

Calgary



The City of Calgary Design Guidelines for the Plus 15 Network

Publishing Information

Author

The City of Calgary

Status

Version 1.0 – March 16, 2022

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1 Introduction

1.1 Purpose

The City of Calgary Design Guidelines for the Plus 15 Network supports the Plus 15 Policy. Its purpose is to provide design criteria and performance requirements required by The City for the design of new Plus 15 links and the renewal of existing Plus 15 links and related network components.

1.1.1 Supplement to Existing Codes and Standards

This Design Guideline is a supplemental document. It does not replace requirements issued by The City as the Authority Having Jurisdiction (AHJ) and does not replace or duplicate the requirements of any codes or standards.

1.1.2 Overlapping Policies

These guidelines may overlap with other City policies and guidelines. Changes to one document may not be immediately reflected in the other documents. If discrepancies are noted, notify The City and request further clarification.

1.1.3 Development Agreements

There may be existing legal agreements governing the bridges and which may include additional/other requirements under such agreements.

1.1.4 Design Innovation

The intent of these guidelines is not to limit innovation. Design Professionals are encouraged to explore all engineering and design options that are deemed appropriate for the project.

1.1.5 Reasonable Application

These guidelines should be applied with reasonable judgment to projects. The Design Professional shall work with The City where these guidelines are inappropriate or contrary to reasonable design or where proposed deviations from these guidelines occur.

1.2 Limitations

These guidelines are intended to supplement, and not to replace or duplicate, the requirements of codes including Alberta Building Code, national codes (e.g. plumbing, gas, electrical), National Building Code Commentaries, CSA and industry design standards, and City of Calgary Development & Building Approvals in respect of permits and inspections. Individual City business units and civic partners may also have their own specific design requirements, which consultants should obtain and abide by along with these guidelines. The City provides these guidelines for use in the design of new Plus 15 links and the renewal of existing Plus 15 links. Receipt of any other information or documentation from City of Calgary employees in no way relieve Design Professionals from the professional obligation to meet all applicable regulatory codes and standards.

Definitions

1.3 The City

The City of Calgary

1.4 Authority Having Jurisdiction (AHJ)

The City of Calgary department responsible for exercising authority over safety related code and standard requirements.

1.5 Design Professional

An Engineer or Architect licensed to practice in the Province of Alberta who is responsible for the design and ensuring construction is completed in general conformance to the design intent of the contract documents.

1.6 Codes and Standards

Codes and standards to be used in conjunction with the guidelines including but not limited to the National Building Code of Canada – Alberta Edition, Canadian Highway Bridge Code, National Building Codes of Canada (including plumbing, gas, electrical, fire, energy), National Building Code Commentaries, CSA and other industry design standards as they apply to the project.

1.7 Building Operator

Owner(s) of a building or their agent(s) who oversee the operations of the building.

1.8 Plus 15 Renewal

Plus 15 renewal includes, but is not limited to, repair, rehabilitation and replacement of any or all components to ensure the infrastructure meets or exceeds its intended design life.

1.9 Plus 15 Bridge Maintenance

Plus 15 bridge maintenance is work carried out on a routine basis during the life of the Plus 15 link to ensure it is safe and comfortable for public use. It includes, but is not limited to, cleaning, washing, servicing of electrical and mechanical systems, vandalism removal, the remedy of any maintenance defects and Plus 15 bridge renewal.

1.10 Plus 15 Bridge New Construction

The construction of a new Plus 15 bridge. This may include construction of a new Plus 15 bridge in conjunction with an adjacent new building where Plus 15 services originate from the adjacent new building and the Plus 15 bridge may connect to an existing adjacent building at the opposite end or directly to street level. This may also reference construction of a new Plus 15 bridge between two existing buildings. Plus 15 services originate from the building initiating the Plus 15 design and construction, or as otherwise agreed to with The City. The Plus 15 bridge may also connect directly to street level at

one end. This may also refer to the complete demolition and reconstruction of a new Plus 15 bridge where one existed previously.

1.11 Plus 15 Network

The Plus 15 Network is an elevated, weather-protected, public pedestrian walkway network located in Calgary's downtown. The Plus 15 network is comprised of Plus 15 bridges, Plus 15 connectors, Plus 15 open-air structures, Plus 15 walkways, Plus 15 level access and public easement areas.

1.12 Plus 15 links

Plus 15 links include Plus 15 bridges, Plus 15 bridge connectors, Plus 15 walkways and Plus 15 level access.

1.13 Plus 15 bridges

Plus 15 bridges are weather-protected and environmentally-controlled structures located approximately 15 feet above a roadway, light rail transit track or public lane. The City of Calgary owns Plus 15 bridges over the road right-of-way, light rail transit right-of-way and public lanes.

1.14 Plus 15 bridge connectors

Plus 15 bridge connectors are a portion of the Plus 15 bridge that are located within private property (from the edge of the property line to the property façade). This portion of the bridge is owned by the property owner.

1.15 Plus 15 walkways

Plus 15 walkways are protected public easement areas located at the Plus 15 level within private and public properties enabling public passage through the Plus 15 network.

1.16 Plus 15 level access

Plus 15 level access include public easement areas, publicly accessible stairs, ramps, escalators and elevators within a property which enable access from street level to the Plus 15 level and Plus 15 network. Plus 15 level is typically the second floor of the property where the Plus 15 bridges and walkways are located.

1.17 Plus 15 open air structures

Plus 15 open air structures are bridges or elevated walkways not weather-protected and/or environmentally-controlled. These structures were constructed prior to the adoption of the 1984 +15 Policy but are part of the current Plus 15 network.

1.18 Plus 15 bridge structural supports

Plus 15 bridge structural supports are engineered substructure elements that support existing or future Plus 15 bridges and Plus 15 bridge connectors.

1.19 Public easement area

Public easement area are areas which grant public access to interior and exterior public areas within properties. They are located on the street level and the Plus 15 level. All

new developments within the Plus 15 boundary must provide for public access through easements regardless of property use.

1.20 Plus 15 security infrastructure

Plus 15 bridge security infrastructure is physical and electronic devices on Plus 15 links for access control, detection and reporting.

1.21 Plus 15 Wayfinding

Plus 15 wayfinding includes physical and digital infrastructure that facilitates pedestrian navigation through the Plus 15 network including, but not limited to, signage, maps, and digital applications.

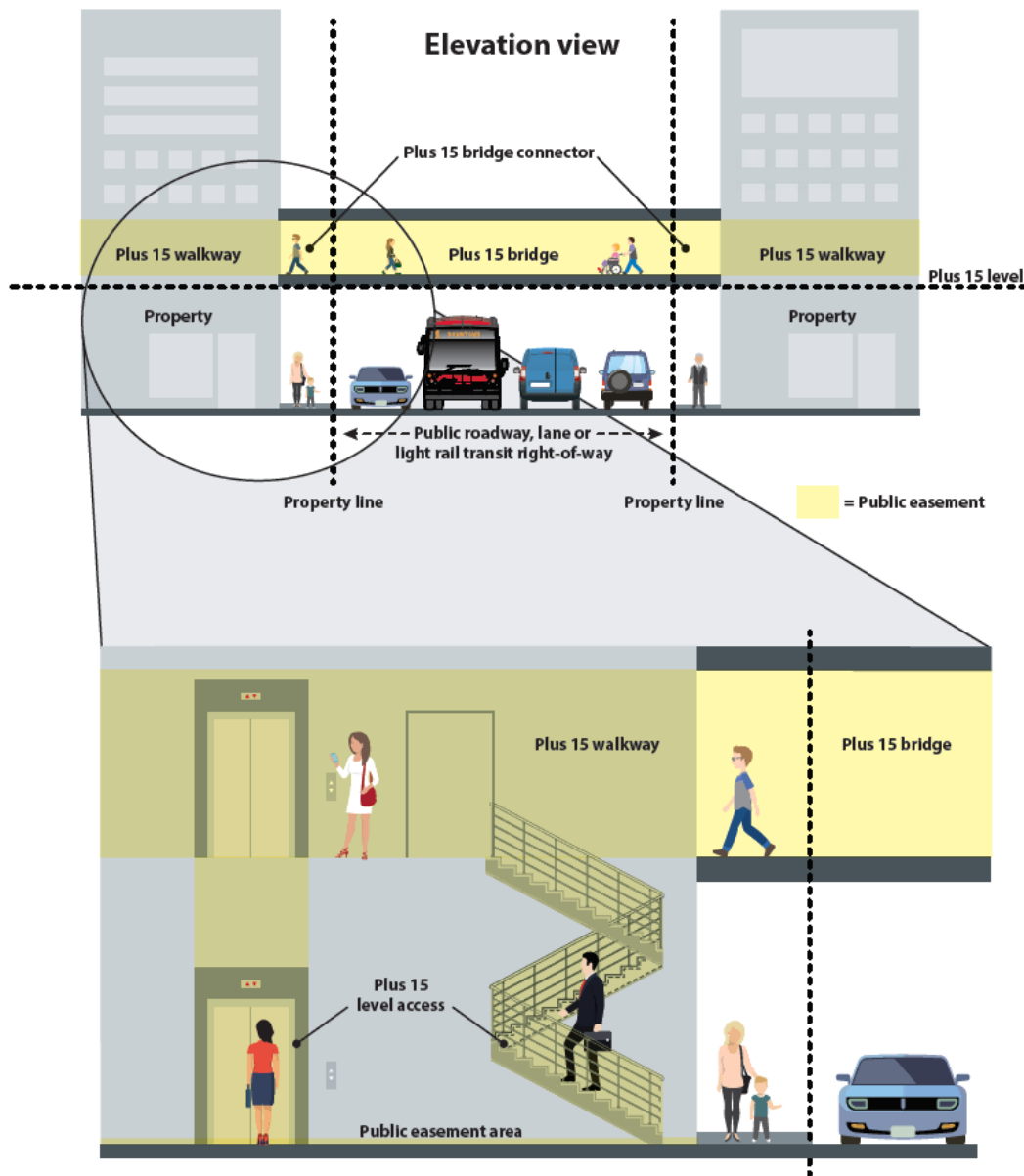


Figure 1 Typical Network Component Layout

2 Design Principles

2.1 Design Principles

Plus 15 bridges contribute to a sense of place in downtown Calgary. The Thirteen Elements of Urban Design as laid out in the Review Protocol of The City's Urban Design Review Panel shall be applied to designs with reasonable judgement. In addition, Plus 15 bridges shall be designed to add value to the public realm by:

- High quality design of all bridges, finishes and associated elements.
- Design and finishes that ensure bridges are integrated and complement the architecture of adjacent buildings through form, transparency, lighting and material selection.
- Design approach where signature designs may be warranted at key landmark or gateway locations (as per Calgary's Greater Downtown Plan). Other locations may require a more subtle design approach. The design approach will be determined at time of application.
- Interior design, finishes and lighting which contribute to the pedestrian experience while facilitating universal accessibility, wayfinding, programming, comfort and safety with integrated security infrastructure.
- Connectivity, both physically and visually, between the network and the at-grade public realm.
- Enhanced sidewalk conditions below Plus 15 bridges including employing lighting to ensure safety and improved vibrancy through creative bridge soffit designs and finishes.
- The display or integration of public art within, on or below bridges and within walkways.

2.2 Crime Prevention Through Environmental Design

Crime prevention through environmental design (CPTED) principles shall be applied with reasonable judgement. These principles include, but are not limited to:

- Access Control: Providing safe entry and exiting to and from the Plus 15 Network.
- Surveillance: The use of passive and active observation. Examples include security cameras, glazing elements on the Plus 15 bridge and lighting underneath the Plus 15 bridge for pedestrians and vehicular traffic.
- Territorial Reinforcement: Promoting a sense of ownership to deter unwanted behavior.
- Maintenance: Creating a sense of guardianship and pride over components of the Plus 15 Network.
- Design: Reduce or eliminate blind corners or dead end spaces in Plus 15 Network.
- Program Space: Encouraging events in the network to activate the space.

2.3 Design Life

The design life is the specified period during which a structure is intended to remain in service while satisfying all specified requirements of the design standard.

The design life of the bridge shall be 75 years.

Durability, maintenance and accessibility of Plus 15 bridge components shall be considered in all aspects of design and detailing including material selection, details and protective measures.

2.4 Constructability

Constructability considerations shall be included in the design of the Plus 15 bridge to minimize impact to vehicle and pedestrian traffic during construction. This includes temporary construction loading and construction sequencing.

2.4.1 Materials

- Durability, maintenance and accessibility of Plus 15 bridge components shall be considered in material selection (e.g., durable, easy to clean, not prone to discolouration, corrosion resistant).
- Identify in the operations and maintenance manual:
 - Specific elements or components having a shorter service life than the Plus 15 bridge or surrounding assemblies.
 - Anticipated timing for maintenance activities of components and materials.
- Assemblies and materials that require replacement before adjacent assemblies must be easily removable without impacting the surrounding assembly.

2.5 Sustainable Development

2.5.1 Construction Waste

Implement a construction waste management plan during construction and set a minimum waste diversion target from landfill. It is recommended that projects target the City's minimum sustainability performance requirements.

2.5.2 Green Certification

If the Plus 15 bridge is being built or replaced when an adjacent building is targeting green building certification, such as LEED, consider including the Plus 15 bridge in the building certification scope.

2.5.3 Energy

- Set lighting power density reduction targets early in the design process. Design lighting systems to achieve a 20% improvement over a baseline as defined in NECB 2017, Division B, Part 4 - Lighting.
- Select energy efficient mechanical and electrical equipment which meet the minimum requirements of the latest NECB and consider passive strategies for lighting, heating, cooling, and ventilating spaces.
- Consider temperature setbacks during both occupied and non-occupied hours to improve energy performance.
- Select an appropriate size, placement, and performance specifications for glazing and skylights to balance the needs for views and access to daylight with thermal comfort and energy performance.
- Overall U-value of glazing units should meet the minimum prescriptive requirements of the latest NECB.

2.5.4 Indoor Environmental Quality

- Implement a construction indoor air quality management plan.
- Select low emitting and low volatile organic compound (VOC) materials including paints, coatings, adhesives, sealants, flooring, composite wood products, ceilings, walls, thermal insulation and acoustic insulation.
- Include the use of daylight.

2.6 Accessibility

The Plus 15 Network shall be designed using accessibility design principles to ensure universal access throughout. The City of Calgary Access Design Standards shall be followed where feasible. The Design Professional shall consult with The City where proposed deviations occur.

2.6.1 Plus 15 Level Vertical Access

Vertical movement between grade and the Plus 15 Level must include:

- A publicly accessible elevator, and
- Escalators or a staircase.

3 Plus 15 Bridges & Bridge Connectors

3.1 Architectural

3.1.1 Building Code Analysis

A building code analysis, and energy code analysis as applicable, is to be included on design drawings, including classifications and fire separations.

3.1.1.1 No Occupancy

Plus 15 bridges are to be defined as “no occupancy”.

3.1.1.2 Exits

Plus 15 bridges and connectors shall not be considered fire exits and shall not be marked as exits. Plus 15 bridges and connectors shall comply with the current City of Calgary Regulatory Bulletin (refer to the www.calgary.ca/plus15 website for link to the bulletin). If an existing Plus 15 bridge is used for exiting it must comply with Subsection 3.2.3. Division B, of the current Building Code.

3.1.2 Clearances

3.1.2.1 Vertical Clearance

Minimum design vertical clearance requirements for Plus 15 bridges & Plus 15 bridge connectors:

- Roadway: 5.5m from Plus 15 bridge soffit to top of the roadway or lane surface.
- Light Rail Transit: 6.0m from Plus 15 bridge soffit to top of rail surface. Refer to the latest Calgary Transit LRT Design Guidelines Manual.
- Heavy Rail: 7.16m from Plus 15 bridge soffit to top of the base of rail above heavy rail corridors and crossing as specified by Canadian Pacific Rail (CPR)

and any relevant Federal guidelines.
Vertical clearance shall account for construction tolerance, long-term deflections and future road paving below.

3.1.2.2 Posted Clearance Height

The posted clearance height shall be 0.1m less than design elevation. Signage shall be posted on both faces of the bridge at base of wall cladding near or at the centre of the roadway.

3.1.2.3 Horizontal Clear Width

Plus 15 bridges shall have a minimum horizontal clear width of 4.5 metres or wider (where required) to accommodate predicted peak pedestrian volumes. 9 metre maximum clear width allowed.

3.1.3 Access to Services

3.1.3.1 Interconnections to Adjacent Buildings

All mechanical systems including plumbing, HVAC, fire protection, and controls; and electrical systems to be connected to one adjacent building only. It is recommended that all systems can be isolated from the adjacent building to accommodate future work (e.g., repairs, renovations, etc.).

3.1.3.2 Interior / Exterior Access to Roof

Where entry is required to the roof of the Plus 15, location of roof access (e.g., interior access hatch, exterior ladder) shall be coordinated with the Design Professional and building operator(s). Safe work plan, procedures and required equipment shall be included.

3.1.3.3 Access Panels

Provide a removable access panel in fixed ceilings and soffits for inspection to Plus 15 bridge components including but not limited to, roof drains, junction boxes, expansion joints, bearings, roof/floor structure and other equipment. Access panels shall be designed with ease of removal and reinstallation by one operator in mind but shall be tamper proof.

3.1.3.4 Mechanical Equipment

Provide sufficient access space for servicing, maintaining and removal of equipment and components (coils, exchangers, fans, motors, filters, etc.). Coordinate required circulation space in mechanical and electrical rooms to enable maintenance activities. Locate and size access doors such that all concealed items are accessible and so that body or hand entry (as required) is achieved.

3.1.3.5 Electrical Equipment

Ensure fixtures, including ballasts and drivers, are easily accessible for maintenance by building operator(s) without removal of adjacent elements (e.g., drywall ceilings or bulkheads).

3.1.3.5.1 Panel Boards

Panel boards to be in storage rooms, mechanical rooms and/or electrical rooms. Where these rooms are not available, panel boards shall be in corridors and provided with a lockable cover. Do not locate panels behind doors that open in the direction of the panels. Panel boards shall be located maximum 30 meters from the Plus 15 bridge and preferably located on the same floor. Where possible, provide dedicated panel board for Plus 15.

3.1.4 Conditioned Space

Plus 15 bridges are to be designed as environmentally controlled, conditioned spaces. Ensure all Plus 15 components, spaces and supporting elements are protected from external environmental conditions.

3.1.5 Deflection Requirements

Finishes shall be designed to accommodate deflection and/or movement in the Plus 15 relative to the adjacent structures.

3.1.6 Bird Deterrents

Use bird deterrents to prevent nesting of birds on or below the structure.

3.1.7 Doors

Doors are to be equipped with weatherstripping to restrict the passage of smoke

3.1.8 Surface Runoff

3.1.8.1 Runoff Impacts to Adjacent Structures

Coordinate with The City and adjacent buildings where the Plus 15 bridge may impact adjacent structures (e.g., snow drift onto adjacent LRT platform canopies).

Consideration should be taken to ensure additional maintenance requirements do not occur for adjacent impacted areas as a result of the runoff and drift impacts.

3.1.8.2 Snow & Ice Control

Control ice buildup, melt runoff, ice dams, icicle formation and sliding snow hazards onto roadways, lanes, LRT, heavy rail and sidewalks. Factors to consider include, but are not limited to, orientation and gradient of roof slopes, incorporation of curbs and/or snow guards, and avoidance of ice buildup with heat tracing, etc.

Coordinate with property owners/managers where the Plus 15 bridge may impact adjacent structures (e.g., snow drift onto adjacent LRT platform canopies).

3.1.9 Infrastructure Considerations

Road signage, traffic signals, security equipment, signals and/or lighting supported at the exterior of the Plus 15 should be considered early in the design stage in order to minimize impacts on aesthetics and building envelope. Engage with City representatives regarding nominal allowances to include in design.

3.1.10 Building Envelope

3.1.10.1 Design Requirements

3.1.10.1.1 Settlement & Deflection

Ensure the effects of short and long-term settlement and deflection are coordinated with the performance and tolerances of the specified building envelope systems on the Plus 15 bridge and the building envelope systems of the adjacent buildings.

3.1.10.2 Thermal Performance

3.1.10.2.1 Thermal Transmittance

Assembly R value targets to be established by the Design Professional. The overall effective R-value shall consider thermal breaks such as glazing transitions, Z-girts, framing materials, junctions and edges, etc.

3.1.10.2.2 Window Glazing

Windows shall be a minimum of double-glazed with at least one low-e surface and overall thermal transmittance that meets the requirements of the latest National energy code for buildings. Fritted glass is permitted. Do not use post-applied tinting films.

3.1.10.2.3 Transmittance of Fenestration

Overall thermal transmittance of fenestration (both windows and skylights) to be in compliance with the latest version of the National energy code for buildings or National Building Code of Canada – Alberta Edition, whichever is more stringent. Girts within insulation depth shall be split into horizontal and vertical framing layers to reduce thermal bridging.

Fenestration should meet the prescriptive requirement of the latest National energy code for buildings.

3.1.10.2.4 Thermal Bridging

- Avoid thermal bridging for road signage, security equipment, signals and lighting that is to be supported on the elevation or soffit of the Plus 15 bridge.
- Thermal bridging should be considered in the overall calculation of effective R values.

3.1.10.3 Air & Vapor Barrier

- Ensure continuity in air and vapour barrier at intersection between walls, roofs and material changes.
- Include fully adhered vapour barrier in all assemblies. Ensure products are compatible with building envelope configuration.
- Provide sequencing details on design drawings.
- Polyethylene vapour barrier shall not be used.

3.1.10.4 Sealants

Sealants are not to be used as a primary method of waterproofing or shedding water at joints. Appropriate counter flashings and cladding details shall be provided. Sealants must be capable of withstanding dynamically moving joints when used in exterior applications.

3.1.10.5 Roofs

3.1.10.5.1 Curbs

A minimum of 200mm high curbs shall be provided at roof penetrations other than drains.

3.1.10.5.2 Equipment / Material Loading

Do not set mechanical equipment, pipe supports, or concrete pavers directly on roofing. A minimum 200mm high curb or purpose made supports shall be used for mechanical equipment. Purpose made supports include, but are not limited to, blocks or bolsters from UV stable recycled rubber, ASA plastic or polycarbonate.

3.1.10.5.3 Green Roofs

Green roofs are not permitted on Plus 15 bridges.

3.1.10.6 Roofing

3.1.10.6.1 Bitumen Membrane

For flat or low-slope roofs, a 2-ply modified bitumen membrane is required for improved durability.

3.1.10.6.2 Non-slip Surface

Provide a supplementary protective, non-slip surface for control zone paths and/or walkways on the roof if access is required.

3.1.10.6.3 Roofing Assembly

Roofing assembly shall be returned vertically at all wall intersections, parapets and curbs for a minimum dimension of 200mm and lapped under the vertical membrane of the adjacent system.

3.1.10.7 Drainage

3.1.10.7.1 Roof Plans

The design drawings shall indicate high and low point elevations, drainage directions, back-slopes, crickets, all drains, all other roof penetrations, and all roof-mounted equipment.

3.1.10.7.2 Minimum Slopes

Provide minimum 2% roof drainage slopes, including in valleys and across parapets.

Consideration will be given for renewal of existing Plus 15 bridges where existing building conditions will not allow for excessive tapered insulation thicknesses. Conditions include, but are not limited to, existing low windowsills, low door thresholds or poor drain locations. Deviation from this requirement must be approved by The City during design.

3.1.10.7.3 Slope Forming

For new Plus 15 bridges form drainage slopes by sloping the structural roof members instead of using tapered insulation, except for back-slopes and crickets.

3.1.10.7.4 Overflow Drainage

Provide roof overflow drainage to prevent ponding overload.

3.1.10.7.5 Scuppers

Scuppers shall not be located over roadway, LRT, heavy rail and sidewalks. The scupper shall be resistant to ice blockage. Scuppers shall be located a minimum of 50mm away from the building face and include a drip edge to avoid risk of draining into the building wall cavity.

Scuppers are not to be the primary means of drainage for the roof.

3.1.10.7.6 Leader Outlets

Rainwater leader outlets to be oversized to prevent ice blockage and located to avoid draining onto roadway, LRT, heavy rail and sidewalks. Tie back to City drainage system where possible.

3.1.10.7.7 Ice Damming at Intersections

Detail wall to floor intersections to minimize ice damming.

3.1.10.7.8 Controlled-flow Drainage

Controlled-flow roof drainage design shall not be used.

3.1.10.7.9 Baskets, Strainers & Screens

All drain baskets, strainers or screens shall be cast iron or aluminum. Plastic is not permitted.

3.1.10.7.10 Tamperproof Downspouts

Downspout extensions shall be corrosion resistant and designed to prevent damage, removal and persons scaling onto roofs

3.1.10.8 Glazing and Skylights

3.1.10.8.1 Collection System Design

Collection system shall be included at all skylights and roof level glazing to prevent leakage and condensation drips.

3.1.10.8.2 Rafter & Framing

Skylight systems shall have continuous rafters. Rafters and supporting steel framing shall be designed for differential thermal movement.

3.1.10.8.3 Sill Flashing

Provide a continuous metal sill flashing to collect leakage and condensation. The flashing shall be sloped and drain to the exterior.

3.1.10.8.4 Rafter Caps

Systems with snap-on rafter caps shall be utilized. Exposed pressure bars are not permitted.

3.1.10.8.5 Lite Glazing

Exterior lite glazing including outer lite, skylight glass and any reflective or body tinted glass shall be heat-strengthened. Interior lite glazing shall be laminated with a minimum 0.76mm PVB interlayer. In addition, provide double edge seaming, flat ground edges, or other approved method to minimize surface flaws that may lead to thermal stress breakage.

3.1.10.8.6 Glazing Extent

Do not extend glazing within 300mm of soffit elevation.

3.1.10.8.7 Glass Spacers

Use thermally broken and efficient glass spacers.

3.1.10.8.8 Curtain Walls

- Choose frames with wept glazing and pocket sills sloped to the exterior to collect moisture that penetrates the glazing and drain it to the exterior.
- Provide a sill flashing with end dams and a back leg turned up into the glazing pocket at the base of the curtain wall to collect and drain curtain wall sill leakage.
- Provide jamb flashings to direct perimeter leakage down to the sill flashing.
- Provide flashing at the sill, jambs and head that are sealed to the air and water barrier at adjacent walls.
- Slope head and sill flashings to the exterior to promote drainage.
- Design the drainage system to handle condensation as well as rain.
- Coordinate the curtain wall system with the type of flashing.
- Coordinate curtain wall framing with glazing to maximize visibility.

3.1.10.8.9 Glazing Coverage and Operability

Provide glazing coverage and placement in the Plus 15 which maximizes visibility, enhances security and optimizes energy performance. Glazing shall extend the entire length of the Plus 15 bridge. Operable glazing is not recommended.

3.1.10.8.10 Skylights

Skylights are not recommended or should be kept to a minimum.

3.1.10.9 Exterior Finishes

3.1.10.9.1 Materials

All cladding materials exposed to de-icing salts (soffits, exterior walls) shall be corrosion resistant or suitably protected against corrosion.

3.1.10.9.2 Fasteners & Connections

Fasteners and connections providing vertical and lateral support to cladding shall be corrosion resistant.

3.1.10.9.3 Finish Expansion

Detail exterior and interior finishes to accommodate expansion and control joints. Expansion joints shall be easily accessible for inspection and maintenance.

3.1.10.9.4 Infiltration Mitigation

Provide a means to drain water which has the potential to infiltrate windows or jambs.

3.1.10.9.5 Entry of Birds & Insects

Drain holes, vents & other envelope discontinuities shall be detailed to discourage entry of birds, rodents and insects.

3.1.10.10 Soffit

3.1.10.10.1 Minimum Soffit Depth

Incorporate a minimum soffit depth of 300mm. Depth to be measured from underside of floor structure to soffit. Design soffit so that individual components can be replaced when isolated damage occurs (e.g., over height impacts).

3.1.10.10.2 Venting

Unheated concealed spaces shall be vented to the exterior.

3.2 Structural

3.2.1 General

The structural design should incorporate redundancy per CSA S6 Canadian Highway Bridge Design Code recommendations, including additional strength and protective measures for critical components of single-load-path structures.

Joints and bearings shall be provided to accommodate structure behaviour and shall incorporate appropriate anchorage, restraint, guides and releases.

The effect of deflection, horizontal movements and construction tolerances on the bearing reaction magnitude and location shall be considered in the design of the Plus 15 structure and supporting structural members.

Bearings and expansion joints for Plus 15 structures shall account for all differential movements between the structure and adjacent buildings.

3.2.2 Adjacent Structures

For new and rebuilt Plus 15 bridges, ensure all newly imposed conditions on existing adjacent structures are accounted for and coordinated with the adjacent Building Operator. These may include but are not limited to structural loads, deflections, vibrations and expected horizontal, vertical and rotational movements.

3.2.3 Settlement & Deflection

Where a new Plus 15 bridge is designed and constructed with a new adjacent building, ensure the effects of short- and long-term settlement and deflection is coordinated with the adjacent buildings and the performance and tolerances of the specified curtain wall and/or glazing systems.

3.2.4 Major Rehabilitation

For major rehabilitation and lifecycle replacements of existing Plus 15 bridges, investigate the safety and adequacy of the existing structure(s), supporting conditions and non-structural attachments where the existing conditions require modification. Where the existing structural lateral force resisting system is affected by new or modified conditions, confirm with the AHJ whether upgrades are required to meet current wind and seismic conditions. Modifications to the structure due to changes in existing conditions shall comply with current building and bridge code requirements.

Example of Major Rehabilitation: Replacement of cladding or glazing systems, replacement of interior finishes or existing mechanical, electrical or life safety systems, etc.

3.2.5 Minor Rehabilitation

For minor rehabilitation of existing Plus 15 bridges, ensure all modifications are compatible with the existing conditions and materials. All modifications to the structure due to changes in existing conditions shall comply with current building and bridge code requirements.

Example of Minor Rehabilitation: Isolated repairs to existing cladding system, replacement of existing roofing system, replacement of select glazing units, maintenance to existing mechanical, electrical or life safety systems, etc.

3.2.6 Effects on Adjacent Foundations

Effects of the structural static and dynamic loading from the Plus 15 bridge onto adjacent building foundations shall be considered.

3.2.7 Plus 15 Bridge Substructure

Where possible, incorporate the Plus 15 bridge substructure into adjacent buildings and away from sidewalks and roadways to minimize impacts at grade.

3.2.8 Wind Studies

Wind tunnel, Venturi and down draught effects should be considered in the design of the Plus 15 bridge.

3.2.9 Assumptions for Specialized Construction Procedures

Indicate assumptions and/or requirements for any specialized construction procedures.

3.2.10 Vibration and Deflection

3.2.10.1 Footstep Induced Vibration

Design the Plus 15 floor structure to prevent transient footstep induced vibration from exceeding the annoyance threshold. Dynamic analysis and design of dynamic response control system may be required. The National Building Code Commentary and AISC/CISC Design Guide Series 11 should be referenced for analysis guidance and design criteria for the structure.

3.2.10.2 Mechanical Unit Placement

Where mechanical units must be located on the roof of the Plus 15 bridge, ensure equipment is located on a stiff portion of roof structure to avoid resonance problems.

3.2.10.3 Vibration and Deflection Coordination

Ensure the effects of vibration and deflection are coordinated with the performance and tolerances of the specified curtain wall and/or glazing systems.

3.2.10.4 Bearing Location

The effect of deflection, horizontal or rotational movements and construction tolerances on the bearing location shall be considered in the design of the Plus 15 bridge and supporting structural members.

3.2.10.4.1 Camber

It is recommended to camber structure to minimize long-term deflection impacts on cladding and prevent appearance of sagging.

3.2.11 Materials

3.2.11.1 Environmental Protection

All Plus 15 components, materials and supporting elements shall be resistant to deterioration and protected from environmental exposure conditions.

3.2.11.2 Splash Zone Concrete

High performance concrete shall be considered in all exposed concrete elements within splash zones of the roadway (10.0m horizontal and 6.0m vertical). Use of galvanized reinforcement or stainless steel is recommended for reinforced concrete members subject to chloride exposure.

3.2.11.3 Supplementary Cementing Materials

Supplementary Cementing Materials (SCM's) such as fly ash, and silica fume may be permitted as partial replacement for cement where concrete performance may be maintained.

3.2.11.4 Exposed Steel

Exposed structural steel components subject to environmental conditions shall be hot dip galvanized steel, stainless steel. Ensure adequate surface preparation is specified to provide proper adherence of finishes.

3.2.11.5 Fracture Critical Elements

Notch tough steels shall be used for all welds and fracture critical members.

3.2.11.6 Fasteners

All fasteners and components for the attachment of miscellaneous steel components such as signage, traffic signals, etc., shall be hot-dip galvanized or stainless steel.

3.2.11.7 Galvanic Corrosion of Dissimilar Materials

All connections and finishes of dissimilar materials shall be compatible or isolated to prevent galvanic corrosion.

3.2.11.8 Differential Shrinkage Between Dissimilar Materials

Shrinkage between dissimilar materials such as concrete, steel and masonry shall be considered.

3.2.12 Civil & Geotechnical

3.2.12.1 Surface Requirements

All exterior pedestrian surfaces, vehicular and man door apron slabs shall have a minimum 2% positive drainage slope away from the Plus 15 perimeter and other structural components.

3.2.12.2 Geotechnical Report

The geotechnical report shall consider the following:

- Differential settlement:
 - Between buildings adjoined by the Plus 15 bridge,
 - Influenced by excavations or vibrations due to construction of adjacent foundations in close proximity; and
 - Between the Plus 15 supports and adjacent structures, namely if the Plus 15 bridge incorporates independent supports and foundations.
- The effects of the structural static and dynamic loading from the Plus 15 bridge onto adjacent building foundations.

Geotechnical report shall be prepared by a Professional Geotechnical Engineer registered in the Province of Alberta.

3.2.13 Detailing

3.2.13.1 Fall Protection

Where access to the roof is required for maintenance, a permanent fall protection system shall be included. Ensure fall protection layout is coordinated with equipment or other structures at roof level.

3.2.13.2 Future Supports

Include an allowance in the Plus 15 bridge design for future road signage, security equipment, signals and/or lighting to be supported on both elevations and at any location over the public right of way.

3.2.13.3 Support Structure Incorporation

Where possible, incorporate supporting structure into adjacent buildings and away from sidewalks and roadways to minimize impacts at grade. Locate impact barriers adjacent to exterior structural components such as columns and stairs adjacent to laneways, loading docks or roadways.

3.2.13.4 Expansion Joint Design

Design expansion joints in roofs, walls and/or floors to allow vertical, horizontal and rotational movements expected due to relative movement between buildings, settlement, wind, temperature and storey drift.

3.2.13.5 Expected Movement & Wheeled Travel

Indicate vertical, horizontal and rotational movement anticipated at expansion joints and design joints to permit unencumbered and smooth wheeled travel.

3.2.13.6 Drain Holes

For all HSS and pipe members subject to exposure should be capped and have drain holds provided at lowest point, seals (e.g., neoprene) around all fastening penetrations exposed to water, positive drainage at the base of the column and cap plates at the end(s) of columns.

3.2.13.7 Grounding

Direct ground connections shall be provided or ensure all metal objects are bonded and grounded to ensure that any electrical charges are conducted to earth as bearings and joints can effectively isolate the Plus 15 bridge from the adjacent buildings. Refer to the City of Calgary LRT Design Guidelines regarding grounding over LRT right of way.

3.2.13.8 Structures Above Light and Heavy Rail Tracks

Reference City of Calgary LRT Design Guidelines and Federal regulations for specific requirements pertaining to structures above LRT tracks (e.g., incorporation of anti-static plates at the soffit, catenary shrouds, etc.).

3.3 Mechanical

3.3.1 Accessibility to Equipment

3.3.1.1 Clear Access Requirements

Indicate access space required for equipment maintenance on drawings. Ensure clear access is provided. Provide access to all valves and accessories associated with the terminals.

3.3.1.2 Mechanical Unit Placement

For new Plus 15 bridges do not locate mechanical units on rooftop of Plus 15 bridge. Existing units to be obscured from street view by screening or architectural elements.

3.3.2 Design Criteria

Design mechanical systems based on the following criteria:

3.3.2.1 Indoor environmental design requirements

Systems to be capable of maintaining a comfortable environment meeting an indoor temperature of 20°C for heating and 27°C for cooling.

Base heating and cooling design on outdoor ambient temperatures given in the building code. For Calgary the 1% January Outdoor Design Temperature is -32C. For Calgary the 2.5% July Outdoor Design temperature is 28C dry bulb, 17C wet bulb.

3.3.3 Plumbing & Drainage

3.3.3.1 Domestic Water Service

3.3.3.1.1 Piping

Domestic water piping to be hard drawn type L copper to ASTM B88. Solder for fittings to be lead-free. Grooved fittings not permitted on domestic water piping.

3.3.3.1.2 Hose Bibs

Hose bibs if required to be non-freeze type complete with isolating valves.

3.3.3.2 Storm Piping System

3.3.3.2.1 Roof Drains

Provide a minimum of two roof drains per contained near-flat roof area. Scuppers are not to be used as the primary means of drainage for the roof. Avoid use of control flow drains and if installed, ensure Structural consultant allows for loading.

3.3.3.2.2 Drainage Routing

If possible, route storm drainage internally within the building and connect directly to the City storm system. Avoid discharging flow to grade.

3.3.3.2.3 Insulation

Insulate roof drain sumps and horizontal storm piping complete with vapour barrier.

3.3.3.3 Natural Gas Piping

Natural gas piping shall be in accordance with ASTM A53, Schedule 40. Weld all distribution piping within the building and utilize screwed and/or flanged fittings at equipment only.

3.3.4 Fire Protection

3.3.4.1 Sprinkler Requirements

Where sprinkler system is to be installed, system shall be designed and installed to the requirements of the National Fire Protection Association (NFPA) 13 or the appropriate version for the building code in force. System should be isolated from the adjacent building.

- Show as a minimum the following on the tender drawings:
 - Location and type of sprinkler heads.
 - Routing of main lines.
 - Location of any supervised valves
 - Fire protection system schematic.
- Show location and types of fire extinguishers to be installed.
- Piping to be black steel and meet requirements of ASTM A53.
- Dry pipe and fittings shall be galvanized.
- All system components shall be U.L.C. listed.
- Grooved piping systems are acceptable on piping 65mm and larger.
- All piping 50mm and smaller to be screwed.

3.3.4.2 Protection Against Freezing

Consider strategies for protection of sprinkler systems against freezing, including but not limited to installing dry systems or insulation and heat tracing of system where freezing may occur.

3.3.5 Heating

3.3.5.1 BMS Contacts

Provide system contacts for Building Management System (BMS) control.

3.3.5.2 Hydronic Heating

3.3.5.2.1 Reverse Return System

Two pipe reverse return system preferred for heating water piping.

3.3.5.2.2 Grooved Fittings

Grooved fittings are not permitted on heating water piping.

3.3.5.2.3 Piping Materials

- Pipe runouts to terminal units to be soft-temper Type L copper, to ASTM B88.
- Pipes mains 65mm to 250 mm to be in accordance with ASTM A53, Schedule 40. Pipes 50 mm and smaller to ASTM A53, Schedule 40 or hard-tempered copper to ASTN B88, Type L

3.3.5.2.4 Valves

Each terminal unit to have isolating valves and control valves on supply side. On return side install balancing valve and isolating valve. Install air vents on high side of return. Provide access to all valves and accessories associated with the terminals. Provide means of isolation, balancing and flow measurement for equipment and major loop circuits.

3.3.5.3 Base Building Isolation

Provide means of isolation, balancing and flow measurement for equipment and major loop circuits. Provide isolating valves on piping between base building and Plus 15 bridge.

3.3.5.4 Service Space Heating

Where services are located in the soffit and/or ceiling space, heat the area to protect services from freezing.

3.3.6 Cooling

3.3.6.1 BMS Contacts

Provide system contacts for Building Management System (BMS) control.

3.3.6.2 Outdoor Air

Use outdoor air for free cooling when ambient temperature conditions permit.

3.3.6.3 Cooling Distribution

Two pipe reverse return system preferred for cooling water piping. Grooved fittings are not permitted for cooling water piping.

3.3.6.4 Pipe Materials

- Pipe runouts to terminal units to be soft-temper Type L copper, to ASTM B88.
- Pipes mains 65mm to 250 mm to be in accordance with ASTM A53, Schedule 40. Pipes 50 mm and smaller to ASTM A53, Schedule 40 or hard-tempered copper to ASTN B88, Type L

3.3.6.5 Base Building Isolation

Provide means of isolation, balancing and flow measurement for equipment and major loop circuits. Provide isolating valves on piping between base building and Plus 15 bridge.

3.3.7 Supply Air Handling

3.3.7.1 Economizer Cycle

Air handling system to be complete with economizer cycle including 100% outside air for cooling as ambient conditions permit.

3.3.7.2 Air Filters

At a minimum, provide air filters with minimum dust spot efficiency of 30% (MERV 8) based on ASHRAE 52.1. Consider using MERV 13 filtration where practical. For hydronic systems provide summer/winter position filters. Filter media shall be ULC listed.

3.3.7.3 Refrigerant Coils

Refrigerant coils with multiple compressors shall be alternate tube circuited in order to distribute the cooling effect over the entire coil face at reduced load conditions. Coils to be ARI certified.

3.3.7.4 Dampers

For outdoor and exhaust air dampers utilize aluminum thermally insulated dampers with leakage characteristics of 25 L/s/m² at 1 KPa differential static pressure at -40°C. For return air dampers utilize non-insulated aluminum airfoil dampers with leakage characteristics of 52 L/s/m² at 1 KPa differential static pressure at -40°C.

3.3.7.5 Manufacturers

Units shall be produced by a recognized manufacturer, who has complete catalogue information and who maintains a local service agency with factory trained mechanics and parts stock.

3.3.8 Controls

3.3.8.1 Automatic Controls

Provide a system of automatic controls for HVAC equipment that ties into adjacent base building system.

3.3.8.2 Control System Requirements

- Control heating, ventilating and air conditioning systems.
- Execute control strategies to minimize energy consumption.
- Monitor and record mechanical systems performance.

- Provide visual/audible alarm to facility operations and maintenance staff if indoor ambient temperatures approach freezing conditions.

3.3.9 Vibration

3.3.9.1 Vibration Isolation

- Use the latest ASHRAE Application Handbook as a guide for selecting vibration isolation of mechanical equipment.
- Provide vibration isolators for all pipe hangers.

3.3.9.2 Ducts, Terminal Units, Air Handling equipment

- Avoid placing rooftop equipment over noise-sensitive areas. Provide details describing acoustic treatment, duct configuration and roof penetration seals for any rooftop installations.
- Locate balancing damper as close to branch takeoff from main as possible.
- Use flexible connections between fans, plenums, and all related ductwork.

3.3.9.3 Plumbing Noise

Ensure sleeves are provided for piping that penetrates walls. Seal space between pipe and sleeve with caulking.

3.3.10 Start-up & Testing

3.3.10.1 Test Reports

Include a complete list and test report forms for all tests required in the specification. Identify which test needs the professional mechanical engineer to witness and those by the commissioning agent if applicable.

3.3.10.2 Start-up

Contractor to conduct operating start-up to confirm that equipment and systems meet specified requirements after mechanical installations are completed and pressure tested, and all systems are operational.

Start-up testing to include:

- Start-up of air systems including fans, coil circulators, humidifiers, exhaust air system and interlocked cooling systems
- Start-up of hydronic systems (pressure testing, balancing, distribution system checks)
- Start-up of plumbing systems (pressure testing, flushing and cleaning, disinfection)

3.3.10.3 Reporting

All tests forms required as per specifications to be recorded on the test report forms and submitted to the Design Professional.

- Include a complete list and test report forms for all tests required in the specification. Identify which test needs the professional mechanical engineer to witness and those by the commissioning agent if applicable.
- Contractor to conduct operating start-up to confirm that equipment and systems meet specified requirements after mechanical installations are completed and

pressure tested, and all systems are operational.

- All tests forms required as per specifications to be recorded on the test report forms and submitted to the Design Professional.

3.4 Electrical

3.4.1 Panel Boards

3.4.1.1 Dedicated Circuits

Provide dedicated circuits for all devices within the Plus 15, including light fixtures, emergency and exit lights, receptacles, mechanical equipment dedicated to Plus 15 etc.

3.4.1.2 Breakers

Use circuit breakers for all branch circuit protective devices.

3.4.1.3 Electrical Panel Schedules

Provide typewritten electrical panel schedules for all distribution equipment feeding facility devices (lighting, receptacles, mechanical equipment etc.).

3.4.2 Conduit and Wiring

3.4.2.1 Conduits and Cable Tray

- Specify all A.C. and D.C. wiring to be installed in conduit or wireway (except where NMD90 and AC90 cables are used). Network, security, and telephone cabling also to be installed in conduit or cable tray.
- Exposed conduit or cable tray is not accepted and must be concealed except in service areas.
- Provide one (1) 21mm conduit from the panel feeding other devices within the facility to junction box for future exterior signage use. Exact location to be coordinated with the Design Professional.
- Where conduit is used in ceiling plenums, use EMT: do not use FT4 low spread rated PVC conduit.
- Minimum size of conduit to be 21mm.
- Use Liquid-tight Flexible Conduit as raceway for final connection to all motor terminal boxes, pipe mounted and other devices subject to movement or water, minimum length to be 460mm plus 4 times and conduit diameter. Provide a separate ground wire within conduit, bond to motor frames and system ground.
- Wiring of power and low voltage devices, even in an existing building, are under no circumstances to be installed or remain in the same conduit.

3.4.2.2 Conductors

- Use copper conductors for all branch circuits to the facility. Use copper conductors with RW90 X-Link or THNN insulation. Minimum size of branch circuit wire to be #12 AWG.
- Provide a 100% rated neutral and bonding conductor with all feeders.
- Size branch circuit conductors to avoid excessive voltage drops. Indicate conductor sizing in design documents.

3.4.2.3 Cables

- Avoid the use of non-metallic sheathed cables.
- Use AC-90 cable only in short lengths for final connections to luminaires and

similar equipment. Provide sufficient length of flexible drop to luminaires to enable unit relocation of one meter in any direction. Drops are to occur from junction box on structure to each luminaire.

3.4.3 Wiring Devices & Boxes

3.4.3.1 Housekeeping Receptacles

Provide a minimum of one 20A T-slot housekeeping receptacles in the Plus 15 bridge at approximately 15m intervals. Avoid using floor mounted receptacles for ease of maintenance. Receptacles to be lockable.

3.4.3.2 Specification Grade Receptacles

Use specification grade receptacles in all locations.

3.4.3.3 Receptacle Labels

Identify each receptacle with panel board identification and circuit number. Use hot, stamped or engraved machine printing labels minimum 6mm (¼”) lettering. Fix label to receptacle cover plate.

3.4.4 Lighting & Lighting Control

3.4.4.1 Energy Efficiency

Design lighting systems to achieve a recommended 20% improvement over a baseline as defined in NECB 2017, Division B, Part 4 - Lighting.

3.4.4.2 Glare

Design to minimize direct and reflected glare.

3.4.4.3 Photocells & Time Clocks

Use photocell and astronomical time clocks for outdoor luminaires.

3.4.4.4 Dimming

For energy conservation purpose, recommend using lighting control strategies to turn off or dim general-purpose luminaires when there is enough daylight and when the facility is closed.

3.4.4.5 Level of Illumination

The facility is required to be illuminated to achieve a minimum average level of illumination not less than 50 lx at floor level when the facility is open, closed and upon normal power failure.

3.4.4.6 Breaker Switching

Do not use breaker switching for lighting control except for night lights.

3.4.4.7 Luminaire Specifications

Luminaires to conform to CSA C22.2 No. 223, CSA C22.2 No. 250.13, UL8750 and UL1310.

3.4.4.8 Luminaire Types

Luminaires are to be Light Emitting Diodes (LED).

3.4.4.8.1 Colour Rendering Index

CRI shall be greater than or equal to 80 for interior and 75 for exterior.

3.4.4.8.2 LED Rating

Rated LED lifetime shall demonstrate 70% lumen maintenance at 35,000 hours as defined in the Illuminating Engineering Society (IES) standards.

3.4.4.8.3 LED Rating & Certification

LEDs shall be IES LM-79 and LM-80 tested and certified.

3.4.4.8.4 Correlated Colour Temperature

Correlated Colour Temperature to match to adjacent building.

3.4.4.9 LED Drivers

Drivers are to be accessible for maintenance.

LED Drivers (Electronic-Instant Start):

- Drivers shall comply with ANSI C62.41 Category A for Transient protection.
- Driver shall contain no PCB or mercury and to be compliant with RoHS, as per RoHS Directive 2002/95/EC.
- Drivers to be primary fused, output ripple maximum 10%, minimum efficiency 93%, power factor >0.9 at full load, frequency 50-60 Hertz, THD <10% at full load at 120V and <15% at 347V.
- Lifetime rated at minimum 50,000 hours, minimum 0-10V dimming function.
- Temperature: -40 to +40 degree Celsius for exterior, 0 to +40 degree Celsius for interior luminaires.

3.4.5 Emergency & Exit Lights

3.4.5.1 Feed

All remote heads, emergency luminaires and exit signs are to be fed from same panelboard wherever possible.

3.4.5.2 Exit Signs

- Exit signs are to be CSA C860 approved (ISO 3846-1 & ISO 7010).
- Exit lights are to have extruded aluminum housing, finish to be confirmed with the Client/Architect/Interior Designer.
- Exit signs are to be LED.
- Exit signs are not required where the Plus 15 bridge is not being used for exiting.

3.4.5.3 Emergency Lighting

Battery operated emergency lighting units are to be complete with long-life sealed lead acid batteries, 10-year life expectancy, fully automatic charger with automatic high and low rates, built-in test switch, high-rate charge indicator, voltmeter, ammeter, and mounting bracket.

3.4.5.4 Remote Heads

Remote heads are to be double head, LED type, finished in approved color by the Client/Architect/Interior Designer.

3.4.6 Fire Alarm System

3.4.6.1 Signs

Provide LED “Fire Alarm Do Not Enter” sign at the entrance to each building and connect the sign to the respective building fire alarm system. This sign is to be mounted at maximum height of 2744mm (9 feet) above finished floor. Sign to be red illuminated when there is a fire alarm and off during normal operation.

3.4.7 Security System and Door Access Control

Review individual security risks and needs for Plus 15 bridge to determine requirements for interior and exterior security infrastructure with all stakeholders. Consult the Physical Security Standards for the Plus 15 Network during design.

3.4.8 Start-up and Testing

3.4.8.1 Test Reports

Include a complete list and test report forms for all tests required in the specification. Identify which test needs the Design Professional to witness and those by the commissioning agent if applicable.

3.4.8.2 Basic electrical start-up and testing:

Test and check all portions of the electrical systems for satisfactory operation. Before energizing any portion of the electrical systems:

- Perform megger tests on all feeder conductors applicable to the facility.
- Torque all bus connections to manufacturer’s requirements and seal with red lacquer.
- Prior to starting motors, confirm motor nameplate data with motor starter heater overloads, verify rotation, ensure disconnect switches are installed and confirm labelling of motors, disconnects and starters.
- Functional test of all luminaires, dimmers and lighting control equipment such as photocells and time clock settings.
- Check operation of all battery-operated emergency lighting units exit lights and connection of exit lights to emergency lighting units as specified.
- Complete fire alarm verification as per current addition of CAN/ULC-S537 Standard for Verification of Fire Alarm System.

3.5 Accessibility

3.5.1 Universal Access

Public access to the Plus 15 level should be universally accessible.

3.5.2 Automatic Doors

Provide automatic sliding doors, push button access and/or occupancy sensors at each end of the Plus 15 bridge. Power door operators to be:

- Installed at 800mm +/- 50mm
- Located in a barrier-free travel path
- Marked with the international symbol of access
- Located clear of the door swing and no more than 1500mm from that door swing
- Capable of the following, unless equipped with safety sensors:
 - Fully opening the door in not less than 3 seconds
 - Requiring a force not more than 65 newtons to stop movement of the door

Cane detectable guard to be installed on the hinged side of the power-assisted doors that swing open into path of travel.

Automatic doors shall have a master control for door closers to keep doors open for a minimum of 8 seconds and held at an angle between 70-90 degrees.

Sliding doors shall be breakaway.

3.5.3 Flooring Materials

Use flooring materials within the bridges that provide low rolling resistance, minimize slips and falls, and are easier for cane detections. Surfaces should be slip-resistant, non-glossy, stable with minimal patterns. Coefficient of friction to be no less than 0.5 when wet or dry.

3.5.4 Wall Surface Treatment

Where wall surfaces are constructed entirely of glass, provide a horizontal warning strip, minimum 150mm wide and 1350mm above the floor surface.

3.5.5 Walking Surface Indicators

Use contrasting colours to assist in wayfinding and to help the visually impaired navigate through bridges at intersections and grade changes.

3.5.6 Clear Walking Path

No protrusions into the clear walking path are permitted.

3.5.7 Grab Railing

Provide a grab railing on both sides of Plus 15 bridges minimum 865-965mm above the finished floor and shall contrast in colour from the adjacent walls or surrounding areas.

3.5.8 Convex Mirrors

At the junction between Plus 15 bridge and adjacent building, provide convex mirrors at strategic locations where 90 degree turns exist to assist in collision avoidance.

4 Plus 15 Security

Plus 15 bridge security infrastructure includes physical electronic devices on Plus 15 links for access control, detection and reporting.

4.1 Signage

Signs will be placed in the locality of the cameras. The signs will indicate:

- The presence of video surveillance monitoring
- Contact telephone number for information about the system
- Contain the following – “Information is being collected for the purposes of law enforcement in accordance with FOIP SEC. 33”

4.2 Cameras

It is recommended that camera infrastructure meet the following requirements:

- Vandal-resistant to an IK10 rating at minimum
- Minimum 1080p resolution (i.e., 2MP or above)
- WDR (Wide Dynamic Range) capability
- IR (infrared radiation) illuminator
- Autofocus / remote focus
- Stream using the H.264 codec at a minimum
- Ability to utilize multiple streams
- Utilize PoE or PoE+ power
- Ability to stream 15 FPS (frames per second) at a minimum
- Ability to connect to an NTP server
- Have a permissions-based user authentication service available
- ONVIF compatible
- Compatible with the video management system software at the site

5 Wayfinding

5.1 Principles

Refer to Appendix C Plus 15 Skywalk Wayfinding System Definition

6 Technical Documents and Submissions

6.1 Development Applications Review Team Process

The Development Applications Review Team (DART) is responsible for reviewing proposed developments, distributing applications to relevant City stakeholders for detailed reviews, and providing comments back to the applicant. Additional details of the Plus 15 bridge are required to ensure the design complies with City policies and to ensure the capital asset taken over meets City Standards. The following shall be submitted at each review stage:

Review Stage	Submission Requirements
Prior to Decision (PTD)	<p>1. Design Review</p> <p>In accordance with the Plus 15 Policy and The City of Calgary Design Guidelines for the Plus 15 Network together with Section 35 of the Land Use Bylaw, provide 60% contract documents including drawings and specifications for the</p>

	<p>proposed Plus 15 bridge(s) as part of this development permit for City review. The Plus 15 Bridge design should conform to The City of Calgary Design Guidelines for the Plus 15 Network.</p> <p>2. Letter of Commitment</p> <p>In accordance with Part 13, Division 3, Section 8.23 of the Land Use Bylaw, provide a letter of commitment from the building opposite the subject site that they are willing to receive the Plus 15 bridge shown on the submitted plans and the building opposite the site is configured to receive the Plus 15 bridge as shown on the submitted plans.</p> <p>3. Easement Plans</p> <p>In accordance with Part 13, Division 3, Section 8.0.4 (c)(B) of the Land Use Bylaw, provide an additional plan which illustrates the Plus 15 easement space throughout the building. Such easement space should conform to the requirements of the Plus 15 Policy and Land Use Bylaw.</p> <p>The plan should show the Plus 15 easement area and should extend from grade, through the 2nd floor, to the Plus 15 bridge including the stair or escalator. This plan forms one of the Schedules in the Plus 15 Development Agreement.</p>
<p>Prior to Release (PTR)</p>	<p>1. Design Review</p> <p>In accordance with the Plus 15 Policy and The City of Calgary Design Guidelines for the Plus 15 Network together with Section 35 of the Land Use Bylaw provide 90% design drawings and specifications for the proposed Plus 15 bridge(s) (incorporating all comments provided as noted above) in accordance with the Plus 15 Policy, The City of Calgary Design Guidelines for the Plus 15 Network and Section 38(1)(h) of the Land Use Bylaw for City review.</p>

In accordance with the Part 17, Section 650(1)(b) (I and ii) of the Municipal Government Act, the Plus 15 Policy and Part 13, Division 3, Section 8.0.4 (c) of the Land Use Bylaw a Development Agreement, to the satisfaction of the City Solicitor, shall be executed in conformity with all reports, plans and materials submitted to and approved by the Development Authority, including:

- The delineation of Plus 15 public access easement areas;
- Construction of the Plus 15 bridge which is the responsibility of the developer as

noted on the development permit plans;

- Details of responsibilities for and construction of all security infrastructure, monitoring and enforcement within the Plus 15 bridge;
- Details of responsibilities for the construction and maintenance of all wayfinding infrastructure;
- Details of responsibilities for and construction of all improvements within the public rights-of-way,
- Maintenance obligations, including but not limited to repairs, lifecycle replacements, and third-party damage for the Plus 15 bridge which shall be the responsibility of the building owner throughout the lifetime of the development;
- The ability for City of Calgary (as asset owner and owner of the right of way over which the bridge is to be constructed) to inspect the Plus 15 bridge during construction (at the time of structure completion prior to cladding of the bridge envelope, upon cladding completion and roof completion) and prior to issuance of a Development Completion Permit;
- If applicable, details with respect to financial contributions to the Central Business District Improvement Fund in accordance with the Bonus provisions of Part 13 Division 3 of Land Use Bylaw 1P2007.

6.1.1 Amending Conditions

As an amending condition, the following packages (including drawings and specifications) shall be submitted to The City:

- Issued for Tender (IFT)
- Issued for Construction (IFC)
- Project Close-out Package
 - As-built drawings
 - Record drawings
 - Operations and Maintenance Manual (refer to section 7.3 Documentation for further details)

6.2 Documentation

6.2.1 Authentication

All documents should follow APEGA and AAA requirements for authentication, including project specifications, that are submitted to The City shall be signed and sealed by the Professionals of Record. Professionals of Record shall be registered in the Province of Alberta.

6.2.2 Contract Document Requirements

6.2.2.1 Design Drawings

Unless noted otherwise, drawings submitted to The City shall be at 11"x17" and in electronic .pdf format. Ensure all drawings are legible.

6.2.2.2 Bridge File Number

The bridge file number, assigned by The City, shall be incorporated into the project title, included on the title block of each drawing page for each discipline and into the header of the specifications.

6.2.2.3 Location Information

The adjacent road and/or laneway names shall be indicated on a site or key plan showing the orientation of the Plus 15 bridge. This plan shall note location information including but not limited to:

- Municipal address for each adjacent building,
- Plan, block and lot numbers for each adjacent building;
- Property name for each adjacent building; and
- Development permit number.

6.2.3 Operations and Maintenance Manuals

6.2.3.1 Digital and Hard Copy Manuals

At a minimum, provide digital Operations and Maintenance manuals in .pdf format complete with bookmarks and Optical Character Recognition (OCR). Copy the final digital copies to CD media with a custom CD label. Where a hard copy is provided, arrange the content and organization of the digital version for each manual in a manner identical to the hard copy version.

Further digital and hard copy manual requirements would be provided on a project-by-project basis.

6.2.3.2 Technical Disciplines

The Design Professional is required to specify all technical documentation required as it pertains to that specific Plus 15 project. The subsequent sections serve as a general list of requirements.

6.2.3.2.1 Architectural

Manual to contain:

- Details for the care and maintenance of all visible surfaces including service instructions, instruction sheets, spare parts lists and supplies and all other information that will be useful to the Owner in the operation and maintenance of the building and its equipment. Include all safety requirements required for maintenance.
- Record drawings, manufacturer drawings and brochures, operating instructions, maintenance instructions, service manuals and parts list including names and addresses of all suppliers, names and addresses of nearest service personnel.
- Manufacturer's recommended caretaking practices for specified interior finishes, including recommended cleaners and equipment required for caretaking.
- A list of all finish materials and locations used on the project and relate actual materials used with specified materials (e.g., Paint (Product Number) specified,

locations in the project).

- A list of all door and window hardware products including manufacturer, supplier, product number and any maintenance or service instructions.
- A list of all firestopping products used with product type and location.
- All guarantees, warranty and performance certificates as required in the technical specifications.

6.2.3.2.2 Structural and Building Envelope

Manual to contain:

- Results from any thermographic or air/water leak testing completed on the project
- All guarantees, warranty and performance certificates as required in the technical specifications.
- Repair recommendations on routine building envelope components such as flashing, gaskets, sealants, drains, scuppers etc.
- Shop drawings for all structural and building envelope components, including:
 - Structural steel (trusses, beams, joists, columns, steel decking, cross bracing etc.)
 - Reinforcing steel
 - Structural connections
 - Structural timber (trusses, beams, columns, bracing, decking etc.)
 - Post-tensioning system
 - Building envelope commissioning reports
 - Roofing
 - Curtains walls
 - Skylights
 - All exterior wall systems (including cladding used, insulation, air or vapor barrier, secondary system to support cladding such as girts/clips etc.)

6.2.3.2.3 Mechanical

Manual to contain:

- Operating instructions, and operating conditions such as temperature and pressure
- Location of equipment and equipment name tags
- Maintenance instructions and schedules for all mechanical equipment and controls
- Recommended list of spare parts
- Lubrication schedule, Filter schedule
- Equipment nameplate data, serial numbers, and operating curves
- A valve schedule and locations
- Sequence of operations
- Copy of all test data

- Copy of all inspection, certifications and warranty letters
- Set of final reviewed Shop Drawings
- Air and water balancing reports
- All completed commissioning reports
- As-built construction drawings
- Summary of consultant, suppliers and contractors including name, address and telephone number of each.
- All guarantees, warranty and performance certificates as required in the technical specifications.

Mechanical equipment and systems may include the following:

- Air handling equipment, distribution and components
- Any storm, sanitary, domestic water and natural gas distribution system
- Chillers and heating water generators, associated equipment, distribution systems
- Automatic controls and instrumentation
- Life safety and fire protection

6.2.3.2.4 Electrical

Manual to contain:

- Table of contents arranged sequentially by systems under section numbers.
 - Label tabs of dividers between each to match section numbers in table of contents.
- Lighting and lighting controls.
- Fire alarm devices.
- Security.
- Electrical equipment and their locations.
- Panel schedules.
- Single line diagram record drawing (2 copies) – One 11x17, other to be full size, folded and placed inside a clear plastic binder page.
- A copy of all wiring diagrams.
- Recommended maintenance for each system and equipment
- Maintenance and operating instructions for all electrical equipment and controls
- Copy of all test data
- Motor list showing each motor number, name, horsepower, current rating, heater size and type etc.
- Copy of all inspection, certifications and warranty letters.
- Set of final reviewed Shop Drawings
- All completed commissioning reports.
- List of spare parts of all electrical equipment complete with names, addresses, service representatives and suppliers.
- Tabs are to be celluloid covered fastened to hard paper dividing sheets.

- List the electrical consultant, electrical contractor and suppliers with names, addresses and telephone numbers of contacts.
- Copies of “as-built” single line diagrams as part of the Operating and Maintenance Manuals. Include a note on the single line diagram indicating which panel is feeding the facility devices.
- All guarantees, warranty and performance certificates as required in the technical specifications.

7 Reference Materials & Standards

This list is a reference and not intended to be a complete or finalized list.

7.1 City and Civic Partner Reference Documents

- Access Design Standards
- Accessing and Working On or Adjacent to Calgary Transit (CT) Right-of-Way (ROW) Policy
- Bird-Friendly Urban Design Guidelines
- Calgary Transit LRT Design Guidelines Manual
- Calgary Transportation Plan
- Centre City Illumination Guidelines
- Centre City Plan
- Centre City Urban Design Guidelines
- Design Guidelines for Bridges and Structures
- Design Guidelines for City Funded Buildings
- Design Guidelines for Street Lighting
- Downtown Underpass Urban Design Guidelines
- Municipal Development Plan
- Security Standard for Buildings & Sites
- Transit Friendly Design Guide

7.2 External Reference Documents

- National Building Code of Canada – Alberta Edition (AE)
- Alberta Fire Code
- Alberta Association of Architects Act and Code of Ethics
- Accessible Design for the Built Environment (CAN/CSA-B651)
- ANSI – Integrative Process for Design and Construction of Sustainable Buildings and Communities
- Association of Professional Engineers and Geoscientists of Alberta (APEGA) Professional Practice Standards and Guidelines
- American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Standards
- ASTM International Standards
- Canadian Engineering Foundation Manual
- Canadian Green Building Council Publications (CaGBC)
- Canadian Handbook of Practice for Architects

The City of Calgary

Design Guidelines for the Plus 15 Network

- Canadian Highway Bridge Design Code (CHBDC) CAN/CSA–S6
- Calgary Land Use Bylaw 1P2007
- Crime Prevention through Environmental Design (CPTED)
- CSA Group Standards
- National Building Code of Canada (NBC)
- National Energy Code of Canada for Buildings (NECB)
- National Fire Code
- National Institute of Building Sciences
- National Plumbing Code
- Occupational Health and Safety Act (OH&S)
- Royal Architectural Institute of Canada Canadian Handbook of Practice (CHOP)

Appendix A: CPTED Report



CPTED Report.pdf

Appendix B: Physical Security Standards for the Plus 15 Network



Physical Security
Standards for the PI

Appendix C: Plus 15 Skywalk Wayfinding System Definition



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g_System_Definition