm (4") wood base.
   .3 Kitchen - Homogeneous or heterogeneous sheet vinyl with painted 102 mm (4") wood base.

.2 Tenant Common Areas
   .1 Amenity areas, Activity & Lounge - Homogeneous sheet vinyl or linoleum sheet with painted 152 mm (6") wood base.
   .2 Commercial Kitchen - Slip resistant sheet vinyl for commercial kitchen with integral cove base.
   .3 Common Dining Area - Homogeneous sheet vinyl or linoleum sheet with painted 152 mm (6") wood base.
   .4 Elevator Cab - Textured sheet rubber flooring.
   .5 Laundry - Homogeneous sheet vinyl flooring with integral or flash cove base.
   .6 Corridor - Homogeneous sheet vinyl or linoleum sheet with painted 152 mm (6") wood base.

.3 Support Areas
   .1 Office Areas - Heterogeneous sheet vinyl or homogeneous sheet vinyl with painted 152 mm (6") wood base.
.2 Utility/Service Areas - Homogeneous sheet vinyl with painted 64 mm (2-1/2") wood base.

.6 Provide a minimum of five percent of each type and colour of resilient floor covering supplied, for the Owner’s maintenance requirements. Neatly package, mark and leave on site in a location as directed by the Consultant.

.7 Submit samples of all resilient flooring, accessories and seam layout to Consultant and Owner for review prior to installation.

.8 Consideration should be given to have an independent third party inspection services for quality assurance at several stages while executing floor installation.

2 Products

.1 EXIT STAIRS – CONCRETE CONSTRUCTION

.1 Tread, Riser and Landing: Concrete finish to be provided. See Division 03 30 00 – Cast-in Place Concrete.

.2 Tactile Warning Strip: Tactile Warning Strip by Johnsonite, or grooves in concrete surface, or approved alternate; size, colour and location as per applicable building code requirements.

.2 EXIT STAIRS – WOOD FRAMED CONSTRUCTION

.1 Tread, Riser and Landing: Visually impaired raised profile rubber stair tread with 152mm (6") base (riser) or Homogeneous sheet vinyl tread and riser with 2.0 mm (0.080") thickness.

.2 Nosing: Visually impaired with appropriate profile, highly contrasting colour to tread, riser and landing.

.3 Tactile Warning Strip: Different colour and texture than flooring; same colour as nosing; size and location as per applicable building code requirements.

.3 FLOOR UNDERLAYMENT Will be required where plywood subfloor is provided. See Division 06 10 00 – Rough Carpentry.

.4 HETEROGENEOUS SHEET VINYL

.1 Standard: ASTM 1303, Standard Specification for Sheet Vinyl Floor Covering with Backing, Type 1, Grade 1, Class B.

.2 Type: Binder Content 90% minimum.

.3 Wear Layer Minimum Thickness: tenant suites – minimum 0.55 mm (0.02") and common and support areas - minimum 0.70 mm (0.028").

.4 Overall Thickness: minimum 2.0 mm (0.080") nominal.

.5 Seams: All seams to be heat welded with matching welding rods.

.6 Maintenance: no wax or polish ever needed, wash and dry buff only to maintain an even luster
.7 Acceptable products: For tenant suites Wood Collection by Altro, Eternal by Forbo and for common or support areas Ruby or Footnotes by Tarkett, Timberline by Armstrong or approved equal.

.5 HOMOGENEOUS SHEET VINYL
.2 Type: Binder Content 50% minimum.
.3 Wear Layer Minimum Thickness: minimum 2.0 mm (0.080”).
.4 Overall Thickness: minimum 2.0 mm (0.080”).
.5 Seams: All seams to be heat welded with matching welding rods.
.6 Maintenance: no wax or polish ever needed, wash and dry buff only to maintain an even luster for the life of the products.
.7 Abrasion Resistance (EN 660): must meet group T.
.8 Acceptable products: iQ Granit or Optima by Tarkett or Pearlazzo PUR by Polyflor or approved equal.

.6 LINOLEUM SHEET FLOORING
.2 Type: Linoleum sheet with backing.
.3 Weight: 3kg/5.5 lbs.
.4 Overall Thickness: same colour throughout, minimum 2.5mm (0.1”) overall (nominal).
.5 Maintenance; no initial surface treatment required, maintain an even luster for the life of the products.
.6 Products should be chosen from manufacturer’s standard colour collection or range.
.7 Acceptable Products: Forbo Marmoleum; Armstrong Marmorette, Tarkett Harmonium Veneto or alternate equal.

.7 RUBBER BASE
.1 Standard: ASTM F1861, Type TP, Group 1 (solid), Style B (Cove) Standard Specification for Resilient Wall Base.
.2 Height: 152 mm (6”); Thickness: 3 mm (1/8”) Location: Stair Riser.

.8 SLIP-RESISTANT SHEET VINYL FOR BATHROOMS
.1 Standard: ASTM F 1303, Standard Specification for Sheet Vinyl Floor Covering with Backing, Type 2, Grade 1, Class A or B backing.

or

.2 Static coefficient of friction of 0.60 or greater for level surfaces and 0.80 or greater for dry ramps, ASTM D 2047.

.3 Overall Thickness: minimum 2.0 mm (0.080”).

.4 Seams: All seams to be heat welded with matching welding rods.

.5 Acceptable products for bathing areas for barefoot: products shall be appropriate for barefoot use: Aquarius by Altro, Multisafe or Safe-T by Tarkett, Safeguard Spa by Armstrong or approved equal.

.6 Acceptable products for bathing areas for non-barefoot: products shall be appropriate for non-barefoot use: Aquarius by Altro, Granit Safe-T by Tarkett, Polysafe Corona by Polyflor or approved equal.

.9 SLIP-RESISTANT SHEET VINYL FOR COMMERCIAL KITCHEN

.1 Standard: ASTM F 1303, Standard Specification for Sheet Vinyl Floor Covering with Backing, Type 2, Grade 1, Class A backing.

.2 Static coefficient of friction of 0.60 or greater for level surfaces and 0.80 or greater for dry ramps, ASTM D 2047.

.3 Overall Thickness: minimum 2.5 mm (0.10”).

.4 Seams: All seams to be heat welded with matching welding rods.

.5 Acceptable products: Designer 25 by Altro, Polysafe Ultima by Polyflor or approved equal.

.10 SLIP-RESISTANT SHEET VINYL FOR DRY RAMPS

.1 Standard: ASTM F 1303, Standard Specification for Sheet Vinyl Floor Covering with Backing, Type 2, Grade 1, Class A backing.

.2 Static coefficient of friction of 0.60 or greater for level surfaces and 0.80 or greater for dry ramps, ASTM D 2047.

.3 Overall Thickness: minimum 2.5 mm (0.1”).

.4 Seams: All seams to be heat welded with matching welding rods.

.5 Acceptable products: Safeguard by Armstrong, Designer 25 by Altro, Polysafe Ultima by Polyflor or approved equal.

3 Execution

Consultant shall ensure that specifications for environmental conditions, products, surface preparation, installation, and maintenance requirements are specified in the contract documents.

.1 The flooring installer shall be competent in the installation of the resilient flooring products specified for the project and have “Red Seal” or “Install” certification. Installer must have 5 years of experience installing these products.
Prior to installation, the Contractor, flooring installer, flooring manufacturer’s representative, independent inspection authority (if required) and Consultant shall meet on-site to establish procedures for inspections, approval of product samples, patterns, colours and accessories, procedures for acceptability of the substrate initial cleaning, environmental conditions, installation procedures, and protection of finished work.

Install flooring wall to wall before the installation of floor-set cabinets, casework, equipment, movable partitions, etc. Extend flooring into toe spaces, door recesses, closets and similar openings as shown on drawings.

Lay flooring to provide a minimum number of seams. Avoid seams in bathrooms. Seams in kitchens are permitted only under fridges, stoves, or in closets.

Floor drains in areas finished with sheet goods should be provided with a clamping system that will ensure positive water flow and a watertight flooring installation. Sheet vinyl required in these areas.

In wheelchair accessible prefabricated shower units, the joint between the edge of the shower and the resilient floor shall be sealed with caulking and the caulking protected by transition strip, to ensure a watertight flooring installation. Exposed caulked joints are not acceptable. Contractor to prepare a mock-up to be reviewed by the Consultant.

Contractor and flooring installer should coordinate with flooring manufacturer’s representative for training and mock up prior installing any products. Obtain Owner’s and Consultant’s acceptance or further actions/revisions if warranted.

Comply with manufacturer’s product data, including product technical bulletins and installation instructions. Manufacturer’s recommended adhesives must be compatible with the subfloor.

Protect all installed flooring from damage by protective coverings and remove the coverings at final cleaning.

End of Section
09 68 00 - Carpet

1 General

.1 Workmanship and materials must conform to the Specification Standards Manual as published by the National Floor Covering Association, latest edition, Canadian General Standards Board (CGSB), and the BC Floor Covering Association (BCFA).

.2 Low pile, interlocking level-loop or textured carpet in common areas.

.3 Provide wood base to all areas finished in carpet.

.4 Provide trims and accessories that will not pose a hazard to persons with mobility aids.

.5 Submit samples of all carpet, accessories and seam layout to Consultant and Owner for review prior to installation.

.6 Provide a minimum of five percent of each type and colour of carpet supplied, for the Owner’s maintenance of floors. Neatly package, mark and leave on site in a location as directed by the Consultant.

.7 VOC limit for adhesives to meet LEED® Canada, on all projects, where applicable. Also recommend using material with recycled contents.

2 Products

Only new materials are to be used, no seconds or substandard materials are to be used.

.1 CARPET FOR COMMON AREAS AND ACCESSIBLE SUITES (GLUE DOWN METHOD)

Carpet For Common Areas and Accessible Suites: 1830 mm (6’-0”), 1980 mm (6’6”) or 3660 mm (12’0”) wide broadloom. Carpet for common and residential areas shall be constructed to the following minimum standards and comply with the latest CGSB Standards:

.1 Pile Fibre: 100% BCF Nylon

.2 Construction: Interlocking level loop or textured

.3 Pile Weight: Minimum 882 g/m² (26 oz/yd²).

.4 Pile Height: max. 4.0 mm (0.16”)

.5 Machine Gauge: 39.4 rows per 10cm (1/10)

.6 Stitch Count: Minimum 46.1 stitches/10cm (11.7 spi)

.7 Density Factor: Minimum 12.0 kilotex/cm²
.8 Pre finish Treatment: Hot water scoured and extracted

.9 Colouration: Solution dyed

.10 Stain Resistant: Min. 8.0 AATCC 175

.11 Ravel Test Performance: Must prevent raveling when tested to PTL-CR (center ravel) and PTL-ER (edge ravel) protocols

.12 Flammability: CGSB 4 GP 129

.13 Static Generation: Maximum 3.5kV under AATCC Method 134

.14 Light Fastness: Min. L5

.15 Resistance to Change on Wet Cleaning: Grey Scale 5 to AATCC 16E

.16 Indoor Air Quality: CCI/CRI Green Label Plus requirement

.17 Primary Backing: Woven polypropylene

.18 Secondary Backing: Woven Synthetic

.19 Anti-microbial: Contact inhibition of fungal and bacterial growth tested according to AATCC methods 30 & 147.

.20 Recycling Program: Eligible for recycling program.

.2 CARPET FOR RESIDENTIAL AREAS (STRETCH-IN METHOD, NON-GLUE DOWN)

Carpet for residential areas, shall be constructed to the following minimum standards and comply with the latest CGSB Standards.

.1 Fibre: Min. 70% Polypropylene / Olefin

.2 Colouration: Solid: Min. 60%. Multi Coloured: Min. 30%

.3 Construction: Loop, Twisted Cable min. 70%. Air Entangled min. 20%

.4 Stitches: min 7.0 spi / 27.6 per 10 cm

.5 Pile Weight: min. 24 oz/ yd² 814 g/m²

.6 Pile Height: max. 0.28”/0.12” 7mm/3mm

.7 Gauge: 1/8” / 31.5 rows per 10 cm

.8 Flame Resistant: CGSB 4-GP-161

.9 Density: 4800 / 6.1 Kilotex/cm²

.10 Primary Backing: Woven polypropylene

.11 Secondary Backing: Woven Synthetic

.12 Static Control: max. 3.5 kv (AATCC 134)

.13 Anti-Soil Treatment: Hot watered scoured and extracted
.14 **Stain Resistance**: Min. 8.0 AATCC 175

.15 **Wear & Anti-Zippering**: 10 year manufacturer’s warranty

.16 **Stain Resistant**: 10 year manufacturer’s warranty

.17 **Edge Ravelling**: 10 year manufacturer’s warranty

.18 **Indoor Air Quality**: CCI/CRI Green Label Plus requirements

.19 **Recycling Program**: Eligible for recycling program

.3 **UNDERPAD: BONDED POLYURETHANE FOAM**

.1 **Type**: Chemically rebonded polyurethane foam

.2 **Thickness**: max. 9.0 mm (3/8”)

.3 **Weight**: 8 lb/ft³ or 128.1 kg/m³

.4 **CGSB**: Passes 20-GP-23 M as Type 2

.5 **Guarantee**: 10 years

.6 **Indoor Air Quality**: CRI Green Label

3 **Warranty**

Warranty Classifications:

- Life time commercial wear warranty
- Life time zipper-lock and no edge ravel warranty
- Life time stain free warranty
- Life time anti shock warranty

.1 **DIRECT GLUE DOWN METHOD**

The installation Contractor shall provide upon completion:

- A ten (10) year manufacturer’s written warranty on the carpet
- A one (1) year materials and installation guarantee from the date of Substantial Completion. This guarantee is to cover material and installtion failures such as parting of seams, unravelling, or loose base.

.2 **STRETCH-IN METHOD (NON-GLUE DOWN)**

The installation Contractor shall provide upon completion:

- A ten (10) year manufacturer’s written warranty on the carpet which will include wear, anti-zippering, edge ravelling and anti-shock.
- A ten (10) year manufacturer’s written warranty on the foam underpad.
• A one (1) year materials and installation guarantee from the date of Substantial Completion. This guarantee is to cover material and installation failures such as parting of seams, unravelling, loose base, or the re-stretching of the carpet.

4 Execution

.1 All carpet must be installed in accordance with the CRI (Carpet and Rug Institute) Carpet Installation Standard (2011)

.2 Contractor must vacuum the existing carpet before removal and vacuum the subfloor prior to installing the new carpet.

.3 Subfloor cracks, holes and flooring irregularities must be adequately repaired to ensure a smooth, finished appearance and to prevent accelerated wear.

.4 To minimize wrinkling and bucking and to facilitate installation, carpet should be unrolled and allow relaxing for a minimum of 24 hours at temperature between 18-35°C.

.5 Lay all carpet in the same direction. All pile must have the same directional fall and run as that of adjacent pieces.

.6 Seams should be kept to a minimum and positioned as recommended:
   .1 Do not place seams in heavy traffic areas.
   .2 All seams must be sealed with an appropriate seam adhesive.
   .3 Seams are not permitted perpendicular to doorways and entries. Where seams occur at corridor change of direction, follow wall line parallel to carpet direction.
   .4 Natural light should not strike across the seam.

.7 Cut and fit carpet for floor outlets, cover plates, and other projections. Cut openings neat, to a minimum size, and thoroughly secured around all edges. Cut carpet evenly along walls and butt tight with no raw edges showing.

.8 Install edge strips at all intersections of carpeting with finish floors of other materials. Edge strips shall provide a smooth transition to avoid tripping hazard. Round metal edges should be avoided.

.9 Inspect carpet closely and remove any soiled spots or excess adhesive with the proper spot remover or solvent. Remove all loose pieces of face yarn with sharp scissors.

.10 For cushion backing use premium multi-purpose or releasable adhesive.
.11 Floor traffic should be avoided for a min of 24 hrs to allow the adhesive to adequately cure and avoid rolling traffic for a min of 48 hrs. Provide protection against damage to the carpet by closing off the area or room to all unauthorized traffic or by covering the carpet with protective covering. Exposure to water from cleaning and other sources should be restricted for a min of 30 days.

.12 Vacuum and clean the carpet just prior to Substantial Performance to the satisfaction of the Consultant.

End of Section
09 91 00 – Painting

1 General

.1 DESCRIPTION

.1 Materials, conditions, surface preparation of substrates, workmanship, quality control, protection and clean-up shall conform to requirements of the latest edition of Master Painters Institute Architectural Painting Specification Manual as issued by the local MPI Accredited Quality Assurance Association having jurisdiction (hereafter referred to as MPI).

.2 Provide labor, materials, tools and other equipment, services and supervision required to complete all exterior and interior painting and decorating work as indicated on Finish Schedules and to the full extent of the drawings and specifications.

.3 All materials and paints shall be lead and mercury free. Use only materials that meet the VOC limits outlined by the State of Californian South Coast Air Quality Management District’s Rule 1113- Architectural Coatings.

.4 Where indoor air quality is an issue use only MPI listed materials having a minimum E2/E3 rating based on VOC (EPA Method 24) content levels.

.2 QUALITY ASSURANCE

.1 The Paint Contractor shall have a minimum of five (5) years proven satisfactory experience and shall show proof before commencement of work that they will maintain a qualified crew of painters throughout the duration of the work.

.2 Only qualified journeypersons who have a Tradesman Qualification Certification of Proficiency shall be engaged in painting and decorating work. Apprentices may be employed provided they work under the direct supervision of a qualified journeyperson in accordance with trade regulations.

.3 All paint manufacturers and products used shall be as listed under the Approved Product List section of the MPI Painting Manual.

.4 Painting and decorating work shall be inspected by a Paint Inspection Agency (inspector) acceptable to the specifying authority and the local MPI Accredited Quality Assurance Association. The painting contractor shall notify the Paint Inspection Agency a minimum of one week prior to commencement of work and provide a copy of the project painting specification, plans and elevation drawings (including pertinent details) as well as a Finish Schedule.

.5 All surfaces requiring painting shall be inspected by the Paint Inspection Agency who shall notify the Consultant and General Contractor in writing of any defects or problems, prior to commencing painting work, or after the prime coat shows defects in the substrate.

.6 The painting contractor shall receive written confirmation of the specific surface preparation procedures and primers used for all fabricated steel items from the fabricator/supplier to ascertain appropriate and manufacturer compatible finish coat materials to be used before painting any such work.
.3 **REGULATORY REQUIREMENTS**
Conform to workplace safety regulations and requirements of those authorities having jurisdiction for storage, mixing, application and disposal of all paint and related hazardous materials.

.4 **GUARANTEE**
Provide and pay for either the local MPI Accredited Quality Assurance Association’s two (2) year guarantee or, alternatively, a 100% two (2) year Maintenance Bond – both in accordance with MPI Painting Manual requirements. Maintenance Bond shall warrant that all painting work has been performed in accordance with MPI Painting Manual requirements.

.5 **SUBMITTALS/MOCK-UP**
1. Submit consent of surety with Bid Submission as proof of ability to supply a 100% two (2) year Maintenance Bond, if an MPI Accredited Quality Assurance Association’s guarantee option is not used.
2. Submit two sets of Material Safety Data Sheets (MSDS) prior to commencement of work for review and for posting at job site as required.
3. At project completion provide an itemized list complete with manufacturer, paint type and colour-coding for all colours used for Owner’s later use in maintenance.
4. When requested by the Consultant or Paint Inspection Agency, prepare and paint a designated surface, area, room or item (in each colour scheme) to requirements specified herein, with specified paint or coating showing selected colours, gloss/sheen, textures and workmanship to MPI Painting Specification Manual standards for review and approval. When approved, surface, area, room and/or items shall become acceptable standard of finish quality and workmanship for similar on-site work.
5. Submit written confirmation from the product manufacturer that products is approved for use in proposed application as well as laboratory tests or data verifying product compliances with criteria specified.

.6 **PRODUCT DELIVERY, STORAGE, AND HANDLING**
Deliver and store all painting materials in sealed, original labeled containers bearing manufacturer’s name, brand name, type of paint or coating and colour designation, standard compliance, materials content as well as mixing and/or reducing and application requirements in strict accordance with manufacturer and MPI requirements.

.7 **ENVIRONMENTAL, WASTE MANAGEMENT AND DISPOSAL REQUIREMENTS**
1. Perform no painting or decorating work when the ambient air and substrate temperatures, relative humidity, dew point and substrate moisture content is below or above requirements for both interior and exterior work.
2. Apply paint only to dry, clean, properly cured and adequately prepared surfaces in areas where dust is no longer generated by construction activities such that airborne particles will not affect the quality of finished surfaces.
.3 Ensure adequate continuous ventilation and sufficient heating and lighting is in place.

.4 Paint, stain and wood preservative finishes and related materials (thinner, solvents, caulking, empty paint cans, cleaning rags, etc.) shall be regarded as hazardous products. Recycle and dispose of same subject to regulations of applicable authorities having jurisdiction.

.5 To reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into the ground, retain cleaning water and filter out and properly dispose of sediments.

.6 Set aside and protect surplus and uncontaminated finish materials not required by the Owner and deliver or arrange collection for verifiable re-use or re-manufacturing.

2 Products

.1 MATERIALS

.1 All materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents etc.) shall be in accordance with the MPI Painting Specification Manual Approved Product Listing (APL) and shall be from a single manufacturer for each system used.

.2 Other materials such as linseed oil, shellac etc. shall be the highest quality product of an MPI listed manufacturer and shall be compatible with paint materials being used as required.

.2 FINISH, COLOUR, GLOSS/SHEEN

.1 Unless otherwise noted, all painting or staining work shall be in accordance with MPI Premium Grade finish requirements.

.2 Colours shall be as selected by the Consultant from a manufacturer’s full range of colours. Refer to Finish Schedule for colours identification, location and gloss level ratings from MPI Painting Manual. The schedule will be furnished after award of the Contract, except general requirements shall be as noted herein.

.3 Colour selection will be based on five (5) base colours and three (3) accent colours with a maximum of one (1) deep or bright colour. No more than eight (8) colours will be selected for the entire project and no more than three (3) colours will be selected in each area. Note that this does not include pre-finished items by others, e.g. flashings, windows, etc.

.4 Avoid choosing dark colours as this usually results in more lighting required.

3 Execution

.1 The condition and preparation requirements for all surfaces and mixing and tinting shall be in accordance with MPI Painting Manual requirements.

.2 Do not paint unless substrates are acceptable and/or until all environmental conditions (heating, ventilation, lighting and completion of other subtrade work) are acceptable for applications of products.
.3 Painting coats specified are intended to cover surfaces satisfactorily when applied at proper consistency and in accordance with manufacturer’s recommendations. Apply a minimum of four coats of paint where deep or bright colours are used to achieve satisfactory results.

.4 **INTERIOR AND EXTERIOR FINISH/COATING SYSTEMS**

**Exterior**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>PAINT CODE</th>
<th>DESCRIPTION/FINISHING SYSTEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pavement Marking</td>
<td>EXT 2.1A</td>
<td>Latex Zone/Traffic Marking</td>
</tr>
<tr>
<td>Concrete Vertical Surfaces</td>
<td>EXT 3.1A</td>
<td>Latex (over alkali resistant primer) G3/4 Satin</td>
</tr>
<tr>
<td>Cementitious Composition Board</td>
<td>EXT 3.3J</td>
<td>Latex (over alkali resistant primer) G3/4 Satin</td>
</tr>
<tr>
<td>Masonry Veneer – Sealed</td>
<td>EXT 4.1G</td>
<td>Water Repellent (paintable)</td>
</tr>
<tr>
<td>Concrete Masonry Units</td>
<td>EXT 4.2A</td>
<td>Latex (over block filler) G3/4 Satin</td>
</tr>
<tr>
<td>Structural And Miscellaneous Steel</td>
<td>EXT 5.1C</td>
<td>Water Based (WB) Light Industrial Coating (over alkyd primer) GL5 Semi-Gloss</td>
</tr>
<tr>
<td>Galvanized Metal</td>
<td>EXT 5.3J</td>
<td>WB Light Industrial Coating (over WB primer), GL5 Semi-Gloss</td>
</tr>
<tr>
<td>Dimension Lumber – Painted</td>
<td>EXT 6.2M</td>
<td>Latex (over latex primer) G3/4 Satin</td>
</tr>
<tr>
<td>Dimension Lumber – Stained</td>
<td>EXT 6.2B</td>
<td>Latex Colour Stain WB</td>
</tr>
<tr>
<td>Dressed Lumber – Painted</td>
<td>EXT 6.3J</td>
<td>Water Based (WB) Light Industrial (over alkyd primer), GL5 Semi-Gloss</td>
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</tbody>
</table>

**Interior**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>PAINT CODE</th>
<th>DESCRIPTION/FINISHING SYSTEM</th>
</tr>
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<tbody>
<tr>
<td>Concrete Vertical Surfaces</td>
<td>INT 3.1C</td>
<td>High Performance Architectural Latex, GL3 Eggshell</td>
</tr>
<tr>
<td>Concrete Horizontal Surfaces</td>
<td>INT 3.1A</td>
<td>Latex Floor Enamel, Low Gloss</td>
</tr>
<tr>
<td>Brick Veneer</td>
<td>INT 4.1J</td>
<td>Water Repellant, Clear</td>
</tr>
<tr>
<td>Concrete Block (all areas except as noted below)</td>
<td>INT 4.2D</td>
<td>High Performance Architectural Latex, GL3 Eggshell</td>
</tr>
<tr>
<td>Concrete Block (wet areas, service corridors, utility/service high traffic)</td>
<td>INT 4.2D</td>
<td>High Performance Architectural Latex, GL5 Semi-Gloss</td>
</tr>
<tr>
<td>Structural And Miscellaneous Steel</td>
<td>INT 5.1R</td>
<td>High Performance Architectural Latex, GL5 Semi-Gloss</td>
</tr>
<tr>
<td>Galvanized Metal</td>
<td>INT 5.3M</td>
<td>High Performance Architectural Latex, GL5 Semi-Gloss</td>
</tr>
<tr>
<td>Glue Laminated Beams</td>
<td>INT 6.1R</td>
<td>WB Varnish, Clear (over stain) GL4 Satin</td>
</tr>
<tr>
<td>Dressed Lumber – Stained</td>
<td>INT 6.3W</td>
<td>WB Varnish, Clear (over stain) GL4 Satin</td>
</tr>
<tr>
<td>Wood Paneling</td>
<td>INT 6.4S</td>
<td>High Performance Architectural Latex, GL5 Semi-Gloss</td>
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</tbody>
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### SECTION 5

#### Construction Standards > Division 9 - 09 91 00 - Painting

<table>
<thead>
<tr>
<th>ITEM</th>
<th>PAINT CODE</th>
<th>DESCRIPTION/FINISHING SYSTEM</th>
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</thead>
<tbody>
<tr>
<td>Gypsum Wallboard - Other Areas Except As Specified Above</td>
<td>INT 9.2B</td>
<td>High Performance Architectural Latex, GL Semi-Gloss GL3 for wall surfaces and GL1 Flat for ceilings</td>
</tr>
</tbody>
</table>

#### .5 MECHANICAL/ELECTRICAL EQUIPMENT AND RELATED SURFACES

.1 Paint exposed conduits, pipes, hangers, ductwork and other mechanical and electrical equipment with colour and texture to match adjacent surfaces, except as noted otherwise. Coordinate with mechanical trades applying banding and labeling after pipes have been painted.

.2 Paint gas piping standard yellow where visible in service spaces.

.3 Paint surfaces inside of ductwork where visible behind louvers, grilles and diffusers beyond sight line with primer and one coat of matte black (non-reflecting) paint. Paint the inside of light valances gloss white.

**End of Section**
10 00 00 - Specialties

1 General

.1 Ensure all equipments and materials supplied to the site are installed in accordance with manufacturer’s printed instructions.

.2 This section is to be read, interpreted, and coordinated with all other divisions in Section 5 - Construction Standards and Section 1 - General Design Guidelines.

.3 Provide vandal resistant, commercial quality materials and accessories in public washrooms, mailboxes, signage and corner guards.

2 Products

1 WASHROOM ACCESSORIES (COMMON AREAS AND RESIDENTIAL)

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grab Bars</td>
<td>Refer to Division 06100 Rough Carpentry, CSA B651 and BC Building Code, amended section 3.8 for locations and loading requirements. Use chrome finish and concealed fasteners.</td>
</tr>
<tr>
<td>Lockable Drawer</td>
<td>One lockable drawer in the vanity - for residential suites main washroom.</td>
</tr>
<tr>
<td>Mirrors</td>
<td>For residential units: frameless plate glass mirrors mounted with &quot;L&quot; shaped steel clips, with full width of the vanity, no more than 102 mm (4&quot;) above washbasin. For public washrooms: 457 mm x 610 mm (18&quot; x 24&quot;) aluminum frame mirror, centered over lavatory, tilt design where used in accessible washroom.</td>
</tr>
<tr>
<td>Paper Towel Dispenser/Waste Disposal (common area washrooms)</td>
<td>Multi-fold towel dispenser, chrome plated finish with dispensing capacity minimum 300 sheets – for public washrooms only. Wall mounted waste disposal, 30 litre (6.6 imperial gallons), enamel finish – for public washrooms only.</td>
</tr>
<tr>
<td>Robe Hook</td>
<td>Double, surface mounted, chrome finish – for residential use only.</td>
</tr>
<tr>
<td>Shower Rod</td>
<td>25 mm (1&quot;) diameter stainless steel tubing to ASTM A269 completed with mounting flanges and nylon curtain hooks – for residential suites only.</td>
</tr>
<tr>
<td>Soap Dispenser</td>
<td>Wall mounted, chrome plated - for public washrooms only.</td>
</tr>
<tr>
<td>Toilet Paper Holder</td>
<td>Single roll, chrome plated, controlled flow delivery (for common area washrooms only), mounted within 610 mm (24&quot;) of water closet. Single roll, chrome plated for residential suites.</td>
</tr>
<tr>
<td>Towel Bar</td>
<td>610 mm (24&quot;) long, chrome finish, specified to grab bar loading requirements including structural backing – for residential suites only.</td>
</tr>
<tr>
<td>Sanitary Napkin Disposal</td>
<td>Stainless steel with satin finish in each common washroom.</td>
</tr>
</tbody>
</table>

2 MAIL BOXES

.1 Provide front/rear loading gang type mail boxes constructed by heavy gauge extruded aluminum doors and boxes with extruded aluminum support bars and clear anodized aluminum finish.
.2 Provide one mailbox per residential tenant, at least two parcel boxes and one box for office management.

.3 Provide clear number plates on each compartment in accordance with suite numbering and Canada Post standards. Specify numbering sequence when ordering.

.4 All boxes to be located not more than 1200 mm (4'-0'') above the floor and minimum 610 mm (2'-0'') from the floor level, measured from center of mailbox lock.

.3 SIGNAGE REQUIREMENTS

.1 Provide code required signage in accordance with the requirements of BC Building Code and authorities having jurisdiction.

.2 Locations: Building entrance, individual suites, service rooms, exit stairs, fire safety and exit route, illuminated exit signs, parking stalls, project entry road signs, direction to exit in stairwells, floor number in stairwell, public washrooms and other rooms required by Owner, BC building Code and local authorities.

.3 Signage Type: Building entrance signage as specified by Owner, individual metal numbers for suite entries, plastic/pressure sensitive vinyl signs for service rooms, direction to exit stairs, fire safety and exit route, painted parking lot signs and refer to division 16000 for illuminated exit signs.

.4 CORNER GUARDS

.1 Rigid PVC extrusions, nominal thickness of 2 mm (0.078'') with matte pebble grain surface and chemical and stain resistance

.2 Colour selection from the manufacturer’s standard colour range. Lengths of corner guards shall be as detailed, complete with matching end caps.

.3 Retainer Clips: continuous extruded aluminum complete with attachment hardware, secured at 457 mm (18'') o. c. maximum.

3 Execution

.1 Fasteners must be concealed wherever possible and to suit the intended use, compatible with all surfaces. Exposed fasteners must be tamperproof.

.2 Secure washroom accessories to blocking or studs in the wall. Washroom accessories must be rigid, square and flush – hollow metal to wall surface, plumb, level and in alignment with other work.

.3 Install corner guards straight and true to lengths detailed, from top of base to manufacturer’s recommendation. Do not remove protective coating until guards are installed and after final clean up.

.4 Provide 75mm (3'') high floor number at floor landing inside stairwell as described in BC Building Code article 3.8.3.13 (1) and required by authorities having jurisdiction.
.5 All lettering at signage shall provide easy identification and maximum legibility. Unless required otherwise, signs shall be free of rough edges, irregular surfaces, non-uniform finishes, and similar imperfections.

End of Section
10 28 19 - Plastic Laminate Tub Enclosure

1 General

.1 Provide prefabricated one piece plastic laminate enclosures where bathtubs are specified in suite bathrooms.

.2 Refer to Division 09 28 00 - Gypsum Wallboard, for mould and moisture resistant gypsum board behind the tub enclosures.

2 Products

.1 Plastic Laminate: To CAN3-A172.M79 or NEMA Class I, General Purpose (GP) grade.

.2 Colour: Owner to select from manufacturer’s standard range.

.3 Height of Enclosure/Surround: 1524 mm (5’-0”) high above tub lip.

.4 Adhesives: As recommended by the manufacturer, water based.

.5 Caulking: Tub and bath caulk – silicone conforming to ASTM C920. Refer to Division 07 92 00 - Joint Sealants and compliant with LEED® Canada.

.6 Accessories: 1.5 mm (1/16”) plastic “J” cap. Colour to match plastic laminate enclosure.

.7 Soap Dish: Ceramic or integral with enclosure.

3 Execution

.1 FABRICATION

.1 Factory formed enclosures. Take exact site measurements for each bathroom. Form enclosure to extend 51 mm (2”) past the front face of the tub and down to floor level.

.2 INSTALLATION

.1 Install contact adhesive over wall substrate and to back of enclosure, let dry.

.2 Install a construction adhesive in ribbons over contact adhesive to permit “dry” fitting of enclosure. Once placed in permanent position, press enclosure tight to wall to bond with contact adhesive.
.3 Install “J” trim at the exposed edges of enclosure and seal with silicon sealant as specified under Division 07 92 00 - Joint Sealants. Seal joint between tub lip and enclosure. Ensure seal is flexible enough to prevent cracking/un-bonding when the tub is full. Seal behind plumbing escutcheons.

.4 Install ceramic soap dish with hot melt adhesive and seal around edges with silicon sealant.

.5 Completed enclosure must fit tight to wall surfaces without hollow areas or bubbles behind enclosure.

.6 Cleanup all excess adhesive and sealant from enclosure and adjacent surfaces.

End of Section
11 30 00 - Residential Equipment

General

.1 All appliances throughout the building must be the same make and model, chosen from a manufacturer’s regular stock run.

.2 All appliances to be readily available from well established manufacturers and, CSA approved and EnergyStar labeled (where applicable).

.3 Coordinate size, location, and services to appliances with kitchen cabinet manufacturer and confirm opening sizes and clearances prior to ordering equipment for all residential units including accessible and adaptable. Refer to CSA B651-04 for accessible units. Coordinate work with mechanical and electrical for location and installation of water supplies, drains, vents, and power supplies. Confirm power requirements and service capacities with affected trades.

.4 As per Division 01 78 00 – Closeout Submittals; in order to meet applicable energy incentive and rebate programs, the Contractor may be required to submit appliance invoices to BC Housing, complete with manufacturer and model numbers, unit price, and quantity.

.5 Owner or Operator to decide what type of operation is required for the laundry equipment (e.g. coin operated, card access)

1 A list of Energystar products is available at: http://oee.nrcan.gc.ca/building/pdf/residential/personal/new-appliances.cfm?attr=4
<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
<th>STANDARD UNITS</th>
<th>WHEELCHAIR ACCESSIBLE/ADAPTABLE UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refrigerator</td>
<td>For all models:</td>
<td>For Single Room Occupancy (SRO) Compact Refrigerator:</td>
<td>For ACCESSIBLE/ADAPTABLE Single Family Unit and Larger units – Medium Size Refrigerator:</td>
</tr>
<tr>
<td></td>
<td>CSA approved</td>
<td>Capacity: 3.1 - 3.6 CF</td>
<td>ADA Compliance</td>
</tr>
<tr>
<td></td>
<td>Slide out wire shelves</td>
<td>Dimensions: Max W - 22&quot; (560 mm)</td>
<td>Energy Star qualified</td>
</tr>
<tr>
<td></td>
<td>Recessed/Integrated Door</td>
<td>Max H - 33 1/2&quot; (850 mm)</td>
<td>Top-mount freezer unit with all controls not more than 1200 mm (4') above finished floor and allow</td>
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<tr>
<td></td>
<td>Reversible Swing Door</td>
<td>Max D - 20&quot; (520 mm)</td>
<td>one-hand operation</td>
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<tr>
<td></td>
<td>No Water/Ice Dispenser</td>
<td>Full Width Interior Freezer Section</td>
<td>Capacity: 14.5 - 17.0 CF</td>
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<tr>
<td></td>
<td></td>
<td>Energy Star (Optional)</td>
<td>Dimensions: Max W = 28&quot; (711 mm)</td>
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<td></td>
<td></td>
<td>100% Frost Free (Optional)</td>
<td>Max H - 66&quot; (1680 mm)</td>
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<td></td>
<td></td>
<td>Max D - 33&quot; (840 mm)</td>
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<td>Vegetable Crispers</td>
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<td>For Single Family Unit – Medium Size Refrigerator:</td>
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<td>Energy Star qualified</td>
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<td></td>
<td></td>
<td>Top-mount freezer unit</td>
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<td></td>
<td></td>
<td>Capacity: 14.5 - 17.0 CF</td>
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<td></td>
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<td></td>
<td></td>
<td>Vegetable Crispers</td>
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<td>For ACCESSIBLE/ADAPTABLE Single Family Unit and Larger units – Medium Size Refrigerator:</td>
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<tr>
<td></td>
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<td>ADA Compliance</td>
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<td>Top-mount freezer unit</td>
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<td>Capacity: 14.5 - 17.0 CF</td>
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<td>Dimensions: Max W = 28&quot; (711 mm)</td>
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<td>Max H - 66&quot; (1680 mm)</td>
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<td>Vegetable Crispers</td>
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<tr>
<td>Electric Range</td>
<td>For all models:</td>
<td>For Studio Units – Apartment size electric range:</td>
<td>For Studio ACCESSIBLE/ADAPTABLE Units:</td>
</tr>
<tr>
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<td>CSA approved</td>
<td>Dimensions: Max W - 24&quot; (610 mm)</td>
<td>ADA compliance (or control panel on front)</td>
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<td>Free standing</td>
<td>Max H - 48&quot; (1220 mm)</td>
<td>Dimensions: Max W = 24&quot; (610 mm)</td>
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<tr>
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<td>Self-cleaning</td>
<td>Max D - 27&quot; (690 mm)</td>
<td>Max H - 48&quot; (1220 mm)</td>
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<tr>
<td></td>
<td>4 Surface Elements: 6&quot; and 8&quot; Diameter</td>
<td>Capacity: 2.5 - 3.0 CF</td>
<td>Max D - 27&quot; (690 mm)</td>
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<td>Removable drip pans</td>
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<td>Capacity: 2.5 - 3.0 CF</td>
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<td>Broiler</td>
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<td></td>
<td>Timer</td>
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<td>Surface Element/Signal Light Oven light</td>
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<td>Oven racks: 2</td>
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<td>Auto shut-off (oven)</td>
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<td>Storage Drawer</td>
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<td>For larger units/multifamily dwellings – Standard size electric range:</td>
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<td>Dimensions: Max W - 30&quot; (760 mm)</td>
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<td>Max H - 48&quot; (1220 mm)</td>
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<td>Max D - 28&quot; (710 mm)</td>
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<td>Capacity: 4.5 - 5.5 CF</td>
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<td>For ACCESSIBLE/ADAPTABLE larger Units:</td>
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<td>ADA compliance (or control panel on front)</td>
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<td>Dimensions: Max W = 30&quot; (760 mm)</td>
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<td></td>
<td></td>
<td>Max H - 48&quot; (1220 mm)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Max D - 28&quot; (710 mm)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Capacity: 4.5 - 5.5 CF</td>
<td></td>
</tr>
</tbody>
</table>
### TABLE 3.1 - Residential Equipment

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
<th>STANDARD UNITS</th>
<th>WHEELCHAIR ACCESSIBLE/ADAPTABLE UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cook Top</strong></td>
<td>For all models: CSA approved ADA compliance Surface Element/Signal Light Removable Drip Pans Timer Easy access to controls</td>
<td>N/A</td>
<td>For Studio - ACCESSIBLE/ADAPTABLE Units: Dimensions: Max W - 24&quot; (610 mm) Max H - 4&quot; (100 mm) Max D - 22&quot; (560 mm) 3-4 Surface Elements: 6&quot; and 8&quot; Diameter For single family/multi-family ACCESSIBLE/ADAPTABLE units  - Standard Electric Cook Top: Dimensions: Max W - 31&quot; (790 mm) Max H - 4&quot; (100 mm) Max D - 22&quot; (560 mm) 4 Surface Elements: 6&quot; and 8&quot; Diameter</td>
</tr>
<tr>
<td><strong>Range Hood</strong></td>
<td>For all models: CSA approved Min. Airflow: 2 speed, 180CFM Max Sones: 7.5 Convertible type Installation type: 3 1/4 x 10 rectangular, 7&quot; round Removable Filter (Grease, Charcoal) Covered light, max 75 watt bulb</td>
<td>For 24&quot; ranges: Dimensions: Max W - 24&quot; (610 mm) Max H - n/a Max D - 20&quot; (510 mm) For 30&quot; ranges: Dimensions: Max W - 30&quot; (760 mm) Max Max H - n/a Max D - 20&quot; (510 mm)</td>
<td>Same as for regular units Provide remote switch at counter front for fan and light</td>
</tr>
<tr>
<td><strong>Wall oven</strong></td>
<td>CSA approved ADA compliance Broil Timer Self-clean Oven Light Oven racks: 2</td>
<td>N/A</td>
<td>For ACCESSIBLE/ADAPTABLE units: Dimensions: Max W - 27&quot; (690 mm) Max H - 32&quot; (820 mm) Max D - 26&quot; (660 mm) Oven capacity: 3 - 5 CF</td>
</tr>
<tr>
<td><strong>Laundry</strong></td>
<td>Front loading, commercial grade washer/dryer, with raised platform c/w raised lip (to prevent toppling), for common laundry Residential type washer/dryers are not accepted.</td>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>

### Execution

1. Built-in appliances: Securely anchor to supporting cabinetry or countertops with concealed fasteners. Verify that all clearances are adequate for proper functioning and rough openings are completely covered or fully used.
.2 Freestanding appliances: Place in designated locations and verify that all clearances are adequate to properly operate the appliance. Refer to CSA B651 for accessible units.

.3 Set equipment in place, level and make necessary adjustments. Connect appropriate utilities, water, drains, venting, gas and electrical.

.4 Clean equipment, ready for use and test for proper operation immediately prior to Substantial Completion of the Work.

.5 Construct a barrier or rail on the raised platforms to prevent washers and dryers from falling off.

End of Section
12 20 00 - Window Treatment

1 General

.1 WINDOW TREATMENT STYLE

.1 Provide horizontal or vertical louvered blinds to all exterior windows and doors, if required. Consider wand/rod control, in lieu of cords, to operate or tilt the blinds. Provide manufacturers written standard ten (10) year guarantee for blinds from the date of substantial performance.

.2 Fabric drapes may be considered as an alternate window treatment, if specifically requested by the Owner.

.3 Submit one (1) representative working sample of a typical blind including all accessories for review by the consultant and Owner prior installation. Colour as selected from manufacturer’s standard range.

2 Products

.1 HORIZONTAL LOUVRE BLINDS

.1 Aluminum: 25 mm (1") width, spring-tempered alloy, rounded corners with rough edges and burrs removed and resistance to internal and external corrosion with baked enamel coating.

.2 Headrails: One-piece steel channel with rolled edges, formed to provide sufficient strength to support blind without sagging, twisting or distorting. Metal 24 gauge minimum.

.2 VERTICAL LOUVERED BLINDS

.1 Polyvinyl Chloride Vanes: 89 mm (3-1/2") wide with length to suit window opening, light stable, to ASTM D1784, thickness 0.25 mm (1/16"), one piece, full length extruded aluminum 6063-T5 alloy head rails.

.2 Brackets: Sized to support weight of blinds plus forces applied to operate blind and designed to facilitate installation and removal of top rail, complete with hardware to secure attachment of brackets to adjoining construction and to headrails.

.3 Operation: Traversing with louvers revolving 180° with positive mechanical control, without binding louvers at any angle. When traversed, blinds shall stack uniformly and tightly to allow maximum clear window openings.

.3 VALENCE: Same material and colour as blinds.
.4 FABRIC DRAPES

.1 Pattern: Jeremy Flax (or equivalent), minimum density or weight of 326.0 grams per linear meter.

.2 Machine washable and flame/fire retardant, with a ratio of 85% Trivera and 15% flax.

.3 Track

.1 25 mm x 19mm (1" x 3/4") extruded aluminum, 6063T5 aluminum alloy, manual operation, and powder coated off white.

.2 Heavy duty brackets to accommodate ceiling and/or wall mount.

.3 Ball bearing carriers and one 711 mm (28") fibreglass baton per drape.

.4 Drape Construction

.1 Minimum of 89 mm (3-1/2") pleat, single heading constructed of woven pallon.

.2 Fullness to be approximately 610 mm (2'-0") of fabric to 305 mm (1'-0") of wall (2:1 fullness).

.3 Seams to be serged with 50/50 polyester/cotton blend thread, bottom hems to be minimum of 76 mm (3") doubled, side hems to be 25 mm (1") doubled.

.4 Heavy duty 38 mm (1-1/2") drapery hooks.

3 Execution

.1 Locate controls as directed by the Consultant. Ensure that the blind/drape operating controls are located at the opposite ends of opening doors and windows (if possible and does not hinder access to operate the controls).

.2 Install blinds square, true-to line, with operable parts adjusted for smooth operation. Include centre brackets where necessary to prevent deflection of headrail.

.3 Ensure maintenance and/or replacement can be performed to the blinds or drapes without damaging the surrounding gypsum board.

.4 Supplier to review existing window controls to eliminate conflict with window covering installation.

End of Section
12 32 00 - Manufactured Wood Casework

1 General

.1 Submit shop drawings of kitchen cabinets and bathroom vanities to the Consultant and BC Housing for review prior to fabrication. Shop drawings must show construction details of all architectural woodwork, general arrangements, locations of all service outlets, typical and special installation conditions, the material being supplied and all connections, attachments, anchorage and location of exposed fastenings, as applicable.

.2 Confirm all dimensions at site prior to fabrication.

.3 Shop drawings must be coordinated with final selection of ranges, dishwashers, refrigerators, washers, dryers and other appliances.

.4 In addition to standard one-year warranty, provide a five (5) year warranty against delamination of finishes and two years on hardware.

.5 Where possible, wood products are recommended to be certified according to the requirements of one of the four internationally recognized third-party audited certification systems: Forest Stewardship Council (FSC), CSA CAN/CSA Z809-08, Sustainable Forestry Initiative (SFI), Program for Endorsement of Forest Certification Systems (PEFC) or other product programs mutually recognized by PEFC.

.6 All composite and agrifibre products used within weatherproofing layer of the building must not contain urea-formaldehyde.

.7 All materials workmanship and equipment shall conform to the architectural woodwork specifications as set forth in the Quality Standards for the Architectural Woodwork Manufacturers Association of Canada (AWMAC), latest edition.

2 Products

.1 MODULAR UNITS

.1 Cabinet and vanity units must be the manufacturer’s standard modular units comprising base cabinets, wall cabinets, to layout as indicated on the drawings.

.2 Style: Frameless or Face Frame. Face Frame minimum 12 mm (0.47”) and frameless minimum 16 mm (0.63”), low VOC compliant plywood, zer formaldehyde constructions. Materials used in all facets of box construction must be consistent when using certified materials.

.3 Upper Cabinets: Standard full height doors, minimum 762 mm (30”) high.

.4 Base Cabinets: Drawers and swing out doors to arrangement as shown on the drawings. Sink
cabinet to have two fixed panels across top. Provide a minimum of four sliding drawers.

.5 Doors and Drawers: High pressure laminate surface on high density particleboard, low VOC plywood or wheatboard core with PVC edge banding. Fix drawer front to drawer body with mechanical fastenings. One drawer must have a minimum depth of 178 mm (7"). Recommendation to use low VOC, high quality plywood for wet and high use areas.

.6 Pass Through: Provide a plastic laminate finish to match kitchen counters.

.7 Lazy Susan: Provide manufacturer’s standard lazy susan to base corner cabinets in each kitchen.

.8 Pulls/Handles: 102 mm (4") nylon or brushed chrome, “D” pulls. No pulls in inactive doors or drawers.

.9 Wheelchair Accessible Units: In addition to the above items, provide 2 pull out work surfaces with surface mounted pulls.

.10 Provide one lockable sliding drawer in the bathroom vanity of each unit.

.2 CABINET CASE CONSTRUCTION

.1 Cabinets with high density particleboard or wheat board cases must be fully laminated, with interior and exterior of gables, both sides of shelves and upper cabinet bottoms covered with melamine. In case of plywood, casework must be constructed with low VOC compliant plywood and finished interior to match exterior. The back must be 3 mm (1/8") hardboard painted, finished to match inside of cabinet. The upper cabinet top and lower cabinet bottom must be high density particle board, wheatboard or low VOC plywood, finished on interior with melamine.

.2 All cabinets over 813 mm (2'-8") wide must have mullion installed adding a fifth support for the adjustable shelves.

.3 Front edges of gables and shelves must be PVC edge banded colour matched.

.4 Base kicks, match to cabinet with plastic moldings at outside corners must be fitted to all base cabinets. Toe space at all base cabinets shall be 152mm deep by 203 mm high (6" x 8") for accessible suites and for other units minimum 76 mm deep by 100 mm high (3" X 4").

.5 Cabinets must be assembled with dowels and bolts.

.6 Cabinet Hanging Rails: High-density particle board, wheatboard or low VOC plywood concealed.

.7 Doors must be mounted using 110° opening, all metal, spring loaded, self closing, six-way adjustable hinges, completely concealed. For high use application, use a 3rd hinge.

.8 Drawer Construction: Sides, backs, and sub-fronts high density particle board or wheat board finished with melamine. Bottom must be 3 mm (1/8") hardboard, paint finished or melamine to match side rails. Finish exposed edges of drawers with plastic edging colour matched. In case of low VOC plywood construction, sides and back solid wood, bottom 3 mm, all stained and finished to match.

.9 Drawer Slides: Drawers must be fitted with epoxy coated metal slides on tandem runners with safety stops to prevent tipping, minimum 40 kg (88 lb) capacity. For high use application, sliders should be captive ball-bearing style to have increased capacity.
.10 Door Bumpers: Provide plastic door bumpers on doors and drawers, for sound absorption.

.11 Screw Caps: Provide colour coordinated screw caps over screw heads exposed to view.

.12 Kick Space Heater Access: Where kick space heaters are provided in bathrooms or kitchens, install an access panel for servicing of the heater. Access panel to fully cover bottom of base cabinet. Contractor shall coordinate with other trades involved for location and sizing of grill opening and access panel.

.3 COUNTER TOPS

.1 Plastic Laminate: American National Standards Institute/National Electrical Manufacturer’s Association (ANSI/NEMA), LD 3-2005, “High Pressure Decorative Laminate”, Type HGS, 1 mm (0.040”) thick.

.2 Counter tops must be one-piece factory “postformed” type with bullnosed edges and minimum 100 mm (4”) high backsplash and sidesplash, composed of high pressure laminate bonded to a particleboard core. High use application, use “layup” type with seams to be located in dry locations; include 100 mm (4”) high backsplash and sidesplash with continuous bead of sealant to prevent water penetration.

.3 Unless otherwise shown on the drawings, kitchen tops must be 648 mm (25-1/2”) wide. Vanity tops must be 572 mm (22-1/2”) wide.

.4 Provide cut-outs in tops for all sinks and plumbing fixtures to templates supplied by plumbing subcontractor at the time of installation.

3 Execution

.1 Supply and install all filler panels, back panels or scribe moulding, etc., to make a complete and finished installation.

.2 Apply a bead of silicone sealant to junctions of plastic laminate and wall surfaces and at the cabinet base/floor junction.

.3 Apply a bead of silicone sealant around the base of plumbing fixtures penetrating the countertop.

End of Section
13 20 00 - Heat Treatment Room (Optional)

1 General

.1 The provision of a heat treatment room shall be project specific. It is intended to provide an Operator the ability to prevent and manage bed bug infestations using high-temperature heat to effectively exterminate bed bug eggs, larva/nymphs and adults from tenant's belongings and furnishings. Materials and workmanship for the room construction will be specified in their related sections.

.2 The heat treatment room's is recommended to be 3.0 m — 4.5m (10’ — 15’) long and 3.0 m — 3.6m (10’ — 12’) wide and if publicly accessible include a vestibule a min. 1.2 m x 1.2 m (4’ x 4’).

.3 Do not install any unnecessary penetrations such as exhaust vents or drains. These provide a place for bed bugs to escape, heat loss, potential failure of fire damper, and wasted energy. If exhaust ventilation is required it should be from outside the room in the vestibule.

.4 Treatment Room

.1 Can be located in basement or service area and away from tenant, support or amenity areas. If possible heat treatment room should be in close proximity to the elevator and a building service entrance and close to building exterior walls.

.2 Should be large enough to hold a three person couch, box spring and mattress, bed side table and chest of drawers. Furniture and other items are to be placed in the room to ensure that there is adequate air circulation to allow for heat penetration. Racks should be considered to ensure adequate air circulation around the furniture and materials being treated.

.3 Ensure that the floor is insulated to a minimum R20, walls insulated to a minimum R22 and ceiling insulated to a minimum R28.

.4 Wall construction to consist of an insulated stud wall, aluminum heat reflective foil, cementitious board and batten finish.

.5 Ceiling construction to consist of insulated ceiling cavity, gypsum board, aluminum heat reflective foil, cementitious board and batten finish. The ceiling assembly to have gypsum board installed to provide a minimum 1 hour fire resistant rating.

.6 Avoid placing any other systems that are not part of the Heat Treatment room, like electrical, plumbing or HVAC systems in the ceiling construction.

.7 Number of sauna heaters or approved portable heaters is depends on the room's cubic foot print. Refer to the manufacturer’s specifications for heaters or portable heaters as to the maximum cubic space allowed.

.8 Heater controls are to be set at a temperature of 60 degrees Celsius and, depending on the room configuration and heater capacity, run continuously for at least two (2) hours; denser packed items (i.e. mattresses, bags of clothes, furniture, etc.) may require more than two (2) hours for the temperature to saturate the material and effectively neutralize the bed bugs.
.9 The room is to have a minimum one (1) hour fire-resistant rating.

.10 Controls, light switches, breaker boxes, electrical panel, relay box or any other heat sensitive electrical components to be located in the vestibule or outside the heat treatment room.

.5 ENTRY VESTIBULE (ONLY IF HEAT TREATMENT ROOM IS ACCESSIBLE TO PUBLIC)

Vestibule doors should be in direct line of each other and must open out of the rooms. Provide a standard vision light or wired glass to the heat treatment room door. Vestibule doors should have door closure.

.6 OPERATION OF THE HEAT TREATMENT ROOM

.1 Tenant’s belongings are to be isolated (bagged) and transported into the room prior to the room being activated.

.2 Electrical items (such as sensitive electronic equipment) can be placed inside the heat treatment room but should remain at the floor level of the heat treatment room and away from the heater to avoid overheating.

.3 Spread items out on shelves, hangers or racks as much as possible so the items get hot enough to kill the bugs.

.4 Once the heater(s) is activated the room is to be left undisturbed for the desired time frame. Operators of the heat treatment room are to be trained for proper use of the heaters and warned about proper precautions around the hot elements.

.5 Once the tenant’s belongings have been heat treated allow the room to cool down for a minimum 30 minutes before entering. Opening the doors to the heat treatment room allow for the ambient temperature to cool more rapidly. Metal items may still be too hot to touch, wear appropriate gloves to protect hands.

.7 OTHER

.1 Hose bibs are not permitted in room. Floor drains are permitted in the vestibule or just outside the heat treatment room providing that they are installed with trap primers.

2 Products

.1 Aluminum Heat Reflecting Foil: 914 mm (36") wide roll of pure aluminum foil, glue mounted to super strength Kraft paper and micro-perforated, available from local heater suppliers.

.2 Cementitious Tile Backer Board: 1/2" cementitious tile baker board; refer to Division 09 28 00 - Gypsum Wallboard.

.3 Extruded Polystyrene Insulation: Refer to Division 07 21 00 - Thermal Protection for Insulation.

.4 Gypsum Board: Refer to Division 09 28 00 - Gypsum Wallboard for Fire-resistant Gypsum Board.
.5 Heat Source: Commercial quality, portable electric heaters with combination of panel fan (specifically designed for bed bug treatment) to be heavy duty, rugged sheet metal enclosure with expanded metal inlet and exhaust screens. Ensure that the temperature sensor is located at heater units. Heater equipments are CSA/UL tested and listed or independent testing agency certified. Heaters should have standard 1 year warranty on labour and material as well as 2 years warranty on the resistor elements.

.6 Heater Fence: For heater installation only, S4S, kiln-dried clear vertical grain 38 mm x 89 mm (2 x 4).

.7 Interior Floor Sheathing: Refer to Division 06 10 00 – Rough Carpentry for Interior Floor Sheathing.

.8 Joint Treatment: Heat resistant low VOC sealant. Acceptable Product: Trimsil 600 by Tremco or approved equal.

.9 Metal Door: Insulated lockable metal door, refer to Division 08 11 00 – Metal Doors and Frames for Exterior Service Room Exit Doors. Door width to be 900 mm (3’) clear doorway opening.

.10 Finished Hardware: refer to Division 08 70 00 – Finish Hardware for Metal kick plates, door hold open device; (public door) exterior key lock with free access from interior; (room door) weather stripping: rigid rubber door sweep or the door frame to be outfitted with a compressible gasket constructed with flexible insert on a rigid metal strip and a standard vision light or wired glass.

.11 Mineral Fibre Insulation: Semi Rigid Insulation/Mineral Wool Insulation. Conforming to CAN/ULC-S702, Type 1, Flame Spread Rating of ≤25; Smoke Developed Rating ≤0 with a mass of 1.22 kg/m².

.12 Resilient Sheet Flooring: Refer to Division 09 65 00 – Resilient Flooring for slip resistant sheet vinyl for bathrooms for non-barefoot areas.

.13 Safety Labeling: Safety Design Label form, or name plate as a permanent information sheet.

.14 Timer & Temperature Controls: Digital control with a programmable temperature and timer combination with a maximum time setting of at least 2 hours. If required the timer could be set up for longer duration. Provide only one switch to turn on/off the timer and temperate control.

.15 Sprinkler Heads: High temperature resistant, wire guard, fast response sprinkler head with an activation temperature above 100 degree Celsius for bed bug room and vestibule. It is recommended to provide a separate fire zone for bed bug room, if the location is publicly accessible.

.16 Lighting: High temperature resistant industrial light fixture complete with metal wire guard. Refer to Division 26 00 00 – Electrical. Provide the lighting switch outside the room.

.17 Portable Fans: Additional fan for heat circulation must be metal and high temperature resistant.
3 Execution

.1 Floors are to be insulated to a minimum R20 and covered with the interior floor sheathing. The floor sheathing is to be glued and screwed. Do not use concrete topping or gypsum concrete as this will affect the floors ability to reach the designated temperature within the given timeframe (it will act as a heat sink).

.2 Insulation to be installed in the wall and ceiling framing in accordance with Division 07 21 00 - Thermal Protection.

.3 Start installing the aluminum heat reflective foil at the bottom of the wall and positively lap additional rows as the foil is installed up the wall. Overlap seams 75mm (3”), seal joints and punctures with foil heating duct tape.

.4 Install cementitious tile backer board and ceiling’s gypsum board in accordance with Division 09 28 00 - Gypsum Wallboard. The cementitious wall board is to be installed vertically to ensure that only a continuous vertical joint is located on the walls. After the installation of the resilient flooring with cove base and finish, install the batten over the vertical wall joint to the floorings aluminum finish edge. The board joints are to be sealed and the batten is to be back caulked to both sides of the board’s joint. Fasten the batten as required.

.5 If a finish is desired the cementitious board and batten should be finished with MPI dry heat resistant to 60 degree Celsius INT 3.3D Epoxy Modified Latex. If the cementitious board is not primed use MPI 3 Alkaline resistant primer.

.6 Sealant is to be installed in accordance with Division 07 92 00 - Joint Sealants. Ensure proper joint design between the cementitious boards. Install sealant between the bottom of the cementitious board and subfloor prior to the installation of the resilient floor to ensure that sealant is installed behind the cove base.

.7 Flooring to be installed in accordance with Division 09 65 00 - Resilient Flooring. Cove base the perimeter of the floor to a min. 4" up the wall and finish with an aluminum edge. The flooring is to be 100% adhered to the substrate using a solvent free 2-part urethane adhesive.

.8 Ensure that the power requirements, air circulation and unit fastening is completed as per the manufacturer’s specifications. Connect the heater power cable to the main disconnect device and sauna heater controls as per the manufacturer’s specifications.

.9 The fencing around the heater is to be installed as per the clearance requirements from the manufacturer’s specifications. The fencing is to be continuous from the floor to the ceiling to ensure materials cannot touch the heater. Ensure that access can be achieved to the unit for proper maintenance or replacement of parts.
.10 The controls are to be installed on the wall adjacent the opening side of the door leading into the heat treatment room. Install the heater controls at a height of 1219 – 2032 mm (4’ – 5’). If more than one heater is installed there should only be one set of controls.

.11 Place caution/warning signs around the heaters warning the heater(s) could be extremely hot and do not touch.

.12 Place a warning sign on the door to the heat treatment room warning:

.1 That the room is not to be entered when the heaters are operating and allow for a 20 minute cool down prior to entering the room.

.2 Wear protective gloves (to prevent burns which may be caused from touching hot or metal objects).

.13 Install an electrical outlet in case additional ventilation is required inside the room to circulate heat. Add a manual switch to turn on/off in the vestibule or outside the room for this.

.14 Other signage to be considered:

.1 ‘DO NOT TOUCH - MAY BE HOT’ on door to Sterile room or door to vestibule

.2 ‘DO NOT PLACE ITEMS IN THIS AREA THAT COULD TIP / FALL AND BLOCK THE DOOR’ in a) sterile room door sterile room side, in b) sterile room vestibule wall between sterile room door and vestibule door, and c) outside sterile room door at the hinge jamb side of the door.

.3 ‘DO NOT PLACE OBJECTS IN THIS AREA THAT COULD TIP / FALL ONTO THE HEATER’ on the walls both left and right sides of the sauna heater protection ‘frame’.

.4 ‘EXTREMELY HOT - DO NOT TOUCH’ on the sauna heater protection ‘fence guard’.

.5 ‘DO NOT ENTER ROOM WHEN HEATERS ARE OPERATING - ALLOW FOR 20 MINUTE COOL DOWN PRIOR TO ENTERING THE ROOM’ on the sterile room door (vestibule side).

.6 ‘KEEP AREA CLEAR’ in front of the heater as per the heater manufacturer’s specifications.
**Construction Standards > Division 13 - 13 20 00 - Heat Treatment Room (Optional)**

**SECTION 5**

**Division 13 – 13 20 00 – Heat Treatment Room (Optional)**

**Heater Fence**
(floor to ceiling)

**Interior Door**
with rigid rubber door sweep and peep hole or wired glass

**Heater Unit**

**Heater Controls**

**Vestibule**
required only if the heat treatment room is publicly accessible

**Public Corridor Door**
with exterior key lock

**Resilient Flooring**

**Plywood Floor Sheathing**

**Insulated floor**

to R20 (2x4 joists with layers of 1" Rigid Insulation)

**Subfloor**

**Sealant**

**Cementitious Batten**

**Cementitious Board**

**Heat Reflective Foil**

**Stud Wall and Insulation**

**Ceiling Joists and Insulation**

**Floor Plan**

**Floor Section View**

**Ceiling Section View**

**Wall Plan View**

End of Section
14 20 00 - Elevators

1 General

.1 RELATED WORK BY OTHER TRADES

.1 Elevator hoistways must be constructed of poured concrete or reinforced concrete block.

.2 Elevator pits must be constructed of poured reinforced concrete and designed to withstand the static and dynamic loading imposed by the equipment. Pits must be waterproofed and have a drain complete with a backcheck valve or other means to prevent water or other liquid to enter the elevator pit. Where provided or necessary, sumps and/or sump pumps shall not be located or accessed from the elevator pit. Elevator pit drains must be designed for a flow rate of 50 gpm per elevator.

.3 For conventional elevator machine rooms must be provided with a poured concrete floor, reinforced to withstand the static and dynamic loading imposed by the equipment and the anticipated occupant load.

.4 Elevator machine rooms, control rooms, controls spaces, and machinery spaces including the hoistway overhead machinery space for the machine-room-less elevators must be provided with mechanical ventilation and/or cooling to maintain a suitable operating environment for heat sensitive controls and equipment.

.5 A three phase power supply and fused, lockable disconnecting means must be provided in the elevator machine and/or control room for each elevator with feeder wiring to the elevator control system.

.6 Energy efficient design and operation should be considered in the specification of elevator equipment.

.7 Pipes, ducts and other mechanical or electrical equipment not used in connection with the elevator must not be installed in any elevator hoistway, machine and/or control room, control space, or machinery space.

.8 Ensure the top of the elevator shafts are fully insulated when at the attic level.

.9 Provide fire alarm signals from the building fire alarm system to each elevator machine and/or control room or control space to activate emergency recall operation of the elevators. Fire alarm signal requirements shall be provided from the following devices and as applicable to the particular installation:

.1 A signal representing smoke detectors located in each elevator lobby (excluding the smoke detector at the main recall level elevator lobby).

.2 A signal representing the smoke detector(s) located in the elevator lobby at the designated recall level for alternate floor recall as required by the B44 Elevator Safety Code.

.3 A signal representing smoke detectors located in the elevator machine room, control room, control space or machinery space. Note: for machine-room-less elevators the top of the hoistway is typically considered a machinery space and therefore would be required to be
equipped with smoke detectors.

.4 A signal representing smoke or heat detectors (if present) that are located in the top of the elevator hoistway.

.5 A signal representing the smoke or heat detectors (if present) that are located in the elevator pit.

.10 Provide a dedicated telephone line and jack in each elevator machine and/or control room for use by the elevator emergency communication system.

.2 MAINTENANCE MANUALS AND SERVICE

.1 Provide complete operating and maintenance data manual and record drawings showing as-built wiring diagrams.

.2 Furnish maintenance on elevator described herein for a period of twelve (12) months commencing on the date of Substantial Performance of the Work. This maintenance must include systematic examination, adjustment and lubrication of all elevator equipment.

.3 REFERENCED STANDARD

All elevators are required to comply with the latest version of the CSA B44 Safety Code for Elevators in effect for the jurisdiction of the work, including any applicable supplements. The requirements of the BC Safety Standards Act and Elevating Devices Safety Regulation shall also apply.

2 Products

.1 Passenger Elevators shall have a minimum capacity rating and size as indicated in Section 1 - Design Guidelines - Elevators.

.2 Types of elevators; Refer to Section 1 - Design Guidelines - Elevators.

.3 Elevator number, type, speed, size, capacity and minimum dimensions to be in accordance with Section 1 - Design Guidelines - Elevators.

.4 Microcomputer, non-proprietary control systems and energy efficient drives must be provided for all elevators.

.5 Provide elevator control systems with non-proprietary diagnostics which will permit on-going maintenance and service by any qualified elevator contractor. Parts and technical support shall be available directly from the control system manufacturer to a third party elevator contractor and/or the Owner on a fair and expedient basis.

.6 The elevator equipment shall be provided with the following finishes:
## Construction Standards > Division 14 - 14 20 00 - Elevators

### Elevator Finishes - Description

<table>
<thead>
<tr>
<th><strong>Elevator</strong></th>
<th><strong>Finishes - Description</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cab Front Finish</td>
<td>Finish the cab front return panel, header, door posts, and car door panel in #4 finished brushed stainless steel.</td>
</tr>
<tr>
<td>Cab Side, Rear Wall Panels</td>
<td>Finish the cab side and rear wall panels with raised plastic laminate faced panels with stainless steel or plastic laminate reveals. Provide colour contrast between cab walls and floors.</td>
</tr>
<tr>
<td>Cab Floor</td>
<td>The cab floor must be finished in a non-slip raised rubber floor tile or equivalent flooring (flooring to be provided by other trades). Provide flooring that is easily recognizable (ie. Not a solid dark surface or dark colours).</td>
</tr>
<tr>
<td>Handrails</td>
<td>Minimum 38 mm (1-1/2&quot;) diameter stainless steel handrails on all non-access walls or other approved graspable design. Handrails shall be installed and mounted 800 mm—920 mm (31.5&quot; - 36&quot;) above the finished floor and 38 mm (1-1/2&quot;) clear of finished walls.</td>
</tr>
<tr>
<td>Cab Ceiling &amp; Suspended Ceiling</td>
<td>The cab ceiling should be finished with a white baked enamel paint finish or white plastic laminate and shall be equipped with a suspended ceiling. Suspended ceiling to consist of aluminum T-bar frame complete with aluminum eggcrate light diffuser panels. Or alternatively provide a stainless steel sectional island type suspended ceiling with energy efficient LED downlights.</td>
</tr>
<tr>
<td>Car and Landing Sills</td>
<td>Extruded Aluminum, Stainless Steel, or Nickel-Silver. Landing sills shall be of contrasting colour to the adjacent floor surface.</td>
</tr>
<tr>
<td>Cab Lighting</td>
<td>Lighting should consist of energy efficient fluorescent lighting with power factor corrected ballasts mounted to the cab ceiling above the suspended ceiling to provide ample and consistent lighting in all areas of the cab. Lighting level in elevators and adjacent lobbies should be flicker free and at least 100 lux measured at floor level. Alternatively provide long life energy efficient LED downlights with warm white colour temperature of no greater than 3000 K</td>
</tr>
<tr>
<td>Accessories</td>
<td>Provide stainless steel protective pad hooks for all walls except the entrance. One complete set of fire retardant protective pads of quilted canvas or vinyl must be provided at other than entrance walls.</td>
</tr>
<tr>
<td>Hoistway Entrance Frames</td>
<td>Hoistway entrance frames must be of standard profile suitable for the finished wall dimensions. All hoistway entrance frames and door panels must be finished with prime coat paint suitable for finish painting on site.</td>
</tr>
<tr>
<td>Car and Hall Operating and Signal Fixtures</td>
<td>Stainless Steel Brushed Finish faceplates or housings.</td>
</tr>
</tbody>
</table>

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### Elevator Features - Description

<table>
<thead>
<tr>
<th><strong>Elevator</strong></th>
<th><strong>Features - Description</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Barrier Free Design</td>
<td>All elevator equipment shall be provided in conformance with Appendix E of the B44 Elevator Safety Code “Elevator Requirements for Persons with Physical Disabilities”</td>
</tr>
<tr>
<td>Voice Communication</td>
<td>Provide each elevator with a vandal resistant, autodialing, hands free speaker/microphone type telephone mounted in a stainless steel plate and flush mounted into the elevator front return panel. Where elevator travel is greater than 18 m (60') provide an elevator “lobby” telephone that is accessible to emergency personnel.</td>
</tr>
<tr>
<td>Door Operation</td>
<td>Elevators must be provided with a high speed heavy duty variable speed door operator and complete with closed loop controls between door operator &amp; and related equipment. The door operator must be capable of operating the doors smoothly and quietly at the time indicated in the performance requirements specified herein. Elevator doors should remain open for at least 5 seconds and should close slowly to allow extra time for people with disabilities where applicable.</td>
</tr>
<tr>
<td>Door Re-Opening Device</td>
<td>An infrared multi-beam door re-opening device must be provided to monitor the door opening and protect passengers from the closing doors. The device shall stop and reopen the doors should a person or other obstruction be detected. For Seniors projects provide a 3 - Dimensional device that also scans the area between the entrance frames in addition to the area directly in the path of the car doors.</td>
</tr>
<tr>
<td>Operating Buttons - Type, Illumination &amp; Size - Bachelor and Family Projects</td>
<td>All operating buttons shall be of a vandal resistant design suitable for rugged use. Illumination of all operating buttons must be provided from a long life LED source rated for 100,000 hours operation and must be clearly visible in the ambient lighting levels.</td>
</tr>
<tr>
<td>Operating Buttons - Type, Illumination &amp; Size - Seniors Projects</td>
<td>Buttons should have a contrasting colour to their background. Illumination of all operating buttons must be provided from a long life LED source rated for 100,000 hours of operation and must be clearly visible in the ambient lighting levels. The use of large or oversized buttons approximately 38 - 50 mm (1.5&quot;-2&quot;) round or square is encouraged.</td>
</tr>
</tbody>
</table>
### ELEVATOR FEATURES - DESCRIPTION

<table>
<thead>
<tr>
<th>ELEVATOR Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Position Indicator - Car</td>
<td>Each elevator car must be provided with a digital position indicator with an LED or Vacuum Fluorescent Segment or Dot Matrix display. The indicator must be mounted a minimum of 1980 mm (6'-6&quot;) above the finished floor level in the cab for easy viewing. The position indicator display shall contain a segment which displays the direction or intended direction of the travel of the car.</td>
</tr>
<tr>
<td>Position Indicator - Hall</td>
<td>Each elevator must be provided with a hall position indicator located at the ground floor level. The indicator display must be the same as the indicator provided in the elevator cab.</td>
</tr>
<tr>
<td>In-Car Lanterns</td>
<td>When a single elevator is used, provide an in-car lantern mounted in the car door jamb. The fixture shall contain direction arrows and an audible signal to indicate the direction of travel with adjustable volume control.</td>
</tr>
<tr>
<td>Hall Lanterns</td>
<td>When more than one elevator is provided in a group, then provide hall lanterns at all levels with double stroke electronic chime with an adjustable volume control to visually and audibly indicate the direction of travel. Hall lanterns shall provide advanced warning of the arrival of an elevator at a landing and shall illuminate and sound approximately 3 seconds prior to the arrival of the car and door opening.</td>
</tr>
<tr>
<td>Voice Announcer (Optional)</td>
<td>If required, provide an audible voice announcer to indicate the direction of travel and the floor level when the elevator is stopping and as the doors are opening. This shall be provided for all elevators regardless of the rated speed.</td>
</tr>
<tr>
<td>Auto Light and Fan Shutoff</td>
<td>Control system to automatically shut off the cab lighting and cab ventilation fan after a predetermined time period once the elevator is idle.</td>
</tr>
</tbody>
</table>

#### INDIVIDUAL ELEVATOR PERFORMANCE CRITERIA

<table>
<thead>
<tr>
<th>Performance Criteria</th>
<th>Machine-Room-Less or Conventional Traction Elevators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leveling Accuracy</td>
<td>+/- 3 mm (1/8&quot;)</td>
</tr>
<tr>
<td>One Floor Run Flight Time</td>
<td>10 seconds</td>
</tr>
<tr>
<td>Door Open Time</td>
<td>2.5 seconds</td>
</tr>
<tr>
<td>Door Close Time</td>
<td>3.5 seconds</td>
</tr>
<tr>
<td>Maximum Rate of Acceleration</td>
<td>1.0 m/s² (3.5 ft/s²)</td>
</tr>
<tr>
<td>Maximum Rate of Change of Acceleration</td>
<td>2.4 m/s³ (8.0 ft/s³)</td>
</tr>
</tbody>
</table>

#### Notes

1. All elevators are required to meet the following Performance Criteria:

2. Sound Isolation: The machinery and control room equipment, including controllers, and traction machines must be mounted securely to the machine and/or control room walls or floors and be sound isolated to prevent the transmission of sound to the building structure. An acoustic and vibration specialist must be consulted when selecting the equipment.

3. Provide for independent service operation by a designated attendant to facilitate tenant moves and other service use of the elevator.
.11 Provide Firefighter’s Emergency Operation Phase I & II for all elevators. Provide Automatic Emergency Recall operation for all elevators initiated by smoke detectors in the elevator lobbies, machine room, control room, control space or machinery space and any detectors that may be provided in the elevator hoistway or pit only. Provide Automatic Recall operation to an Alternate Level. Provide Phase II Emergency in-car operation for each elevator. These features shall be provided for all elevators regardless of building height per the requirements of the B44 Safety Code for Elevators. Elevators shall not be designated for use by Firefighter’s unless required by the applicable building code. (Note: elevators designated for use by firefighter’s in accordance with section 3.2.6.5 of the Building Code must also be provided with emergency power operation).

.12 Door Nudging operation is not suitable for use on elevators in Seniors projects and shall be disabled as permitted by the B44 Safety Code for Elevators when Automatic Emergency Recall operation is provided. Do not provide door nudging operation in normal use of elevators in Senior’s projects.

.13 For machine-room-less elevators, provide means to release the elevator brake from the elevator control room regardless of its location. Do not provide access panels into the hoistway for the purposes of brake release unless they are located within the elevator control room area.

.14 For machine room-less elevators provide self-resetting governors complete with a means to remotely reset the over-speed switch and to activate the governor for testing purposes to comply with the relevant sections of the Elevator Safety Code. Do not provide governors that require access panels in the hoistway enclosure.

3 Execution
Not Applicable

End of Section
21 00 00 - Fire Protection

1 General

.1 Provide a complete sprinkler system for the building in accordance with the requirements of BC Building Code, and NFPA as required by Authority Having Jurisdiction.

.2 Refer to Section 1 - Design Guidelines, Fire and Life Safety Measures, for a summary of all fire and life safety system requirements. Note that these requirements may exceed the requirements of the BCBC and/or the Authority Having Jurisdiction.

.3 QUALITY ASSURANCE

.1 Sprinkler systems and all equipment shall be installed by qualified contractors licensed and regularly engaged in the installation of automatic fire sprinkler system.

.2 All pipe, sprinklers, valves, fittings, gauges, pipe hangers, and other accessories to be of a type which is listed or labeled by Underwriters Laboratories of Canada (ULC). Use of such materials and equipment shall conform to all requirements and limitations of their listings. If suitable ULC listed or labeled products are not available, products listed by other testing agencies (FM, UL, Warnock Hersey, etc.) may be used subject to the prior written approval of the Consultant, Owner, BC Housing and Authority Having Jurisdiction.

.4 SUBMITTALS

Sprinkler system shop drawings complete with hydronic calculations as outlined in NFPA shall be sealed by the fire protection system design engineer who is a Professional Engineer Registered in BC.

.5 WARRANTY

Provide full 2 years warranty for all labour and materials along with full 2 years of service contracts for the project. Refer to Division 23 00 00 HVAC for details on Warranty.

2 Products

.1 AIR COMPRESSORS

.1 Supply and install air compressors, approved for use in sprinkler systems and ULC approved for the dry sprinkler systems.

.2 Compressors to be sized in accordance with the requirement of NFPA, for capacity as determined by hydraulic calculation design of dry sprinkler systems.

.2 DRY PIPE VALVES

Dry System alarm check valve to be iron body, bronze trim, complete with quick opening device if needed, and all accessories, interconnecting piping and subassembly valves and complete trims in accordance with NFPA.
.3 PIPING
Piping to be schedule 40 standard weight, lightwall threadable pipe, Victaulic style grooved pipe and fittings and shoulder rolled light wall pipe and fittings or type L copper if ULC approved as indicated above. Blazemaster PVC pipe may be used if installed in accordance with the ULC listing, NFPA and applicable fire codes.

.4 PRESSURE GAUGES
Provide pressure gauges at the following locations and additional gauges as required by NFPA, Authority Having Jurisdiction and system configuration;

.1 Water entry valve station both upstream and downstream of backflow preventer.
.2 Upstream and downstream of pumps.
.3 At top of fire suppression standpipe and sprinkler risers.

.5 SIAMESE CONNECTIONS
Provide appropriately labeled wall type Siamese fittings consisting of rough brass body with polished swivels, and polished chrome caps and chains. Units to have 64 mm (2-1/2") BC Fire Marshal threads and shall be ULC listed and approved. Ensure thread pattern matches local fire department hose connections.

.6 STANDPIPES
Provide fire suppression standpipe system within the building, as required by NFPA and Authority Having Jurisdiction. Generally concealed except standpipe risers located within stairwells or piping within mechanical rooms.

.7 SPRINKLER HEADS
.1 Sprinkler heads within residential suites, corridors, and common areas shall be “residential” type sprinklers except where prohibited by NFPA or the sprinkler listing.
.2 Provide quick-response heads where required by NFPA.
.3 Provide standard brass upright or pendant heads for unfinished areas with mechanical protection in areas susceptible to damage (mechanical rooms, ceiling spaces, etc.).
.4 Provide dry heads, standard brass upright or pendant, for cold concealed areas.
.5 Provide spare sprinkler heads for the Owner as required under NFPA.

.8 SPRINKLER SYSTEM ZONING
Provide zoning in accordance with the NFPA and in accordance with the requirements of the Authority Having Jurisdiction. As a minimum, provide separate zones for each floor and the attic. Valve assemblies to be in accordance with NFPA and shall be accessible and tamper proof.
.9 VALVES
All valves to be Underwriter's Laboratories Canada listed for minimum 1200 kPa (175 psi) working pressure on sprinkler and standpipe systems.

.10 FIRE EXTINGUISHERS
Provide Fire Extinguishers in accordance with NFPA 10 with Fire Extinguisher type to suit building area hazard.

3 Execution

.1 INSTALLATION
.1 Use materials that bear the manufacturer’s identification mark in addition to all other markings required by the specifications.

.2 All tests and adjustments required by NFPA shall be performed. Copies of completed Aboveground and Underground Contractor’s Material and Test Certificates shall be delivered to the consultant at least five (5) full working days prior to the building takeover inspection.

.3 Supply and install cabinet containing spare sprinkler heads corresponding to the types and temperature ratings as installed in the building. Cabinet to be located as indicated on site and shall include sprinkler wrench suitable for each head type. Provide a minimum of six spare heads for each type of head installed.

.4 Ensure that the sprinkler system is protected from freezing in accordance with the requirements of the Authority Having Jurisdiction. Installing wet sprinkler system piping in cold attics and exterior wall is only permitted if the system in completely insulated.

.5 Fire extinguisher cabinets shall be installed no more than 1219 mm (4'-0'”) above the floor. Provide fire extinguishers in recessed enclosures in corridor walls. Do not compromise required fire separation or rating. Fire extinguishers to comply with NFPA and the BC Fire Code.

.2 EARTHQUAKE PROTECTION
.1 Provide seismic bracing in accordance with the requirements of the BC Building Code, CSA S832, and NFPA.

.2 Provide Letter of Assurance from Seismic Professional Engineer Registered in BC on commencement of design and completion of field review, must be provided to confirm that seismic restraint meets regulatory requirements.

.3 PERFORMANCE
.1 The construction documents shall indicate the location of sprinkler heads and suggested layout of piping. The Contractor shall be responsible for the final layout of the sprinkler system and submission of shop drawings complete with hydronic calculations for review by the Consultant and approval by the Authority Having Jurisdiction.

.2 The Contractor shall provide the hydraulic design for the system in accordance with NFPA.
.3 Hydraulic calculations are to include for 20% more in volume than the total sprinkler demand and 10% more pressure at the base of the riser than required by Authority Having Jurisdiction and NFPA.

.4 Hydraulic calculations and working drawings to be presented in a manner acceptable to NFPA. Contractor to note and confirm compliance with all requirements of NFPA including which edition of NFPA was used in the design.

.5 The Contractor shall test the system flow to provide the final data for the sprinkler system design and shall report the results of the flow test to the Consultant.
22 00 00 - Plumbing

1 General

.1 Provide complete sanitary and storm drainage systems, including clean-outs, manholes, catch basins, piping, pumps, sumps, fixtures and all other equipment connected to local drainage. Avoid sump pumps for storm and sanitary wherever possible. If pumps are needed, route only that drainage through the pump that cannot be drained by gravity. Design, construct and install storm and sanitary drainage systems to conform to applicable codes and good engineering principles. Permanent structures must not be located over any underground services. Plumbing system shall be design to comply with the requirements of the BC Plumbing Code and Local Authority Having Jurisdiction.

.2 Insulate all plumbing system components including, but not limited to, hot water mains, recirculation and run outs to comply with ASHRAE 90.1 - 2010 and National Energy Code for Buildings (NECB) 2011. Provide a continuous vapour barrier for all cold water and chilled water piping to prevent condensation.

.3 Low water consumption plumbing fixtures shall be specified, e.g., water closets, sink and lavatory faucets, and shower heads.

.4 WARRANTY

Provide full 2 years warranty for all labour and materials along with full 2 years of service contracts for the project. Refer to Division 23 00 00 HVAC for details on Warranty.

.5 POTABLE WATER SYSTEM

.1 Street pressure system is to be used whenever possible. If the following conditions apply, install a booster system:

.1 minimum street water pressure, discounted 35 kPa (5 psi) for future unknowns, does not meet all building requirements or,

.2 if the street pressure is below 276 kPa (40 psi).

.2 Install a pressure reducer if the street pressure is greater than 551 kPa (80 psi).

.3 Provide an approved double check valve backflow preventer as per CSA and code requirements.

.4 Provide Reduce Pressure Backflow Preventer for water main for site.

.5 Where a permanent irrigation system is approved for the project by BC Housing, provide. Reduce Pressure Backflow preventer for irrigation system.

.6 Water supply piping in outside walls is not permitted. Route piping in a furred-out chase completely outside of the exterior wall. Do not embed piping in the wall insulation.

.7 Avoid drainage piping in outside walls. If unavoidable, ensure that the exterior wall insulation is between the pipe and the exterior wall, that the pipe is not embedded in the insulation and
that the R value of the insulation complies with the required value for the assembly. Use EPS or polyisocyanurate insulation if the pipe must be installed in an exterior wall stud space.

.8  Provide a shut off for each riser in apartment buildings. Valves 57 mm (2") and less in diameter must be ball valves. Shutoffs to be easily accessible.

.9  Provide a shut-off valve for each unit. Provide a prefabricated, keyed metal access panel. Shut offs to be easily accessible.

.10 Provide pre-manufactured water hammer arrestors as per BC Building Code (Sentence 2.6.1.9.) and at the termination of all hot and cold water branch lines serving groups of fixtures or any fixture with a solenoid valve such as a dishwasher or clothes washer. Field fabricated arrestors are not permitted.

.11 Provide plastic sleeves for pipes through concrete 25 mm (1") larger than pipe, packed with insulation and smoke seal per code.

.12 Provide frost free hose bibs c/w automatic draining vacuum breakers/backflow preventer at the following locations:
   .1  garbage enclosures
   .2  main entry
   .3  near landscaped areas – provide minimum one per building face; maximum spacing 30.5 m (100’-0”)
   .4  locate hose bibs to avoid conflict between hose and sidewalks

.13 Provide individual curb shut-offs to each building and a main water shut-off within each building. Provide a curb stop and key.

.14 Provide independent water metering for common areas, for the collective residential suite area and, where applicable, for areas with separate lease agreements.

.6 DOMESTIC HOT WATER SYSTEMS
   .1  Hot water temperature must not exceed 43°C. (110°F) at faucet used by tenants. Hot water distribution to laundry facilities shall be at 60°C (140°F). Hot water storage shall not be below 60°C (140°F) to control the propagation of Legionella bacteria. On central domestic water heating systems provide hot water recirculation system. Care shall be taken to minimize dead legs to outlets (2 m is the maximum allowable).

   .2  Boiler and Storage Tank System – the use of a boiler and storage tank system is the preferred hot water system for projects.

   .3  If a solar hot water system is specified, install according to the guidelines from CanSIA's Solar Ready program and the CAN/CSA-F383 Installation Code for Solar Domestic Hot Water Systems and comply with BC Building Code 2.2.10.13.

.7 DRAINAGE SYSTEMS
   .1  Locate roof drains to minimize number of stacks from roof to storm sewer. Balance this requirement with the need to provide minimum 2 way drainage to roof drains.
.2 Provide floor drains with trap primer in common laundry.

.3 Floor Drains for:
   .1 Sheet vinyl flooring shall be dura-coated cast iron body with bottom outlet, combination invertible membrane clamp and adjustable collar with polished nickel bronze strainer and complete with trap primer connection.
   .2 Ceramic tile floor shall be dura-coated cast iron body with bottom outlet, combination invertible membrane clamp and adjustable collar with “Type Y” polished nickel bronze square strainer with stainless steel screws and complete with trap primer connection.

.4 Provide a membrane under any ceramic tiled shower areas and clamp the membrane into the membrane clamp of the floor drain. The membrane shall be in accordance with Part 7 of the BC Building Code.

.5 Provide a bi-level drain in suite areas if required by Authorities Having Jurisdiction. Coordinate with other trades for provision of waterproofing membrane under the concrete topping and/or resilient flooring subtrade for installation of clamping drain.

.6 Utilize cast iron DWV piping for all vertical drainage risers, horizontal drainage over areas with noise sensitivity (especially bedroom and sleeping areas) and for all drainage in parkade areas. Non-metallic DWV can be considered in less noise sensitive areas, but the drainage layout shall be reviewed and commented on by an acoustic consultant. Waste stacks and rain water leaders (RWL’s) must not touch the structure and should be resiliently supported at floor penetrations on neoprene pad isolators sized for a minimum of 3mm of static deflection.

.7 Provide a drainage system for covered or underground parking areas. Comply with the City of Vancouver Bulletin 2008-007-EV/PL Parkade Drainage Treatment System.

.8 COMMON LAUNDRY
   Contractor to provide plumbing rough-in for tenant laundry equipment, including a utility sink.

Products

.1 POTABLE WATER PIPING
   .1 Use Type L copper pipe for all hot and cold water supply piping.
   .2 Use Type K copper pipe on hot water recirculation piping when recirculation system is used.
   .3 Use only lead free solder in copper piping systems.
   .4 Non-metallic pipe and fitting systems, i.e. cross linked polyethylene (PEX), chlorinated polyvinyl chloride (CPVC), polypropylene (PP-R) shall be accepted as alternates for potable hot and cold water mains and risers applications as per the BC plumbing code 2012 Division B - Appendix A.

It is the responsibility of the consultant to ensure they are suitably specified and detailed to comply with BCBC 2012 Sentence 3.1.5.16.(1) combustible piping materials in buildings required to be of noncombustible construction with regard to flame spread rating and smoke developed classification.
The Consultant shall coordinate specifications and detailing for the installation of the system and confirm that all components meet the local authority’s requirements including referenced standards, fire stopping and STC rating.

The thermal expansion and supports shall be as per the pipework manufacturers requirements.

.5 The Consultant shall submit written confirmation of approval for the specified system from the authority having jurisdiction and, where applicable, a copy of the approved equivalency, to BC Housing prior to approval of the construction documents.

.6 The potable water system shall be designed to ensure that the maximum design temperatures and pressure of the piping material are not exceeded. Provide pressure reducing valves and controls if required to ensure that approved pressures and temperatures are not exceeded.

.7 The Contractor shall provide a 25 year manufacturer’s warranty on all piping, in line fittings and domestic water distribution manifolds which includes coverage for consequential damage.

.8 Cross linked polyethylene (PEX) may be used for potable water piping for in-suite run outs from fixtures to manifold subject to the following conditions:

.1 Approved PEX piping systems are acceptable in lieu of copper for in-suite run-outs to fixtures. The PEX piping and fitting system shall conform to CSA B137.5 and shall be approved for potable water use.

.2 Distribution manifolds shall be manufactured of brass or copper, approved for use in the system by the piping manufacturer and covered by the manufacturer’s 25 year warranty.

.3 In-line fittings shall be approved for use in the system by the piping manufacturer and covered by the manufacturer’s 25 year warranty.

.4 Where PEX potable water piping is installed in structural slabs, a larger diameter polyethylene sleeve is required. Polyethylene bags are not acceptable.

.5 PEX potable water piping shall not be installed in slabs used for radiant heating/cooling, due to potential problems with heat gain in the DCW and conflict with the heating pipe layout. PEX piping shall not be exposed to UV prior to or during installation and must be warranted for a minimum of 30 days exposure.

.6 Protect piping and manifolds from entry of contaminating material by installing suitable plugs in all open ends until installation. Where possible, connect pipes to assembled manifolds to eliminate possibility of contaminants.

.7 Provide lockable metal access covers for all manifold locations.

.8 The Contractor shall submit the following for review and acceptance by the Consultant prior to installation: specifications for all components of the system, confirmation of compliance with referenced standards, confirmation of municipal approval, confirmation in writing from the manufacturer that the installer is trained and approved to install the system and a copy of the manufacturer’s warranty.

.2 FIXTURES

.1 Provide fixtures of same make, model and colour throughout project.

.2 All faucets shall meet the American Disabilities Act Guidelines and ANSI A117.1 requirements for
the physically disabled.

.3 Provide aerated low flow fixtures for the bathroom: 2 LPM/0.5 GPM faucet, and 5.7 LPM/1.5 GPM showerhead. Fixtures shall display CSA approval.

.4 Plumbing fittings shall be to CAN/CSA B125, Plumbing Fittings.

.5 Plumbing fixtures shall be to CAN/CSA B45, ‘General Requirements for Plumbing Fixtures.’

.6 Vitreous china plumbing fixtures shall be to CAN/CSA B45.1, ‘Ceramic Plumbing Fixtures.’

.7 Enamel cast iron plumbing fixtures shall be to CAN/CSA B45.2, ‘Enamel Cast Iron Plumbing Fixtures.’

.8 Porcelain enamel steel plumbing fixtures shall be to CAN/CSA B45.3, ‘Porcelain Enamel Steel Plumbing Fixtures.’

.9 Stainless steel plumbing fixtures shall be to CAN/CSA B45.4, ‘Stainless Steel Plumbing Fixtures.’

.10 Plastic plumbing fixtures shall be to CAN/CSA B45.5, ‘Plastic Plumbing Fixtures.’

.11 Cartridge shall be brass with ceramic disc and 5 years warranty.

.3 WATER CLOSETS

.1 Low Flush Water Closets: Vitreous China, ADA compliant, free standing elongated rim, wash-down bowl, china bolt caps, single flush 4.8 LPF (1.3 GPF), min. 54 mm (2-1/8") fully glazed trapway, and comply with the latest edition Maximum Performance (MaP) testing rated at 1000 gram of waste per flush.

.2 Water closets shall be closed front with cover seat that shall be rugged, high impacted solid plastic that is highly stain and chemical resistant with stainless steel hardware package and factory-installed top tite hinges.

.3 Water closets shall be supplied with chrome-plated supply line, escutcheon plate and ball-valve type fixture stop.

.4 KITCHEN SINKS

.1 Sink shall be grade 18-8 stainless steel, single bowl counter mounted sink complete with back ledge, self rimming, sound deadening, mounting kit, strainer, and 89 mm (3-1/2") crumb cup.

.2 Faucet shall be deck mounted, solid cast brass lead-free body complete with washerless, ceramic drip-free disc valve cartridge, 240 mm (9-1/2") long cast swing spout with vandal-resistant, 5.7 LPM (1.5 GPM) flow pressure compensating aerator outlet, removable brass escutcheon plate, single control metal lever handle, flexible copper supplies and less hand spray (cap provided for non-spray application).

.3 Where a faucet is installed on a island type counter the faucet is to have a maximum swing of 180 degrees

.4 Mixing valve with Thermostatic Limit Stop, with temperature adjusting dial and with integral back checks, metal angle stops, adaptors, escutcheons and metal flexible risers.
.5 Sink Dimensions

.1 Standard applications: 521mm x 508mm x 178mm (20-1/2" x 20" x 7") deep complete with mirror finished rim, satin finished bowl, and 38 mm (1-1/2") tailpiece.

.2 Wheelchair accessible applications: 522mm x 511mm x 127mm (20-9/16" x 20-1/8" x 5") deep, satin finished rim and bowl, and with rear corner 38 mm (1-1/2") tailpiece, located in left hand back corner. Provide sanitary covering that is vandal-resistant flexible seamless construction, anti-microbial, to exposed piping (to protect against heat/contusions) as per local codes.

.5 AMENITY AREA

.1 Sink for the recreation area shall be a double compartments, 18-8 grade stainless steel counter mounted sink complete with back ledge. It shall be selfrimming, with 89 mm (3-1/2") crumb cup, strainers, sound deadening coating and come complete with mounting kit.

.2 Faucet shall be deck mounted, and have a solid cast brass lead-free body, washerless, ceramic drip-free disc valve cartridge, 240 mm (9-1/2") long cast swing spout with vandal-resistant, 5.7 LPM (1.5 GPM) flow pressure compensating aerator outlet. The faucet shall also come with a removable brass escutcheon plate, single control metal lever handle, flexible copper and omit the hand spray (cap is to be provided for non-spray application).

.3 Mixing valve with Thermostatic Limit Stop, with temperature adjustment dial and with integral back checks. Complete with metal angle stops, adaptors, escutcheons and metal flexible risers.

.6 LAUNDRY

.1 Utility sink for the laundry shall be a single compartment, deep bowl, grade 18-8 stainless steel 560mm x 651mm x 305mm (22-1/16" x 25-5/8" x 12") deep counter mounted sink, with back ledge, mirror finished rim, satin finished bowl, self rimming, with crumb cup strainer, 38 mm (1-1/2") tailpiece, sound deadening and mounting kit, 89 mm (3-1/2") crumb cup and strainers.

.2 Faucet shall be deck mounted, and have a solid cast brass, lead-free body, washerless, ceramic drip-free disc valve cartridge, 240 mm (9-1/2") long cast swing spout with vandal-resistant, 5.7 LPM (1.5 GPM) flow pressure compensating aerator outlet. The faucet shall also come with a removable brass escutcheon plate, single control metal lever handle, flexible copper supplies and omit the hand spray (cap is to be provided for non-spray application).

.3 Provide mixing valve with Thermostatic Limit Stop, with temperature adjustment dial and with integral back checks. Valve shall be complete with metal angle stops, adaptors, escutcheons and metal flexible risers.
.7 JANITOR ROOMS

.1 Janitor room shall be provide with precast terrazzo floor mounted, mop sink, 610mm x 610mm x 254mm (24" x 24" x 10") deep, and Integral Cast Brass Drain with stainless steel strainer 75 mm (3") outlet.

.2 The faucet shall be wall mounted, cast brass body, with metal handles, integral vacuum breaker, integral stops, hose end, pail hook and top brace.

.3 Provide bracket and 915 mm (3') hose with coupling, bumper Guards, 3 stainless steel mop hangers, drain gasket, connection for 75mm (3") pipe, stainless steel back splash panels, on two sides and ‘p’ Trap.

.8 BATHTUBS (FAMILY PROJECTS)

Bathtubs must be non-slip, stain resistant, porcelain enameled steel with plug and chain drain, sound deadening, overflow, over-rim spout and cast brass trap. Fiberglass bathtubs are not acceptable. Provide tub spout with diverter and pressure-balanced single lever, non-scalding type valve with integral stops and high temperature limit safety stop.

.9 PRE-FABRICATED SHOWER UNIT – FOR ADAPTABLE AND SENIOR TENANT’S SUITES

.1 One piece, Gelcoat finish, reinforced with fibreglass, to minimum 914 mm x 1521 mm (3' x 5'). Includes three grab bars, wall hook and low curb at floor. In lieu of acrylic grab bar install 32 mm diameter, 914 mm long stainless steel grab bar (1-1/4" x 3'). For Renovation project, two or three piece shower unit can be considered, if one-piece cannot be installed due to existing bathroom configuration. Make sure the potential leak sources are sealed properly to prevent water damage.

.2 Provide pressure balanced single lever, non-scalding type valve with integral stops, and high temperature limit safety stop. Provide a push button hand-held showerhead and vacuum breaker. Shower heads shall be low flow, limiting water flow to 5.7 LPM (1.5 GPM) or less.

.10 PRE-FABRICATED SHOWER UNIT – FOR WHEELCHAIR ACCESSIBLE SUITES

.1 One piece barrier-free, fibreglass or custom non-slip showers for wheelchair accessible suites, to minimum 974 mm x 1586 mm (3' 2-3/8" x 5' 2-1/2"). Includes three grab bars, folding seat, and rollover threshold to maximum 13 mm (1/2"). Conform to recommendations of CSA B651. Provide pressure balanced single lever, non-scalding type valve with integral stops, and high temperature limit safety stop. For Renovation project, two-piece shower unit can be considered, if one-piece cannot be installed due to existing bathroom configuration. Make sure the potential leak sources are sealed properly to prevent water damage.

.2 Provide a combination stainless steel slide/grab bar with 1778mm (5'-10") long hose, push button hand showerhead and vacuum breaker. Shower heads shall be low flow, limiting water flow to 5.7 LPM (1.5 GPM) or less.

.3 Confirm with tub/shower supplier that reinforcing or backing is provided behind the tub/shower wall to support the installation of the slide/grab bar.
.11 LAVATORIES

.1 Lavatories shall be vitreous china self-rimming lavatory basin with rear overflow.

.2 Lavatories shall be supplied with chrome single lever washerless faucet with ceramic disc cartridge and temperature limit stop.

.3 Low-Flow faucet aerators must be provided for bathroom sinks and any faucet used primarily for hand washing, limiting water flow to 2 LPM (0.5 GPM) or less.

.12 MANHOLE COVERS AND CATCH BASINS

.1 Provide manhole covers and catch basins with circular precast sewer cover sections with top sections having eccentric cone or flat slab top type with opening offset for vertical ladder installation. All bolt down applications must have pentagon style heads.

.2 Provide light duty type manhole and catch basin frames and covers for landscape service and heavy duty traffic type for all other applications.

.3 Castings to be coated with two applications of asphalt varnish after being sand blasted or cleaned and ground to eliminate surface imperfections.

.4 Set frame and cover to required elevation on no more than 4 courses of brick. Bricks to be jointed and bonded to frame with cement mortar. Parge brickwork and make smooth and watertight.

Execution

.1 Damaged or repaired bathtubs will not be accepted.

.2 Penetrations through exterior walls must be sealed to the water barrier of the wall assembly using self-adhesive bituminous membrane and/or expanding foam sealant suitably applied to protect from weather penetration. The method of sealing penetration must be acceptable to the building envelope consultant.

.3 Caulk plumbing fixtures where fixture contacts wall, floor or vanity. Refer to Division 07 92 00 - Joint Sealants, for acceptable products.

.4 Piping

.1 Installation shall comply with the manufacturer’s specifications and be carried out by a trained installer, certified by the manufacturer.

.2 Insulate all domestic hot cold and recirculation piping with preformed glass fibre type insulation. Insulate all domestic hot and recirculation piping as required ASHRAE 90.1 - 2010 and MNECB 2011. PEX piping in slab is not required to be insulated but shall be sleeved.

.3 Provide supports for pipes. Maintain required grading by adjustment; allow for expansion and contraction and produce a neat appearance. Design supports to suit loading and services. Prevent undue stress to structural members. Supports must secure pipe and prevent vibration.

.4 For all copper horizontal piping use wrought clevis hangers 25 mm (1") larger than pipe diameter suitable for vertical adjustment, isolated from pipe with plastic tape.
.5 Provide access panels to concealed valves and clean-outs. ULC rating required in rated assemblies.

.6 Install escutcheon plates at piping penetrating wall and at exterior hose bibs.

.7 Provide a metal access panel for all hose bibs with concealed isolating valves.

.5 SEISMIC RETRAINT

.1 Seismic restraint must be provided for all mechanical equipment and accessories including attachment to structural members where required by code.

.2 Letter of Assurance from Seismic Engineer on commencement of design and completion of field review must be provided where required.

.6 ACOUSTICAL CONSIDERATIONS

.1 Consultant to review acoustic requirements and incorporate or revise the following standards to achieve required STC ratings:

.1 Plumbing (including RWL’s) shall be installed without direct contract to drywall or studs. Position risers/wastes in centre of wall chase to meet this requirement. Where concrete penetrations (cans) are not centred on plumbing chase; advise site superintendent.

.2 Oversize sleeves through structure. Use firestopping and smoke seal in accordance with Section 5 – Division 07 80 00 – Firestopping and Smoke Seals. Support plumbing at floor level only.

.3 Where risers serve suites on each side, provide individual take-offs from riser. Do not service two suites through single “T” connection off riser. Minimum size for end of riser is 19 mm (3/4") for 13 mm (1/2") takeoffs on each side. Provide premanufactured water hammer arrestor at all riser terminations and at appliances with solenoid activated valves.

.4 To avoid contact with studs and drywall, orient all pipe clamps parallel to walls. Only use plastic pipe clamps on 13 mm (1/2") diameter supply piping with suite being served. Attach wing back elbows, shut off valves, faucets, etc., to separate wood plates in separate rows of studs in party walls. Provide clearance and use resilient (fire) caulking where piping passes through party walls and floors. The intent of these requirements is to minimize bridging of wall by plumbing system.

.5 Where supply pipes serve suites above, suspend piping from hangers from the floor above. On supply piping, use oversized hangers/straps and include layer of resilient, 13 mm (1/2") thick neoprene, pipe insulation between hanger and insulated pipe, with metal shim to distribute load (20% maximum compression). Fibreglass pipe insulation is also acceptable provided manufacturer’s loading criteria are met.

.6 Where main wastes are offset, isolate pipe clamp at offset floor using 6 mm (1/4") thick 60 durometer neoprene pads. Cut pads to size of clamp with clearance on each side, e.g., about 51 mm x 75 mm (2" x 3"). Load pads evenly not exceeding 4140 kPa (600 psi). If necessary, provide trowel finish topping under pads if concrete floor is not smooth. Provide layer of resilient, 13 mm (1/2") thick neoprene pipe insulation (20% maximum compression) in oversize pipe clamps for first two hangers after bend.
.7 Maintain minimum 13 mm (1/2”) clearance between pipes and studs, electrical conduit, or other pipes. If clearance is minimal, use resilient neoprene insulation to avoid contact. This requirement is to avoid rattling between pipes.

.8 Do not use foam spray-on products for insulation.

.9 Approval of the plumbing system is required before insulation and drywall work is started. Do not commence final boarding until plumbing has been reviewed for clearance.

.10 Submit shop drawings showing equipment and installation details to isolate equipment. Supplier to visit site as necessary to ensure an acceptable installation.

.11 Isolate pumps and other equipment which may generate vibration on Mason BC neoprene isolators or neoprene hangers, unless otherwise specified. Immediately upstream and downstream of all 3500 rpm pumps, provide flexible pipe connectors (multi-layered nylon tire cord fabric reinforced with EPDM cover and liner). Provide shut-offs to allow replacement of connectors without draining system.

.12 Isolate piping for 10 m (32'-10") upstream and downstream of all pumps and other equipment generating vibration. Isolate main water supply pipe from street supply to 10 m (32'-10") downstream of booster pump using thermal insulation of neoprene hangers. Use oversize clevises outside insulation with high density block rated for pipe weight pipe support insulation. Do not use rigid ceramics, etc. Where pipes pass through walls, avoid rigid contact and provide continuous insulation. If fire rating is necessary do not grout. Use soft fireproof caulking.

.13 Insulate all vibrating equipment, pumps and piping in mechanical rooms as described above. In penthouses, isolate boilers, hot water tanks, etc. on rubber pads (Durometer 50 with a max 15% deflection per 50mm x 50mm at 80kg/s) pads with hold down bolts and grommets.

.14 Use cable restraints only on isolated piping and equipment. Do not bridge isolation elements.

.15 Avoid all contact between plumbing and framing/drywall. Frame all plumbing chases and drop ceiling plumbing cavities at least 25 mm (1") larger than the maximum insulated collar size of the piping in the cavity. Loosely insulate cavity with R8 or R10 Fibreglass Home Insulation on each side of pipe. Avoid compression of the insulation between piping and drywall. Where plumbing chases are in bedrooms or living rooms, provide two layers of drywall.

.16 Where bathrooms/kitchens occur above critical spaces such as bedrooms/living rooms, provide suspended ceiling consisting of framing spanning between walls and two layers of drywall with R10 insulation in cavity. To avoid rigid connection of metal framed walls to kitchen/bathroom floors above, include deflection header detail in wall framing incorporating interlocking tracks with isolating tape between flanges 5 mm x 25 mm (3/16" x 1") standard tape. Ensure no contact of any drywall/framing to plumbing and do not compress insulation under pipes.

End of Section
23 00 00 - Heating, Ventilating and Air Conditioning

1 General

Multi Unit Residential buildings shall be designed to use 26% less energy than required by ASHRAE 90.1-2007, also reference Section 3 - Energy and Environmental Design.

BC Housing is committed to achieving optimal energy performance on equipment and materials that are specified for our existing buildings and in new developments. As such, BC Housing is committed to selecting energy efficient materials and securing all rebates and incentives associated with these energy efficient choices. The Consultant is to ensure that any of these applicable programs are included and captured in all projects.

Designing and specifying material and/or equipment must account for local servicing availability and accessibility of parts for future maintenance and replacement.

.1 QUALITY ASSURANCE

.1 All heating, ventilating and air-conditioning systems must be designed and inspected by a professional mechanical engineer registered in the Province of B.C.

.2 Installation must be by skilled tradesmen holding a valid TQ license of apprentices under the supervision of a licensed tradesman. As required, installers must be trained and certified by system and equipment manufacturers to conform to warranty provisions.


.2 WARRANTY

.1 Provide full 2 years warranty for all for new construction and renovation projects. This includes all materials and labour of mechanical systems. The mechanical systems shall include HVAC systems, plumbing and fire protection.

.2 Provide full 2 years of service and maintenance contracts for new construction and as appropriate for renovation projects for overall mechanical systems including control systems. The service contracts are to follow the manufactures recommended annual maintenance recommendations and running inspections throughout the 2 years. They shall include one major annual maintenance visit and a minimum of three running inspections each year. All findings and work completed shall be recorded in a report format and issued to the owner.

.3 Consideration should be given to further extended warranties on all products in northern and more remote regions of the province.

.3 DESIGN REQUIREMENTS

.1 Provide positive pressurization in all common corridors.

.2 Insulate pipes and ducts to ASHRAE 90.1-2010. Avoid duct liners where possible. If used, provide as a minimum, acrylic coating formulated with anti microbial agent to resist microbial growth.
as determined by ASTM. Design the heating system to comply with ASHRAE 55 most current edition Thermal Comfort Conditions for Human Occupancy.

.3 Direct Digital Controls (DDC): Where applicable, provide a permanent monitoring system to ensure building performance to the desired comfort level as determined by Item 4. DDC to monitor all main equipment and temperature of all common areas. Where DDC system is used, make sure the following requirements are met:

.1 The system should be non-proprietary.

.2 The system design should take into account the regional consideration, local availability of servicing and accessibility of the equipment, capacity of the operator to effectively maintain and use the equipment and cost associated to operate and run the facility.

.3 It is recommended that the Operator maintain a contract with an experienced controls service provider. If the Operator has a separate mechanical service provider, make sure the mechanical service provider is coordinating with the controls provider to troubleshoot issues and maintain systems.

.4 The Operator will maintain a business internet service with a static IP address.

.5 All controls to be clearly labelled, easy to locate and networked together unless otherwise specified. Detailed network layout with panel locations, network/circuit numbers to be provided by the controls contractor.

.6 Programming: all equipment with status to be placed in a runtime log. All points to be trendable, stored on externally accessible server for three years minimum and all outputs to have individual programs.

.7 Graphics: all graphics are to show the outdoor air temperature. A summary page will graphically display all units and hotlinks from this page will take the end-user to pages for mechanical units.

.8 BACnet: all components should be native BACnet and must supply protocol implementation conformance statements. BACnet must connect to the Building Management System (BMS), communicate on 47806 and/or 47808 (port must be interchangeable) and have BACnet over IP integration.

.4 Design Temperatures (Heating): Design to indoor design temperature of 21°C (70°F). System design shall be based on BC Building Code climatic data for the 2.5% January design temperature for the location.

.5 Design Temperatures (Cooling): Design for maximum indoor temperature of 24°C (75.2°F) when outside air is 30.5°C (87°F). Maintain a difference of 8.5°C (15°F), when outside temperature exceeds 30.5°C (87°F).

.6 Provide base connections to enable independent gas metering where applicable, areas with separate lease agreements or separate Operators.

.7 The Consultant shall take into consideration project specific factors such as climatic data, microclimate conditions, building envelope thermal resistance, orientation, glazing area and other relevant factors that affect heat gain to determine heating and cooling requirements for the project and to ensure compliance with the Design Temperature performance requirements.
noted in this section and conduct load calculations using dynamic modeling software.

.8 The Consultant shall take into consideration redundancy in the design of the mechanical systems. When centralized mechanical systems serve multiple dwelling units a failure of equipment shall not cause a total failure of that system. i.e. provide multiple circulation pumps, provide multiple boilers, multiple hot water tanks etc.

.4 AIR CONDITIONING

.1 Air Conditioning is required for all projects as noted below (refer to the BC Building Code, Appendix C, for climatic data):

.1 In all areas of the building (e.g., dwelling units and common areas) – in municipalities where the July 2.5% design temperature is equal to or exceeds 30.5ºC dry bulb and where the indoor temperature would exceed 25ºC at the above design temperature.

.2 Refer to the BC Building code to determine which municipalities exceeds 30.5ºC dry bulb in July for 2.5% of the year. In common areas only, but not including corridors (e.g., amenity, administration and support.) – in municipalities where the July 2.5% dry bulb temperature is less than 30.5ºC, unless factors noted above indicate a need for cooling in the residential suites.

.2 Individual air conditioner units that mount in the windows are not permitted.

.3 All penetrations through the building envelope must be approved and reviewed by the building envelope consultant.

2 Products

.1 HEATING SYSTEM – ENERGY SOURCE

The heating system will meet the requirements of Section 3 – Energy and Environmental Design and as stated in Section 1 – 9.2 Heating, Ventilation and Cooling Systems.

.2 HEATING SYSTEMS

The heating system and its selection is the responsibility of the design team. It shall be selected to suit the building construction and the energy code requirements. The selection of the systems shall take into account, system operation and maintenance, with the aim of simplicity. The chosen system shall be discussed and explained with the building owner/operator during the schematic design phase and sign off is to be achieved prior to the commencement of the contract documents. This is to ensure that the system proposed is robust and with the capability of the service team who will operate and run the facility.

For renovation projects, consideration should also be given to the existing equipment, systems and overall condition of the building before selecting the heating system and equipments.

It can be one or more of the heating systems, following the requirements below:

.1 Electric Heating

.1 Where electric heat is installed the following must be provided:
.1 For wall inserted units, the equivalent of RSI 3.5 (R20) insulation above, below and behind the heating unit.

.2 For baseboard heaters, locate in bedrooms and living rooms under windows. Blank walls should be left clear of heaters to allow for furniture installation. Coordinate the location of heaters with the furniture layout, this may require heating units to be split into multiple units.

.3 Ensure heaters are mounted in accordance with the manufacturers requirements. Ensure carpet installation does not block intake and ensure maximum air circulation.

.4 Avoid installation of heaters in kitchens due to cleaning problems and lack of wall space.

.5 All electric heaters must be equipped with anti-ticking guides to eliminate expansion/contraction ticking.

.2 Electric heating must be controlled by wall-mounted thermostats installed at 1067 mm (3'-6") above the finished floor, directly above room light switch (same centre line). Built-in thermostats are not permitted on heating appliances. Thermostats must not be installed in locations susceptible to drafts, direct sunlight or near heat sources. All thermostats must provide sensitivity to 16.6°C (2°F). Night set back thermostats must be provided for rooms exceeding 2000 watts of electric heat.

.3 Co-ordinate electrical power supply requirements with Division 16000 General Electrical Provisions.

.2 Forced Air Heating

.1 All furnaces shall be High-efficiency furnaces at >90% efficient.

.2 Separate combustion and ventilation air shall be provided to each furnace room.

.3 At least one heating outlet per habitable room shall be installed, located at the floor level. Outlets at the ceiling are not acceptable. For each floor/dwelling unit there shall be at least one return duct. Do not locate heating ducts under refrigerators or food storage cabinets.

.4 Ducts in walls shall be a minimum of 50 mm x 300 mm (2" x 6").

.3 Hot Water Heating

.1 If the boiler serves more than one dwelling unit it must be installed in a separate room, boilers shall not be installed on combustible floors.

.2 Each boiler shall have its own circulator pump and each boiler shall be equipped with a flow switch, backflow preventer, automatic pilot ignition and flue draft control.

.3 Each system must have a pressure by-pass to provide boiler circulation, if all zones are in a closed position.

.4 If the boiler supplies hot water only for infloor heating coils, the maximum supply temperature shall not exceed 60°C (140°F).

.5 The B-vent design shall be stainless steel if the stack temperature allows for condensation of flue gases in either the chimney or boiler.
.4 **Hot Water Baseboard Heating**

.1 Hot water heating must not be combined with the domestic hot water supply through heat exchangers.

.2 Provide separate heating loops for each unit with appropriate isolation, balancing and control valves.

.3 Control radiators and convectors with wall mounted thermostats, provide a separate thermostat for each bedroom and one for the common areas. Do not install thermostats in areas subject to drafts or direct sunlight or near heat-sources such as warm air registers, refrigerators or ranges. Install vandal-resistant thermostats and baseboard covers in public areas. All baseboard radiation units shall have isolation valves.

.4 Each riser must have an automatic air vent on the return side.

.5 Type “L” copper tubing or better must be used for hot water baseboard heating. Non-metallic pipework is not permitted.

.5 **Infloor Heating**

.1 Provide the detailed design information on the drawings for all heating zones including, but not limited to, room identification, total heat loss calculation room by room, floor covering insulation value, supply water temperature, design temperature drop, tube size and spacing layout, total length, number of loops and flow rate required per zone, location of headers and thermostats.

.2 Supply water temperature in the in-floor loop shall not exceed 48°C (120°F).

.3 All installations shall be tested with minimum twice the working pressure, the test shall stay on during the construction period.

.4 All tubes and recommended fasteners shall be placed as per this guideline, and to the manufacturer’s specifications. Tube spacing should not exceed 305 mm (12”) centre to centre. Each loop must be fastened at each bend, and spacing between each fastener should not exceed 914 mm (3’). The length per loop in a zone for 12.7 mm (1/2”) tubing shall not exceed 76.2 m (250’).

.5 Designate loops room by room and shall not be installed within close proximity of water closet wax seals.

.6 No pipework tubing joints are permitted under the slab, or in any hidden areas. Tubing shall not be placed under any area where a fridge or freezer may be placed, or under any cabinets.

.7 Topping should be gypsum concrete, or equivalent. Minimum 19 mm (3/4”) coverage shall be provided by the topping. Exposed PEX piping shall be protected from UV exposure during construction.

.8 At exterior walls, tubing should be installed 150 mm (6”) on centre up to 1200 mm (4’) from the wall.

.9 Only tubing with an oxygen barrier is permitted, and shall meet permeation levels required in German Din 4726 Standard.

.10 Solid PVC sleeves shall be provided where tubes pass through concrete floors.
.11 Provide a separate zone with an electronically controlled thermostat for each bedroom, and one for the common areas, installed at 1067 mm (3'-6") above the finished floor.

.12 Each radiant zone shall be equipped with the following:

.1 a supply and return manifold, complete with a lockable metal access cover
.2 an automatic air vent on the return manifold
.3 balancing, or isolating valves on each loop, supply and return
.4 a zone valve with an end switch
.5 labels, or tags indicating room, and area of service, and length of each loop
.6 a thermometer on the supply and return manifold
.7 a drain

.3 AIR CONDITIONING – SUITES

.1 All air conditioning units shall be Energy Star rated.
.2 All units shall have electronic, remote mounted thermostat.
.3 HVAC&R systems shall not use CFC or HCFC-based refrigerants.
.4 Chassis shall be slide-in, plug-in type; ready to operate after installation. Hermetically-sealed refrigerant system with external vibration isolated rotary type compressor, condenser and evaporator coils and capillary refrigerant control.
.5 Noise Rating: Supplier to submit sound power levels for unit operation and allow for field review of an operating system prior to ordering equipment. Unit suitability is dependent upon the outcome of the field review.
.6 Installation: Install to Manufacturer’s recommendations. Secure unit rigidly to chassis, seal around chassis, mount true to wall frame.

.4 VENTILATION

.1 Develop and implement a construction indoor air quality management plan and test before occupancy to minimize indoor air quality problems from construction. Refer to LEED® Canada Construction IAQ management plan.
.2 Fresh air intakes must be galvanized steel or aluminum watertight hood type or weatherproof louver type with insect protection. Wall type grills are not acceptable. All exhaust hoods must have a backdraft damper. Intakes must be designed to prevent rain penetration at design wind pressure for the location. Connections must be sealed to the weather barrier of the wall assembly. Each hood must be connected to the duct it serves by durable airtight connections. Screens must be removable for cleaning, without seal damage.
.3 Exhaust and fresh air intakes must connect directly with the exterior. Venting through a soffit is not acceptable. Provide a minimum 3048 mm (10'-0") separation between exhaust vents and fresh air intakes.
.4 Fresh air ventilation shall meet the requirements of ASHRAE 62.1 2001 except Addendum N. (If
the project is following LEED later versions of ASHRAE 62.1 should be referenced to confirm compliance with the rating scheme). The largest air flow will take precedent for design. In areas of variable occupancy such as amenity spaces, install a permanent carbon dioxide (CO₂) monitoring system that provides feedback on space ventilation performance that allows operational adjustments. Outdoor air shall be distributed to all occupied spaces within the building.

.5 Carbon monoxide alarms installed in suite and common spaces near combustion equipment. IAQ testing is required of all suites at the end of construction and immediate prior to occupancy to develop a baseline indoor air quality profile. Sampling will be conducted for at least 10% of the first 100 dwelling units in the building and 5% of any additional units by a certified industrial hygienist or a licensed engineer. Tested suites should attempt to be a relative selection of different units with different elevations in the building and on different floors.

.5 SUITE VENTILATION

.1 Suite ventilation to comply with the requirements of ASHRAE 62 edition and Addenda accepted by Authority Having Jurisdiction and British Columbia Building Code. Where smoking is permitted in suites, BC Housing requires a minimum ventilation rate of 1.0 ACH to ensure that adequate indoor air quality and ventilation is maintained.

.2 Suite ventilation systems may have heat recovery with a minimum sensible heat recovery effectiveness of 60%. Principal exhaust fans shall run continuously. A recommended approach is to duct bathroom exhaust fans into a central duct and pass exhaust air through a central heat recovery unit that may be used to pre-heat central make-up air. Limiting the suite duct size to less than 5 inch diameter eliminates the requirement for fire dampers through partitions. Heat recovery shall be equipped with a by-pass to limit overheating during the summer.

.3 Provide kitchens with range hoods as per Division 11 30 00 – Residential Equipment.

.4 Non centralized bathroom exhaust systems shall utilize ultra-quiet, energy star exhaust fans with a maximum 1 sone at 80 CFM. Consider exhaust fans that runs 24 hours with an occupancy sensor to bring the exhaust down to 30 CFM (from 80 CFM) when the room is unoccupied after a delayed period of time.

.5 In centralized building exhaust systems the principal exhaust fans, that run continuously, should have variable speed motors.

.6 TENANT LAUNDRY ROOMS

.1 Provide make up air supplied directly from the exterior or other means as required by the mechanical consultant. Include provision for adequate make up air. Make up air shall be in equal volume to the exhausted air volume. The makeup air must be heated to room temperature with fully modulating controls. Transfer of excess air from surrounding rooms may be used. Consider concentric supply and exhaust duct with exhaust in centre duct and makeup air in external ring to back of dryer with sufficient heat provided behind the dryer to finish heating the makeup air.

.2 Exhaust dryers directly to building exterior (outside). Do not use plastic or thin foil ducting, use rigid metal duct.

.3 Provide dryer exhaust duct(s) to 102 mm (4”) from floor level.

.4 Consultant to ensure that adequate space is provided to service commercial equipment.
.7 PARKING EXHAUST

Provide mechanical exhaust ventilation for common underground or enclosed parking areas, controlled by CO and combustible gas sensors. Locate parking exhaust louvers a minimum of 3048 mm (10'-0") clear of any operable window or fresh air intake.

.8 TEMPORARY USE OF SYSTEMS

.1 The Contractor shall obtain the Owners’ permission prior to using any permanent heating or ventilation systems during construction.

.2 Prior to approval, the Contractor shall confirm in writing that use of heating equipment during construction does not void warranty. If approved, the Contractor must ensure that all filters are in place prior to use of the equipment.

.3 The Contractor must also overhaul any mechanical equipment used for temporary heating or ventilation, prior to completion of project as follows:

   .1 Replace all filters.
   .2 Clean all pipes and ducts.
   .3 Inspect, service and lubricate all equipment.

.9 LABELING

.1 In projects with a central distribution system, identify main valves, pipes and devices. In individual units identify each hot water heating zone indicating room, area of service and length of each loop if system is radiant in-floor heating.

.2 Band main piping with 51 mm (2") wide pressure sensitive self-adhering plastic coated tape, colour-coded. Provide colour code and arrows and words to identify pipe or duct function and flow direction.

.3 Provide colour-coded piping in boiler and equipment rooms complete with flow indication. Provide to each valve in these rooms a brass tag, embossed with valve number. Install charts listing these valves and their purposes, together with remarks concerning operation, in glassed-in frames fixed to the walls of rooms.

.4 Provide a directory of these valves.

3 Execution

.1 Connect natural gas supply lines to equipment with proper approved flexible connectors.

.2 Construction assembly penetrations:

   .1 Fit wall finishes and cabinet backs with escutcheon around openings for supply and waste piping where pipes are hidden in cabinetry.

   .2 Caulk gaps between wall finishes and pipes where the gap is less than 13 mm (1/2"). For gaps greater than 13 mm (1/2"), provide escutcheon plate.
.3 Where escutcheon plates are too small to cover the gap, neatly patch with the prefinished material used for cabinet backs or with the same wall finish as the pipe surround.

.4 All openings through fire separations shall be repaired to maintain the integrity of the fire separation. Any openings around piping or ductwork shall be sealed with a ULC listed fire-stop and smoke seal system. Refer to Division 07 80 00 – Firestopping and Smoke Seals.

.5 Provide vibration and acoustic isolation treatment for mechanical equipment, to prevent vibration and noise transference to adjacent living spaces.

.3 PIPING

.1 Insulate heating and cooling piping with preformed glass fibre type insulation. Insulate all supply and return piping as required by ASHRAE 90.1 - 2010 and follow BC Insulation Contractors Associations approved insulation details.

.2 Provide supports for pipes. Maintain required grading by adjustment; allow for expansion and contraction and produce a neat appearance. Design supports to suit loading and services. Prevent undue stress to structural members. Supports must secure pipe and prevent vibration.

.3 For all copper horizontal piping use wrought clevis hangers 25 mm (1") larger than pipe diameter suitable for vertical adjustment, isolated from pipe with plastic tape.

.4 Provide access panels to concealed valves and clean-outs. ULC rating required in rated assemblies.

.5 Install escutcheon plates at piping penetrating wall.

.4 DUCTS

.1 All duct joints must be sealed with a water-based duct sealant to ensure no air leakage into surrounding space. Where a duct passes through cold space, it must be insulated with glass fibre wrap to ASHRAE 90.1 - 2010 and to prevent condensation within the duct.

.2 Ducts which penetrate the weather barrier of the exterior wall assembly must be sealed to the weather barrier using self-adhesive bituminous membrane, expanding foam sealant, and/or an accessory specifically designed to provide a water and air tight connection to the weather barrier of the exterior wall assembly.

.3 Make up air duct shall be insulated to appliance as required by ASHRAE 90.1 - 2010 if it passes through a heated space.

.5 SEISMIC RESTRAINT

.1 Seismic restraint must be provided for all mechanical equipment and accessories including attachment to structural members where required by code.

.2 Letter of Assurance from Seismic Professional Engineer Registered in BC on commencement of design and completion of field review must be provided to confirm that seismic restraint meets regulatory requirements.

End of Section
26 00 00 - Electrical

1 General

.1 Sustainable, Energy Efficient, Green and LEED® strategies are fundamental design strategies to be implemented in the project. Refer to Section 3 - Energy and Environmental Design.

.2 Each project shall be designed in accordance with the specific requirements of available incentive programs such as BC Hydro’s Power Smart Program. The Consultant shall complete and submit BC Hydro Lighting Calculator to BC Housing at the Construction Document review phase. Reference the BC Hydro Lighting Calculator for additional design guidelines. Refer to Section 3 - Energy and Environmental Design.

.3 Measures shall be implemented to reduce energy consumption in association with the requirements outlined in Section 3. Control systems shall be installed to reduce energy consumption and shall include measures beyond the mandated requirements. Whenever practical utilize lighting controls like occupancy sensors, vacancy sensors, day lighting sensors etc. As a minimum provide for occupancy sensors in underground parking, bike storage, service rooms and closets.

.4 Provisions shall be included to reduce peak electricity demand by at least 10%, not including use of stand-by power generator (where provided). Refer to ASHRAE 189.1 for further information.

.5 All material and/or equipment installed must bear evidence of CSA approval or special CSA certification acceptable to the Chief Inspector of Electrical Energy for the Province of British Columbia, and/or the authority having jurisdiction.

.6 All equipment must remain clean during construction and be thoroughly cleaned to “as new” condition prior to Substantial Performance.

.7 Where, in the following clauses of the criteria, reference is made to the “Canadian Electrical Code (or CEC)” it must refer to the latest edition and addenda to the British Columbia Electrical Code Safety Act and Regulations as stated above.

.8 Execute all work in a professional manner, to present a neat mechanical appearance, co-ordinate and arrange equipment in proper relation with other apparatus, ducts, pipes, etc. and with building construction and finishes. Coordinate the installation with all other consultants, contractors and subcontractors for consistency and completeness.

.9 Refer to General Requirement section for details regarding project closeout deliverables such as As-Built Drawings and Maintenance Manuals.

.10 Elevators - Division 14 20 00 - Elevators for elevator requirements. Ensure provisions for all related infrastructure is included in the electrical/telecommunication systems.
.11 Review of structural drawings must be done to ensure that requirements for electrical penetrations, block-outs, etc through structural elements have been allowed.

.12 Warranty: Provide full two (2) years of warranty for all materials and labour. Contractor shall repair or replace any item which proves to be defective due to workmanship, equipment, or materials, without any cost to the Owner.

2 Products & Installation

1 UTILITY SERVICES

.1 Provide termination for incoming Hydro, Telephone and CATV ducts and cables. Obtain service connection point and locations of all ducts with Supply Authorities before installation. Provide nylon pull cord for Hydro, Telephone, and CATV ducts. Include all Hydro utility, Telephone utility and CATV charges. Include secondary conductors where required by the local Hydro utility.

.2 All service connections to utility networks must be underground unless directed otherwise by BC Housing and/or other relevant authorities.

2 MAIN DISTRIBUTION AND METERING

.1 Main service voltage must not exceed 250 V unless specific approval is received from the Owner and BC Housing. This condition is imposed to limit maintenance costs associated with services of higher voltage.

.2 Surge Protective Devices (SPD), as a minimum, must be provided on the service entrance main distribution (Category C).

In accordance with sound engineering practice additional protection if required shall be provided in category B and category A locations. SPD Installation shall conform to ANSI/UL 1449 current edition Standard for Safety for Surge Protection Devices.

.3 If required by codes, provide power and any monitoring of heat tracing.

.4 Continuous separate demand and consumption metering equipment shall be considered for lighting loads, mechanical loads, process equipment loads and power loads where it is determined that monitoring of energy demand and consumption values are beneficial, or to satisfy the requirements of LEED® Credit for Measurement and Verification. Minimum provisions shall include distribution design to facilitate installation of separate meters for each load type in compliance with ASHRAE. As a minimum requirement of the design, the Consultant shall define a methodology describing the implementation of demand and consumption metering equipment in the future.

.5 Demand side management provisions shall be incorporated in the design and installation of the main distribution equipment shall be in accordance with ASHRAE 189.1.

.6 A complete system of grounding must be provided in accordance with code requirements. In addition to code/safety requirements, adequate grounding must be provided for all technology systems as required by relevant standards.
.3 BRANCH CIRCUIT PANELBOARDS

.1 CSA approved panels must be provided. All common area Panelboards must be bolt on (or equal) moulded case circuit breaker type, with copper mains, rated for the available interrupting capacity.

.2 Residential suite panels must be provided with main disconnecting means (main breaker) and must incorporate a means to lock out range branch circuit.

.3 All two and three pole breakers must have common trip type with single handle.

.4 A minimum of 20% spare capacity must be provided for all common area Panelboards.

.5 Locate suite electrical panel board in an accessible location.

.6 Mounting heights for all devices must be in accordance with the table below:

<table>
<thead>
<tr>
<th>DEVICE DESCRIPTION</th>
<th>HEIGHT ABOVE FLOOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light switches – to centre</td>
<td>1067 mm (3'-6&quot;)</td>
</tr>
<tr>
<td>Duplex receptacles – to centre</td>
<td>455 mm (1'-6&quot;)</td>
</tr>
<tr>
<td>Thermostats and control devices – to centre; align vertically with light switch</td>
<td>1067 mm (3'-6&quot;) In some circumstances, depending on the housing and tenants, mounting height may differ</td>
</tr>
</tbody>
</table>

.4 WIRING METHODS

.1 The maximum ampacity of wire and cable must be based on the ratings as defined by 75° column of the applicable CSA 22.1 Canadian Electrical Code, Table 1 through 4.

.2 All wiring must be copper, except for main distribution feeders 100 Amps or larger and Residential Suite Panel feeders sized 60 Amps or larger where aluminum conductors of the same ampacity may be utilized. Aluminum wiring alloys shall be AA8030 (or NUAL) also known as Aluminum Conductor Material (ACM). Aluminum conductor terminations shall be completed using appropriately approved plating, hardware and processes. The installation shall conform to the following specification:

.3 Aluminum Alloy Conductors – Distribution Feeder Applications with Recommendations for Connections:

.1 Distribution Feeder Installation

.1 Distribution feeder conductors in sizes #6 AWG to 1000 kcmil may be copper or aluminum conductor material (ACM).

.1 Aluminum alloy conductors shall be compact stranded conductors of NUAL® (AA-8030) as manufactured by Alcan Cable or of a recognized 8000 Series aluminum alloy conductor material by the Aluminum Association.

.2 Manufacturer shall verify compliance with the elongation requirement per Table 10.1 of UL Standard 1581 for stranded AA-8000 series aluminum alloy conductors on wires taken from the conductor after stranding.

.2 Insulation:
.1 For use in raceways: Sizes #6 AWG to 1000 kcmil Type RW90, temperature rating 90º C.

.3 Connections for Conductors:

.1 Using Mechanical Screw Type Connectors:

.1 Connectors shall be dual rated (AL7CU or AL9CU) and Listed by CSA for use with aluminum and copper conductors and sized to accept aluminum conductors of the ampacity specified.

.2 Using a suitable stripping tool, to avoid damage to the conductor, remove insulation from the required length of the conductor.

.3 Clean the conductor surface using a wire brush and apply a CSA listed joint compound.

.4 Tighten the connection per the connector manufacturer’s recommendation.

.5 Wipe off any excess joint compound.

.2 Using Mechanical Compression Type Connectors:

.1 Connectors shall be dual rated (AL7CU or AL9CU) and Listed by CSA for use with aluminum and copper conductors and sized to accept aluminum conductors of the ampacity specified.

.2 The lugs shall be marked with wire size, die index, number and location of crimps and shall be suitably colour coded. Lug barrel shall be factory pre-filled with a joint compound Listed by CSA.

.3 Using a suitable stripping tool, to avoid damage to the conductor, remove insulation from the required length of the conductor.

.4 Clean conductor surface using a wire brush.

.5 Crimp the connection per the connector manufacturer’s recommendation.

.6 Wipe off any excess joint compound.

.3 Termination of Aluminum Conductor to Aluminum Bus:

.1 Prepare a mechanical connection conforming to .1 or .3.

.2 Hardware:

.1 Bolts: Anodized aluminum alloy 2024-T4 and conforming to ANSI B18.2.1 and to ASTM B211 or B221 chemical and mechanical property limits.

.2 Nuts: Aluminum alloys 6061-T6 or 6262-T9 and conforming to ANSI B18.2.2.

.3 Washers: Flat aluminum alloy 2024-T4, Type A plain, standard wide series conforming to ANSI B27.2.

.4 Lubricate and tighten the hardware as per the manufacturer’s recommendations.

.4 Termination of Aluminum Conductor to Copper Bus:

.1 Prepare a mechanical connection conforming to 1 or 2.
.2 Hardware:

.1 Bolts: Plated or galvanized medium carbon steel; heat treated, quenched and tempered equal to ASTM A-325 or SAE grade 5.

.2 Nuts: Heavy semi-finished hexagon, conforming to ANSI B18.2.2, threads to be unified coarse series (UNC), class 2B.

.3 Washers: Should be of steel; Type A plain standard wide series conforming to ANSI B27.2.

.4 Belleville conical spring washers: shall be of hardened steel, cadmium plated or silicone bronze.

.5 Lubricate and tighten the hardware as per the manufacturer’s recommendations.

.5 Termination of Aluminum Conductor to Equipment Not Equipped for Termination of Aluminum Conductor:

.1 Prepare compression connection using an adapter listed by CSA for the purpose or by pigtailling a short length of suitable size of copper conductor to the aluminum conductor with a compression connector Listed by CSA.

.2 Provide an insulating cover over adapter body or the compression connector.

.3 Terminate the adapter or the pigtail on to the equipment per manufacturer’s recommendation.

.4 NMD 90 cable in stud partitions may be used where permitted by code.

.5 Minimum conductor size must be #12 AWG except for 15 Amp branch circuits within residential suites, where #14 AWG may be used. The use of code accepted 20A branch circuit wiring for receptacles is not intended to be excluded, #12 AWG shall be used for 20A branch circuit wiring in residential suites.

.6 Distribution and Panelboard feeders must use either multiple conductor in conduits or multi conductor cables.

.7 Conduits must be EMT type except where susceptible to mechanical damage, where rigid threaded galvanized steel conduit must be used.

.8 Underground conduits for branch circuit wiring and conduits in slab must be heavy wall Rigid PVC or EMT where permitted by code.

.9 Use of ENT, commonly referred to as coreline, shall be reviewed on a project basis and approval shall be received from Owner and BC Housing prior to use. Under no circumstance shall ENT be utilized for telecommunication pathways.

.10 Where accepted, ENT conduit runs shall be installed neatly parallel or at right angles to building lines, must be supported using appropriate methods (tie wire is not appropriate), must be oversized and at no time shall conduit less than 3/4" be used.

.11 All conduits must be installed concealed in slabs, ceiling space or partitions except where permission is specifically obtained for running on the surface. Where exposed conduits must be painted to match surroundings.
.5 WIRING DEVICES

.1 Outlet boxes must be sized to suit the number of conductors. Boxes in concrete must be PVC. Plates must be either white or as approved by Electrical Consultant, Owner and BC Housing, plates in service areas and where susceptible to damage must be unbreakable or stainless steel.

.2 Line voltage switches in service areas must be specification grade, rated for 120 Volt, 20 Amp operation with quiet, quick make/break toggle movement and totally enclosed case.

.3 Receptacles in non-residential areas must be specification grade, duplex, polarized type complete with parallel and U-grounding slots and rated at 1-5/20 Ampere, T-slot 125 Volt. Mounting height must be 455 mm (1'-6") above finished floor to centre of box.

.4 All Receptacles in residential units shall be tamper proof type.

.5 All wiring devices in residential areas may be residential grade white finish, “Décora” style or as approved by Owner & BC Housing.

.6 Receptacles, telecommunications and television outlets on common or party walls shall be installed such that the continuity of the fire separation is maintained. All communication outlets must be provided with backboxes.

.7 Weatherproof receptacles for block heaters must be provided in Zone 2 and Zone 3, cold climate areas, such as the Interior and the North. If the receptacles are to be located adjacent to the unit, they should be connected to the tenant electrical panel. If the receptacles are to be located in a common area parking lot, they should all be connected to a common area electrical panel. The block heater receptacles, in both of the above applications, must be equipped with thermostatically controlled timers capable of energizing the receptacles at pre-programmed set point temperatures and should also have the capability of cycling on and off during the times that the receptacles are energized.

.8 Weatherproof GFCI duplex receptacles for exterior building maintenance must be provided. These receptacles to be located to minimize potential damage and misuse and shall be switched from inside the building.

.9 Weatherproof GFCI duplex receptacles must be provided at each unit patio and at all common area patios.

.10 Provide a ground fault current interrupter (GFCI) electrical outlet at each bathroom vanity in all residential suites, in a location accessible from a seated position.

.11 Provide ground fault current interrupter electrical receptacles on kitchen counter as per CEC requirements.

.12 Accessible units – Provide convenient kitchen outlets, light, fan and range hood controls at locations accessible from work or seated positions. Refer to CSA B651.

.13 Provide ARC Fault breakers for all bedroom receptacles as per CEC requirements.

.6 LIGHTING

.1 Adequate illumination must be provided in all areas to levels as recommended by IESNA. Lighting power densities must conform to the requirements of current editions of ASHRAE 90.1, NRCC 54435 “National Energy Code of Canada for Buildings” and other applicable Federal,
.2 Provide lighting control zones in accordance with current BCBC, current edition of ASHRAE 90.1, and comply with LEED® requirements for perimeter and non-perimeter spaces as defined by LEED® credits.

.3 It is strongly recommended to consider LED type light sources for all areas. Depending on the feasibility, including financial constraints, other light sources may be considered. Consult with the BC Housing representatives before final selection of lighting specification.

.4 If fluorescent luminaires are specified, they must be compact fluorescent (CFL) or standard linear fluorescent units (T8 or T5). Standard length units must be utilized wherever possible and units must be hardwired.

.5 Lighting specification must include consideration for standardization of lamps, ballasts and other luminaire components to reduce maintenance requirements, standardize components, and ease maintenance programs. Lamp types shall be minimized for maintenance ease.

.6 High Intensity Discharge (HID) lighting for interior lighting should be avoided.

.7 Incandescent lamps are not permitted in common areas, administration or service areas. In-suite lamp sources shall be reviewed with Owner and BC Housing for each project. Where suite maintenance is performed by Owner’s representative all luminaires shall be LED, compact fluorescent, linear fluorescent or alternate energy efficient, and maintenance friendly source.

.8 For bed bug room, light fixture must be metal wired, vandal and high temperature resistant. The heat at the ceiling is between 55 and 60 degree Celsius. Light fixture has to be approved for the above conditions.

.9 Energy efficient technology must be integrated into the chosen luminaire. Low wattage luminaires and/or fixtures are to be considered and incorporated where feasible. Ballasts must be high power factor, rapid start, sound rating “A”, energy saving electronic type where appropriate.

.10 Design shall incorporate maintenance strategies to reduce overall operating costs including specification of products that offer longer than traditional one (1) year warranties on products such as lamps, ballasts, drivers etc. (product example: Phillips ALTO fluorescent energy savings lamp technology which offers a 36 month warranty).

.11 Exterior area lighting shall conform or improve upon the Illuminating Engineering Society of North America (IIESNA) current edition of RP-33 standard and shall comply with current edition of ASHRAE 90.1, and LEED® requirements limiting light trespass onto adjacent properties and into adjoining rooms and spaces. Parking and general area lighting should be c/w full cut off optics.

.12 Primary Pathways and Building Exterior shall be controlled by photocell sensor(s).

Secondary Pathways shall be additionally controlled by local exterior motion sensors. Secondary pathway lighting must be provided with instant on capability.

.13 Exterior lighting shouldn't interfere with CCTV cameras and should not be directed at the camera itself. The lighting should illuminate the areas and provide a sufficient colour spectrum range where the cameras are intended to capture images.
If cameras are directed to areas that should not be illuminated in the evening (e.g. areas immediately adjacent to bedroom windows), then illumination should be provided by methods detectable to the cameras but not the human eye.

.14 Crawl spaces and accessible attic spaces must be illuminated utilizing luminaires with mechanical protection of lamps. Lighting design must incorporate means to adequately locate and service equipment, ducting, etc.

.15 All luminaires shall be selected to minimize glare.

.16 Light fixtures in bedrooms and suite corridors must contain two or more lamps.

.17 In-suite under-counter lighting shall be vandal proof.

.18 Luminaires, lamps, and ballast shall be selected, specified and installed to provide optimum energy efficiency, controllability and maintenance ease. Lamp and ballast combinations must be identified and must comply with current BC Hydro Power Smart programs and be eligible for the available product rebate incentive program(s). BC Hydro Lighting Calculator shall be completed and submitted to BC Housing for review at Design Development and Construction Document phase.

Luminaire specification shall include provisions for the supply of spare lamps and ballasts for initial maintenance purposes. Furnish additional materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.

.1 Lamps: 5 lamps for every 100 of each type and rating installed. Furnish at least 2 of each type and not more than 25 per type.

.2 Plastic Diffusers and Lenses: 1 for every 100 of each type and rating installed. Furnish at least 1 of each type and not more than 5 per type.

.3 Ballasts: 1 for every 100 of each type and rating installed. Furnish at least 2 of each type not more than 5 per type.

.4 LED Drivers: 1 for every 100 of each type and rating installed. Furnish at least 2 of each type not more than 5 per type.

.5 Globes and Guards: 1 for every 20 of each type and rating installed. Furnish at least 2 of each type and not more than 3 per type.

.19 Lighting products are to be readily available from well established manufacturer’s and Energy Star labeled (refer to NRCAN), and/or listed in the BC Hydro e-catalogue.

.20 In order to assist in selecting and implementing energy efficiency products, BC Housing strongly recommends that electrical contractors and/or installers are approved BC Hydro Power Smart Alliance members. This is to ensure that BC Housing is eligible for any BC Hydro incentive programs.

.7 EMERGENCY LIGHTING AND EXIT SIGNS

.1 Where provided, emergency generator shall be utilized for supply of power to emergency lighting. All luminaires used for emergency lighting must immediately illuminate on actuation of emergency power source.
.2 Consideration will be given for emergency lighting integrating battery backup into lighting fixtures. The maintenance and consistency of the application must be reviewed. The intent is to minimize the types of devices within the building.

.3 Emergency battery packs and remote heads shall be utilized where generator is not provided. Each pack must be sealed lead acid type with a minimum 5 year manufacturer's warranty, wall mounted with approved bracket supports. Remote heads must be 12 Volt seal beam style.

.4 The total load (lighting heads connected) connected to the battery must operate for time required by the BC Building Code with a minimum of 87.5% of rated battery voltage output. Note the required emergency lighting levels exceed BC Building Code minimum requirements.

.5 EXIT signs

.1 Located to clearly indicate the direction of travel and be clearly visible. If required, low mounted (480mm AFF) Exit signage in addition to BCBC requirements on exit routes is recommended to assist all users along exit routes particularly people who have vision impairments.

.2 Posted at all exits and the building entrance regardless of building height.

.3 Lamping and Powered:

.1 All EXIT signs must be LED type and connected to both normal power source and approved emergency power source. Separate raceways must be provided for each source, or

.2 Use of self-powered EXIT signs is acceptable only where applicable and approved by the Owner and BC Housing.

.8 FIRE PROTECTION — FIRE ALARM SYSTEM

.1 Provide a complete and operational Fire Alarm system as required by the BC Building Code, Authority Having Jurisdiction and as described herein.

.2 It is recommended to use an addressable type Fire Alarm System. If required, depending on the type and size of the building an analogue system could be provided. Consult with BC Housing representatives before final specification is chosen.

.3 All fire alarm interlocks with other equipment (re-circulating air equipment, magnetic door holders, etc.) must be provided.

.4 A primary annunciator panel (LED display) will be located in close proximity to the main entrance to the building for ease of emergency personnel response. This location must be approved by the local Fire Department. Secondary annunciator may be required to be installed in a manager’s office. Consult with BC Housing and/or Owner representatives for the requirements.

.5 Electrical Supervision — The fire alarm system will be electrically supervised. The sprinkler system will be electrically supervised to indicate a supervisory signal on the annunciator for each of the following:

.1 Movement of a valve handle that controls the supply of water to sprinklers,

.2 Loss of excess water pressure required to prevent false alarm in a wet pipe sprinkler system,
.3 Loss of air pressure in a dry pipe sprinkler system,

.4 Loss of power to any automatically starting fire pump,

.5 A temperature approaching the freezing point in any dry pipe sprinkler system valve enclosure

.6 Loss of power to heat trace installed on sprinkler piping, and

.7 Movement of a valve handle that controls the supply of water to the standpipe system (except for standpipe system hose valves).

.6 Signals to Fire Department – The fire alarm system shall be designed to automatically transmit separate independent signals for fire alarm, supervisory, sprinkler flow, and trouble signals to the Fire Department via an independent central station (ULC listed central station).

.7 Annunciators and Zoning

.1 An annunciator shall be provided at the fire department response point.

.2 Within each storey, separate zones are required for each device type (sprinkler flow switch, smoke detectors, and manual pull stations).

.3 Main annunciator at the fire alarm panel is to indicate to authorized building staff and/or Fire Department response the location and event of the in-suite smoke/heat detectors in cases where no secondary annunciator is in the building.

.8 Manual Stations – Manual stations shall be installed on every floor near every required exit and near the principal entrance to the building.

.9 Smoke Detector Locations – Smoke detectors shall be provided at the top of each exit stair shaft and in all public corridors serving residential suites. As requested in the relaxation, it is proposed to provide in-suite combined smoke/heat detectors in lieu of in-suite smoke alarms.

.10 Duct Type Smoke Detectors – Where required to be provided, duct mounted detectors shall be provided where air handling systems serve more than one suite or more than one storey.

.11 Audibility of Fire Alarm Systems – Audible signal devices are required to be installed throughout the project. The sound pressure level in a sleeping room from a fire alarm audible device shall not be less than 75 dba, when any intervening doors between the device and the sleeping room are closed. Further, the sound pressure level from the fire alarm systems audible signal devices within the floor area shall not be less than 10 dba above the ambient noise level, and no less than 65 dba.

.12 Visual Signaling Devices – All fire alarm signaling devices in suites shall incorporate visual signals (strobes) in addition to audible signals (buzzers). Visual signaling devices shall be provided through public and service spaces in accordance with good design practice and the requirements of the BC Building Code. In addition to the above, for Seniors and Adaptable units, provide special outlet boxes, complete with cover plates and power requirements, to all units in accordance with the BC Building Code.

.13 Elevator interconnection with the Fire Alarm System shall be provided in accordance with the current edition of CSA B44 - “Safety Code for Elevators and Dumbwaiters”. Provide fire alarm signals from the building fire alarm system to each elevator as applicable to the particular
installation including the following:

.1 Signal representing the smoke detector located in each elevator lobby (excluding the smoke detector at the main recall level) or the building Fire Alarm System.

.2 Signal representing the smoke detector(s) located in the elevator lobby at the designated alternate recall level for alternate level recall.

.3 Signal representing smoke detectors located in each elevator machine room, control room, machine space or control space. For machine room less elevators the top of the hoistway is typically considered as elevator machine space and must comply with this requirement.

.4 Signal representing smoke or heat detectors located at the top of the elevator hoistway.

.5 Signal representing smoke or heat detectors located in the elevator pit.


.15 Fire alarm verification must include verification of the transmitted signal between the fire alarm system and the remote monitoring facility. A letter documenting the type of signal received by the monitoring facility must be submitted prior to occupancy. Fire Alarm monitoring facility must receive separate signals for Fire Alarm, Sprinkler Supervisory, Fire Alarm Trouble and Sprinkler Supervisory. The letter must be received prior to Substantial Performance.

.9 FIRE PROTECTION – IN-SUITE SMOKE ALARMS

Smoke Alarms conforming to CAN/ULC-S531 shall be installed in each dwelling unit and in each sleeping room not within a swelling unit, as per BC Building Code Requirements.

.1 120 Volt Smoke Alarms must carry a minimum 5-year warranty.

.2 Smoke Alarms should be provided with an integral silencing switch.

.3 Combination Smoke Alarms with visual signal, strobe light, should be considered for installation within the dwelling units.

.10 CARBON MONOXIDE ALARMS

.1 Carbon Monoxide Alarms shall be installed where required by code. If feasible it is recommended to consider using combination of CO and Smoke Alarm.

.11 FIRE PROTECTION ALTERNATE SOLUTION – IN-SUITE COMBINATION SMOKE AND HEAT DETECTORS

.1 Considerations for a voluntary fire alarm system upgrade to improve occupant safety may be explored on an individual project basis. The typical upgraded system will include a single-stage fire alarm system and a combined smoke/heat detector within each residential suite in place of the standard 120V smoke alarm.

.2 The intent of this upgrade is to provide electrical supervision of the in-suite smoke detector portion of the approved combined heat/smoke detector by the fire alarm system and to provide
on-site annunciation of the actuation of the smoke detector portion of the device within each suite. Activation of the smoke detector portion of the device would not put the building into alarm nor send a signal to the Fire Department.

.3 The smoke detector portion of the combined device shall include a sounder base with auxiliary relay to provide in-suite audible and visual signals.

.4 Operation of the heat detector component of the combined smoke heat detector is designed to transmit an alarm signal to the Fire Department on activation.

.5 A secondary annunciator (LCD panel) located at the on-site building manager’s area would provide annunciation of the in-suite smoke detector portion of an approved smoke/heat detector for authorized building staff. As a mitigating feature the annunciation of the individual in-suite smoke detector portion of the combined device, shall also be included on the Main Fire Alarm Annunciator located at the Fire Department Response Point to assist responding Fire Department personnel.

.6 A letter from the manufacturer shall be provided indicating that the device can operate in the proposed manner. Note that the “high sensitivity level” setting cannot be used in the suites as it is unlikely that the residential suites can be considered smoke-free environmentally controlled environments.

.7 Each in suite combination detector shall be electrically supervised by the fire alarm system and shall incorporate a “tamper-resistant” capability that will prevent removal of the detector from the base without a special tool.

.8 Incorporation of this voluntary upgrade to the Fire Alarm and Detection system must receive acceptance by the Authority Having Jurisdiction’s Fire and Rescue Services and may require a code equivalency.

.12 AUTOMATIC POWER OPERATED DOORS:

.1 Provide conduit rough-ins and power to the door operator as required. Coordinate with other relevant disciplines.

3 Execution

.1 Air leakage between units shall be minimized by using sealant or foam. Electrical receptacles may be treated using air tight drywall type gasket boxes prior to the installation of drywall.

.2 Large electrical penetrations (greater than 50 mm diameter) are most effectively treated by boxing out the penetration within the stud cavity, filling with foam, then installing neoprene gaskets around the perimeter of the box. This is used when a double plate party wall provides the sound and fire separation and is required by Code. Refer to Appendix D - Reducing Air Leakage Between Suites.

End of Section
27 00 00 - Communications

1 General

.1 WARRANTY
Provide full two (2) years of warranty for all materials and labour. Contractor shall repair or replace any item which proves to be defective due to workmanship, equipment, or materials, without any cost to the Owner.

.2 TELECOMMUNICATIONS CABLE PLANT

.1 A complete telecommunications Cable Plant shall be provided. The Cable Plant includes all components to support telecommunications services from the service provider demarcation point to the telecommunications outlet.

.2 The Cable Plant, as a minimum, shall support all systems mentioned herein (e.g. Entryphone System, Cable TV, telephone, ADSL Internet access etc.).

.3 Cable plant design and installation shall meet or exceed the recommendations outlined in the following standards (including all any associated addenda):

.1 BC Building Code (including variance by local authorities)
.2 Canadian Electrical Code (including variances by local authorities)
.3 TIA/EIA 568B Telecommunications Cabling Standards
.4 TIA/EIA 569B Standards for Telecommunications Pathways and Spaces
.5 TIA/EIA 570-B Residential Telecommunications Cabling Standard
.6 TIA/EIA 606-A Administration Standard for Telecommunications Infrastructure
.7 TIA/EIA 607 J-STD-607-A Telecommunications Grounding Standard
.8 Cable TV Cabling Requirements
.9 The telecommunications cable plant and all of its components shall meet or exceed TIA/EIA standards for Category 5e performance.

.4 Telecommunication Rooms and Spaces

.1 There shall be one Main Telecommunications room/area. This room/area shall be the location for service provider demarcation points as well as other base building system equipment. The Main Telecommunications Room a security sensitive room and the overall location and door hardware shall be designed to mitigate potential threats.

.2 Sub-telecommunications rooms or closets shall be provided as required by TIA/EIA standards to service the building/facility.

.3 Fire rated or plywood or fire-retardant painted plywood backboard for the telephone distribution equipment and wiring shall be provided in the main distribution room. Fire rated
plywood or fire retardant paint shall bear such seal and meet the requirements Authorities Having Jurisdiction. Sub distribution closets shall be provided throughout in accordance with Cable TV and TIA/EIA requirements.

.4 Equipment such as Digital Video Recorder, Access Control Server, and UPS devices shall be mounted in an equipment rack which is positively connected to the building structure in accordance with the BC Building Code and CSA 832.

.5 **Telecommunications Pathways**

.1 Main Telecommunications shall have conduits to all Sub-telecommunications Room/Closets and the generator area (where applicable).

.2 Sub-telecommunications Room/Closets shall have conduits to each Suite Demarcation Point.

.3 Telecommunications outlets (for voice, data or CATV) in common spaces shall have a minimum 25mm (1") conduit to the telecommunications room serving that area.

.4 Pathways shall have minimum 40% spare capacity.

.6 **Backbone Cabling**

.1 Provide Backbone Cabling for connectivity from the Main Telecommunications Room to the Sub-Telecommunications Room/Closets to support service provider services from the demarcation point to each telecommunications outlet.

.2 Voice tie cables shall have minimum 50% spare capacity.

.3 Provide data backbone cabling if required to support voice and data applications. If fibre optic cabling is required, provide 50 micron, multimode fibre. Where length limitations exceed that of multimode fibre, provide single mode fibre.

.4 Cabling run in conduit under slab for in areas that are susceptible to water penetration shall be rated for such installation.

.5 Cabling routed between buildings shall be rated for such installation and shall have lightning protection on all copper pairs.

.7 **Telecommunications Cabling**

In-suite Telecommunications Cabling (see Typical In-suite Telecommunications Cable Plant and CATV Television Wiring diagram herein).

.1 Each suite shall have a Suite Demarcation Point.

.2 All in-suite cabling shall have at least Category 5e performance.

.3 Telephone jacks shall be RJ11/12.

.4 Data jacks shall be RJ45.

.5 Resident suites – each resident suite shall be provided with a telephone outlet.

.6 Each Television Outlet shall have a combined Cable TV and phone jack (refer to Cable TV standards).
.8 Data Communication – telecommunications outlets in common areas shall meet or exceed
Category 5e performance for both voice and data applications. Provide data backbone as
required (see Backbone Cabling herein). Data jacks shall be Category 5e RJ45 type.

.9 Telephone home runs, horizontal cable, from main or sub-distribution rooms or closets to
designated common areas such as offices, resident library/internet and resident lounges shall
be minimum 4 pair UTP category 5e via 1" conduit.

.3 CABLE TELEVISION (CATV) AND SATELLITE SYSTEMS

.1 A complete outlet and wiring system for cable television service shall be provided. All work
shall be in accordance with the recommended standards of the local Cable Television Provider
and shall allow service delivery from such provider to each outlet.

.2 Plywood backboard for the television distribution equipment and wiring shall be provided in
the main distribution room. Sub distribution closets shall be provided throughout in accordance
with Cable Television Provider requirements (see Telecommunications Rooms and Spaces herein).

.3 All cabling for television shall be provided from demarcation point (main distribution room)
to television jacks within the suite. (see Typical In-suite Telecommunications Cable Plant
and CATV Television Wiring diagram herein).

.4 Each residential suite shall be provided with minimum of two (2) Television Outlets; one located
in the master bedroom and one located in the living room.

.4 SECURITY SYSTEMS

.1 Security Systems include Access Control, Intrusion Detection and Video Surveillance (i.e. CCTV) Systems.

.2 Security System Requirements vary significantly with varying threats due to factors such as
location, what other facilities are around the building etc. For this reason, the Consultant shall
review security issues at the design development stage and incorporate cost effective security
systems subject to the review of the Sponsor and BC Housing. The site specific technical
requirements for these systems shall be identified during design stage to allow for coordination
and inclusion in the contract documents. Measures such as proximity card access systems,
closed circuit TV and security alarms should be considered and the related costs shall be
identified prior to project commitment.

.3 All security systems shall be connected to an un-interruptible power supply (UPS) which
provides at least 30 minutes of continuous power. The UPS and all Security Systems will
be connected to the emergency generator (where applicable). As a minimum, the following
Security Systems shall be provided:

.1 Entryphone System

.1 Provide an Entryphone system at the main entrance to buildings with a common
entrance as well as other visitor access points such as underground visitor parking. The
Entryphone master panel shall be located in an area protected from the weather.

.2 The Entryphone system shall be a non-subscriber line type c/w call waiting capable of
interrupting an active call and shall be an Enterphone 2000 series or approved equal.
The master panel shall be complete with a microphone, built in speaker and directory
panel adequately sized to accommodate all residents.
.3 Each residential unit shall have the capability of receiving calls from the Entryphone master panel and releasing the door via the system. Each resident shall be able to operate the system without the need for a residential phone line from the local utility.

.4 Entryphone panels at entrances shall have an integrated colour camera. The video signal(s) shall be viewable on any television within the building. The number of cameras viewable per channel shall not exceed 4.

.2 Access Control System

.1 There shall be a proximity reader at the main entrance to allow residence entry into the building. The proximity card reader should be located at or near the Entryphone panel.

.2 There should be proximity readers to amenities areas where accessible by general public or other user groups.

.3 If there is an underground parkade, there should be a RF system to allow residents entry and exit.

.4 Combination RF and proximity key tags should be used to avoid carrying a keyfob and RF “clicker”.

.5 In locations where cabling of card reader controlled doors may be prohibitive the use of wireless door control hardware should be considered, this would include sites where equipment closet space is limited.

.3 Intrusion Detection System

.1 The mailboxes shall be monitored. The door position switch on the mailboxes (i.e. used by mail delivery persons) is to be bypassed during regular mail delivery times and armed otherwise.

.2 A local audible alarm shall sound a local alarm if the mailboxes are breached while armed.

.3 The intrusion detection shall have the capability of being monitored.

.4 Each emergency exit only doors shall have a proximity request to exit device. The request to exit device shall monitor door held open and door forced open occurrences and sound a local audible alarm when these occurrences are detected.

.4 Video Surveillance System

Provide a video surveillance system that addresses the Sponsors security requirements. Refer to BC Housing Guidelines for Placement and Adjustment of CCTV Cameras, CCTV Camera Installation Specification Sheet, and CCTV System Commissioning Checklist. Where required provide as a minimum:

.1 Cameras at main entry points into the building, including parkade entrances, all elevators, and in the main lobby to cover the mail boxes.

.2 DVR (digital video recorder), located in a secured space, with storage capacity between fourteen (14) and ninety (90) days at 15 fps recording on motion activation for all required cameras.

.3 Devices and connections necessary to allow residents to view one or more CCTV images on a designated channel of the cable television system.
.4 Personal Call System (for Assisted Living Projects, if required by the Owner and/or Operator)

.1 If the Owner requires, a tenant activated, wireless personal call system to be installed in all the suites and in all common areas.

.2 A telephone jack (regular analog) and adjacent electrical outlet shall be installed in suites to allow the installation of a personal call system. The Owner will supply in-suite system receiver/communicator capable of voice communication or receiving signals from pendant or bracelet transmitters.

.3 Where the Operator monitors the system in-house, the system shall be fully integrated (computer, software, receiver, pager, etc.) to receive the signals and send it to the responsible staff. All calls must be monitored 24 hours a day, 7 days a week by the staff.

.4 The system can be connected to a remote monitoring agency if the Operator do not have 24/7 monitoring staff available.

2 Products

Not Applicable

3 Execution

.1 LABELING AND IDENTIFICATION

.1 All panels to be c/w a typewritten circuit directory which shall be set in a metal holder complete with a plastic cover on the inside of the panel.

.2 Other equipment and apparatus including all switchgear, transformers, disconnects, contactors, junction boxes, fire alarm components, communication equipment, motors, instruments, control devices, incoming service and communication cable shall be labeled, using 118 mm x 31 mm (3/4” x 1-1/4”) adhesive lamicoid nameplates.

.3 A lamicoid label shall be provided naming the Consulting Electrical Engineer. This label shall be located on the main distribution equipment.

.4 All common area receptacles and switch cover plates to be c/w label indicating panel name and circuit number.

.5 All recessed junction boxes to be labeled in indelible ink indicating function of junction box (equipment name, fire alarm, emergency or exit) and panel name and circuit number. Labels to be located on the side of the junction box and on the cover plate.

.6 All conduits, conductors, wires to be labeled in indelible ink at panel and all junction boxes indicating device being fed, panel name and circuit number.

.7 Labels shall identify all electrical equipment mounted or connected. Colour coding of conduit, junction boxes, etc. shall be provided.

.8 Telecommunications cable plant, including CATV wiring system, shall be labeled in accordance
of Owner’s cable plant administration requirements. Otherwise, label per TIA/EIA 607-A.

.2 **FIRE, SOUND AND VAPOUR BARRIERS**

.1 Openings around electrical wireways passing through sound rated walls shall be filled with soundproofing materials.

.2 Fire stops as required by the current edition of the **BC Building Code** or **Vancouver Building By-Law** shall be provided. Fire stop and smoke seal material shall be used to seal any penetration of compartment separation in concealed spaces. Refer to **Division 07 80 00 – Fire Stopping and Smoke Seal**.

.3 Weather and Vapour barriers shall be maintained. All penetrations shall be sealed and made weather and airtight.

.3 **DRIP SHIELDS**

Where a sprinkler system is installed, all electrical equipment shall have drip shields to protect equipment against water from the sprinkler heads.

.4 **SEISMIC RESTRAINT**

.1 Seismic restraint shall be provided for all electrical equipment and accessories including attachment to structural members where required by BC Building Code, CAN/CSA-S832 Seismic risk reduction of operational and functional components (OFC’s) in the buildings.

.2 Letter of Assurance from Structural Engineer on commencement of design and completion of field review shall be provided where required.

.5 **WIREGUARDS AND POLYCARBONATE GUARDING BOXES**

All equipment and wiring devices, in areas susceptible to damage, including light fixtures, pull stations, exit lights, etc., shall be protected by approved wire guards or polycarbonate boxes. These locations include but are not limited to, storage, janitorial, mechanical, electrical and similar places.

.6 **MASTER LOCK**

All lockable Panelboards, boxes, sub-distribution panels, etc., shall have common master lock c/w a total of 20 keys.

.7 **PLYWOOD BACKING**

Where plywood backing is required, plywood backing shall cover walls from the floor up to 1830 mm (6'-0") A.F.F. and be firmly secured. Plywood shall be minimum 18 mm (3/4") thick Good 1 Side and be fire retardant treated. Where plywood treated plywood is used, ensure that the fire-treated stamp or seal is visible for each sheet of plywood. Where fire retardant paint is used, apply visible stamp or seal certifying such on each sheet of plywood.
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End of Section
31 23 00 - Excavation and Backfill

1 General

.1 Comply with the following standards unless the Geotechnical Engineer specifically recommends otherwise.

.2 Develop and implement an Erosion and Sedimentation Control Plan in accordance with the requirements of the authority having jurisdiction and/or LEED® Canada.

.3 Review existing site conditions and provide excavation support measures such as shoring, slope protection, underpinning or other retention measures, where required. Arrange for any underpinning agreements with adjacent property owners if necessary.

.4 QUALITY ASSURANCE

.1 Comply with municipal bylaws and applicable building codes. Comply also with the current Master Municipal Construction Documents as appropriate for all subsurface and paving work.

.2 Geotechnical engineer to specify backfill requirements, subgrade bearing, compaction testing and submittal requirements.

.3 Contractor to engage and pay for independent testing as specified by the geotechnical engineer.

2 Products

1 GENERAL

.1 Fill material must be clean, free-draining, contain no organic matter or other deleterious materials and have less than 5% passing the 75µm (USS 200) sieve size by dry weight.

.2 Fill materials shall be approved by the Geotechnical Engineer prior to the start of work.

2 BACKFILL FOR UNDERSLAB

.1 19 mm (3/4”) minus well-graded crush sand and gravel (base course) with less than 5% passing the 75µm (USS 200) sieve size by dry weight.

.2 A minimum of 70% of particles with one fractured face when tested in accordance with ASTM D5821.

3 GRANULAR ENGINEERED FILL

Well-graded granular mineral material with a maximum size of 75 mm and containing less than 5% passing the 75µm (USS 200) sieve size by dry weight.
.4 BACKFILL FOR FOUNDATION DRAINAGE

.1 19 mm (3/4") clear crushed gravel, free of sand, silt and clay with maximum particle size of 25 mm (1") and containing no particle sizes less than 9.5 mm (3/8").

.2 A minimum of 75% crushed stone.

.3 Unless otherwise specified or approved by the owner or engineer, the surface layer of the backfill shall consist of not less than 300 mm (12") thickness of low to moderate permeability materials, consisting of:

.1 for soft landscaping areas – topsoil or other mineral material approved by the engineer having at least 10% passing the 75µm (USS 200) sieve size by dry weight or

.2 for hard landscaping/paved areas – underslab or granular engineered fills.

In both cases surface fills shall be separated from the backfill by a continuous layer of low permeable geotextile/geomembrane as approved by the engineer.

.5 BACKFILL FOR WATERPROOFED FOUNDATION WALLS

Well-graded, granular, free-draining mineral material with a maximum size of 75 mm (3") and containing less than 5% passing the 75µm (USS 200) sieve size by dry weight.

.6 FOUNDATION DRAINS

150 mm (6") diameter rigid perforated ABS pipe to CSA B1800 and B182.1.

Execution

.1 BACKFILL

.1 Underslab Fill: Provide a 150 mm (6") layer of 19 mm (3/4") clear crushed gravel and compact to approval of Geotechnical Engineer.

.2 Backfill waterproofed foundation walls with clean, well-graded, granular structural fill compacted to 90% Modified Proctor (ASTM D1557) Maximum Dry Density (MPMDD) beneath areas which will receive soft landscaping and to 95% MPMDD beneath areas which will receive hard landscaping and paving (concrete, wood, unit pavers and asphalt type).

.3 On or adjacent to public property, backfill to conform to the above requirements or to those of the Authority Having Jurisdiction whichever is most stringent. Care shall be taken to prevent damage to dumpproofing and/or waterproofing materials.

.2 FOUNDATION DRAINS

Provide foundation drains with 300 mm (12") min of drain rock cover extending to the perimeter foundation walls, and completely encapsulated in a nonwoven geotextile providing effective drainage and filtration properties. Slope to drain to suitable collection and discharge location. Provide cleanouts at changes in direction and in pipe runs longer than 15.2 m (50'-0").

End of Section
32 12 16 - Asphalt Pavement

1 General

.1 Provide asphalt paving, base and sub-base courses as per requirements of Geotechnical Consultant and subsurface investigation report.

.2 Confirm geographic conditions, climatic variations and seasonal restrictions when no work should be taken place.

.3 Quality Assurance
   .1 Conform to current Master Municipal Construction Document (MMCD) requirements and to geotechnical engineer requirements.
   .2 Geotechnical or civil consultant to specify independent testing and submittal requirements for roadbase compaction, asphalt mix and installation.
   .3 Contractor to arrange and pay for all specified inspection and testing.

2 Products

.1 Sub-base course 75 mm minus well-graded pit run sand and gravel with less than 5% fines passing 75µm sieve. Place and compact to 95% Modified Proctor Maximum Dry Density (MPMDD).

.2 Base course 19 mm (3/4") minus crushed gravel with less than 5% fines passing 75µm sieve. Place and compact to 95% MPMDD.

.3 Asphaltic Concrete:
   .1 Hot mix, dense graded, conforming to Upper Course #1 of the MMCD or Class 1 Medium Mix of Ministry of Transportation or local municipal specification, if approved by geotechnical/civil engineer.
   .2 Provide a minimum 9000N Marshall Stability.
   .3 Asphalt cement penetration grade 80 – 100.

3 Execution

Ensure final asphalt pavement surface is shaped to provide adequate drainage and is free of depressions. Unless noted otherwise the following minimum requirements shall apply:

.1 AT PARKING LOT AREAS:
   .1 lay sub-base course gravel to a minimum of 150 mm (6") compacted thickness
.2 lay base course gravel to a minimum of 100 mm (4") compacted thickness
.3 lay asphalt paving in one layer of 50 mm (2") thickness

.2 **AT FIRE ACCESS ROUTES:**
.1 lay sub-base course gravel to a minimum of 150 mm (6") compacted thickness.
.2 lay base course gravel to a minimum of 100 mm (4") compacted thickness
.3 lay asphaltic paving to a total of 75 mm (3"); lay paving in two layers – bottom layer 40 mm (1-5/8") thick and top layer 35 mm (1-3/8") thick.

.3 **COMPACUTION REQUIREMENT**
.1 Roll asphalt pavement to average density of not less than 97% of 75 blow Marshall density with no individual test being less than 95%.

End of Section
32 90 00 - Planting

1 General


.2 Warranty: Plant material will remain free of defects for period of one year from the date of Substantial Performance of the Work. Replace all unsatisfactory plant material and continue to replace such plant material until the replacement is acceptable, at no cost to the Owner.

.3 All plants incorporated into the project shall be accepted by the Owner and/or Consultant.

.4 Refer to Section 1 - Design Guidelines for site design, landscaping, and other landscaping requirements.

2 Products

.1 Plant Material: shall conform to the Canadian Nursery Trade Association Canadian Standards. In particular: Nursery grown stock, grading, size and quality in accordance with BCNTA, legibly tagged using standardized plant names, free of disease, insects, defects or injuries and structurally sound with strong fibrous root systems and well developed branch systems. Trees must have straight trunks, well and characteristically branched for their species.

.2 The selection of native and/or drought resistant plants is the preferred strategy for all projects. Conform the compatibility to local soil, geographic conditions and climatic variations; local plants native to that region should be recommended wherever possible.

.3 Sod which requires permanent watering should not be installed unless LEED® Canada can be satisfied. Sod to be Canada No. 1 nursery grown turf from seed, free of diseases, clovers, stones, pests, debris and containing no more than two broadleaf weeds or ten other weeds per 42 m² (50 yd²).

.4 Where applicable on previously developed sites, implement strategies to restore a minimum of 50% of the site area excluding the building footprint by replacing impervious surfaces with native or adaptive vegetation.

3 Execution

.1 The Landscape Consultant will inspect all plants including sod before planting commences. Also
plant fertilizers, backfill mixes, mulches and soil amendments will be inspected by the Consultant prior to planting operations.

.2 The contractor is responsible for plant maintenance, including watering, weeding, the removal and replacement of dead plants and plants not in healthy growing conditions, including sod, for a period of sixty (60) days from the date of the Certificate of Completion for the landscape work or the date of Substantial Performance, whichever is later.

.3 Plant material will be inspected by the design consultant sixty (60) days after the Certificate of Completion is issued for the landscape work, provided that plant material exhibits healthy growing conditions and is free from disease, insects and fungal organisms.

End of Section
section 6

Drawing and Document Requirements

- Schematic Design Phase
- Design Development Phase
- Construction Document Phase
Drawings and Documents

The following sections outline the minimum drawing and document submission requirements for the three stages of the BC Housing (BCH) Plan review (refer to Appendix A) process. These stages include the Schematic Design stage, the Design Development stage and the Construction Documents stage. The level of detail required for drawings and specifications submitted at these stages are similar to the phases referenced in the Canadian Standard Form of Contract for Architectural Services.

In order to reflect the appropriate level of information required for new construction/conversion projects and for renovation projects, the following phases identify the items that are required for the above mentioned projects.

Drawings, specifications, and other required documents at different stages should provide sufficient information to confirm conformity with the BCH Design Guidelines and Construction Standards and to confirm the construction budget.

Drawing scale may be in imperial or the metric equivalent as noted.

1 Phase 1: Schematic Design Phase (new construction and conversion projects only)

The purpose of the drawing submission at this stage is to provide sufficient information to evaluate the project’s basic design concepts in relation to the program design guidelines and project cost framework.

Submit one (1) set of hardcopy and one set (1) of electronic copy including drawings and specifications.

1.1 DRAWING REQUIREMENTS

.1 Site Plan (1/16" = 1'-0" or 1:200)

List all applicable required and provided land use by-law requirements and note on the site plan, such as:

.1 Setbacks

.2 Building height

.3 Site area

.4 Site coverage

.5 Landscape open space (LOS), gross livable area (GLA), gross floor area (GFA), units per acre (UPA)

.6 Daylight angles, sun angles (where required by municipality)

.7 Vehicle and bicycle parking ratios

.8 Number and type of units including unit sizes
.9 Residential area, amenity and program area, circulation and service area, commercial area
(if any)

Note: GFA is the total floor area inside the building including parking. GLA excludes parking
area. Refer to GLA definition in Section 1.

.2 Floor Plans (scale 1/8" = 1'-0" or 1:100)
Provide for each level with a different floor configuration. Identify all amenity spaces,
commercial areas, service room areas.

.3 Typical Unit Plans (scale 1/4" = 1'-0" or 1:50)
Provide floor plans for all typical unit types and include the following information:
.1 Furniture layouts – show proposed furniture layouts and clearances
.2 Turning radii at unit entrance, kitchen, bedroom, bathroom, living/dining
.3 Note unit area and dimensions of each room
.4 Cabinet layouts – show configuration, layouts and clearance

.4 Functional Program
A functional program for the project should be prepared by the project team that identifies the
spatial requirements of the user group.
Refer to Section 1 - General Design Guidelines for the functional programme table.

.5 Social Housing Cost Target Framework
For new construction projects, the Society’s project team shall prepare for review by BC
Housing, a completed Cost Target Framework for their proposed building design.
Refer to the Social Housing Cost Target Framework and Costing Framework spreadsheet

1.2 SPECIFICATIONS REQUIREMENTS
The schematic design submission shall include an outline of the basic specifications of the project
such construction type, exterior finishes, major interior finishes, and systems description of the
proposed mechanical and electrical systems.

If any alternatives to the BCH Design Guidelines and Construction Standards are anticipated, the
sponsor’s design team should submit a summary of any requested alternatives to the applicable
BCH Design Guidelines and Construction Standards, in particular, to Section 5 – Construction
Standards. To facilitate the review of the proposed alternatives, the list must be accompanied by a
brief justification. The justification shall include a review as outlined in the Section 5 – Division
01 23 00 – Alternatives.

1.3 SUSTAINABILITY REQUIREMENTS
Provide a brief description of the major sustainability features of the project. If the project is
targeted for LEED certification, provide an initial draft of the LEED® checklist and a report on
strategies that are being considered to achieve the target.

Submit preliminary energy modeling to demonstrate the alternative energy conservation measures
considered and how the proposed design meets BC Housing's target for energy conservation, cost premium and payback.

2 Phase 2: Design Development Phase

Submit one (1) set of hardcopy and one (1) set of electronic copy including drawings and specifications.

2.1 DESIGN DEVELOPMENT – NEW CONSTRUCTION AND CONVERSION PROJECTS

.1 Drawing Requirements

.1 Location Plan

Provide a key plan with sufficient information to locate the site.

.2 Site Plan (scale 1/16" = 1'-0" or 1:200)

.1 Cross reference unit types to site plan.

.2 Land Use Bylaw: list required and proposed land use bylaw requirements; see requirements for the Schematic Design Site Plan. Note setbacks on site plan.

.3 Site services: show existing and proposed site services located at grade e.g. electrical, gas and water fixtures and sewer catch basins. Confirm required setbacks from electrical services (transformers, high voltage lines).

.4 Site boundaries: show all property lines, orientation, length and corner pins; refer to survey by registered land surveyor.

.5 Site topography: note all existing and proposed topographic features (e.g. swales, rock outcrop, watercourses, etc.). Note extent of cutting and filling required (dotted cutouts).

.6 Grades: show existing and proposed grades at principal corners of the building and property lines, sufficient to indicate drainage patterns. Show spot levels on a grid as required by architect, plot contours at minimum interval of 1 m (3'-3").

.7 Show existing grades of adjacent properties and streets to 3.1 m (10'-0") depth of adjacent lot or to centerline of street.

.8 First floor grade elevation(s) of proposed structures.

.9 Building Plan: note extent of building at grade, ramp gradient, underground garage and roof overhang.

.10 Paved areas: note all existing and proposed paved areas and indicate dimensions and materials (e.g. roads, parking including bike and scooter, walks, and patios).

.11 Landscaping: note extent of planted areas and existing and proposed trees with trunk diameter over 100 mm (4"); coordinate with landscape plan.

.12 Snow storage: in areas with substantial snowfall note designated snow storage areas.

.13 Retaining walls, fences and screens: note extent and materials; coordinate with landscape plan.
.14 Garbage pad: note pad and enclosure location and dimensions; confirm location with municipal authorities.

.15 Heritage, demolition or renovation: note existing buildings to be renovated, restored or demolished and outline scope of work.

.16 Recreation area: indicate outdoor recreation area, coordinate with landscape plan.

.17 Access for disabled: review and verify compliance with requirements for accessibility for disabled persons.

.18 Number and type of units including unit sizes.

.19 Gross Floor area, Gross Livable area, residential area, circulation and service area, amenity area, and commercial area (if any).

.3 Floor Plans (scale 1/8" = 1'-0" or 1:100)

.1 Levels: show each level from lowest floor to roof where layout varies.

.2 Structural grid: provide lettered and numbered structural grid and dimensions.

.3 Rooms: label all common spaces and unit types.

.4 Stairs and corridors: dimension stairs and corridors; ensure compliance with accessibility requirements.

.5 Mechanical/Electrical: coordinate locations of all mechanical and electrical rooms with incoming services. Show rooms such as generator room, transformer room, exhaust and intake shafts, electrical closets, boiler rooms, elevator machine rooms, corridor fresh air shafts, etc.

.6 Fire hose / extinguisher cabinets: locate as per building code requirements.

.7 Mail: note proposed mailbox location.

.8 Balconies & overhangs: show all balconies, entrance canopy and roof overhangs, roof decks.

.9 Storage: show all storage locations including tenant & bicycle.

.4 Unit Plans (scale 1/4" = 1'-0" or 1:50)

.1 Scope: show all unit types and common rooms (e.g., lounges, laundry and others where applicable).

.2 Furniture layouts: show proposed furniture layouts and clearances.

.3 Show door swings.

.4 Show turning radii at unit entrance, kitchen, bedroom, bathroom, laundry, living/dining.

.5 Cabinet Details: provide cabinet elevations for all unit types with sufficient detail to verify conformity with the Design Guidelines.

.6 Mechanical/Electrical shafts: note location of all ducts and vent shafts. Provide for pipe chases in unit plans clear of exterior and party walls.
.7 Note unit area and dimensions of each room.

.5 Cross Section (scale 1/8" = 1'-0" or 1:100)

.1 Grades: note existing and proposed finish grades at section line to centerline of street.
.2 Elevations: note elevations of all floors and top of roof.
.3 Detail sections: locate and cross-reference details on section for details noted in Typical Details (listed below).

.6 Elevations (scale 1/8" = 1'-0" or 1:100)

Elevations – show all elevations of all buildings and note the following:

.1 Finish materials: note extent of all finish materials.
.2 Grades: show finish grade at building.
.3 Elevations: show top of each floor level and roof and note height.
.4 Roof slope

.7 Typical Details (scale 1-1/2" = 1'-0" or 1:10, or larger as required)

Provide the following details and describe typical assemblies:

.1 Foundation wall: from footing to top of slab on grade or suspended slab.
.2 Suspended slab: at junction with building wall.
.3 Exterior wall: at grade and typical floor.
.4 Window: head, jamb, sill.
.5 Roof: at eaves, roof decks, low slope roofs, and parapets.
.6 Building Envelope: describe recommended wall assemblies and window types based on the most recent version of Woodframe Envelopes in the Coastal Climate of BC: Best Practice Guide Building Technology, CMHC, Table 5.1, or other relevant standard, where applicable. Document calculations for window ratings. Recommend air barrier, vapour barrier and sheathing membrane materials and assemblies and outline the rationale for the recommended strategy.

.8 Landscape Plan (scale 1/8" = 1'-0" or 1:100)

.1 Paving: note extent of all paving for walks, roads, parking and label finish materials.
.2 Planting: note planting types: trees, shrubs, sod, groundcover, etc., and clearly indicate extent (species and number of plants to be provided at Construction Documents stage.
.3 Indicate extent of irrigation system (non-permanent or permanent).
.4 Note existing trees and planting to be retained.
.5 Recreation Areas: note play areas, common decks or patios. Indicate play equipment or outdoor furniture as required. Grading: indicate slope to drain, grades at building, roads, walks and site perimeter.
.6 Screens/Fences: note extent and provide detail for fence and screen types.

.7 Recycling and garbage storage areas.

.9 Mechanical Drawings:

.1 Mechanical site services plan (scale 1/16" = 1'-0" or 1:100) – show all existing municipal services for the site and proposed services.

.2 Irrigation system layout. Coordinate with landscape drawings.

.3 Overall floor plans (scale 1/8" = 1'-0" or 1:100) – ventilation, plumbing and fire protection layout including riser diagrams, domestic hot and cold water distribution, makeup air control diagram, heating layout.

.4 Typical unit plans (scale 1/4" = 1'-0" or 1:50) – HVAC, plumbing and fire protection layouts for all unit types.

.10 Electrical Drawings

.1 Electrical site services plan (scale 1/16" = 1'-0" or 1:100) – existing and new site services including underground power cable, power distribution diagram.

.2 Floor plans (scale 1/8" = 1'-0" or 1:100) – lighting, emergency lighting, exit lights, fire protection devices, entry phone/intercom, television cable, and telephone system layouts.

.3 Typical unit plans (scale 1/4" = 1'-0" or 1:50) – electrical layout for all unit types.

.2 Specification Requirements

The intent of the outline specifications is to enable BC Housing to confirm conformity with the BCH Design Guidelines and Construction Standards and to review any alternatives that the Sponsor may propose to Section 1 – General Design Guidelines and Section 5 – Construction Standards. The outline specifications should be accompanied by a list that summarizes all alternatives with brief justification as outlined in the Section 5 – Division 01 23 00 – Alternatives. Clarification of proposed alternatives at this stage will expedite the approval of future submittals.

The outline specifications should be presented in CSA MasterFormat 2014 trade divisions and shall describe introductory project information and all major building components, systems and finishes including, but not limited to:

.1 Contacts: identification of owner, developer (where applicable), design consultants.

.2 Scope: brief description of the scope of the project: e.g., number of units and type, number of storeys, gross floor area, parking spaces provided, major common areas provided.

.3 Civil: proposed road works, site drainage, sewage collection and domestic water supply.

.4 Landscape: paving, planting, fences, and other major landscape elements.

.5 Structural: structural systems, foundation design, identify any landscape elements that require structural design such as retaining walls.

.6 Architectural Materials and Systems: describe construction assemblies, finish materials and their integration within the building.
.7 Mechanical: define the HVAC system, including confirmation of air conditioning, plumbing systems, fire protection and control systems.

.8 Electrical: outline service and distribution, feeders and wiring, proposed lighting fixtures and light levels, security system, fire alarm system, personal call system, communication system, generators, data and television and emergency lighting. Describe energy conservation measures. Confirm specifications for independent metering for electricity.

.3 Sustainability Requirements

Provide a brief description of the major sustainability features of the project. If the project is targeted for LEED® certification: submit LEED® scorecard, checklist and task list – indicating which points will be pursued, strategies that will be used to achieve these points and who is responsible for each point.

Submit preliminary energy modeling to demonstrate the alternative energy conservation measures considered and how the proposed design meets BC Housing’s target for energy conservation, cost premium and payback.

Refer to Section 3 – Energy and Environmental Design for energy performance, energy report and GHG emissions.

2.2 DESIGN DEVELOPMENT – RENOVATION PROJECTS

For renovation projects, the design development phase allows for the conceptual repair options to be refined and evaluated, in order to assist the Owner in selecting a preferred repair option for the project. The consultant shall prepare for the Owner’s and BC Housing’s review and approval one (1) hardcopy and one (1) electronic copy of design development documents and written reports appropriate to the size and nature of the Project to describe the size, aesthetic, and scope of the entire project, including architectural, structural, mechanical systems, materials, and such other elements as may be appropriate.

The design development documents shall include the following items:

.1 Outline of the program and building occupancy requirements of the Project and the characteristics of the site. Occupancy requirements are to be discussed with the Owner (and BC Housing where they are not the Owner).

.2 Plans and elevations showing the extent of the scope of work and the areas of the building that will be impacted by the repair.

.3 Where exterior or interior finishes are being renovated, provide coloured drawings, and/or sketches, and/or pictures of elevations, plans, etc., showing the various conceptual design options, complete with product, material and colour samples.

.4 Description of the scope of work that will be undertaken and an outline of the impact of those repairs on the building residents.

.5 List of the specification sections that will be included in the construction documents and any standard detailing that will be utilized.

.6 A written comparison of the conceptual repair options, by material, discussing performance (including energy performance of building), appearance, maintenance, service life, construction time and cost.
.7 Discussion regarding code or zoning issues that will impact the scope of work, schedule or cost. It is expected that a full review of applicable statutes, regulations, codes and by-laws, and where necessary review same with authorities having jurisdiction, will be completed during this phase.

.8 Outline of impact of hazardous material abatement on project design, scope and cost.

3 Phase 3: Construction Document Phase

Drawings must be a set of construction documents coordinated for consistency and completeness by all consultants involved in the project. Submit one (1) set of hardcopy and one (1) set of electronic copy.

including bound drawings and specifications.

All drawings must bear the stamp of the appropriate professional.

Construction Documents for renovation projects should include all information relevant to the scope of work that is being undertaken and are to clearly denote existing and new components.

BC Housing review should be undertaken at 50% and 100% completion of working drawings and specifications for new construction/conversion projects, and 75% and 100% for renovation projects, to verify conformity with Section 5 - Construction Standards.

3.1 DRAWING REQUIREMENTS

.1 Site Plan (scale 1/16" = 1'-0" or 1:200)
   As outlined in the Design Development stage for new construction and conversion projects, with the following additional information:
   .1 Provide detailed grading at perimeter of building.
   .2 Indicate percent of slope and direction of site drainage to curb (not just to property line).
   .3 Note extent of paving materials and location of drains, catch basins and other features for stormwater management.
   .4 Show retaining walls and note elevations (top and bottom).
   .5 Include all detail, section and window/door schedule references.
   .6 Include legend of all items referenced on the plan.
   .7 For renovation projects, include outline of area of work.

.2 Floor Plans (scale 1/8" = 1'-0" or 1:100)
   As outlined in the Design Development stage above for new construction and conversion projects, with the following additional information:
   .1 Show drop ceilings for services for areas not shown elsewhere.
   .2 Include all detail, section and window/door schedule references.
   .3 Include legend of all items referenced on the plan.
.4 For renovation projects, include outline of area of work.

.3 Roof Plans (scale 1/8" = 1'-0" or 1:100)
   .1 Indicate all penetrations, percent of slope, drainage pattern, roof drains and roof top equipment.

.4 Unit Plans (scale 1/4" = 1'-0" or 1:50)
   Provide detail plans of all typical unit types, as outlined in the Design Development stage above for new construction and conversion projects, with the following additional information:
   .1 Room names – room finish schedule.
   .2 Door, window types – door and window schedule.
   .3 Cabinets – kitchen, bathroom elevations.
   .4 Show drop ceilings for services.

.5 Common Areas (scale 1/4" = 1'-0" or 1:50)
   .1 Detail common areas – e.g., lobbies, amenity and service rooms as required.
   .2 Show drop ceilings for services.

.6 Sections (scale 1/8" = 1'-0" or 1:100 for high-rise; 1/4" = 1'-0"or 1:50 for low-rise, 4 storey or less)
   .1 Full sections from footings to roof to show typical exterior wall sections and non-typical conditions where wall plane changes or low roofs occur.
   .2 Cross reference sections on plans.
   .3 Details – cross reference all typical details at sections, e.g. foundation, wall, window, and roof.
   .4 Assemblies – cross reference all typical floor and roof assemblies.
   .5 Note the following (or cross reference to details) to show:
      .1 Existing and proposed grades.
      .2 Foundation drainage requirements as per geotechnical requirements.
      .3 Roof and slopes.
      .4 Window and /patio door sections.
      .5 Floor to ceiling heights and elevations of all floor levels.
   .6 Include legend of all items referenced on the plan.
   .7 For renovations, include outline of area of work.

.7 Elevations (scale 1/8" = 1'-0" or 1:100)
   .1 Show all exterior elevations including portions of buildings hidden on the principal elevations, e.g. courtyards.
   .2 Grade – note existing and finish grade line.
.3 Floor elevations – note all levels and top of roof.

.4 Walls – note elevation at top of foundation and retaining walls.

.5 Materials and finishes – note all exterior materials and finishes including railings, trim, and flashing.

.6 Roof slopes – note all roof slopes.

.7 Doors and windows – note all door and window openings, indicate hinge location; provide sufficient information for windows to locate head and sill heights.

.8 Mechanical vents and louvers – locate all vents and louvers and coordinate with mechanical, including roof vents.

.9 Lights – locate all wall mounted electrical fixtures and coordinate with electrical.

.10 Roof drainage – show all gutters and rain water leaders.

.11 Details – cross reference details as required.

.12 For renovations, include outline of area of work.

.8 Detail Sections (scale 1\(\frac{1}{2}\)" = 1'-0" or 1:10, or larger as required)

.1 Waterproofing – provide three-dimensional sequential details for assemblies such as windows, doors, saddle conditions, exhaust vents and balconies to give a clear indication of the installation of the building envelope components in these assemblies (e.g., flashing, membranes, building paper, vapour barrier, caulking, etc.).

.2 Wall, Floor and Roof construction – provide wall, floor and roof type schedule; note assembly components and any required ratings, including Sound Transmission Class (STC) and fire resistance rating. Provide BC Building Code or Underwriters Laboratory of Canada (ULC) ratings and numbers.

.3 Wall/shaft sections – show non-typical conditions (i.e. those not shown on full cross or longitudinal sections) including changes in wall plane, low roofs, elevator shafts, garbage chute, penthouse, garage ramps, exhaust shafts, etc.

.4 Stair details – provide cross section at party walls and typical tread.

.5 Windows – show head, jamb, sill for all conditions. Detail sections to indicate waterproof membrane, building paper, thermal breaks, flashing, caulking and show continuity of air and vapour barrier.

.6 Non-typical openings – provide details at grilles and louvers, etc.

.7 Miscellaneous metal – railings, ladders, special fabrications.

.8 Shafts, bulkhead – provide details for all horizontal and vertical rated shafts and non-rated bulkheads (e.g., mechanical - plumbing and duct enclosures and drop ceilings).

.9 Roof types – provide detail sections through all typical roof types at eaves, low roof at wall junctions and penetrations.
.9 Stair Details (1/4" = 1'-0" or 1:50)
   .1 Stair shafts — show all exit stairs and indicate rise/run dimensions, headroom and landings; section and plan detail required.
   .2 Show railing height and material.
   .3 Landing and tread — note and dimension non-slip nosing and tactile warning strips as required.

.10 Window Schedule (1/4" = 1'-0" or 1:50)
   .1 Elevations — note all window types, including dimensions, height above finish floor, operable portions, hinge location, direction of slide or swing, and glazing type.
   .2 Ensure operable portion of unit windows are easily accessed, i.e. less than 1219 mm (4'-0") above finish floor; note latch height above finish floor and confirm latch location with specified manufacturers.

.11 Door Schedule (elevation 1/4" = 1'-0" or 1:50; frame detail 3" = 1'-0" or 1:5)
   .1 Elevations of all door types.
   .2 Frame types — jamb section of all frame types.
   .3 Schedule — include door dimensions, hinges, frame types, glazing, hardware, fire rating and any special installation requirements, e.g. threshold, weather-strip, closer, panic set, etc.

.12 Cabinet Details — Kitchen, Bathroom, Common Areas (scale 1/4" = 1'-0" or 1:50)
   Provide cabinet elevations for all unit types (kitchen and bathroom) and common area cabinets (e.g. amenity and laundry).

.13 Room Finish Schedule
   .1 Scope — provide room finish schedule for typical suite and for all common area rooms; cross reference to floor plan room names and numbers.
   .2 Note floor, wall, and ceiling finish.
   .3 Include subfloor, base and ceiling height; note drop ceilings where applicable.

.14 Structural Drawings (scale 1/8" = 1'-0" or 1:100)
   .1 Overall footings and foundation plans.
   .2 Overall floor construction plans.
   .3 Roof construction plans, including roof truss layout.
   .4 Sections and details of structural connections.
   .5 Columns, beams, wall and lintel schedules (sizes and reinforcements).
   .6 General design notes on loads, e.g., snow, earthquake, etc.
   .7 Spacing, size, construction of control joints (both horizontal and vertical).
   .8 Details to include miscellaneous metal fabrication and related code and submittal requirements.
.15 Mechanical Drawings (scale as noted)

.1 Mechanical site services plan – show all existing and new services, their sizes, invert elevations, etc. (scale 1/16" = 1'-0" or 1:100); show storm water disposal arrangement. Mechanical consultant is to obtain the inverts, sizes and status of all existing services from utility or municipality.

.2 Overall floor plans with ventilation (exhaust and make-up) forced air heating ducts, plumbing and fire protection layouts (scale 1/8" = 1'-0" or 1:100).

.3 Typical unit plans (scale 1/4" = 1'-0" or 1:100) – HVAC and plumbing layouts for all unit types.

.4 All riser diagrams for services listed above.

.5 Domestic hot and cold water distribution and fire protection diagrams; include sprinklers, standpipes, fire hose cabinets, etc.

.6 Irrigation system layout. Coordinate with landscape drawings.

.7 Make-up air control diagram and details of make-up air unit.

.8 Heating layout drawings – coordinate with framing plans to minimize drop ceilings.

.9 Plumbing fixtures – cross reference plumbing fixtures to the mechanical specifications. Refer to Section 5 - Division 22 00 00 - Plumbing.

.16 Electrical Drawings (scale as noted)

.1 Electrical site services plan (scale 1/16" = 1'-0" or 1:100). Detail underground power cable installation, site lighting, type and detail of installation, etc.

.2 Overall floor plans with lighting, emergency lighting, exit lights, fire protection devices, entry phone/intercom, television cable, and telephone system layouts (scale 1/8" = 1'-0").

.3 Typical unit plans (scale 1/4" = 1'-0" or 1:50) – electrical layout for all unit types.

.4 All riser diagrams for services listed above.

.5 Power distribution diagrams.

.6 Details of emergency power supply.

.7 Main distribution panel for typical apartment and other panel diagrams (including laundry, mechanical room, etc.); include estimated power consumption load.

.8 Electrical light fixtures – cross reference light fixtures to the electrical specifications. Refer to Section 5 - Division 26 00 00 - Electrical.

.17 Landscape Drawings (scale 1/16" = 1'-0" or 1:200)

Add the following information to the Landscape Concept Plan:

.1 Lighting – note site lighting locations.

.2 Drainage – note swales, area drains, co-ordinate with mechanical.

.3 Details – provide details for all landscape elements including planting, paving assemblies, fences and screens, planters, retaining walls, etc.

.4 Outdoor furniture – note type and location.
3.2 SPECIFICATION REQUIREMENTS

Provide full specifications organized according to the CSA MasterFormat 2014 trade divisions adopted by Construction Specifications Canada, prepared by a qualified construction specification writer. Incorporate relevant standards from the BCH Design Guidelines and Construction Standards, Section 5 - Construction Standards. Note that these standards are not intended to be used as project specifications.

The Architect/Design Consultant is to ensure that sub-consultants’ specifications and contract administration requirements do not conflict with the architectural/design specifications. Include a copy of the Geotechnical Report in the appendix of the specifications and, in the case of design tender projects, the report shall be included in the bid documents. For renovation/conversion projects, a copy of the hazmat survey must be included.

3.3 SUSTAINABILITY REQUIREMENTS- NEW CONSTRUCTION AND CONVERSION PROJECTS

Incorporate relevant LEED® documentation and requirements into the specifications if the project is targeted for LEED® certification.

For the Energy Model and Lifecycle Cost Analysis, submit the revised energy model which includes final design choices and technology selections, including energy and GHG savings each year over a baseline model. The lifecycle cost analysis should identify paybacks for specific design options or technologies and for the energy package as a whole.

The copy of the final LEED® scorecards, signed LEED® letter templates and final energy model made to CAGBC shall be submitted to BC Housing by the consultant.

End of Section
ABC Housing Review Process and Sample Letters

Review Process

Sample Letters

1. Drawings/Documents Review

2. Drawings/Documents Acceptance

3. Owner’s Sign-off
Review Process

1.1 Drawings for BC Housing projects are required at the three stages in the BC Housing development review process: Schematic Design stage, Design Development stage and Construction Documents stage as specified in Section 6 - Drawing and Document Requirements.

1.2 A Drawing/Document Review Letter will be issued by BC Housing at each stage of project development. An acceptance letter will be issued at each stage after all major review issues are addressed.

1.3 During the review process the Owner/Operator and their design consultant should meet with BC Housing to discuss and agree on the issues raised in the drawings/documents review.

1.4 A sign-off letter will be issued by Owner/Operator for non-profit projects at each stage of the project development confirming that drawings/documents are acceptable to be used for next stage.

1.5 A construction cost review will be undertaken by BC Housing at every review stage (i.e. at schematic design, design development and at the construction documents phase.)

Sample Letters

2.1 The following sample letters are included for the project team's reference:

.1 Drawings/Documents Review Letter – all stages

.2 Drawings/Documents Acceptance Letter – all stages

.3 Owner's sign-off letter on non-profit projects – all stages

.4 Please note the following:

.1 For design-tender projects, documents shall not be issued for tender prior to issue of the Drawings/Documents Acceptance Letter and/or Sign-Off Letter after reviewing 100% Construction drawings/documents.

.2 For design-build projects, construction shall not commence prior to issue of the Drawings/Documents Acceptance Letter and/or Sign-Off Letter after reviewing 100% Construction drawings/documents.
SAMPLE DRAWINGS/DOCUMENTS REVIEW LETTER

Date:

Project File No:

Sponsor/Consultant Contact
Sponsor/Consultant Name
Sponsor/Consultant Address

Dear Sponsor/Consultant Contact:

Re: Drawing/Document Review Letter for project address

The attached BC Housing drawing/document review lists deficiencies and discrepancies noted by us in the Schematic Design/Design Development/Construction Documents submission for your project at Project address, Municipality. Please rectify these items and supply one(1) set of hardcopy and electronic copy of revised drawings/documents to BC Housing.

This drawings/documents review lists the items required or recommended for revision by BC Housing. The current edition of the BC Housing Design Guidelines and Construction Standards governed our review. Please ensure that your project conforms with these standards.

Please contact the undersigned if you have any questions regarding our comments, and to confirm when a response to this review will be submitted.

Yours truly,

Senior Project Officer/BC Housing Representative's name

Attachment

pc: Architect
    Developer/Contractor/CM
    Development Consultant
    Project Technologist
    Consultant Inspector/Commissioning Authority
    Owner/Operator
SAMPLE DRAWINGS/DOCUMENTS ACCEPTANCE LETTER

Date:

Project File No:

Sponsor/Consultant Contact
Sponsor/Consultant Name
Sponsor/Consultant Address

Dear Sponsor/Consultant Contact:

Re: Drawings/Documents Acceptance for project address

BC Housing has reviewed and accepted the drawings/documents noted below for compliance with the criteria contained in the current edition of the BC Housing Design Guidelines and Construction Standards.

Schematic Design/Design Development/Construction working Drawings/Documents accepted:

- List of drawings/documents

You may now instruct your project architect to commence the preparation of Design Development/Construction working/Construction tender drawings/documents. Please submit one (1) set of complete hardcopy and electronic copy of these documents to BC Housing as soon as they are available, if applicable.

BC Housing will conduct a construction cost review of these documents as part of the approval process.

Yours truly,

Senior Project Officer/BC Housing Representative’s name

pc: Architect
Developer/Contractor/CM
Development Consultant
Project Technologist
Consultant Inspector/Commissioning Authority
Owner/Operator
SAMPLE OWNER’S SIGN-OFF LETTER

Date:

Project File No:

Senior Project Officer/BC Housing Representative for the Project
BC Housing Management Commission
1701 – 4555 Kingsway
Burnaby, BC V5H 4V8

Dear Senior Project officer/BC Housing Representative:

Re: Schematic Design/Design Development/Construction Document Sign-Off for Project Address

This letter is to confirm that the Owner/Non-Profit Society and its operation staff have reviewed the attached Schematic Design/Design Development/Construction working drawing/document dated (date of the issue) and accepted that the drawing/document met the requirements for the Owner/Non-Profit Society.

The Owner/Non-Profit Society also ensures that all programming and functional spaces have been incorporated into drawings and specifications and are cost effective in maintaining and operating the building.

We consider the drawings/documents acceptable to be used for the next phase of project development purposes.

Sincerely,

Owner/Non-Profit Society’s Signing Authority

cc: BC Housing Project Technologist
    Development Consultant
Reducing Air Leakage between Suites

- Background
- Typical Air Sealing Details and Leakage Areas
- Approach and Air Sealing Details
- References
1 Background

Air movement from floor to floor and suite to suite is relatively common in multi-unit residential buildings. While smoke and fire control measures are implemented, little other attention is given during construction to ensuring the air tightness of internal partitions. Limiting the amount of uncontrolled air movement within the building will improve building performance by

1. reducing tobacco smoke and odour transfer between suites
2. enhancing smoke and fire integrity between zones
3. preventing bed bug infestations
4. reducing ventilation air flows needed to maintain pressurization in corridors
5. minimizing paths for sound transfer between suites
6. permitting better sizing of in-suite ventilation and space conditioning systems, thus energy and cost savings
7. enhancing occupant comfort
8. achieving the Environmental Tobacco Smoke (ETS) Control prerequisite in a LEED certified project

While the intrinsic benefits of air leakage control within buildings are relatively well-understood, there is little practical knowledge available regarding how easily internal partitions between suites, and between suites and common areas could be sealed. This appendix has been developed to assist Design Team and Contractor with a focus on reducing air leakage/smoke and ensuring bed bug control between suites in BC Housing projects.

The appendix provides general guidance only and is not intended to replace professional site specific requirements.

2 Typical Air Leakage Areas

While each building will be somewhat different, the location of significant air leakage is usually the same. Here are some common locations of air leakage within the interior partitions:

- Stairway-corridor doors
- Bottom/top plate to the floor/ceiling slab
- Plumbing risers, and stack penetrations through floor levels
- HVAC duct risers through partition walls and floors
- Garbage chute door and access hatches
- Wiring raceways through walls and floors
- Wall-floor and wall-ceiling joint in service areas such as, mechanical room, electrical room, common areas and suites
- Elevator doors
3 Approach and Air Sealing Details

Air leakage between suites can be minimized through

1. Sealing of penetrations in floors, ceilings and walls
2. Air sealing vertical chases located adjacent to units
3. Weather stripping the suite access door

A range of approaches may be applied to minimize air leakage between units, including

1. Sealed polyethylene air/vapour barrier installation
2. Air tight drywall
3. Installation of closed cell expanding foam in conjunction with typical drywall installation

The table below provides potential leakage points and sealing options to address interior compartmentalization of MURBs. In addition to sealing the interior walls, continuity of the exterior air barrier is critical too. Envelope air barrier details are not included in this table or appendix.

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>DESCRIPTION</th>
<th>DETAIL</th>
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</thead>
<tbody>
<tr>
<td>Seal Bottom/top plate to the floor/ceiling slab</td>
<td>Foam Sealant installed after drywall installation. Sealant is recommended for joints from 3 mm to 20 mm. Foam sealant is recommended for joints between 20 mm and 75 mm. Alternatively, the slab to wall joint may be treated by sealing the bottom plate/top plate to the slab, then using neoprene gasket to seal the drywall to the plates.</td>
<td>![Image of foam sealant application]</td>
</tr>
<tr>
<td>Plumbing/electrical fixtures</td>
<td>Plumbing and electrical penetrations may be treated similarly using sealant for small joints and foam for larger joints. Fire rated foam may be used to achieve both air leakage control and fire stopping. Large electrical or plumbing penetrations (greater than 50 mm diameter) are most effectively treated by boxing out the penetration within the stud cavity, filling with foam, then installing neoprene gaskets around the perimeter of the box. This is used when a double plate party wall provides the sound and fire separation and is required by Code.</td>
<td>![Diagram of plumbing/electrical fixture installation]</td>
</tr>
<tr>
<td>LOCATION</td>
<td>DESCRIPTION</td>
<td>DETAIL</td>
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<tr>
<td>Electrical Receptacles</td>
<td>Electrical receptacles may be treated using air tight drywall type gasketed boxes prior to the installation of drywall.</td>
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<td>In situations where the drywall has been installed, pre-punched neoprene gaskets may be installed.</td>
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<td></td>
<td>In cases where the fit between the electrical box and the drywall is poor, foam may be installed to seal the joint.</td>
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<tr>
<td>Door weather stripping</td>
<td>A range of products are available for jamb, head and sill details.</td>
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<tr>
<td></td>
<td>In applications where accessibility precludes the use of a sill threshold, a pile seal may be considered to provide the necessary air sealing. As entrance doors are self latching, ensuring the door can operate properly with the door weather stripping should be confirmed.</td>
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</tr>
<tr>
<td>Transfer grille fire dampers</td>
<td>Transfer grilles installed in walls for supply air may be sealed between the duct and the wall. If the transfer grille is installed in the door, it should be sealed between the duct and the door. In general transfer grilles require a fire damper when installed between the suite and corridor.</td>
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<tr>
<td></td>
<td>Testing of the fire damper in the closed position should be included in assessing the overall air tightness of units.</td>
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<tr>
<td>Pocket Doors</td>
<td>Pocket doors connected to partition walls may provide a significant air leakage path unless the stud space is compartmentalized. Boxing in and air sealing the pocket door rough opening is recommended, as it is difficult to air seal pocket door once installed.</td>
<td></td>
</tr>
</tbody>
</table>
### Supply and Exhaust Ducts
- Seal duct to flange and flange to wall connections of supply and exhaust ducts. Ensure that duct grilles are equipped with flaps or dampers to prevent back flow.
- Joints in ducting can be a significant source of air leakage that may be addressed through specifying maximum duct leakage, and installing joint seals in all duct joints.

### Stacks and vents
- Vertical stacks for water and sewer lines may run within party walls and provide floor to floor air leakage paths. In general these penetrations are fire sealed. A range of fire rated foam products are available that meet fire rating and air seal requirements and may be considered for these applications.

### Plumbing fixtures
- Plumbing fixtures may be treated as other large penetrations. They are most effectively treated by boxing out the penetration within the stud cavity, filling with foam, then installing neoprene gaskets around the perimeter of the box. This detail is required by code when configured back to back but frequently gets omitted in single sided applications.

### Drop Ceiling
- Drop ceiling frequently provide runs for electrical, plumbing and ventilation runs. As such they can be difficult to air seal prior to closing in. However, they are almost impossible to treat once drywall is up.
- It is recommended to install wiring within sleeves that can be sealed once rough in is complete. Similarly, it is recommended to install collars or flanges in ducts as they penetrate walls and seal the flanges to the walls.
Reducing Air Leakage between Suites

4 References

The test procedures to demonstrate compliance:

ASTM-779-03, Standard Test Method for Determining Air Leakage Rate by Fan Pressurization
CBSB 149.10.M86, Determination Of The Air-tightness Of Building Envelopes By The Fan Depressurization Method

A range of documents have been prepared to assist with air sealing and compartmentalizing buildings:

Canada Mortgage and Housing Corporation, Air Leakage Control in Multi-unit Residential Buildings, 2005
City of Calgary, Fire Stopping Service Penetrations in Buildings, Version 1.0, 2003
Contractor’s Waste Management Tracking Form
**Project Information**

<table>
<thead>
<tr>
<th>Project Name:</th>
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<tbody>
<tr>
<td>General Contractor's Project Number:</td>
</tr>
<tr>
<td>LEED Coordinator's Project Number:</td>
</tr>
<tr>
<td>General Contractor's Company Name:</td>
</tr>
<tr>
<td>Signing Authority for General Contractor:</td>
</tr>
</tbody>
</table>
# Contractor’s Waste Management Tracking Form

Declaration:
I certify that this project has implemented a waste management plan and diverted the following quantities of construction, demolition and land-clearing waste to uses other than landfill. The type of waste, receiving facility, amount and diversion ratio are listed below. Material sent to landfill is considered to have a diversion rate of 0% with fully recycled/salvaged waste materials equivalent to 100%.
Hazardous and excavated materials (such as asbestos, lead, earthwork) can be excluded from this waste management plan.

Waste material measured in: ________________

Contact the Recycling Council of BC for information regarding recycling facilities across the province (www.rcbc.bc.ca, 1-800-667-4321, hotline@rcbc.bc.ca)

<table>
<thead>
<tr>
<th>Type of Waste [wood, steel, landfill, etc.]</th>
<th>Date of Haul [Month, DD, YYYY]</th>
<th>Receiving Facility</th>
<th>Amount of Waste [select units above]</th>
<th>Diversion Rate [%]</th>
<th>Amount Diverted [select units above]</th>
<th>Comments</th>
<th>GC Sign-off (signature or initials)</th>
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<tbody>
<tr>
<td>Miscellaneous furnishings (cabinets, equipment, etc.)</td>
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<td>Gypsum Wallboard</td>
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<td>Metals (pipe, T-bars, baseboards, light fixtures, etc.)</td>
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<td>Plastic Trim, Packaging</td>
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<td>Concrete</td>
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<td>Ceiling Tiles</td>
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<td>Wood Products</td>
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<td>Rubber</td>
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<td>Insulation</td>
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<td>Siding (stucco, vinyl, plaster)</td>
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<tr>
<td>Aluminum</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Total quantity of waste diverted from landfill: ________________
Total quantity of waste taken offsite: ________________
Percentage of waste diverted: ________________

Name: ________________
Organization: ________________
Role in Project: ________________
Signature: ________________
Date: ________________
1 Hazardous Material General Information

Conducting building maintenance, repair, renovation, or demolition may disturb hazardous materials, especially materials containing asbestos. There are strict guidelines that control the management, identification, disturbance, transport and disposal of hazardous materials to prevent exposure to workers.

This section provides a quick overview when disturbing hazardous materials to establish safe working conditions and provide additional information.

BC Housing is committed to reducing, minimizing, or eliminating the potential hazards posed to individuals as a result of working with or around hazardous materials including asbestos-containing materials. Additional information can be found at BC Housing website: http://www.bchousing.org/Partners/Ongoing/Hazard-Management

Properties and buildings may contain several types of hazardous materials, some of these materials are in limited quantities in housing complexes, and others like asbestos remain throughout the building and may contain high concentration.

In general, a hazardous material is considered safe and does not pose a health risk when it is intact and in good condition, but does cause a health risk when physically disturbed (i.e. cut, drilled, damaged, removed, etc.).

2 WorkSafe BC Regulations

In British Columbia, the control and disturbance of all hazardous materials, is regulated by WorkSafeBC’s Occupational Health and Safety Regulations.

It is the responsibility of each employer to ensure that no worker is exposed to a substance that exceeds WorkSafeBC’s regulations. There are several Parts of the regulations that are to be referred to when disturbing hazardous materials:

• **Part 5’s guidelines**: Contains the Table of Exposure Limits for Chemical and Biological Substances for workers disturbing materials like asbestos and lead.

• **Part 6**: Regulations for the disturbance of chemical and biological substances (asbestos, lead, silica, etc).

• **Part 8**: Regulations for personal protective clothing and equipment, specifically the requirements for respiratory protection.

• **Part 20**: Regulations for construction, excavation and demolition, specifically the requirements for testing materials and submitting a Notice of Project.

WorkSafeBC: http://www2.worksafebc.com/Publications/OHSRegulation/Home.asp

As mentioned for Part 20, before beginning any work that disturbs hazardous materials like asbestos and lead, WorkSafeBC is to be notified:

• **Notice of Project, NOP**: Written notification to WorkSafeBC for each project initiated with proposed work activities involving hazardous materials including asbestos and lead. It’s to include site specific work procedures, tentative schedule, and location.
3 Potential Locations for Asbestos Materials

4 Owner and Consultant Requirements

Owners (BC Housing and Housing Providers) and Consultants are responsible for informing workers of known hazards on the property and in the building. For asbestos, WorkSafeBC requires an inventory to be maintained that documents building materials that have been sampled and tested for the presence of asbestos. The inventory is to include summary and conclusion statements which provide clear, easy to understand instructions of what products contain asbestos.

BC Housing maintains inventories for many properties; these can be viewed by registering and logging into BC Housing’s Hazardous Material Website: http://hazmat.bchousing.org

Where hazardous materials are present, as a minimum, the Owner should have the following information available for their staff as well as Consultants.

- **Exposure Control Plan (ECP):** Provides guidance and instruction to workers regarding training, education, roles and responsibilities, risk assessment, notice of project, inventory, label & identification, personal protective equipment, and work procedures.
• **Asbestos (or Hazmat) Inventory:** Provides details on the presence or absence of any identified asbestos containing materials. Review the inventory prior to starting work activities and inform workers of hazards.

• **Awareness:** Inform workers of the presence of the hazardous material, any health hazards and related diseases if exposed to the hazard, and what to do if it is to be disturbed.

Owner’s that have staff performing work to materials containing asbestos will need to meet the same requirements as stated in Contractor Requirements. In addition, when asbestos materials remain in place, tenants should be provided with general information to not disturb these materials and what to do if damaged.

Consultants should be informed of, or make arrangement to be aware of any hazards. All known hazards must be provided to the Contractor who will become responsible for Health and Safety; this is most cost effective when included in the tender period.

## Contractor Requirements

Where **hazardous materials are to be disturbed** in addition to the ECP requirement above, as a minimum, the contractor should have the additional documentation available:

• **Risk Assessment:** A qualified person reviews the hazardous material(s), scope of work, and other factors in order to determine the level of protection required for workers, public, and environment.

• **Safe Work Procedures:** Developed after the risk assessment, it establishes how to perform the work safely. Each ‘type’ of job, i.e. drilling &/or fastening into drywall, fixing floor tiles, patch/repair, clean-up, emergency work, etc should have a safe work procedure.

• **Tools and Equipment:** Trained workers are to be provided with the appropriate tools and equipment required to perform the work and for their personal protection, safety of other workers, safety of the building and safety of the public.

• **Respirators & Fit Testing:** Trained workers are required to have a personal respirator and be trained in its maintenance, use, and limitations. Workers are to be fit tested annually and be able to provide a valid certificate. Facial hair is not allowed to disrupt the seal between the respirator and the skin.

• **Worker Training:** Supervisors and/or workers should be able to provide proof of training and education. The training/education should be to a level acceptable for the work being performed by the worker.

• **Notice of Project:** Submitted electronically to WorkSafeBC a min. 24 hours in advance of work being performed to hazardous material such as asbestos, lead, and silica. A copy must be posted at the work site.

• **Air Sampling (If Applicable):** If air sampling is completed, copies of the air sample results are to be analyzed and returned to the job site within 24 hours.

At the end of the project, Contractors should provide the information necessary for Owner’s to update the asbestos inventory to ensure it is current and up to date. Request the Contractor’s Hazardous Material Management Tracking Form from a BC Housing representative.
Additional Considerations

Whether performing routine maintenance, renovations, repairs, or demolition the following information is a guideline and should not replace the requirements of WorkSafeBC.

6.1 KNOW YOUR SCOPE OF WORK

It's best if the Owner and Consultant know the location and extent of the work to be complete prior to reviewing the inventory or arranging for additional sampling or survey. Anticipate what areas and materials may be impacted when completing the scope of work. The benefits for this is that it can reduce costs, reduce risks, prevent construction delays, and prevent exposure.

6.2 RETAINING A CONSULTANT FAMILIAR WITH HAZARDOUS MATERIALS

There are several advantages to retaining an environmental consultant early on a project to collaborate and provide information. The Consultant can provide additional advice on sampling requirements, conduct risk assessments, establish contractor requirements, and as necessary conduct reviews and air sample.

6.3 CHECK THE INVENTORY / PREVIOUS SURVEY

The Owner may already have completed a representative survey for hazardous building materials and developed an inventory of known hazards. Where no previous survey has been completed, a survey may be required due to the age of the building, refer to ADDITIONAL SAMPLING with respect to requesting a survey.

If an inventory does exist for the property, review the inventory (or report) to see that it contains information for the material within the scope of work, such as:

- Asbestos
- Heavy Metals (Incl. Lead)
- Lead based paints
- Mercury
- Ozone Depleting Substance (ODS)
- Polychlorinated Biphenyl (PCB)
- Radioactive / Radiofrequency
Not all hazards may be listed on the inventory and these may need to be addressed prior to starting construction, this includes but not limited to:

- Wall, floor and ceiling cavities may not have been accessed during the representative survey and may conceal and/or hide materials that require testing.
- Sharps & needles, animal droppings and carcasses, biological (i.e. bacteria), and mould may also be present.

### 6.4 ADDITIONAL SAMPLING REQUIREMENTS

Additional sampling may be required to determine if a material poses a hazard, especially for asbestos and lead containing materials, and/or there are gaps in the inventory between the scope of work and materials sampled.

If the inventory is not comprehensive enough, it may be needed to complete the following:

- For larger projects: Prior to tender, recommend an additional detailed survey be conducted with the defined scope of work to more accurately determine hazards and associated costs.
- For smaller projects: Either arrange for an additional survey or if the scope of work is small enough, request the contractor, if qualified, to collect samples for analysis of suspect or unknown materials.

When requesting a survey, generally there are 3 types of surveys that can be conducted:

- **Representative (or occupied) Sampling – Typically/Standard**: Typically used to develop an inventory as it is non-destructive and checks most building materials and usually does not include entering accessible cavities and opening up walls for hidden materials.
- **Non-Destructive Sampling – Request**: Will check and enter accessible cavities, bulk heads, etc. for hazardous materials.
- **Destructive Sampling – Request**: Will open-up wall, floor and ceiling cavities to check for hazardous materials. Best for projects commencing shortly and the scope of work is defined.


### 6.5 KEEP THE ASPEROSIT (HAZMAT) INVENTORY CURRENT

After completed additional sampling or survey for asbestos, update or create the inventory with all materials sampled. Housing Providers can submit a copy of the inventory to [amp@bchousing.org](mailto:amp@bchousing.org). This will ensure all the information is in one place and prevent re-sampling of the same materials.

Upon completion of the project, the inventory should be kept current by updating the inventory spreadsheet or by the contractor filling out and submitting the Contractor’s Hazardous Material Management Tracking Form. The contractor is required to submit the updated inventory list as part of Closeout Procedures; Refer to [Division 01 78 00 - Closeout Submittals](#).
6.6 AIR SAMPLING DURING WORK ACTIVITIES

Air sampling may be required to check a worker’s exposure to a hazardous material such as asbestos, lead, mould, and silica. A qualified person can inform the Owner if air sampling is required, the type of air sampling necessary and the frequency of it.

For asbestos, air monitoring is not required for low-risk and moderate-risk work activities when performed by trained workers using strict work procedures and the regulations they are governed by. However, there may be a need to conduct some air sampling if:

- working in a tenanted or occupied building. Air sampling at the beginning of the project can prove that effective measures are in place to protect workers, tenants and public; or
- large amounts of asbestos are to be removed. Air monitoring may be required as there is a potential for generating enough fibres to pose a health hazard.

Air sampling is mandated by WorkSafeBC for high-risk work activities, they are monitored closely to ensure asbestos fibres do not migrate out of the enclosure and that workers are adequately protected.

6.7 RETAINING A CONTRACTOR

Contractors must be appropriately trained and educated in disturbing hazardous materials. Employers should review a contractor to ensure the contractor is capable of performing the work appropriately and safely.

6.8 DOCUMENTATION TO REQUEST FROM A CONTRACTOR

Depending on who is performing the work and the relationships on the project, the following documentation is to be at the job site, BC Housing requires some of the following documentation:

- Risk Assessment;
- Work Procedures;
- Notice of Project (NOP);
- Respirators & Fit Testing;
- Worker Training; and
- Air Sampling (if applicable)

A copy of the NOP, Work Procedures and any Air Sampling are to be maintained on site at all times while the work activity is in progress. Prior to initiating any asbestos related work, the contractor will inform the Owner. For BC Housing managed properties, the above three documents must be submitted to ohs@bchousing.org.

6.9 WASTE GENERATOR

When removing waste from a property, depending on the quantity being removed, the contractor may require the waste generator number. This is a requirement from the Ministry of Environment to track which property the hazardous waste came from.
Small amounts of appropriately bagged asbestos containing materials may be stored on sites in a secure and labelled container. When the container is full, arrange for the waste to be disposed of in accordance with BC Ministry of Environment, Lands and Parks regulations, and Transportation of Dangerous Goods (TDG) Legislation.

Contact the Recycling Council of BC for information regarding recycling facilities across the province for local disposal of waste (www.rcbc.bc.ca, 1-800-667-4321, hotline@rcbc.bc.ca)

For Provincial Rental Housing Corporation (PRHC) properties, contact BC Housing representative responsible for the project for the BCG#. For non-PRHC properties, the property owner will need to supply the BCG # or request one from the Ministry of Environment.

6.10 WASTE MANIFEST FORMS FROM THE CONTRACTOR

The waste manifest form documents the generation of the hazardous waste, and is proof that it was transported and disposed of in accordance with regulations.

- For PRHC properties, a copy of the waste manifest form is to be sent to BC Housing at amp@bchousing.org
- For non-PRHC properties, a copy of the waste manifest form is to be sent to the Owner of the property.

6.11 COMMUNICATING WITH TENANTS

The Owner’s have a responsibility to appropriately advise tenants on the precautions that should be taken when asbestos containing materials are present in a living space. As a precaution, tenants must not be present in the suite/room while asbestos work is being performed nor shall they be allowed to return to that suite/room until the area has been cleaned in accordance with the requirements of the WorkSafeBC’s Occupational Health and Safety Regulation.

A few template letters for communicating with tenants are available on BC Housing website under the Asbestos Management Program Step 2 page, under the Information and Template section.

The extent to which a tenant is advised about potential asbestos containing materials within their building must be reviewed and should be based on the potential exposure risk to that tenant. Care must be taken to not create undue stress and anxiety among tenants.

- If ‘Friable’ asbestos containing materials remain and they are located in areas easily accessible to tenants, then tenants must be advised about the need to maintain these materials in good repair and to promptly report any damages.

For BC Housing managed properties, communication plans in this area should be communicated and coordinated through the Property Portfolio Manager, Maintenance Manager, and/or Building Manager Supervisor.
1 Terms of Reference

1.1 GENERAL

1. The Consultant Inspector is to be engaged early in the design process on new construction projects, the Inspector is engaged by BC Housing to provide comments on BC Housing Design Guidelines and Construction Standards and reviewing the construction work for compliance with the approved construction documents.

2. The Inspector also advises both BC Housing and the Sponsor on the extent to which the Contractor’s progress claim is consistent with the progress of construction as observed on site. The Inspector is to report directly to BC Housing any results, findings, reviews and recommendations.

3. The Inspector may request verification from the design consultants or the Contractor to confirm that they are meeting their contractual obligations as well as BC Housing and Sponsors requirements.

4. The Inspector may be requested to provide other related additional technical services beyond those already provided under Article 2. Responsibilities which are considered as basic services. The fee for such additional services shall be based on the rates in basic services or as otherwise mutually agreed with the Owner. The Inspector shall only provide these additional services if authorized in writing by the Owner.

5. The Inspector will not be liable to the Commission for services provided to the Commission under other contracts or agreements to which the Inspector is not a party and, without limiting the generality of the foregoing, the Inspector is not liable for damages or deficiencies resulting from the failure of any Architect, Engineer or other Consultant or any Building Contractor to perform their obligations under their respective contracts or professional obligations. The Inspector is acting only as an advisor to the Commission and is not liable for the design or construction of the Project.”

The purpose of this clause is to confirm that the Inspector does not assume any of the contractual or professional responsibilities of the design consultants or Contractor, nor does the Inspector assume the risk associated with those responsibilities.
2 Responsibilities

2.1 GENERAL

.1 The Inspector provides an advisory role to BC Housing on design and technical issues relating to the project that he/she is assigned to.

.2 Specific responsibilities of the Inspector will depend on the phase at which the Inspector is engaged on a project. BC Housing staff will issue a Plan Assignment Letter specifying the required Consultant-Inspector services for the project.

.3 The Inspector is required to be completely familiar with and understand the BC Housing Design Guidelines and Construction Standards.

.4 To the extent that is required to understand the technical and design requirements for the project, the Inspector should be familiar with the applicable codes and bylaws affecting the assigned project, including, but not limited to, the BC Building Code or Vancouver Building By-law, Authority Having Jurisdiction and referenced supplements.

.5 The Inspector shall attend meetings as necessary with the design team and BC Housing.

2.2 PLAN REVIEWS

The Inspector is typically engaged to conduct Plan Reviews at the Construction Documents review phase of a new construction project. However, BC Housing may elect to engage the Inspector at the early design phases to comment on compliance with BC Housing’s Design Guidelines and to provide technical advice as required.

The Inspector shall:

.1 Review the submitted plans, specifications and other required documents for compliance with the BC Housing Design Guidelines and Construction Standards. Identify any material variances from the Standards.

.2 Prepare reports addressed to BC Housing identifying in detail any deviations or deficiencies in the plans and specifications at different percentage completion of Construction Document, as determined by BC Housing. The Inspector should be available to meet with BC Housing and the project team to discuss the results of the Plan Review.

.3 The Inspector shall conduct an inspection of the site and report any observed site conditions which may not have been taken into consideration in preparing the construction documents.

The Inspector may recommend any additional field reviews, mock-ups or submittals required by the design team, given the particular project site and design. The Inspector shall review the design team’s response and recommend acceptance or any further actions/revisions if warranted.

2.3 CONSTRUCTION PROGRESS AND COMPLIANCE REVIEW

.1 Construction Start-Up
Meet with the design team and the Contractor to:

.1 agree on a progress claim format, copies of which are to be provided by the Contractor to BC Housing, the Design Consultant, the Society and the Inspector;

.2 review the construction schedule, prepared by the Contractor;

.3 review mandatory field reviews, mock-ups and submittal requirements and other quality control procedures.

.2 Site Meetings

.1 Review accuracy of all regular project meeting minutes and ensure that they capture all important decisions or follow-up items.

.2 Attend all regular project meetings with the design team and the Contractor to:

.1 Verify the accuracy of the Contractor’s progress claim based on a mutual assessment of work completed and costs to complete. Where there is a disagreement about the value of work completed which cannot be resolved on site, refer recommendations and reasons to BC Housing.

BC Housing may elect to engage the services of a Professional Quantity Surveyor to undertake progress claim reviews. In this case, the Inspector will exclude this work from the scope of his/her service.

.2 Verify that the mandatory field review, mock-ups, submittals, and relevant requirements from the Project Manual are being performed and reports being provided by the design team consultants. The Inspector is to receive site reports from all Consultants prior to signing off on the progress draw.

.3 If required, provide input on the amount of adjustment in the contract price for the proposed change orders and any revisions to the schedule.

.3 Field Reviews

.1 Conduct periodic field reviews of the project as required by its size and complexity. Where the Inspector is of the opinion that reviews will be required more than twice monthly, review the proposed inspection schedule with BC Housing’s representative.

.2 The purpose of the field review is to enable observation of any material variations from the contract documents and record those variations in regular site visit reports (see Sample Site Visit Report in this section). The Inspector, while using all reasonable efforts to observe and report on deficiencies in the construction of the project, is not responsible, pursuant to these standards or in contract, for deficiencies resulting from any breach of the contractual or professional obligations of the Contractor, Design Consultant or other consultant.

.3 Provide electronic reports of all field reviews. Written field reviews are acceptable for on-site copies. Field review are to be emailed or faxed to the Architect, Contractor, Sponsor and BC Housing within three (3) days of the field review. Outline and discuss any observed deficiencies and concerns with the Contractor’s representative and the Architect, as appropriate, and note in the report items which have not been resolved.

.4 Maintain a running list of observed project deficiencies and/or unresolved issues, and update it on a regular basis, recording their resolution. These observed deficiencies shall be
noted in the site visit reports under “Quality Items” until they are resolved.

.5 Note that it is the responsibility of the Architect to interpret the construction contract documents and to advise the Contractor, consultants, Sponsor and BC Housing with respect to relevant deficiencies or concerns. Any deficiencies or concerns observed by the Inspector shall be referred to the Architect to review and provide advice and direction as required.

.4 Submittals, Shop Drawings and As-Built Drawings

.1 Review the Contractor’s submittals, shop drawings, product data and samples, for conformance with the general design concept of the Work as provided in the Contract Documents and BC Housing Design Guidelines and Construction Standards. Provide a report of these observations to the design team, Contractor and BC Housing of any apparent non-compliant submittals.

.2 Obtain copies of submittals and shop drawing to ensure compliance with the contract documents.

.3 Review on-site as-built mark-up set on a monthly basis for inclusion of all changes to the project manual.

.5 Mock-ups and In-situ Testing

.1 Attend mock-up and in-situ testing to ensure compliance with the contract documents. Review all site reports that verify the mock-ups and in-situ testing was performed and recording accurately.

.2 Report any alterations to the mock-ups and in-situ testing as stated in the Contract Documents.

.3 Ensure any follow-ups to the mock-ups and in-situ testing is conducted including retesting.

.6 Substantial Performance/Certificate of Completion

.1 Obtain a copy of the Architect’s deficiency list and consider its accuracy by performing some selective reviews on site. Such reviews shall not be deemed to be conclusive.

.2 Report any material variances in reported versus observed deficiencies to the Architect, the Contractor and BC Housing. Review correction of the deficiencies, confirming in writing when they have been satisfactorily addressed. When requested by BC Housing, verify appropriate deficiency holdbacks as recommended by the Architect.

.3 Participate in the deficiency review and identify known outstanding deficiencies as well as observations made during the review. Review the consultant’s report and ensure an appropriate dollar value is established for each item identified during the review.

.4 Verify the Contractor’s application for final payment and the issued certificate of final payment.

2.4 POST CONSTRUCTION PHASE

.1 Operating and Maintenance Manual

Ensure that the Operating and Maintenance manual:
.1 is submitted by the Contractor to the Owner no later than thirty (30) business days after the Certificate of Completion is issued;

.2 contains all the information in hardcopy and electronic copy as listed in Section 5 – Division 01 78 00 – Closeout Submittals.

.2 Maintenance and Renewal (M&R) plan

Ensure the Owner’s M&R plan:

.1 is prepared no later than thirty (30) business days after the Operating and Maintenance Manual is received by the Owner.

.2 contains all the information in hardcopy and electronic copy as listed in Section 5 – Division 01 78 00 – Closeout Submittals.

Coordinate with the Contractor/Commissioning Authority to ensure that building systems demonstrations and trainings have been conducted for the benefit of the Sponsor’s building and maintenance personnel.

.3 As-Built Drawings

Ensure that copies of as-built drawings as required in the contract are submitted to the Society and BC Housing.

2.5 POST-OCCUPANCY PHASE

.1 Within 2 months prior to expiry of warranty, ensure that the Society and Consultants conduct a final inspection to review and report defects or deficiencies reported or observed during the warranty period.

.2 Participate in the final inspection and report observed items requiring attention by the Contractor to the Consultant.

.3 Monitor the Contractor’s correction of observed deficiencies and confirm the date for correction of deficiencies.
# Sample Site Visit Report

## Consulting Inspector Letterhead

<table>
<thead>
<tr>
<th>Topic</th>
<th>Action Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workforce on Site</td>
<td>(Note trades on site.)</td>
</tr>
<tr>
<td>Progress</td>
<td>(Document progress by MasterFormat division or trade where applicable.)</td>
</tr>
<tr>
<td>Quality Comments</td>
<td>(Maintain a list of observed deficiencies until resolved and note date.)</td>
</tr>
<tr>
<td>Schedule Comments</td>
<td>(Note progress in relation to Contractor's schedule.)</td>
</tr>
<tr>
<td>Photos</td>
<td>(Note any photos attached to report.)</td>
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</tbody>
</table>

The following is to be completed after each site meeting

<table>
<thead>
<tr>
<th>Topic</th>
<th>Action Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site Meeting/Issues</td>
<td>(Note material issues from monthly progress claim meeting that require review.)</td>
</tr>
<tr>
<td>Progress Claim</td>
<td>(Note recommended revisions to the progress claim &amp; attach annotated progress claim.)</td>
</tr>
<tr>
<td>Next Site Meeting</td>
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</tr>
</tbody>
</table>

End of Section