

Notes to Part 11

Existing Buildings

A-11.2.1.2. Existing Building Upgrade Mechanism.

BACKGROUND AND INTENT. When work is carried out to an existing building, the Building By-law requires that the building be upgraded to an “acceptable” level. On April 20, 2004 Council approved a new model for determining the “acceptable” level of Building By-law upgrade for existing buildings undergoing alterations under the City’s building permit process.

Prior to April 20, 2004, the Upgrade Mechanism Model was based primarily on construction values. The new Upgrade Mechanism Model determines the required “acceptable” level of upgrade for an existing building using the concept of “Project Types and Categories of Work”.

The intent of the Upgrade Mechanism Model is to provide a road map for building owners and designers to determine the required level of Building By-law upgrade for the existing portion of a building as a function of the project types and the related categories of work.

The Upgrade Mechanism Model is not generally intended for existing residential buildings containing not more than two principal dwelling units. The general upgrade requirement for these types of buildings is defined in Article 11.2.1.4. of Division B.

VOLUNTARY BUILDING BY-LAW UPGRADES. Where a voluntary upgrade for fire alarm systems, sprinkler systems, exits, accessibility, seismic work, building envelope repair, energy efficiency, or water efficiency is performed, it is not the intent of this By-law to require the owner to further upgrade the building provided no other work is included in the project. If other work is included in the project, the upgrade requirement will only be based on the non-voluntary work proposed.

PROCEDURE FOR USING THE UPGRADE MECHANISM MODEL

The following steps outline a recommended procedure for using the Upgrade Mechanism Model.

STEP 1 – Determine Any Other Requirements that may be Applicable. Other Building By-law requirements may be applicable to the existing building project. Review the Overall Conditions for the Upgrade Mechanism Model to determine if other requirements are applicable.

STEP 2 – Determine the appropriate Project Type(s) and Related Category or Categories of Work as a function of the scope of work for the alteration.

If the renovation includes more than one category of work or project type, then the most restrictive upgrade levels from each project type would be applied.

Table A-11.2.1.2.-A
Project Types and Related Categories of Work

| Project Type | Rehabilitation (See Flow Chart No. 1) | Change of Major Occupancy (See Flow Chart No. 2) | Addition (See Flow Chart No. 3) |
|---------------------------|---|---|--|
| Categories of Work | Voluntary Upgrade Repair/Small Suite Minor Renovation Major Renovation Reconstruction | Change of Major Occupancy Classification Change of Major Occupancy Classification to a Small Suite | Major Horizontal Addition Minor Horizontal Addition Major Vertical Addition Minor Vertical Addition |

STEP 3 – Determine the Required Design Upgrade Level Based on the Category of Work for the Project

The required upgrade levels for fire, life & health safety; structural safety; non-structural safety; accessibility for persons with disabilities; and energy efficiency are to be determined using each of the applicable project type flow charts and the related category of work

For Rehabilitation Type Projects use Flow Chart No. 1.

For Change of Major Occupancy Type Projects use Flow Chart No. 2.

For Addition Type Projects use Flow Chart No. 3.

NOTE: Where a project involves more than one category of work, the most restrictive upgrade level, as determined from each category of work, shall determine the upgrade design level.

STEP 4 – Determine the objective and acceptable solution for the most restrictive upgrade level for fire, life and health safety; structural safety; non-structural safety; accessibility for persons with disabilities; and energy efficiency. The most restrictive upgrade levels are the design upgrade levels that are to be applied to the existing building.

The model is based on incremental upgrade levels for each of the fire, life and health safety (F), structural safety (S); non-structural safety (N); accessibility (A); and energy (E) objectives. For each of the upgrade levels, the model states the objective of the upgrade level as well as the corresponding acceptable solution that is deemed to meet the intended objective of the applicable upgrade level. The objective statement and acceptable solution for each F, S, N and A upgrade level is defined in Table A-11.2.1.2.-B. The objective statement and acceptable solution for each E upgrade level is defined in Table A-11.2.1.2.-C.

The alternative acceptable solution for energy efficiency requires that the determined E design upgrade level from Flow Chart No. 1 is used to enter Table A-11.2.1.2.-C to determine the Objective Statement and review the list of options of alternative acceptable solutions. Within Table A-11.2.1.2.-C and the appropriate E Level section, the user selects one alternative acceptable solution from within the Building System chosen by the user to be upgraded. Only one (1) of the solutions in the Alternative acceptable solutions Options column in Table A-11.2.1.2.-C is required to meet the objective. It is up to the user to determine which system in the Building System column and corresponding upgrade solution in the Alternative acceptable solution Option column shall be chosen to satisfy the objective. Within any 5 year period, when an alternative acceptable solution has been used previously within the project area, then that option is not permitted to be used as an alternative acceptable solution.

PROJECT TYPES AND THEIR RELATED CATEGORIES OF WORK

The Upgrade Mechanism Model is based on the following defined three Project Types and related Categories of Work as illustrated in Table A-11.2.1.2.-A. If the renovation includes more than one category of work or project type, then the most restrictive upgrade levels from all the applicable project types would be applied.

Table A-11.2.1.2.-A
Project Types and Related Categories of Work

| Project Type | Rehabilitation (See Flow Chart No. 1) | Change of Major Occupancy (See Flow Chart No. 2) | Addition (See Flow Chart No. 3) |
|---------------------------|---|---|--|
| Categories of Work | Voluntary Upgrade Repair/Small Suite Minor Renovation Major Renovation Reconstruction | Change of Major Occupancy Classification Change of Major Occupancy Classification to a Small Suite | Major Horizontal Addition Minor Horizontal Addition Major Vertical Addition Minor Vertical Addition |

REHABILITATION PROJECT TYPE (Flow Chart No. 1)

Voluntary Building By-law Upgrades – Voluntary Building By-law upgrades are limited to alterations that directly contribute to the improvement of the fire alarm, sprinkler, exit, accessibility, seismic, building envelope, and energy or water efficiency systems in an existing building.

REPAIR – Repair pertains to a limited scope of interior or exterior renovation work to replace existing building components with functionally equivalent components. Repair work may not include work that increases the usable floor area of a building, creates an interconnected floor space, supports an addition or change of use, or the consolidation of more than one existing suite into a single tenant space. For Repairs, an E1 level of energy upgrade shall be applied.

SMALL SUITE – The upgrade trigger for a Small Suite pertains to limited renovation work within a suite separated from adjacent spaces in a building by a fire separation incorporating at least two layers of gypsum wallboard on the suite side, which is

- a small suite as defined in Division A, Article 1.4.1.2., or
- a suite of Group A, Division 2, D, or E major occupancy with an occupant load up to 100 persons as determined by Division B, Article 3.1.17.1.(1)(c) and egress directly to the adjoining ground level.

Small Suite work may include reconfiguration of the interior space of the suite, but may not include work on more than level (storey or mezzanine), interconnected floor spaces, exterior renovations, or the consolidation of more than one existing suite into a single new tenant space. For Small Suite renovations, an E2 level of energy upgrade shall be applied.

MINOR RENOVATION – Minor renovation means a project whose scope of work includes construction limited to the improvement, renovation, reconfiguration, or refurbishment of a single suite contained within a single tenant space and those demising walls shared with the adjoining suites, but which does not include the public or common floor areas of the building. Minor renovation may also include the subdivision of a single suite of not more than one storey into smaller constituent suites.

Minor renovations may include the following:

- Reconfiguration of the interior space of the suite which may occupy multiple levels in a building,
- Retention of existing interconnected floor spaces that do not create new connections to previously unconnected floor areas,
- Retention of existing mezzanines that do not add floor area,

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- Subdivision of an existing suite of not more than one storey into one or more suites which do not include floor area outside of the subdivided suite
- Renovation in adjacent suites to the extent necessary to support the relocation of shared demising walls, or
- Exterior renovations pertaining to the subject suite.

Where the renovation includes a new interconnected floor space, this work would not be considered to be a minor renovation. New mezzanines are considered to be additions.

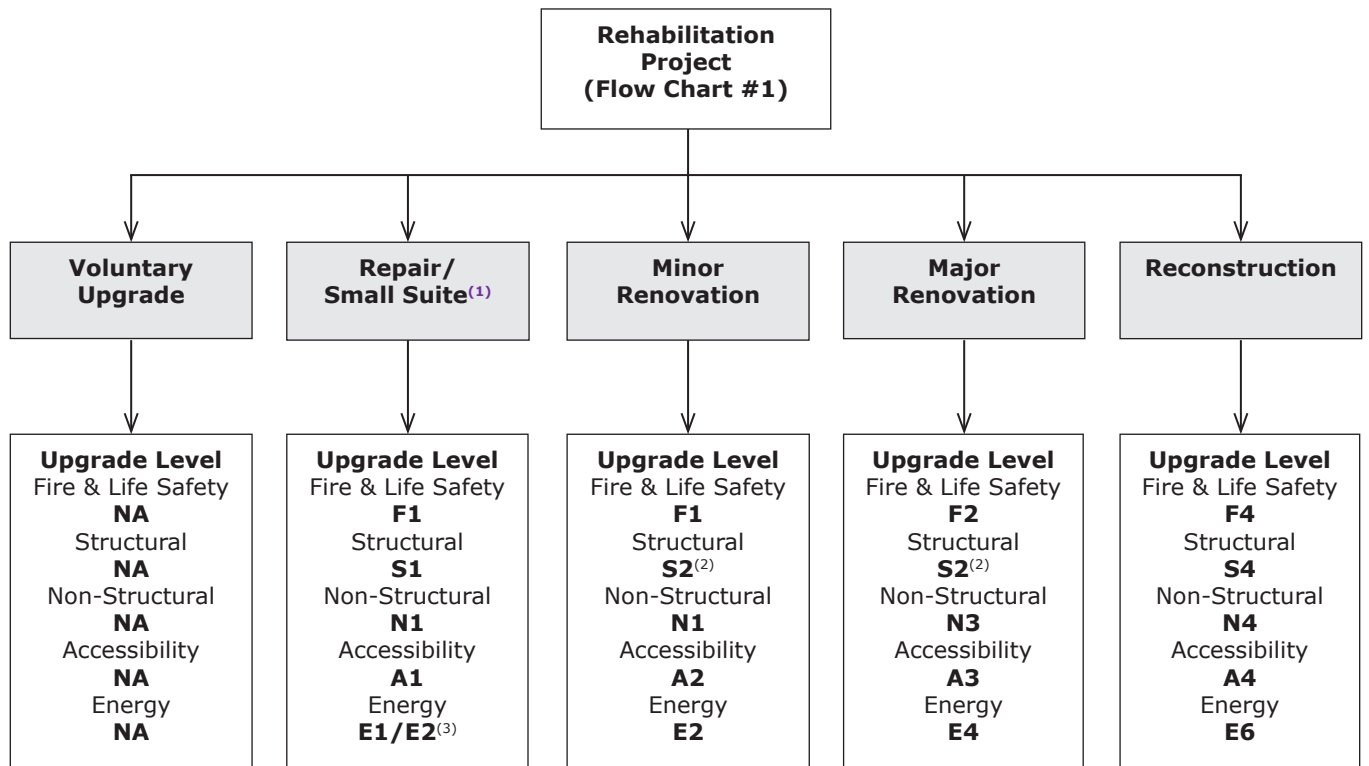
MAJOR RENOVATION – Major renovations means work within multiple tenant spaces that is not otherwise considered a minor renovation. Major renovations may include (singly or in combination): Interior re-configuration of multiple tenant spaces, creation of interconnected floor spaces, exterior alterations, or alterations that create a new tenant space. However, where such renovation includes a change of major occupancy classification or a new mezzanine, this work would not be considered solely as a major renovation. New mezzanines are considered to be additions.

RECONSTRUCTION – Reconstruction means the extensive removal of the majority of construction to expose the building’s primary structure on interior and exterior walls, floors and roof with only the primary structural elements remaining in place (building skeleton). Reconstruction also includes substantial reconfiguration of the interior floor space. Where work, which might otherwise be considered as reconstruction, is undertaken solely to facilitate the repair or the abatement of a health hazard of a building, then such work need not be considered a reconstruction and would be considered a repair, minor renovation or a major renovation as defined in this By-law.

Reconstruction project typically include:

- extensive renovations throughout the entire building and the building is gutted.
- removal of the majority of drywall and plaster from the interior walls.
- the removal of the majority of drywall, plaster, insulation and exterior cladding from the exterior walls, or
- the removal of floor and roof membranes and coverings.

FLOW CHART NO. 1



Notes to Flow Chart No. 1:

(1) For small suites, the small suite must be separated on the suite side of the suite separation with at least two layers of gypsum wall board (GWB). Where only one layer exists, then an additional layer of GWB must be added to the suite side only. The additional layer of

GWB may be any type of GWB with a minimum thickness of 13 mm.

- (2) Notwithstanding the upgrade levels in Flow Chart #1, where a minor or major renovation involves an entire building and the renovation includes the removal of the majority interior wall cladding then the structural seismic upgrade level shall be S3.
- (3) For Small suite renovations, an E2 level of energy upgrade shall be applied.

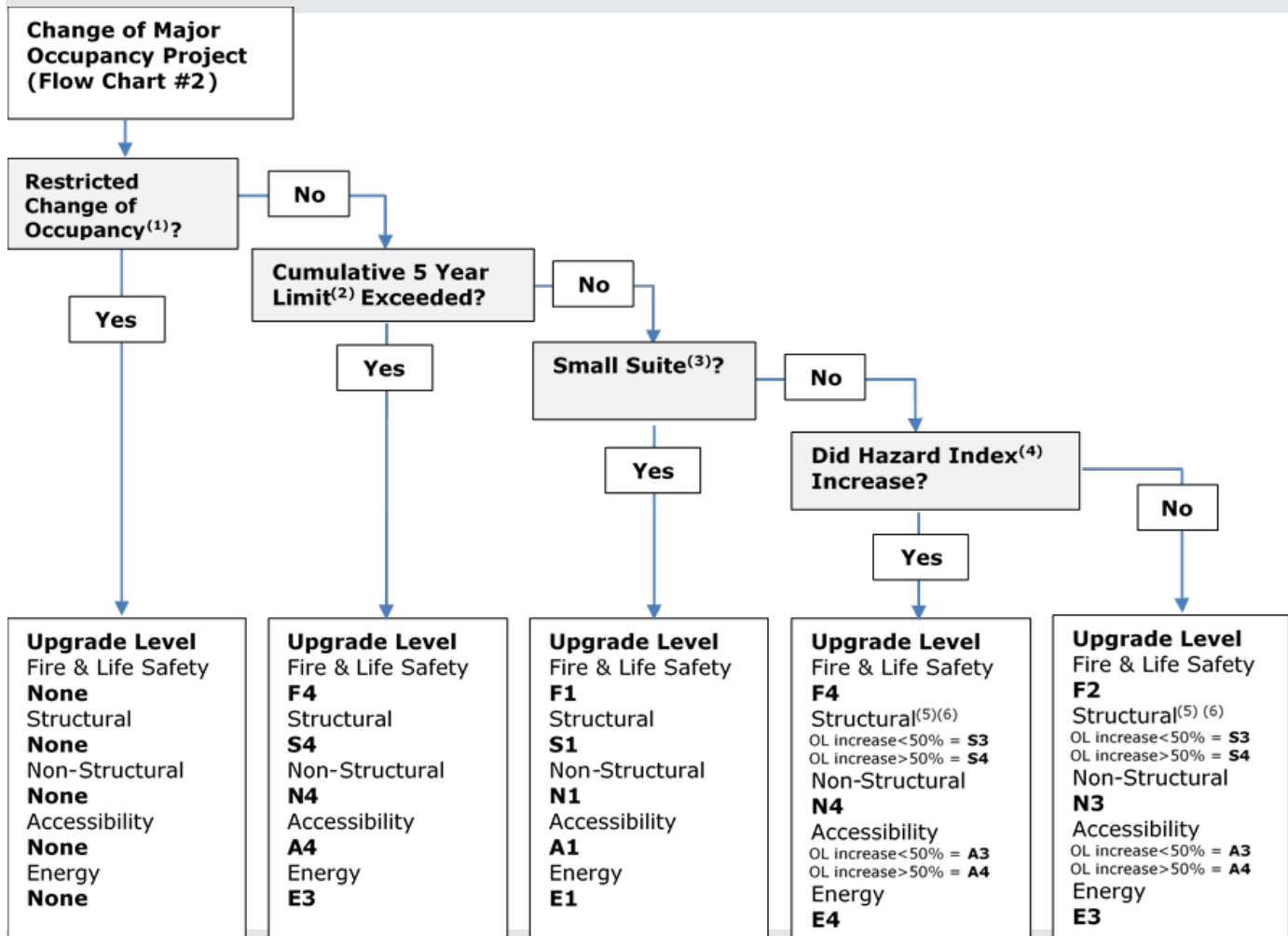
CHANGE OF MAJOR OCCUPANCY CLASSIFICATION PROJECTS (Flow Chart No. 2)

Restricted Change of Occupancy – The term “restricted change of occupancy” refers to a change in major occupancy restricted to a specific set of uses as set out in Article 11.2.1.2.(10) that are limited both in scope and risk such that it does not increase the overall hazard.

Change of Major Occupancy Classification – Change of major occupancy classification means a change of *major occupancy* within a building, a suite, or its constituent floor areas where the proposed *occupancy* is outside of the currently defined *occupancies* of the existing major occupancy classification permitted for the building, the suite, or its constituent floor areas.

Small Suite Change of Major Occupancy Classification – Small suite change of major occupancy classification means a change of *occupancy* within a *small suite*, or the constituent floor areas of a small suite, where the occupant load for the entire suite does not exceed 60 persons and the small suite is limited to a Group A, Division 2, Group D, Group E, Group F, Division 2 (wholesale showroom), or Group F, Division 3 major occupancy.

FLOW CHART NO. 2



Notes to Flow Chart No. 2:

- (1) Restricted Change of Occupancy (see Article 11.2.1.2.(10) and note A-11.2.1.2.(10))
- (2) The cumulative 5 year limit is triggered when there is a change of major occupancy in an existing building and the aggregate area of the change in major occupancy including the current work within any 5 year period is greater than 50% of the building area (as defined in Article 1.4.1.2. of Division A) in a building of not more than one storey, or the aggregate area of the change in major occupancy within any 5 year period is greater than 100% of the building area (as defined in Article 1.4.1.2. of Division A) in a building of more than one storey.
- (3) For small suites, the small suite must be separated on the suite side of the suite separation with at least two layers of gypsum wall

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board (GWB). Where only one layer exists, then an additional layer of GWB must be added to the suite side only. The additional layer of GWB may be any type of GWB with a minimum thickness of 13 mm.

- (4) Where there is a change of major occupancy and the structural load paths or structural design criteria are altered then it must be demonstrated that the existing building has the structural capacity to carry the increase in load or the building shall be structurally upgraded to carry the increase in live load.
- (5) Occupant load (OL) increase is based on the proposed occupant load for the entire building versus the current occupant load for the entire building. The OL change may be assessed in a comparative manner by considering only those areas undergoing a change of major occupancy, where the occupant load of the remainder of the building cannot otherwise reasonably be assessed. Occupant loads are to be determined by the acceptable solutions in Subsection 3.1.17. of Division B.
- (6) The Hazard Index may be determined by the Hazard Index Table A-11.2.1.2.-D. or other methodology as deemed acceptable to the Chief Building Official.

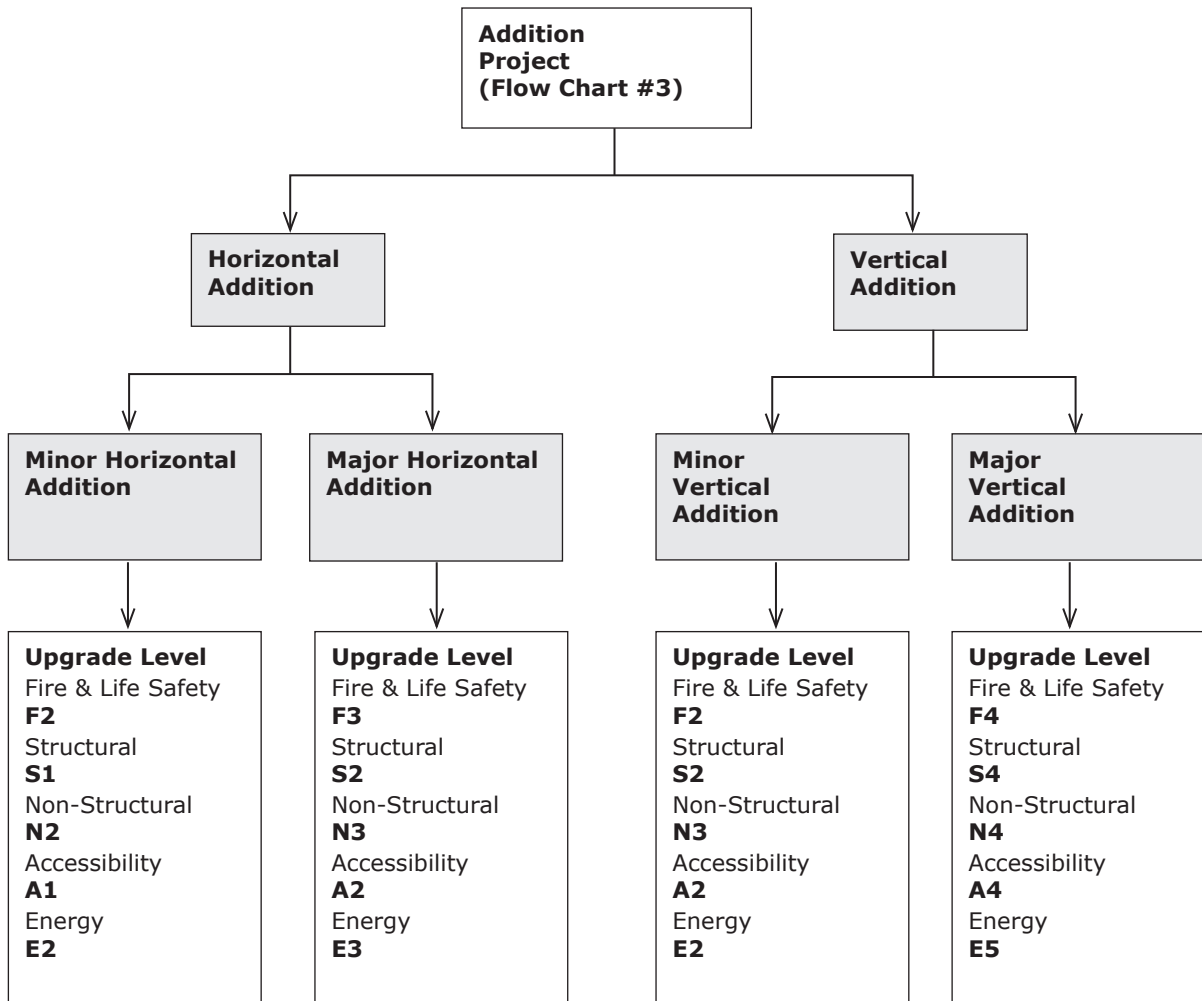
ADDITION PROJECTS (Flow Chart No. 3)

Horizontal Addition – Horizontal additions include both “minor” and “major” horizontal additions. A minor horizontal addition is any expansion of a floor area beyond the extents of the existing floor area in which it is located by not more than 25 per cent of the existing building area, or by not more than 500 m² in aggregate floor area. A major horizontal addition is any expansion of a floor area beyond the extents of the existing floor area that exceeds the limits permitted by a minor horizontal addition. Any construction that creates new floor area, by in-filling existing roof or deck areas, or creates new superimposed floor area over existing building structure or floor area is not considered a horizontal addition.

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Vertical Addition – Vertical additions include both “minor” and “major” vertical additions. A minor vertical addition is the addition of new floor area (storey, mezzanine, decks or other roof areas intended for occupancy) that in-fills existing unoccupied roof or deck areas, or is superimposed over existing building structure or floor area, with an aggregate floor area increase of not more than 25 per cent of the building area, or by not more than 500 m² in aggregate floor area. A major vertical addition is an addition that increases the aggregate floor areas or mezzanine area increase that exceeds the limits permitted by a minor vertical addition.

FLOW CHART NO. 3



DESIGN UPGRADE LEVEL TABLES

Table A-11.2.1.2.-B
DESIGN UPGRADE LEVELS FOR FIRE, LIFE AND HEALTH SAFETY (F), STRUCTURAL SAFETY(S),
NON-STRUCTURAL SAFETY (N), and ACCESSIBILITY (A)

| DESIGN LEVEL ⁽¹⁾ | OBJECTIVE STATEMENT | ALTERNATIVE ACCEPTABLE SOLUTIONS |
|-----------------------------|--|---|
| F1 | Exiting to be reviewed to ensure that the exits do not present an unsafe condition. | Project Area – Exits to be upgraded with respect to number, capacity, and fire separations only. |
| S1 | Proposed work must not have an adverse effect on the structural capacity of the existing structure. | Entire Building – Proposed work must not reduce the structural integrity of the existing building. |
| N1 | Project area to be reviewed to ensure safety from overhead falling hazards. | Project Area – Restrain all ceiling supporting frames, T-bars assemblies, ceiling gypsum wall boards, all overhead mechanical ducts, sprinklers , equipment, sprinkler system, overhead electrical conduits and lights |
| A1 | The proposed work must not adversely affect the existing accessibility level of the building. | Project Area – Existing level of accessibility must be maintained throughout the project area. No additional accessibility enhancements are required. |
| F2 | Existing building to meet the fire & life safety requirements of the Building By-law within the project area and have conforming exits leading from the project area to an acceptable open space. | Project Area – Alarms and detectors (only where existing devices are provided), emergency lights, access to exit, exits, exit signs, and exit lights. Public Area (leading from project area to an acceptable open space) – emergency lights, exit signs, access to exit, exits, and flame spread ratings. |
| S2 | Limited structural upgrade required in order to provide minimum protection to building occupants during a seismic event within the project area. | Project Area – Non-structural elements and falling hazards must be restrained to resist lateral loads due to earthquakes within the project area. |
| N2 | Project area and means of egress to be reviewed to ensure safety from overhead falling hazards. | Project Area Means of Egress – Restrain interior partition walls. Restrain all ceiling supporting frames, T-bars assemblies, ceiling gypsum wall boards, all overhead mechanical ducts, sprinklers , equipment, sprinkler system, overhead electrical conduits and lights. Restrain cladding veneer, parapets, canopies and ornaments over exit and extended to 5 m on either side of exit |
| A2 | A limited level of upgrade shall be provided within the project area to ensure access for persons with disabilities. | Project Area – door clearances, door hardware, and areas of refuge. |
| F3 | Existing building to meet fire, life and health safety requirements within the project area. Existing building to meet fire, life & health safety requirements within the public areas. | Project Area – Alarms & detectors (only where existing devices are provided), emergency lighting, access to exit, exits, exit signs, exit lights, flame spread ratings, floor assemblies & supports, occupancy separation, standpipes and sprinklers, washrooms. Public Area – Alarms & detectors (only where existing devices are provided), emergency lighting, access to exit, exits, exit signs, exit lights. Entire Building – Fire fighter's access. |
| S3 | The building structure shall be upgraded to an acceptable level in order to provide a minimum level of property and life safety to unreinforced masonry or other buildings having less than 30 percent of the current required seismic resistance. Falling hazards that may impact adjacent properties and over public ways must be addressed. | Entire Building – Building to be upgraded to resist 50 per cent of the current By-law specified lateral force levels, where the building is evaluated as having less than 30 percent of the current required seismic resistance. Restrain falling hazards from major building components such as cantilevered walls, parapets, exterior ornaments, towers, chimneys, or other appendages, which could impact adjacent properties and public ways to resist forces due to a seismic event. |
| N3 | Building exits and to acceptable open space to be reviewed to ensure safety from overhead falling hazards. | Entire Building Exits – Restrain interior partition walls. Restrain ceiling supporting frames, T-bars assemblies, ceiling gypsum wall boards, overhead mechanical equipment and services, sprinklers , sprinkler system, overhead electrical equipment and services. Restrain falling hazards to resist forces due to a seismic event from non-structural elements including cladding, veneer, cornices, canopies, awnings, and ornaments over exit and extended to 5 m on either side of exit. |
| A3 | The existing building shall be upgraded to an acceptable level in order to ensure complete access within the project area as well as access to the remainder of the building. | Project Area – Door clearances, door hardware, accessible washrooms, and areas of refuge. Public Area – Door clearances, door hardware, areas of refuge, washrooms, ramps, and elevators. |

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Table A-11.2.1.2.-B (continued)
**DESIGN UPGRADE LEVELS FOR FIRE, LIFE AND HEALTH SAFETY (F), STRUCTURAL SAFETY(S),
 NON-STRUCTURAL SAFETY (N), and ACCESSIBILITY (A)**

| DESIGN LEVEL ⁽¹⁾ | OBJECTIVE STATEMENT | ALTERNATIVE ACCEPTABLE SOLUTIONS |
|-----------------------------|---------------------|----------------------------------|
|-----------------------------|---------------------|----------------------------------|

Table A-11.2.1.2.-B (continued)
**DESIGN UPGRADE LEVELS FOR FIRE, LIFE AND HEALTH SAFETY (F), STRUCTURAL SAFETY(S),
 NON-STRUCTURAL SAFETY (N), and ACCESSIBILITY (A)**

| DESIGN LEVEL ⁽¹⁾ | OBJECTIVE STATEMENT | ALTERNATIVE ACCEPTABLE SOLUTIONS |
|-----------------------------|---|---|
| F4 | Entire building to substantially meet the intent of health, fire and life safety requirements of the VBBL as well as provide protection to adjacent property. | Entire Building – Alarms & detectors, emergency lighting, access to exit, exits, exit signs, exit lights, flame spread ratings, firefighting access & water supply, floor assemblies & support, spatial separation, occupancy separation, standpipes & sprinklers, washrooms, high building requirements, lighting levels, sound transmission classifications, ventilation, building envelope review, and radio antenna systems. |
| S4 | The entire building structure shall be brought up to an acceptable level in order to meet seismic requirements of the VBBL. | Entire Building – Building to be upgraded to resist 75 percent of the current By-law specified lateral force levels, where the building is evaluated as having less than 60 percent of the current required seismic resistance. |
| N4 | Entire Building and to acceptable open space to be reviewed to ensure safety from overhead falling hazards. | Entire Building – Restrain all interior partition walls. Restrain all ceiling supporting frames, T-bars assemblies, ceiling gypsum wall boards, overhead mechanical equipment and services, sprinklers , sprinkler systems, overhead electrical equipment and services. Restrain exterior falling hazards to resist forces due to a seismic event from cladding, veneer, cornices, parapets, canopies, awnings, and ornaments attached to the exterior of the building. |
| A4 | The existing building shall be upgraded in order to provide the minimum accessibility requirements of the VBBL. | Entire Building – Building to meet accessibility provisions of the current VBBL. |

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Notes to Table A-11.2.1.2.-B:

(1) Where there is one or more upgrade level(s) within the same category preceding the design upgrade level in Table A-11.2.1.2.-B, then the design upgrade level shall also include all of the preceding upgrade levels. For example, where the design upgrade level is F3, then all of the upgrade requirements under F2 and F1 also apply.

TABLE A-11.2.1.2.-C
Alternative acceptable solutions for Energy Efficiency

| General Objective Statement: Improve the energy and GHG emissions performance of <i>buildings</i> , systems or components. Solution Location: E1 through E5 – Project Location. E6 and E7 – Building Location | | |
|--|------------------------|--|
| E Level | Building System | Alternative Acceptable Solution Options⁽¹⁾ (Choose one) |
| E1 Level Objective Statement: Review and maintain, or upgrade, basic efficiency of equipment or components. | | |
| E1 | Envelope | <ol style="list-style-type: none"> 1) Reduce air leakage of all Glazing & Doors (per 5.4.3.2 of ASHRAE 90.1-2016) 2) Upgrade all Opaque Doors performance (per 5.5.3.6 of ASHRAE 90.1-2016) |
| | HVAC ⁽³⁾ | <ol style="list-style-type: none"> 1) Upgrade Dead Band settings (per 6.4.3.1.2 of ASHRAE 90.1-2016) 2) Upgrade Set-point Overlap Restrictions (per 6.4.3.2 of ASHRAE 90.1-2016) 3) Upgrade Off-Hour Controls (per 6.4.3.3 of ASHRAE 90.1-2016) 4) Upgrade Ventilation System Controls (per 6.4.3.4 of ASHRAE 90.1-2016) 5) Upgrade Heat Pump Auxiliary Heat Controls (per 6.4.3.5 of ASHRAE 90.1-2016) 6) Upgrade Freeze Protection and Snow/Ice Melting Systems (per 6.4.3.7 of ASHRAE 90.1-2016) 7) Upgrade Ventilation Controls For High-Occupancy Areas (per 6.4.3.8 of ASHRAE 90.1-2016) 8) Upgrade DDC Controls (per 6.4.3.10 of ASHRAE 90.1-2016) 9) Inspect and remediate HVAC Insulation (per 6.4.4.1 of ASHRAE 90.1-2016) 10) Inspect and remediate Duct and Plenum Leakage (per 6.4.4.2 of ASHRAE 90.1-2016) 11) Upgrade Heat and Cool Limitation (per 6.5.2.1 of ASHRAE 90.1-2016) |
| | SWH ⁽⁴⁾ | <ol style="list-style-type: none"> 1) Upgrade all SWH Piping Insulation (per 7.4.3 of ASHRAE 90.1-2016) |
| | Lighting | <ol style="list-style-type: none"> 1) Upgrade internal Exit Signs to not exceed 5W per face 2) Functional Testing (per 9.4.3 of ASHRAE 90.1-2016) |
| E2 Level Objective Statement: Review and maintain, or upgrade, basic efficiency of sub-systems. | | |
| E2⁽²⁾ | Envelope | <ol style="list-style-type: none"> 1) Reduce air leakage of all Loading Dock Doors (per 5.4.3.3 of ASHRAE 90.1-2016) 2) Upgrade all Floor Insulation (per 5.5.3.4 of ASHRAE 90.1-2016) 3) Reduce total Skylight Fenestration/Glazing Area to 3% of gross roof area (per 5.5.4.2.2 of ASHRAE 90.1-2016) |
| | HVAC ⁽³⁾ | <ol style="list-style-type: none"> 1) Upgrade Chilled Water Plant Monitoring (per 6.4.3.11 of ASHRAE 90.1-2016) 2) Upgrade Economizer Fault Detection and Diagnostics (per 6.4.3.12 of ASHRAE 90.1-2016) 3) Clean and Balance all Air Systems (per 6.7.2.3.2 of ASHRAE 90.1-2016) 4) Balance all Hydronic Systems (per 6.7.2.3.3 of ASHRAE 90.1-2016) 5) Remove Wood-Burning Fireplace unit 6) Replace gas fireplace pilot light with electronic ignition unit with energy rating over 50 7) Install makeup air supply per code to balance exhaust fan(s) over 300 cfm |
| | SWH ⁽⁴⁾ | <ol style="list-style-type: none"> 1) Upgrade SWH system Temperature Controls (per 7.4.4.1 of ASHRAE 90.1-2016) 2) Upgrade SWH system Temperature Maintenance Controls (per 7.4.4.2 of ASHRAE 90.1-2016) 3) Upgrade SWH system Outlet Temperature Controls (per 7.4.4.3 of ASHRAE 90.1-2016) 4) Upgrade SWH system Circulating Pump Controls (per 7.4.4.4 of ASHRAE 90.1-2016) 5) Upgrade Pool systems (per 7.4.5 of ASHRAE 90.1-2016) 6) Upgrade pipe risers to incorporate Heat Traps (per 7.4.6 of ASHRAE 90.1-2016) |

TABLE A-11.2.1.2.-C (continued)
Alternative acceptable solutions for Energy Efficiency

| General Objective Statement: Improve the energy and GHG emissions performance of <i>buildings</i> , systems or components. Solution Location: E1 through E5 – Project Location. E6 and E7 – Building Location | | |
|--|---------------------------|---|
| E Level | Building System | Alternative Acceptable Solution Options ⁽¹⁾ (Choose one) |
| E2 ⁽²⁾ | Lighting | <ol style="list-style-type: none"> 1) Upgrade to Local Control (per 9.4.1.1.(a) of ASHRAE 90.1-2016) 2) Upgrade to Restricted to Manual ON (per 9.4.1.1.(b) of ASHRAE 90.1-2016) 3) Upgrade to Restricted to Partial Automatic ON (per 9.4.1.1.(c) of ASHRAE 90.1-2016) 4) Upgrade to Bilevel Lighting Control (per 9.4.1.1.(d) of ASHRAE 90.1-2016) 5) Upgrade all Automatic Daylighting Responsive Controls for Sidelighting (per 9.4.1.1.(e) of ASHRAE 90.1-2016) 6) Upgrade all Automatic Daylighting Controls for Toplighting (per 9.4.1.1.(f) of ASHRAE 90.1-2016) 7) Upgrade to incorporate Automatic Partial OFF (per 9.4.1.1.(g) of ASHRAE 90.1-2016) 8) Upgrade to incorporate Automatic Full OFF (per 9.4.1.1.(h) of ASHRAE 90.1-2016) 9) Upgrade to incorporate Scheduled Shutoff (per 9.4.1.1.(i) of ASHRAE 90.1-2016) 10) Upgrade to control Parking Garage Lighting (per 9.4.1.3 of ASHRAE 90.1-2016) 11) Upgrade to incorporate Additional Controls for Special Applications (per 9.4.1.3 of ASHRAE 90.1-2016) 12) Exterior Lighting Control (per 9.4.1.7 of ASHRAE 90.1-2016) 13) Reduce total Skylight Fenestration/Glazing Area to 3% of gross roof area (per 5.5.4.2.2. of ASHRAE 90.1-2016) |
| | Exterior or Patio Heating | <ol style="list-style-type: none"> 1) Remove exterior space heating system 2) Upgrade energy intensity (per 10.2.2.22.(3)) and system controls per 10.2.2.22.(4) |
| E3 Level Objective Statement: Review and and improve energy performance of systems. | | |
| E3 ⁽²⁾ | Envelope | <ol style="list-style-type: none"> 1) Provide a Building Envelope Assessment Report, to be signed and sealed by a design professional, report to include: effective R-value, blower test, list of upgrades to achieve a compliance rating using COMcheck⁽⁵⁾ software (latest version). 2) Reduce air leakage of all Fenestration & Doors (per 5.4.3.2 of ASHRAE 90.1-2016) 3) Upgrade all Below-Grade Wall Insulation (per 5.5.3.3 of ASHRAE 90.1-2016) 4) Inspect and remediate all ceiling space and floor space equipment and services including ductwork, plumbing, insulation, penetrations, dampers, valves, coils, pans and drains. 5) Inspect and remediate all floor/crawl space services (ducts, plumbing, insulation, penetrations, drains etc) |
| | HVAC ⁽³⁾ | <ol style="list-style-type: none"> 1) Provide an HVAC System Assessment Report, to be signed and sealed by a design professional. Report to include: systems reviews, upgrade and re-commissioning options, with estimates for energy savings and cost paybacks. 2) Upgrade all ducts, plenums, and insulation (per 6.4.4 of ASHRAE 90.1-2016); inspect and remediate HVAC Insulation (per 6.4.4.1 of ASHRAE 90.1-2016); and inspect and remediate Duct and Plenum Leakage (per 6.4.4.2 of ASHRAE 90.1-2016) 3) Incorporate Exhaust Air Recovery systems (per 6.5.6.1 of ASHRAE 90.1-2016) 4) Incorporate a Service Water Heating Recovery system (per 6.5.6.2 of ASHRAE 90.1-2016) 5) Upgrade all Kitchen Exhaust and Replacement Air systems (per 6.5.7.2 of ASHRAE 90.1-2016) 6) Upgrade all Laboratory Exhaust and Replacement Air systems (per 6.5.7.3 of ASHRAE 90.1-2016) 7) Balance all systems (per 6.7.2.3 of ASHRAE 90.1-2016) |

TABLE A-11.2.1.2.-C (continued)
Alternative acceptable solutions for Energy Efficiency

| General Objective Statement: Improve the energy and GHG emissions performance of <i>buildings</i> , systems or components. Solution Location: E1 through E5 – Project Location. E6 and E7 – Building Location | | |
|--|---------------------------|---|
| E Level | Building System | Alternative Acceptable Solution Options⁽¹⁾ (Choose one) |
| E3⁽²⁾ | SWH ⁽⁴⁾ | <ol style="list-style-type: none"> 1) Provide an HVAC System Assessment Report, to be signed and sealed by a design professional <ul style="list-style-type: none"> • Report to include: systems reviews, upgrade and re-commissioning options, with estimates for energy savings and cost paybacks. 2) Upgrade SWH system Controls (per 7.4.4 of ASHRAE 90.1-2016) |
| | Lighting | <ol style="list-style-type: none"> 1) Provide a comprehensive Lighting System Assessment Report to be signed and sealed by a design professional <ul style="list-style-type: none"> • Report to include: systems reviews, upgrade options, with estimates for energy savings and cost paybacks. 2) Upgrade total Exterior Lighting Power (per 9.4.2 of ASHRAE 90.1-2016) of the suite. 3) Meet the interior lighting power allowance by the Building Area Method (per 9.5 of ASHRAE 90.1-2016) 4) Meet the interior lighting power allowance by the Space-by-Space Method (per 9.6 of ASHRAE 90.1-2016) |
| | Exterior or Patio Heating | <ol style="list-style-type: none"> 1) Remove exterior space heating system 2) Upgrade energy intensity, system and unit/zone controls (per 10.2.2.22.(3) and (4)), and circulation fans (per 10.2.2.22.(5)) |
| E4 Level Objective Statement: Review and improve energy performance of larger systems. | | |
| E4⁽²⁾ | Envelope | <ol style="list-style-type: none"> 1) Reduce air leakage of entire Building Envelope (per 5.4.3 of ASHRAE 90.1-2016) 2) For single retail/tenant spaces < 500 m²) Perform an Air Leakage / Blower test and remediate 3) Upgrade all Roof Insulation (per 5.5.3.1 of ASHRAE 90.1-2016) 4) Upgrade all Above-Grade Wall Insulation (per 5.5.3.2 of ASHRAE 90.1-2016) 5) For single retail/tenant spaces < 500 m²) Replace storefront window(s) to meet the By-law. 6) Reduce total vertical Fenestration/Glazing Area to 40% of gross wall area (per 5.5.4.2.1 of ASHRAE 90.1-2016) 7) Upgrade all Fenestration/Glazing Performance (per 5.5.4.3 and 5.5.4.4 of ASHRAE 90.1-2016) 8) Inspect and remediate roof systems including membrane, parapets, scuppers, drains, gutters, downspouts and drains. |
| | HVAC ⁽³⁾ | <ol style="list-style-type: none"> 1) Upgrade all Zone Thermostatic Controls (per 6.4.3.1 of ASHRAE 90.1-2016) 2) Upgrade HVAC to incorporate Economizers (per 6.5.1 of ASHRAE 90.1-2016) 3) Upgrade Heat Rejection Equipment (per 6.5.5 of ASHRAE 90.1-2016) 4) Upgrade to Air and Service Water Heating Heat Recovery systems (per 6.5.6 of ASHRAE 90.1-2016) 5) Upgrade entire Radiant Heating system (per 6.5.8 of ASHRAE 90.1-2016) 6) (Re-)Commission all systems (per 6.7.2.4 of ASHRAE 90.1-2016) |
| | SWH ⁽⁴⁾ | <ol style="list-style-type: none"> 1) Upgrade all Service Water Heating Equipment Efficiency (per 7.4.2 of ASHRAE 90.1-2016) |
| | Lighting | <ol style="list-style-type: none"> 1) Lighting Control (per 9.4.1 of ASHRAE 90.1-2016) |
| | Exterior or Patio Heating | <ol style="list-style-type: none"> 1) Remove exterior space heating system 2) Upgrade exterior space heating system (per 10.2.2.22) |

TABLE A-11.2.1.2.-C (continued)
Alternative acceptable solutions for Energy Efficiency

| General Objective Statement: Improve the energy and GHG emissions performance of <i>buildings</i> , systems or components. Solution Location: E1 through E5 – Project Location. E6 and E7 – Building Location | | |
|--|------------------------|--|
| E Level | Building System | Alternative Acceptable Solution Options⁽¹⁾ (Choose one) |
| E5 Level Objective Statement: Review and bring to present VBBL energy requirements, entire system(s) affected by vertical addition. | | |
| E5⁽²⁾ | Envelope | 1) Upgrade insulation levels of entire Building Envelope (Opaque Areas) (per 5.5.3 of ASHRAE 90.1-2016) 2) Upgrade all Fenestration/Glazing (per 5.5.4 of ASHRAE 90.1-2016) |
| | HVAC ⁽³⁾ | 1) Upgrade all HVAC Controls, Insulation and Leakage (per 6.4 of ASHRAE 90.1-2016) |
| | SWH ⁽⁴⁾ | 1) Upgrade Service Water Heating system to meet the Mandatory Provisions (per 7.4 of ASHRAE 90.1-2016) |
| | Lighting | 1) Upgrade Lighting system to meet the Mandatory Provisions (per 9.4 of ASHRAE 90.1-2016) |
| E6 Level Objective Statement: Reconstruct entire building systems to meet energy efficiency requirements of present Vancouver Building By-Law. | | |
| E6 | Envelope | 1) Upgrade all aspects of Building Envelope (per Section 5 of ASHRAE 90.1-2016) |
| | HVAC ⁽³⁾ | 1) Upgrade all aspects of HVAC (per Section 6 of ASHRAE 90.1-2016) |
| | SWH ⁽⁴⁾ | 1) Upgrade all aspects of SWH (per Section 7 of ASHRAE 90.1-2016) |
| | Lighting | 1) Upgrade all aspects of Lighting (per Section 9 of ASHRAE 90.1-2016) |
| E7 Level Objective Statement: Reconstruct building to meet energy efficiency requirements of present Vancouver Building By-Law. | | |
| E7 | Energy | 1) Upgrade existing building (per VBBL 1.3.3.7 Energy Use) |

Notes to Table A-11.2.1.2.-C:

- (1) References to ASHRAE 90.1 in Table A-11.2.1.2.-C can be considered guidance for determining the scope of work when applying the upgrade requirements to low-rise multi-family projects, otherwise these projects may apply the energy upgrade requirements of Table 11.2.1.4, per the options provided within Sentence 11.2.1.2.(9)(d).
- (2) BOMA BEST (Path 1) may be substituted as the solution for upgrade level E2. BOMA BEST (Path 2) may be substituted as the solution for upgrade levels E3, E4 or E5. BOMA BEST is a Canadian industry standard for commercial building sustainability certification. Official certification documentation produced by BOMA would be required for acceptance as an alternative acceptable solution option.
- The intent of the inclusion of the BOMA BEST rating system is to recognise the efforts made towards improved building performance. BOMA BEST Path 1 or Path 2 will be accepted provided
- the BOMA BEST certification is administered by BOMA,
 - BOMA BEST Path 1 - BOMA BEST (Level 1, 2, 3, 4) provides proof of a valid Certification and ongoing commissioning per BOMA's BEST Practice Q.3 (Preventative Maintenance Program), and
 - BOMA BEST Path 2 - BOMA BEST (Level 1-AL2, 2, 3, 4) provides proof of a first-time Certification (to at least Level 1 with an ASHRAE Level 2 audit) within the previous 18 months, or a valid Certification and an increase in BOMA BEST's Energy Performance Benchmark Scale by at least one level within the previous 18 months, or advancing Certification (from one level to another) within the previous 18 months.
- Proof means in the form of official certified documentation produced by BOMA, or a single Commissioning/Energy Report developed and provided by a qualified consultant, contractor, or other expert in this specialized field.
- (3) HVAC – Heating, Ventilating and Air Conditioning
- (4) SWH – Service Water Heating
- (5) COMcheck – software developed by the US Department of Energy for use with ASHRAE 90.1-2016 Building Envelope Trade-Off option

HAZARD INDEX TABLE

The hazard index for various building uses are indicated in Table A-11.2.1.2.-D.

The required level of Building By-law upgrade for a Change of Major Occupancy Type projects is dependent on whether or not the Hazard Index has increased for the proposed alteration. Hazard Index ratings are intended to reflect the level of fire and life safety risk to occupants for various building uses. Hazard index ratings range from 1 to 6, such that a hazard index of rating of 6 represents the highest risk to occupants.

For the purposes of a Restricted Change of Occupancy, the Hazard Index may be established based on the aggregate area of the suite, to provided indices that can be compared to establish a relative level of risk between the proposed and current uses of different sizes. Where a suite is subdivided as part of change in major occupancy, the relative risk is established based on the index number of the final aggregate size of the suite as compared to the original size of the suite (see Note A-11.2.1.2.(10)).

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**Table A-11.2.1.2.-D
Hazard Index Table**

| Group A, Division 1 | | |
|------------------------------------|-----------------------------------|------------------------------|
| Building Use | Hazard Index⁽¹⁾ | |
| | ≤200 m² | >200 m² |
| Dinner Theatres | 4 | 5 |
| Live Theatres | 4 | 5 |
| Motion Picture Theatres | 4 | 5 |
| Opera Houses | 4 | 5 |
| Television Studios (With Audience) | 4 | 5 |
| Group A, Division 2 | | |
| Building Use | Hazard Index | |
| | ≤200 m² | >200 m² |
| Art Galleries | 3 | 4 |
| Auditoria | 3 | 4 |
| Billiard Halls, Amusement Arcades | 3 | 4 |
| Bowling Alleys | 3 | 4 |
| Churches | 3 | 4 |
| Clubs, Lodges (Non-Residential) | 3 | 4 |
| Community Halls | 3 | 4 |
| Concert Halls | 3 | 4 |
| Court Rooms | 3 | 4 |
| Dance Halls | 3 | 4 |
| Daycare Centres | 3 | 4 |
| Exhibition Halls (Without Sales) | 3 | 4 |
| Exhibition Halls (With Sales) | See Group E | |
| Gymnasias (Multi-Purpose) | 3 | 4 |
| Gymnasias (Athletic) | 3 | 4 |
| Lecture Halls | 3 | 4 |
| Libraries | 3 | 4 |
| Licensed Beverage Establishments | 3 | 4 |
| Licensed Clubs, Lodges | 3 | 4 |
| Museums | 3 | 4 |

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Table A-11.2.1.2.-D (continued)

Hazard Index Table

| | | |
|--|-----------------------------------|------------------------------|
| Passenger Stations/Depots | 3 | 4 |
| Recreational Piers | 3 | 4 |
| Restaurants (Seating Over 17) | 3 | 4 |
| Schools, Colleges | 3 | 4 |
| Undertaking Premises | 3 | 4 |
| Group A Division 3 | | |
| Building Use | Hazard Index⁽¹⁾ | |
| | ≤200 m² | >200 m² |
| Arenas (No Occupancy On Activity Surface) | 3 | 4 |
| Armouries (No Occupancy On Activity Surface) | 3 | 4 |
| Enclosed Stadia or Grandstand | 3 | 4 |
| Ice Rinks (No Occupancy On Activity Surface) | 3 | 4 |
| Indoor Swimming Pools | 3 | 4 |
| Group A Division 4 | | |
| Building Use | Hazard Index⁽¹⁾ | |
| | ≤200 m² | >200 m² |
| Amusement Park Structures | 2 | 3 |
| Bleachers | 1 | 3 |
| Grandstands (Open) | 1 | 3 |
| Reviewing Stands | 1 | 3 |
| Stadia (Open) | 1 | 3 |
| Group B, Division 1 | | |
| Building Use | Hazard Index | |
| | ≤200 m² | >200 m² |
| Detention Facilities (Minimum Security) | 4 | 5 |
| Detention Facilities (All other types of security) | 6 | 6 |
| Police Station with Detention (not meeting Article 3.1.2.4.) | 3 | 4 |
| Group B, Division 2 | | |
| Building Use | Hazard Index | |
| | ≤200 m² | >200 m² |
| Hospital, Nursing Home, Geriatric, Sanitarium (Immobile) | 4 | 5 |
| Hospital, Nursing Home, Geriatric, Sanitarium (Non-Ambulatory) | 4 | 5 |
| Psychiatric Hospitals (Maximum Confinement) | 4 | 5 |
| Psychiatric Hospitals (Minimum Confinement) | 3 | 4 |
| Police Station with Detention (Meeting Article 3.1.2.4.) | 3 | 3 |

Table A-11.2.1.2.-D (continued)
Hazard Index Table

| Group B, Division 3 | | |
|---|---------------------------|------------------------------|
| Building Use | Hazard Index | |
| | ≤200 m² | >200 m² |
| Residential Care Facilities (Ambulatory) | 3 | 4 |
| Residential Care Facilities (Non-Ambulatory) | 4 | 5 |
| Children Custodial Homes | 3 | 4 |
| Convalescent Homes (Ambulatory) | 3 | 4 |
| Convalescent Homes (Non-Ambulatory) | 4 | 5 |
| Group Homes for Adult Residents with Developmental Disabilities (Minimum Confinement) | 3 | 4 |
| Group Homes for Adult Residents with Developmental Disabilities (Maximum Confinement) | 4 | 5 |
| Group C | | |
| Building Use | Hazard Index | |
| | ≤200 m² | >200 m² |
| Apartments | 3 | 4 |
| Clubs, Residential | 3 | 4 |
| Colleges Residential | 3 | 4 |
| Congregate Care Housing for Seniors | 3 | 5 |
| Convents | 3 | 4 |
| Dormitories/Hotels | 3 | 4 |
| Hotels | 3 | 5 |
| Detached Houses (1 or 2 Family) | 2 | 2 |
| Live/work units | 3 | 5 |
| Monasteries | 3 | 4 |
| Retirement Homes | 3 | 4 |
| Schools, Residential | 3 | 4 |
| Group D | | |
| Building Use | Hazard Index | |
| | ≤200 m² | >200 m² |
| Advertising and Sales Offices | 3 | 3 |
| Automatic Bank Deposit | 3 | 4 |
| Barber/Hairdresser Shops | 3 | 4 |
| Beauty Parlours | 3 | 4 |
| Branch Banks | 3 | 4 |
| Car Rental Premises | 3 | 3 |
| Chiropractic Offices | 3 | 4 |
| Communications Offices (Telephone Exchange) | 3 | 4 |
| Communications Offices (Telex) | 3 | 4 |

Table A-11.2.1.2.-D (continued)
Hazard Index Table

| | | |
|--|---------------------------|------------------------------|
| Communications Offices (Courier) | 3 | 3 |
| Computer Centres | 3 | 4 |
| Construction Offices | 3 | 3 |
| Costume Rental Premises | 3 | 4 |
| Dental Offices (Denture Clinic) | 3 | 4 |
| Dental Offices (General) | 3 | 4 |
| Dental Offices (Surgical/Anaesthesia) | 4 | 5 |
| Dry Cleaning Depots | 3 | 4 |
| Dry Cleaning Premises (Self-Serve) | 4 | 4 |
| Health/Fitness Clubs | 3 | 4 |
| Laundries (Self-Serve) | 4 | 4 |
| Massage Parlours | 3 | 4 |
| Medical Offices (Examination) | 3 | 4 |
| Medical Offices (Surgical Anaesthesia) | 4 | 5 |
| Offices (Business) | 3 | 3 |
| Offices (Charitable) | 3 | 3 |
| Offices (Legal/Accounting) | 3 | 3 |
| Offices (Design) | 3 | 4 |
| Pharmacy Offices | 3 | 4 |
| Photographic Studios | 3 | 4 |
| Physiotherapy Offices | 3 | 4 |
| Police Stations (No Detention) | 3 | 4 |
| Printing and Duplicating | 4 | 5 |
| Public Saunas | 3 | 4 |
| Radio Stations (No Audience) | 3 | 4 |
| Small Tool Rental Premises | 3 | 4 |
| Suntan Parlours | 3 | 4 |
| Veterinary Offices | 3 | 4 |
| Group E | | |
| Building Use | Hazard Index | |
| | ≤200 m² | >200 m² |
| Automotive/Hardware Department Store | 4 | 5 |
| China Shops | 3 | 4 |
| Department Stores | 4 | 5 |
| Electrical Stores (Fixtures) | 3 | 3 |
| Exhibition Halls (With Sales) | 4 | 5 |
| "Fast Food" Outlets | 3 | 4 |
| Feed and Seed Stores | 4 | 5 |

Table A-11.2.1.2.-D (continued)
Hazard Index Table

| | | |
|--|---------------------------|------------------------------|
| Flea Markets | 3 | 5 |
| Flower Shops | 3 | 4 |
| "Food" and Vegetable Markets | 3 | 4 |
| Garden Shops | 3 | 4 |
| "Gas" Bars | 4 | 5 |
| Gift Shops | 3 | 4 |
| Home Improvement Stores | 4 | 5 |
| Kitchen/Bathroom Cupboards Stores | 3 | 4 |
| Plumbing Stores (Fixtures/Accessories) | 3 | 3 |
| "Pop" Shops | 3 | 4 |
| Restaurants (Not More Than 30 Persons) | 3 | 4 |
| Shopping Malls | 4 | 5 |
| Stationery/Office Supply Stores | 3 | 4 |
| Stores (Art) | 3 | 4 |
| Stores (Baked Goods) | 3 | 4 |
| Stores (Beer) | 3 | 4 |
| Stores (Book) | 3 | 4 |
| Stores (Camera) | 3 | 4 |
| Stores (Candy) | 3 | 4 |
| Stores (Clothing) | 3 | 4 |
| Stores (Drugs) | 4 | 4 |
| Stores (Electronic) | 3 | 4 |
| Stores (Floor Coverings) | 4 | 5 |
| Stores (Food) | 3 | 3 |
| Stores (Furniture/Appliances) | 3 | 4 |
| Stores (Hardware) | 4 | 5 |
| Stores (Health) | 4 | 4 |
| Stores (Hobby) | 3 | 4 |
| Stores (Jewellery) | 3 | 3 |
| Stores (Paint/Wallpaper) | 4 | 5 |
| Stores (Pet) | 3 | 4 |
| Stores (Records/Tapes) | 3 | 4 |
| Stores (Spirits) | 4 | 5 |
| Stores (Toys) | 4 | 5 |
| Stores (Variety) | 4 | 4 |
| Stores (Video Sales/Rental) | 3 | 4 |
| Supermarket | 3 | 4 |
| Group F, Division 1 | | |
| Building Use | Hazard Index | |
| | ≤200 m² | >200 m² |
| All Uses | 6 | 6 |

Table A-11.2.1.2.-D (continued)
Hazard Index Table

| Group F, Division 2 | | |
|--|---------------------------|------------------------------|
| Building Use | Hazard Index | |
| | ≤200 m² | >200 m² |
| Aircraft Hangars | 3 | 5 |
| Abattoirs | 3 | 4 |
| Bakeries | 3 | 5 |
| Body Shop | 3 | 5 |
| Candy Plants | 3 | 4 |
| Cold Storage Plants with Flammable Refrigerant | 3 | 5 |
| Cold Storage Plants with Non-flammable Refrigerant and | 3 | 4 |
| Dry Cleaning Establishments (non-flammable or non-explosive) | 3 | 4 |
| Electrical Substations | 3 | 4 |
| Factories (High Fire Load) | 3 | 5 |
| Freight Depots (High Fire Load) | 3 | 5 |
| Laboratories (High Fire Load) | 3 | 5 |
| Laundries (not self-serve) | 3 | 4 |
| Manufacturer Sales (High Fire Load) | 3 | 5 |
| Mattress Factories | 3 | 4 |
| Meat Packing Plants | 3 | 4 |
| Packaging Manufacturers (Cellulose) | 3 | 4 |
| Packaging Manufacturers (Noncombustible) | 3 | 3 |
| Packaging Manufacturers (Plastics) | 3 | 5 |
| Paper Processing Plants (Wet) | 3 | 5 |
| Plaining Mills | 3 | 5 |
| Printing Plants | 3 | 4 |
| Public Heritage Buildings | 3 | 3 |
| Repair Garages | 3 | 5 |
| Sample Display Rooms (High Fire Load) | 3 | 5 |
| Self Service Storage Buildings | 3 | 4 |
| Service Stations (no spray painting) | 3 | 5 |
| Storage Rooms (High Fire Load) | 3 | 5 |
| Television Studios (no audience) | 3 | 4 |
| Tire Storage | 3 | 5 |
| Warehouse (High Fire Load) | 3 | 5 |
| Welding Shops | 3 | 5 |
| Wholesale Rooms (High Fire Load) | 3 | 5 |
| Wood Working Factories | 3 | 5 |
| Workshops (High Fire Load) | 3 | 5 |

Table A-11.2.1.2.-D (continued)
Hazard Index Table

| Group F, Division 3 | | |
|--------------------------------------|---------------------------|------------------------------|
| Building Use | Hazard Index | |
| | ≤200 m² | >200 m² |
| Creameries | 2 | 2 |
| Factories (Low Fire Load) | 2 | 3 |
| Freight Depots (Low Fire Load) | 2 | 3 |
| Laboratories (Low Fire Load) | 2 | 3 |
| Manufacturers Sales (Low Fire Load) | 2 | 3 |
| Power Plants | 3 | 4 |
| Public Heritage Buildings | 3 | 3 |
| Sample Display Rooms (Low Fire Load) | 2 | 3 |
| Storage Garages | 2 | 3 |
| Storage Rooms (Low Fire Load) | 2 | 3 |
| Warehouse (Low Fire Load) | 2 | 3 |
| Wholesale Rooms (Low Fire Load) | 2 | 3 |
| Workshops (Low Fire Load) | 2 | 3 |

Notes to Table A-11.2.1.2-B:

(1) For the purposes of a Restricted Change of Occupancy, the Hazard Index may be established based on the aggregate area of the suite provided the suite changing occupancy is fully contained in the original suite area.

A-11.2.1.2.(10) Restricted Change of Occupancy. The term “restricted change of occupancy” refers to a change in major occupancy restricted to a specific set of uses as set out in Article 11.2.1.2.(10) that are limited both in scope and risk such that it does not increase the overall hazard.

While it is intended that designers and owners seeking to apply this requirement refer to the hazard index table A-11.2.1.2.-B, for the purposes of this Article – they may substitute the aggregate suite area of the suite in lieu of the building area where the change of major occupancy is wholly contained within the original suite.

For example: a suite of 300 m² is being repartitioned and converted from a “business office” use (Group D) to a suite of “retail toystore” use (Group E) of 150 m² and second suite of “health care office” use which are fully contained within the original 300 m² suite area. The aggregate suite area is therefore permitted to be used for the purposes of determining the appropriate hazard index which is then established as follows:

- Business Office (300 m²) – 4 (original)
- Retail Toystore (150 m²) – 4 (new)
- Health Care Office (150 m²) – 3 (new)

By comparison, a larger toystore, such as the conversion of the original 300 m² suite area into a toystore, would result in a hazard index of ‘5’ which would not meet the requirements of Article 11.2.1.2. for a “restricted change of occupancy” as it represents an increase in hazard.

While the hazard index table is a useful tool for assessment, it is also important to understand that no table can address all possible combinations of uses. Designers and owners should exercise caution when making judgments of relative hazards in this regard.

A-11.2.1.3 Sprinkler Installation Determination Where Dwelling Units Are Added. Table 11.2.1.3. provides a matrix that determines sprinkler upgrades for existing unsprinklered or partially sprinklered buildings. The location of the newly created dwelling unit will determine the extent of the sprinkler coverage for the subject building.

A-11.2.1.4.(3)(a) Replacement Value. The term “replacement value” is used as a baseline for determining the applicability of specific upgrade requirements. The term refers to an assessed cost to replace the structure in its current state, the net asset value. This is similar to what would be considered the ‘book value’ in financial terms, in that it considers the depreciated cost of the asset. This is not intended to be an assessment of the construction, planning, and ancillary costs that could be incurred if the structure in question

was built as new construction.

A-11.2.1.5. Self-contained Separated Spaces. The self-contained space provisions of Article 11.2.1.5. are intended to be applied to modest upgrades or minor additions to existing buildings where the normal application of the upgrade requirements Part 11 would constitute a hardship. It is not intended that these provisions be utilized for the construction of additions of substantial size relative to the original building construction, or the conversion or substantial reconstruction of a heritage structure. Such structures should be upgraded in conformance with the general provisions of Part 11 as applicable to the intended scope of work.

A-11.3.1.1. Application of Alternative Measures for Existing Conditions. This Article is not intended to be applied to new construction. In general, it is the purpose of Sections 11.3 to 11.5 to facilitate retention of existing conditions where the existing construction is not being substantially modified and the conditions of construction of the building do not otherwise affect their compliance. If there is new construction, this is subject to the general requirements pertaining to new construction in this By-law. Furthermore, “new work” (as opposed to existing construction) may include not only new construction, but could also consist of converted floor areas that feature newly occupied areas or spaces, areas of increased occupant load or net new floor area, or the altering of existing floor space beyond its original configuration to support new uses or occupancy.

A-11.3.3.3.(1)(b) Intumescent Paint. Experience has shown that maintenance considerations of fire retardant intumescent paint are not well understood by applicants. To be effective, multiple coats are required at installation time for complete and proper application. Proper surface preparation is also a significant portion of the work and imperative to prevent pre-mature delamination. This preparation and application period could span several days based on existing surfaces and re-coat durations. Then there is the curing time needed prior to the application of any exterior finish coat. Exterior finish coat(s) will likely be necessary as most intumescent coatings are not suitable for prolonged exterior exposure. As well, there could be a detailed installation and inspection process to confirm the installation. Experienced labour is a major factor in the process.

Another consideration is exposure to weather effects; particularly water can lead to cracking and delamination of the coating systems. As well, product information has stated that fire-resistive coatings are not intended for exterior exposures or interior environments exposed to freeze/thaw conditions. This exposure can lead to severe cracking and delamination. This could lead to expensive re-application.

Ongoing maintenance and re-application due to weather degradation or mechanical damage is another significant consideration. Product and care information must be provided to new owners or tenants when there is a change of use or ownership. This must be provided in the strata information, maintenance manuals and guaranteed by restrictive covenant against the property’s deed.

A-11.3.3.4.(4) Window Replacement. The provisions of Sentence 11.3.3.4.(4) are intended to facilitate voluntary window replacements to higher energy efficient products as part of a renovation project. As modern windows may have slightly different dimensional requirements, this Sentence allows for minor variations that do not substantially affect the existing spatial condition of the existing building. This means that the location, orientation, and size of the windows may not change, excepting minor dimensional variations to the extent necessary to accommodate the new window.

A-11.3.7.1.(1) Temporary Refuge for Persons with Disabilities. These measures are intended to provide temporary refuge for persons with disabilities. It is acknowledged, however, that the measures cannot provide absolute safety for all occupants in the fire area. It may, therefore, be necessary to develop special arrangements in the fire safety plan to evacuate persons with disabilities from these areas. Details for a suitable plan are contained in the Fire By-law.

The protected elevator referred to in Clause 11.3.7.1.(1)(a) is intended to be used by firefighters as a means for evacuating persons with disabilities. It is not intended that this elevator be used by persons with disabilities as a means of egress without the assistance of firefighters.

If an estimate is to be made of the number of persons with disabilities in a floor area who can be accommodated in each zone in Clause 11.3.7.1.(1)(b), this estimate may be based on Table 3.8.2.3., which is used to determine the minimum number of spaces to be provided for wheelchair occupants in fixed seating areas. If more precise information is available, it should be used for sizing the zones.

For residential occupancies, the choices of protection include the option to provide an accessible balcony, but it is not required that balconies be the chosen means of protection.

A-11.4.3.1.(1) Interconnected Smoke Alarms and Carbon Monoxide Detectors. Concern has been expressed to the interconnection requirement of smoke alarms served by different electrical panels if the panels do not share a common ground. The concern is a current could be generated through the interconnecting wires and false alarms could result. Interconnected smoke alarms must be powered off the same (main) electrical panel so that a common ground and reliable operation is achieved.

A-11.4.7.1.(2) Bare Lands Strata Conversions. It is the general intent of the strata conversions requirements of this By-law to require upgrades to existing buildings where they undergo subdivision under the provincial Strata Act. In cases where the land is being subdivided, and existing buildings are not being internally subdivided into separate strata lots, then the extent of the upgrades may be limited to upgrades addressing the external where there is no other intent to alter the buildings. These upgrades

could include, but are not limited to, risks associated with the partial or total collapse of the existing buildings, overhead fall hazards, and fire exposure to or from adjacent buildings and the egress and access routes. ‘S4’ and ‘N4’ and sprinklering are the appropriate upgrade categories, but as with all existing buildings, there may be a need to consider the impacts of site specific features which could constitute a hardship. Such cases should be evaluated by appropriately trained professionals, and alternative measures discussed with the *Chief Building Official*.

A-11.6.3.2.(2) Fixed Term Transitional Housing or Emergency Shelter. The requirements for fixed term transitional housing or emergency shelters described in Sentence 11.6.3.2.(2) are intended to accommodate temporary, but longer term housing that may be deployed for a fixed duration to address ongoing housing concerns.

Fixed term housing or shelters may consist of temporarily repurposed buildings, or may be constructed as modular factory built structures in accordance with CSA Z240 MH to the extent permitted by Division A (See also note A-1.1.1.1.(3) of Division A) or other regulatory requirements.

The requirements of Sentence 11.6.3.2.(2) and Division C Article 1.6.8.1.(1) require that the term of occupancy be limited. This reflects the potential risk that the form of construction may not be appropriate for permanent use, either as a consequence of the inability to maintain the building due to ongoing use, or due to reduced durability. However, this term may be extended once by the Chief Building Official in accordance with Article 1.6.8.8., provided that it can be shown that the building will be able to support extended use.

A-11.7.1.1.(3) Alteration Language Supporting NECB 2015. The term “alteration language” is used in Section 11.7 to describe the design upgrade requirements pertaining to the energy efficiency performance of buildings that are being altered from their existing condition. These requirements are fully described in the living document available on the City of Vancouver website and which is updated from time to time.

This document contains an introduction that clarifies Intent, Implementation, Scope, and Application and is reproduced here for convenience. By-law users are reminded of the need to keep up to date with the current requirements.

Alteration Language to Support the Application of the NECB 2015

Version: June 1, 2020

ACKNOWLEDGEMENT

The City of Vancouver would like to acknowledge the permission granted by ASHRAE for use of their alteration language, from the ASHRAE 90.1-2016 standard, as the foundation for this document. ASHRAE’s willingness to support consistency within a jurisdiction with multiple energy standards is very much appreciated.

INTENT

The intention of this document is to provide building rehabilitation requirements to support the NECB in a manner consistent with the existing requirements pertaining to the ASHRAE 90.1-2016 standard.

With the implementation of NECB 2015 within Vancouver’s Building Bylaw on June 3, 2019, this document provides the minimum requirements for alterations to existing buildings designed and constructed to NECB 2011 and those buildings subject to this document through 11.7 of Division B.

SCOPE

This document pertains to the application of **existing buildings**, specifically **buildings**:

- designed to NECB 2011,
- designed to ZEBP (10.2.2.5), or
- subject to 11.7.1.1(3)(c) requirements.

APPLICATION

This document applies to the alteration of any and all building components with prescriptive requirements listed within NECB 2015, with the exception of Solar Heat Gain Coefficient requirements being applicable to the City of Vancouver only.

DEFINITIONS

Alteration means a replacement or *addition* to a *building* or its *systems* and *equipment*; routine maintenance, *repair*, and service or a change in a building’s use classification or category shall not constitute an *alteration*.

Equipment means devices for comfort conditioning, electric power, lighting, transportation, or *service water*, including but not limited to, furnaces, boilers, air conditioners, heat pumps, chillers, water heaters, lamps, luminaires, ballasts, elevators, escalators, or other devices or installations.

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Existing building means a *building* or portion thereof that was previously occupied or approved for *occupancy* by the *authority having jurisdiction*.

Existing system means a *system* or *systems* previously installed in an *existing building*.

Fenestration area means the total area of the *fenestration* measured using the rough opening and including the glazing, *sash*, and *frame*. For doors where the glazed vision is less than 50% of the door area, the *fenestration area* is the glazed vision area. For all other doors, the *fenestration area* is the door area.

Solar Heat Gain Coefficient (SHGC*) means the ratio of the solar heat gain entering the *space* through the *fenestration area* to the incident radiation. Solar heat gain includes directly transmitted solar heat and absorbed solar radiation, which is then reradiated, conducted, or convected into the *space*.

*All SHGC references within this document apply to the City of Vancouver only

Space means an enclosed *space* within a *building*.

System means a combination of *equipment* and auxiliary devices (e.g., controls, accessories, interconnecting means, and terminal elements) by which energy is transformed so it performs a specific function such as HVAC, *service water*, or lighting.

1.1 General

1.1.1 Instructions

This document shall be read in conjunction with NECB 2015. Words that appear in italics are defined in this document unless already defined within NECB 2015. All references to Parts are referring to the Parts within NECB 2015.

1.1.1.1 Additions to Existing Buildings. An extension or increase in the floor area or height of a *building* outside of the *existing building envelope* shall be considered *additions to existing buildings* and shall comply with 1.2 of this document.

1.1.1.2 Alterations of Existing Buildings. *Alterations of existing buildings* shall comply with 1.2 of this document.

1.1.1.3 Replacement of Portions of Existing Buildings. Portions of a *building envelope*, heating, ventilating, air-conditioning, *service water*, power, lighting, and other *systems* and *equipment* that are being replaced shall be considered as *alterations of existing buildings* and shall comply with 1.2 of this document.

1.2 Compliance

1.2.1 Compliance Paths

1.2.1.1 Additions to Existing Buildings. Additions to *existing buildings* shall comply with either the provisions of Parts 3, 4, 5, 6, and 7, or Part 8.

Exception: When an *addition* to an *existing building* cannot comply by itself, trade-offs will be allowed by modification to one or more of the existing components of the *existing building*. Modelling of the modified components of the *existing building* and *addition* shall employ the procedures of NECB's Part 8; the *addition* shall not increase the energy consumption of the *existing building* plus the *addition* beyond the energy that would be consumed by the *existing building* plus the *addition* if the *addition* alone did comply.

1.2.1.2 Alterations of Existing Buildings. *Alterations of existing buildings* shall comply with the provisions of Parts 3, 4, 5, 6, and 7, or Part 8.

Exception:

- a. A *building* that has been specifically designated as a Heritage building by the *authority having jurisdiction*, need not comply with these requirements.

2.1 Building Components and Systems

2.1.1 Building Envelope (supports Part 3 of the NECB 2015)

2.1.1.1 Envelope Alterations. *Alterations* to the *building envelope* shall comply with the requirements of Part 3 for insulation, air leakage, and *fenestration* applicable to those specific portions of the building that are being altered. Fenestration must also comply with the SHGC values of 10.2.2.3 of the Vancouver Building Bylaw.

Exceptions: The following *alterations* need not comply with these requirements, provided such *alterations* will not increase the energy usage of the building:

- a. Installation of storm windows or glazing panels over existing glazing, provided the storm window or glazing panel contains a low-emissivity coating. However, a low-emissivity coating is not required where the existing

- glazing already has a low-emissivity coating. Installation is permitted to be either on the inside or outside of the existing glazing.
- b. Replacement of glazing in existing sash and frame provided the U-factor and *SHGC* (Vancouver only) will be equal to or lower than before the glass replacement.
 - c. *Alterations* to roof, wall, or floor cavities that are insulated to full depth with insulation having a minimum nominal value of R-3.0/in.
 - d. *Alterations* to walls and floors, where the existing structure is without framing cavities and no new framing cavities are created.
 - e. Roof recovering
 - f. Removal and replacement of a roof membrane where there is existing roof insulation integral to or below the roof deck.
 - g. Replacement of existing doors that separate a conditioned *space* from the exterior shall not require the installation of a vestibule or revolving door, provided that an existing vestibule that separates a conditioned *space* from the exterior shall not be removed.
 - h. Replacement of existing fenestration, provided that the area of the replacement fenestration does not exceed 25% of the total *fenestration area* of an *existing building* and that the U-factor and *SHGC* (Vancouver only) will be equal to, or lower than before the fenestration replacement.

2.1.2 Lighting (supports Part 4 of the NECB 2015)

2.1.2.1 Lighting Alterations. For the *alteration* of any lighting *system* in an interior *space* or *exterior area*, that *space* shall comply with the entirety of Part 4 as applicable to that *space* or *area*.

For the *alteration* of any lighting *system* for the exterior of a building application, that lighting *system* shall comply with the lighting power density (LPD) allowances of Part 4 applicable to the area illuminated by that lighting *system* and the applicable control requirements of 4.2.4.

Exceptions:

1. Interior lighting *alterations* where the total new wattage of all *replaced luminaires* on a project is 2,000 watts or less, the total wattage of *replaced luminaires* of a lighting *system* within a *space* shall be at least 50% below the total wattage of all *removed luminaires* of that lighting *system*, unless the *space* is at or below the LPD allowances of Part 4.
Controls shall comply with the requirement of 4.2.2.1.(20).
2. Exterior lighting *alterations* where the total number of *replaced luminaires* on a project is 10 or less, the total wattage of *replaced luminaires* shall be at least 50% below the total wattage of all *removed luminaires*, unless each altered area is at or below the LPD allowances of Part 4.
Controls shall comply with the requirement of 4.2.4.
3. The replacement of a failed lamp or *ballast/driver* in an individual *luminaire* or the replacement of any failed lighting control.
4. The removal or relocation of interior or exterior *luminaires* as part of, or independent of, exceptions 1, 2, or 3.

2.1.3 HVAC (supports Part 5 of the NECB 2015)

2.1.3.1 Additions to Existing Buildings. Mechanical *equipment* and *systems* serving the heating, cooling, or ventilating needs of additions to *existing buildings* shall comply with the requirements of Part 5.

Exception: When HVAC to an addition is provided by existing HVAC *systems* and *equipment*, such *existing systems* and *equipment* shall not be required to comply with Part 5. However, any new *systems* or *equipment* installed must comply with specific requirements applicable to those *systems* and *equipment*.

2.1.3.2 Alterations to Heating, Ventilating, and Air Conditioning in Existing Buildings

2.1.3.2.1 New HVAC *equipment* as a direct replacement of existing HVAC *equipment* shall comply with the specific minimum efficiency requirements of Part 5, applicable to that *equipment*.

2.1.3.2.2 New cooling systems installed to serve previously uncooled spaces shall comply with 5.1.1.3.

2.1.3.2.3 Alterations to existing cooling systems shall not decrease economizer capability unless the system complies with 5.2.2.8 and 5.2.2.9,

2.1.3.2.4 New and replacement ductwork shall comply with 5.2.2 and,

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2.1.3.2.5 New and replacement piping shall comply with 5.2.5.

Exceptions: Compliance shall not be required:

- a. for *equipment* that is being modified or repaired but not replaced, provided that such modifications and/or repairs will not result in an increase in the annual energy consumption of the *equipment* using the same energy type;
- b. where a replacement or *alteration* of *equipment* requires extensive revisions to other *systems*, *equipment*, or elements of a building, and such replaced or altered *equipment* is a like-for-like replacement, or better;
- c. for a refrigerant change of existing *equipment*;
- d. for the relocation of existing *equipment*; or
- e. for ducts and pipes where there is insufficient *space* or access to meet these requirements.

2.1.4 Service Water Systems (supports Part 6 of the NECB 2015)

2.1.4.1 Additions to Existing Buildings. Service water *systems* and *equipment* shall comply with the requirements of Part 6.

Exception: When the service water *system* to an addition is provided by existing service water *systems* and *equipment*, such *systems* and *equipment* shall not be required to comply with Part 6. However, any new *systems* or *equipment* installed must comply with specific requirements applicable to those *systems* and *equipment*.

2.1.4.2 Alterations to Existing Buildings. Building service water *systems equipment* installed as a direct replacement for *existing building* service water *system equipment* shall comply with the requirements of Part 6 applicable to the *equipment* being replaced. New and replacement piping shall comply with 6.2.3.

Exception: Compliance shall not be required where there is insufficient *space* or access to meet these requirements.

2.1.5 Power (supports Part 7 of the NECB 2015)

2.1.5.1 Addition to Existing Buildings. Equipment installed in addition to existing buildings shall comply with the requirements of Part 7.

2.1.5.2 Alterations to Existing Buildings.

Exception: Compliance shall not be required for the relocation or reuse of existing *equipment* at the same site.

2.1.5.3 Alterations to building service *equipment* or *systems* shall comply with the requirements of this section applicable to those specific portions of the building and its *systems* that are being altered.

2.1.5.4 Any new *equipment* subject to the requirements of this section that is installed in conjunction with the *alterations*, as a direct replacement of existing *equipment* shall comply with the specific requirements applicable to that *equipment*.

A-11.7.1.1.(5) Spaces Never Previously Occupied.

Spaces “never previously occupied” shall be designed and constructed to “new building” requirements, and must comply with all applicable new construction requirements within the applicable standard/code (ASHRAE 90.1, NECB, ZEBP), rather than the *alteration* language supporting the applicable standard/code. No length of unoccupied period can downgrade the design requirements, for a space’s first occupancy, from full code to *alteration* requirements.